

LinkedIn Discussion Group

Sept 2012

130 Comments

Short Introduction: This is an example of the concern among PhD's in the current job market and possible solutions within and outside academia. This of course, respects those who wish to stay in academia, but addresses the concern among those who wish to pursue non-traditional science career paths. Stemming from this, what happens at the Post-Doc level and how can we fix this situation? This pool of discussion comments goes into great detail and pinpoints the issues that we are currently faced with. Enjoy.

~Ryan Raver



PhD Careers Outside of Academia



Start of Discussion-Article Posted: Is There A "Post-Doc Crisis"? Give Post-Docs A Career Not Empty Promises...

<http://www.nature.com/news/2011/110302/full/471007a.html>

Discussion Started: Sept 2012



[Give postdocs a career, not empty promises](#) nature.com

The career structure for scientific research in universities is broken, particularly in the life sciences, my own overcrowded field. In coffee rooms across the world, postdocs commiserate with each other amid rising anxiety...

[Ryan Jensen](#), [Isabel Martín Manjarrés, Ph.D.](#) and [35 others](#) like this

130 Total Comments:



[Jason Mastaitis](#) •Excellent article. This is exactly the type of thing that needs to happen, but probably won't because of budgets and the surplus of applicants. What incentive is there for the system to change when you still have so many young PhDs competing for postdoc positions? Still good to see this published in Nature.



[Ryan Raver](#) • I agree. I wish there were incentives to bring about some sort of change. In some realities, the "broken" system may always stay "broken" until something dramatically changes to allow for top-down structural changes. I just wish post-docs had the option of becoming permanent to allow for benefits or even retirement. Instead it is deemed as a 'temporary' position but in my opinion, if you jump from post-doc to post-doc this is no longer a 'temporary' type of solution. It then becomes something prolonged in order to avoid the true goal completely: landing a 'real world' permanent position/career. The only way around this is for the job market to improve (with better job prospects for PhDs-which I don't think will happen for a long time), skip the post-doc, or somehow restructure the post-doc system allowing for a permanent-type of status. Or just ignore the problem completely, which many seem to do. As you said, without incentives and the current dilemma of having an overabundance of PhD applicants along with budget cuts and poor funding situations, how will this sort of change ever come about? 50% of PhDs do a post-doc upon graduation. Don't you think there should be a much bigger concern about this issue (ignoring the fact that some are complacent)?



[Yevgeniy Grigoryev, PhD](#) • Well, a professionalized post-doc would basically equal a position of a staff scientist. However, by the current model, post-docs are much cheaper, and better yet, they are DISPOSABLE. As a contract worker, a post-doc is totally at the mercy of the PI, and can be disposed of whenever there is a budget shortage. As for a change in the system ... the reason that the situation has not changed is because it works perfectly for the present system, which is in fact, broken, from a post-doc perspective. It is a simple supply and demand equation. The only way to really balance it out is either by decreasing supply, but with the current PhD glut it seems unlikely, or increasing demand, which is also unlikely as the life science funding has not really increased over a long, long time.



[Yevgeniy Grigoryev, PhD](#) • "to force a highly trained postdoc from research is a terrible waste of time and public expense" - that is exactly the kind of reasoning that leaves thousands of post-docs stranded, unable to find any meaningful application outside the bench. Instead of only training post-docs and PhDs for an academic career, perhaps the way to fix the system is to train PhDs and post-docs for a number of meaningful careers, inside and outside academia.



[Andrew Ray](#) •Of course there's a crisis. The NIH asked academic institutions to crank out more PhD's, and they responded by increasing the number of graduates 300%. But they only gave the institutions enough support for doubling the number of graduates, and then withdrew that when the economy tanked. So now you have 3 postdocs for every 2 supported positions, and that's only when everything is going well. And it ain't going well right now over in Bethesda. :(



[Li Bao](#) •I think that the mentality is changing at least among graduate students and postdocs that academics is not the only way to ran. As a matter of fact, for the class I was in, more people got out of academics than those who stayed. Simply the job condition is so bad now, and hope it will only get better from here.



[Giuseppe Tomasso](#) •In my PhD school we organize a recruitment session (see www.phd-school.org), where we invite postdoc and graduated engineers. Big companies usually comes to this meeting, and several participant to the school are directly recruited during the school! I believe that big companies have a strong interest for post-docs.



[Ryan Raver](#) •Good call. Any career fairs, biotech recruitment events/seminars or product shows all show great promise and could potentially lead to something.



[Ryan Raver](#) •“While there is no easy solution to fix the growing lack of U.S. jobs for Ph.D. scientists, there are several ideas worth exploring. An important first step would be for college presidents, deans, chairpersons, and tenured faculty members to acknowledge there is an employment problem for newly minted Ph.D.s and postdoctoral scientists. This, in turn, may result in curricular changes at the graduate level that would allow students and postdoctoral scientists to actively participate in additional specialized training to acquire the requisite skills to pursue nontraditional career paths. If curricular changes turn out to be too labor intensive, expensive, or unconventional, then offering graduate students and postdoctoral scientists access to regularly scheduled nontraditional job seminars or holding annual on-site career fairs may be more appropriate. In contrast with the prevailing view that nontraditional career programs may interfere with graduate and postdoctoral training, it is likely the career insights offered by these programs may help expedite rather than hinder research progress.”
~Cliff Mintz



[Sarah Collier](#) •Excellent article indeed! Thanks for sharing. It has been a topic weighing on my mind for sure!



[Devendra Mistry](#) •"The slightly fewer trainees in the pool would work in the knowledge that their career prospects are brighter, and that the system that trains them wants to nurture them, not suck them dry and spit them out."

WOW couldn't have said it better. Great article! I just wish there was a way to convey its idea to the broken system.

All the post-docs I know work at least more than 40h a week and spend significant amount of their time troubleshooting unforeseen problems. It is such a great waste of tax payer money how many of such hardworking and talented individuals have to compromise for less scientifically relevant jobs and start from scratch after years and years of specific training.



[Melissa Mendez](#) • That was a great piece. I would love to see a funding model that prioritized continuity and ...productivity! Fresh blood and ideas from naive minds are invaluable, but so is expertise. Lets have a funding model that facilitates both, so a PI can maintain a senior scientist, a tech and a few trainees, instead of a trainee army. We could, as a community, probe questions much more deeply with a little more continuity of expertise. As it stands, our experts leave the bench to become grant writers and 'big thinkers.' The big ideas they generate are necessary, but the expertise in their hands - the muscle memory that made them experts at the bench - is traded off.

The few labs I have the chance to see in action that (can afford to) maintain 'senior researchers' are able to maintain a core of knowledge and continuity that gives them an incalculable advantage in terms of making advances and actually solving research questions. Contrary to the one comment suggesting that senior research staff are likely to become like techs (which I'm sure could happen in some backwater lab, but may be the exception that would prove the rule), the few I see are excited, dynamic people who stay on top of their field and grow as technology and findings allow - this is necessary to stay at the forefront! Unfortunately, they're also working for salaries well below what they ought to command because NIH/universities don't make appropriate allowances for their positions.

Why aren't we facilitating that some of those experts, instead of stepping aside (or up) after postdoc, be allowed to keep growing - they would only get better at what they do.



[Ryan Raver](#) • Although an excellent article, I would like to see more informative, possible solutions.. For one, the author wants to professionalize and make a post-doc position permanent. The author doesn't really give a whole lot of specifics: "It won't be easy. Staff positions are typically attached to a lab head's temporary grant, not to the institutes that house them. Finance and numbers will need to be carefully balanced. Universities would have to create new permanent positions, and be willing to fund them long term. But the first step is to admit we have a problem, and that the problem is worth tackling." The author has the right mindset; until some people with power sit down and discuss these possible solutions, nothing will change (most likely) the status quo for a long time.



[Shelley Sandiford, PhD](#) • Excellent comments, Ryan. Yes, the first step indeed is to admit that the system is broken. My take on the problem is to start doing a better job of educating PhD students currently in the system. For some reason (possibly the insular environment that academia provides), many still don't seem to get it that academia is not where they'll likely end up. Some

of the students that I speak with seem not to believe that they could ever take a postdoctoral position... and then get stuck there for years on end with low wages and no benefits. They really believe that their experience will be different - that they're special and/or immune to the realities of the current economy. I'm finally starting to see some newly minted PhDs forgo the postdoc all together to pursue MBAs, law, etc. This is what needs to happen in my opinion - the natural flow of PhDs into postdoctoral positions that has partially (unfortunately) contributed to the problem needs to stop. When students ask me (and they rarely do) for advise about plans beyond thte PhD, I tell them to not even consider postdoctoral work unless they are certain academia is where they want to end up. Some industrial positions require a postdoc, but some don't. If they are certain that industry is where they'd like to head, then look for industrial postdoc opportunities or look for an academic lab with an industrial collaborator.

I completely agree with Cliff Mintz's solution, and he has commented many times on threads like this one. Universities need to provide students (and postdocs) with opportunities to pursue non-academic career options during their degrees. This might be as simple as allowing a student or postdoc the opportunity to use a travel award to attend conferences on regulatory affairs, clinical trials, patent law, government policy or whatever floats their boat. However, even this solution requires that the powers that be recognize and admit there is a problem, and for PIs to be willing to allow their students and postdocs a little time away from the bench. Opportunities to pursue internships while in school are another great option, but this is going to be a much harder sell. Let's just start with some conferences and opportunitites to network.

I know this is by no means an easy solution, but so long as there are hundreds upon thousands of PhDs desperat to take postdoctoral jobs, the situation isn't going to change. Educate the students (and postdocs), move as many of them as possible into non-academic streams, lighten the number of posdocs currently in the system (which might allow for more of them to move into staff scientist positions)... and then maybe, we'll start to see the light at the end of the tunnel.



[Sarah Collier](#) •Shelley, I completely agree. I am currently in my fourth year of graduate training and looking for such career guidance but all I am finding that mentors in general (as spoken from their trainees) only know how to train us to be academics. Some have had industry experience but if you utter the word "teaching" consider investment in your future to be dead in the water. The entire system needs to shift where the academic climate, which is founded upon the philosophy of teaching, recognizes that to truly educate its trainees there has to be an openness to diversify based upon their trainees career trajectories. That includes exposure to a variety of avenues leading to successful careers. Frankly, there isn't enough room at the top of this Ponzi scheme and we are just kidding ourselves to this that all PhDs have a faculty spot available in their career area. It just won't happen.



[Halina Zakowicz |Freelance Writer](#) •There's definitely a need here to inform would-be Ph.D.'s that simply knowing how to perform a PCR, Western, ELISA, etc. is not going to be enough for gainful employment outside of academia (or even within). When I was at my last biotech, I can't even begin to count how many CV's I saw come through where the Ph.D./postdoc listed only what s/he had done in the lab without relating how this experience would help the company. Such "tunnel vision" is certainly a good part of the problem, but hardly any university is taking measures to educate its future WORKFORCE about it.



[Marie Rippen](#) •I agree that the system is broken. I think a solution will be difficult, but most of all it requires that a real dialogue be started at the level of university administration.

In various threads on blogs, facebook, and here, people have wondered why nothing changes. I suggest that it's partially because we as students, postdocs, and concerned faculty tend to talk much more openly about the problem in these online forums than in real life, to real people who might have the power to affect change.

Therefore, I would like to ask everyone who agrees that the way we train scientists needs an overhaul to tell someone at your institution who is in a position of higher power than yours. Whether it's the dean or your own PI, these people need to hear our concerns and understand that we want a change before they'll make one.



[David Adenuga](#) •Excellent piece by Shelley there. To be honest, if i had the choice to do this all over again i would have gone for an MBA after the masters program rather than pursue the phd. It took me switching to an industrial postdoc to realize i had very little interest in pursuing an academic career. I consider myself one of the lucky few, many brilliant phds i worked with have all ended up in dead-end labs pursuing benchside "research" they have no true interest in coupled with poor wages and no benefits. Unless research is your ultimate passion, stop at the masters level and consider alternate career options.



[Ryan Raver](#) •Hey David, stemming from your comment.. You might even want to consider the role of a Field Application Scientist since it is an excellent stepping stone into a business type of position. And it allows you to skip the post-doc. Most of these roles also require a PhD, which will give you an edge over other candidates with just a Master's. You can even work for a few years, then pursue and MBA later on down the road after a few years of work experience (and ideally have the employer pay for some of it). I for one, thought that there was a "post-doc obligation" and it almost made me drop out of my PhD program. I honestly thought that the master's was more marketable and it was the only way to go.

After reading this article:

http://sciencecareers.sciencemag.org/career_magazine/previous_issues/articles/2010_02_19/career.a1000018 (Excellent Article by Dave Jensen), I finally realized that I could not be more wrong. It wasn't until I did informational interviews with other PhDs in the field in the biotech community in my area that I realized they are actually working in very satisfying careers away from the lab bench. Some move into product management, sales, consulting, business development, marketing, tech transfer, regulatory affairs, operations management, and other various roles. But many started out as an FAS (or in house tech-services). Sure times are tough right now and each company may or may not have a glass ceiling, job security or even open positions, but I'm just pointing out that there is hope and things don't have to seem so dismal.

Networking can play a huge role in where you end up and what type of role you can obtain. You would be amazed at what Networking can do for you (even when shifting away from an FAS role), and I think a lot of post-docs and PhD grad students don't Network near as much as they should... You can never Network "too much," and even after securing your first job after a post-doc or right out of grad school you should never stop. In this economy, if you don't Network I don't really see how you even stand a chance... If you are doing all these things, at least you know you're trying your best and that will give you the best satisfaction overall... Eventually something will happen, but keep trying no matter what and don't give up... If I could do it all over again, I would still get the PhD, because I know in the long run it is going to benefit me the most and I learned so much in the process (especially as a scientist).



[H. Chidi Agbo Ph.D](#) •An exciting article that has generated a lot of comments.The post-doc position is not getting any make-over soon especially in life sciences because it is based on the availability of the funding;their long hours will endure because the funding agencies review benchmark- publications.I remember asking an accomplished guest speaker ,a professor from

Stanford University a question when we went for a pre-seminar lunch in 2010. The question I asked was "does he foresee a situation where PhD graduates will be flipping burgers or become Cab drivers if this current trend of demand-supply imbalance continues?" The only thing I learnt from his answer (he was more interested in discussing his research) is that it costs about \$0.5 million to train a PhD and every PhD does make a unique contribution. Then I realized how unaccountable some PIs are to the public that fund their research. I also realized how wasteful the academic research can be sometimes and need for an over-haul not only in the post-doc but the entire academic research.



[Ryan Raver](#) • "Many scientists opt for a research career in the pharmaceutical or biotech industry, so why not kick-start the process by also doing a postdoc in industry? Industrial postdocs often provide higher salaries and greater access to resources than their academic counterparts. But how do you find out about available positions and whether they are a good fit for you? Will a position as a postdoctoral fellow provide you a foot in the door at a company? And what if you don't like it? Will an industrial postdoc cut you off from returning to academia?"

http://sciencecareers.sciencemag.org/career_magazine/previous_issues/articles/2008_06_13/science.opms.r0800055



[Guy Havet](#) • Hi Chidi,

Do you mean that actually this PI cared more about his research than the people doing the research for him?

Actually, in France there is a famous "docteur" who decided, as a permanent position, to be self-employed and work as a house keeper.

She wrote a book about it.

King regards

Guy



[Vlad Speransky](#) • The title really disturbs me, sorry. *Give* postdocs a career?! Come on... Same old entitlement thing..



[Devendra Mistry](#) •Vlad,

The entire title is "Give postdocs a career, not empty promises" So I believe you are taking things out of context. The author is demanding "career" instead of "empty promises" which I know many, if not all, graduate students/post-docs are given before they join the graduate programs/labs. Therefore, give me one instead of another.

After working hard every single day at work if you don't get paid at the end of the month, you asking for salary would not be entitlement but rather something you were promised. Similarly, the article states that if you train someone for such a long period on false promises of a career in the field, you are wasting that person's time, talent and taxpayer's money.



[Vlad Speransky](#) •Well, I guess I'm the only one who was not really given such promises. And told instead that it will all depend on how good I am.
It has been or long time that careers in science are competitive. Not like some recent surprise.



[Halina Zakowicz](#) [[Freelance Writer](#)] •I have a saying "May you always get what you deserve." If you're working in a lab 50-60+ hours per week, you should deserve some decent pay, benefits and hope of advancement. Otherwise, it's volunteer work!



[Vlad Speransky](#) •Sorry, but in real world, it just doesn't work that way. Some work is simply more in demand than other. If "decent pay, benefits and hope of advancement" are the goal, finance industry might just suit such person better.
Simply working 50-60h or whatever a week does not automatically entitle one for a decent pay,

sorry.. I really believe whether these 50-60h/week are wasted or not is ultimately your own responsibility.



[Ryan Raver](#) •The problem with your level of thinking is that nothing will ever change or be fixed. This isn't a matter of entitlements or who deserves what. It is a matter of actually giving Post-Docs something beyond that of another Post-Doc. The whole reasoning here is that the actual "Post-Doc Crisis" means that after spending sometimes 5-6 years at one Post-Doc you have to jump to doing another one. Your argument is simply "Pick A Different Field." Well, that doesn't help fix the current problem that we have now. There should at least be a JOB waiting at the end of the Post-Doc. I don't think that is much to ask for. It is irrational to side with the status-quo argument or "welcome to the real world", because for the amount of time invested and education there should be something waiting beyond a Post-Doc. Why? There are numerous reasons. Some of which were already mentioned by Devendra. It is a waste of tax payer money. It is a waste of talent. It is a waste of potential scientific breakthroughs. It is a waste of a person's contribution to the field whether academic or industry.

I honestly think that you need to read this entire article so you understand that gravity of the situation: http://www.sauvonslarecherche.fr/IMG/pdf/the_postdoc_crisis.pdf

Instead of saying Science should be competitive and things are just the way they are and should just stay that way.. Why don't you at least propose a solution? That is the whole point of this discussion. Not to bash on the already harsh life that Post-Docs have or will be faced with.



[Halina Zakowicz](#) [[Freelance Writer](#)] •The issue, like Ryan noted, is not whether 50-60 hour workweeks justify a real job; sure, you could spend all those hours playing on Facebook or sleeping at your desk and that kind of "effort" will not qualify you for a real job. No- the fact here is that postdocs have little upward mobility or hope of going beyond an apprenticeship-type post because those jobs are far and few between. In fact, an artificial apprentice-type industry now exists for PhDs, whereas in the past they would typically go into a faculty or staff scientist position almost immediately post-graduation.

Scientific work has always been in demand; unfortunately, academics have discovered a way to keep Ph.D.'s in a type of serfdom for decades. While their colleagues are moving on to become managers or directors at companies, these postdocs work hard, make seminal discoveries and then, after many years, are promoted to the level of...another postdoc. It's insulting at best, but it

also impoverishes our best scientists. And for too many such scientists, it forces them to leave science for other professions.



[Vlad Speransky](#) •Halina, thanks for a measured reply. Makes all the difference for a civil exchange of opinions, and has made me see and respect you perspective better. "The problem with your level of thinking.." - Ryan, really?.. That's a terrible thing to say in an argument, sorry I have made you say that. "*Level* of thinking", huh.. :)

My perspective comes from my own experience building a science career in two different political and economical systems, and also that of my multiple close friends who chose paths other than science, taking charge of their own career early in life. I strongly believe that these are the people who really make the world turn around. Especially entrepreneurs, those who create jobs - including our jobs. It is no coincidence that we end up serving them.

Unlike those people, I'm really one of you guys - just kept going to school as long as possible, then went on doing essentially same things now as my job.. I have come to realize that scientific career is the easiest choice, the most passive one. It takes much more guts, maturity, etc., to go for almost any other kind of career, as opposed to simply keep going with the flow, following the assembly line. Basically, our plan was that we submit ourselves to the Science, and expect it to take care of us, right? (not unlike the socialist/communist system where you submit to the State and expect the Government to take care of everything) I did just that thing. And then, being generally low in entrepreneurial spirit, we keep acting the same, not being proactive enough, and then get frustrated when we discover, as I did, that it's really up to you to make sure you'll be in demand.

I ended up with a good career, but realize that I probably simply got lucky at a few important junctions. Which may have made me so believe in capitalism and that the *best* will not be impoverished. And I still believe in that. If you really love what you are doing, just stick with it and be good. And accept the current uncertainty as expected and normal.



[Matthew Vallejo](#) •Vlad, you make some really good points. I definitely see where your perspective is coming from. But I think the part that frustrates post-docs and senior graduate students like myself is not that life, especially scientific life, is tough. We have been trained and prepared for the fact of a tough research life. The frustrating part is the "empty promises" part. We were told that once we worked really hard and were smart, we would have a real job with decent wages not an apprenticeship making less than if we dropped out of high school and

worked hard and smart for all these years.

I agree that those that do not go with flow are the real drivers of society. But everyone else can make also make a contribution without having to be stuck in serfdom. Science research seems to be one of the few careers where in order to make a contribution to the field one has to subject themselves to serfdom. For example my brother is certainly not a driver of society. However, he is an engineer with a bachelor's degree and has job that fills a niche without being completely bound to serfdom. He even has the chance to be promoted (he has been) if he works hard and is competent. Whereas post-docs are stuck in positions where advancement is unlikely despite working hard and being extremely competent.

I agree that scientists normally cannot go with the flow of the system in order to have a great career and that young scientists have to work with reality not fantasy. But that does not mean we have to accept the system the way it is. After all have not the people that have changed the world around in big ways always been the ones that did not accept the status quo but worked within reality to change the status quo?



[Yevgeniy Grigoryev, PhD](#) • I do not think that this is a question of entitlement, or unrealistic expectations. As the article and several participants here said, we are not asking that someone miraculously just gives us jobs because we "deserve" them. However, the simple fact is that in the current system, despite extensive training, very specialized and effective skills, and significant personal and capital investment, most post-docs have no job mobility and are used as "serfs" to perform tasks that they are grossly over-qualified for.

I have no problem starting at the bottom and working my way up, but as the situation stands now, there is no way up. Most post-docs I know are either doing multiple post-docs or completely drop out of the field.

The system is being usurped by individual lab heads to fuel their own research at the expense of their "trainees". I doubt many post-docs get any actual training during their stint that will allow them to be competitive on the job market right now. Instead, they are a cheap and expandable pair of hands. Let's not forget that these people have a doctorate degree and have been working in the field for at least 8 or 10 years now. In most other professions, such dedication and hard work is usually rewarded with a promotion, a more comfortable lifestyle ... something to show for all the hard work.

I agree that a graduate degree does not guarantee you a job, it is your skill set and determination that will allow you to succeed. However, the current system of apprenticeship does not make PhDs competitive in the current job market. Considering the fact that fewer than 15% will actually get tenure in Academia, I do not see why it would be considered wrong to demand that the system is changed so that public resources and talented candidates are not washed down the sink and misappropriated. The system has to change, but the change has to come from us, post-docs and graduate students.



[Andrija Finka](#) •After 5-7 years postdoc should become permanent and independent staff at any university having their own research project and and they are entitled to train only one PhD student (or more if they have grant money), but not a postdoc, while professors could be entitled to have only few postdoc, but not PhD students. This staff can be only promoted to professor only if they move to another university.



[Tracy Terry-Allison](#) •Excellent and bravo to both the author for writing what we PhDs know all too well and the publisher for having the courage to publish it. I too left the bench and lamented the loss of all the skills I had honed for more than a decade. Eventually I accepted the reality that a career in academia would not materialize, despite my best efforts to land the elusive tenured scientist positions. I am not one to boo hoo and say 'Woe is me' the vision of security that once was an academic career turned out to be a mirage, so PhDs are no longer insulated and have to deal with ebbs and flows like any other career. My issue is that training hasn't changed; current students are no more aware or prepared for this reality than was I. Are graduate schools simply sticking their heads in the sand and not acknowledging their lapse in responsibility? Do they not realize that by not preparing these students for the stark employment realities they face, they are basically just lining up students like sheep and pushing them off the proverbial cliff? With the ones in the back totally insulated from the fate of the ones in the front? I advise my students not to waste their time getting a PhD and just get the MD instead...at least they will have a very lucrative career as a physician if the research thing doesn't work out. Just wish my 'advisers' had had the decency to be that real with me when I was in graduate school.



[Halina Zakowicz](#) [[Freelance Writer](#)] •I guess the question we now face is: How do we take charge of our scientific careers so that we're not all stuck doing lowly postdoc work 10 years from now (and continually towing the assembly line)? For me, it involved taking two steps:

- 1) Getting out of academia and going into industry.
- 2) Getting out of industry and starting my own business.

Both of these steps were scary. I questioned what I was doing with my life when I was supposed

to be an academic researcher. After all, I had spent 11 years of my life attaining the degrees I needed to go forth and do lab work. But, after my second postdoc came to a close, I knew I didn't want to do a third one. I also knew that I had to pick up some "real world" experience, something that eluded me during my graduate years and cost me some valuable career moves. So I jumped into industry and never looked back. And then, when I had learned all I hoped to learn at that place, I jumped again and started my own business.

Taking proactive business-centric approaches to future employment would definitely be the way to go for today's PhD students. Schools need to start emphasizing the need for business as well as grant writing classes. Lab work needs to be interspersed with corporate internships. And knowing about money and how it is made in the "real world" should be just as important as knowing the principles of a Western or ELISA. Taking this approach would help mold future scientific entrepreneurs and not just more postdocs towing the line.

Meanwhile, as already mentioned, starting postdoc unions at schools and institutes would help protect the interests of what are, in essence, contractors. Such unions would be better placed at negotiating wage increases and benefits for their postdocs, many of whom are in their early 40's and still earning what someone would earn right out of college.

Contractually, I'd like to see a cap placed on the postdoctoral time period; all apprenticeships are meant to eventually end, not go on for 8, 9 or even 10 years. A 5 year postdoc term would be ideal, after which the "apprentice" would need to find actual employment. Having this defined term would reduce postdoc abuse at the hands of associate professors who look at postdocs as a cheap source of skilled labor. It would also put pressure on schools to provide real life job training and employment solutions for their graduate students.



[Devendra Mistry](#) •Excellent points Halina,

I graduated with PhD little more than a year ago and it was only towards the later years of my PhD students decided to get together and started inviting more industry speakers as they all realized that number of PhDs produced by a program is much higher than number of faculty job openings at the any given institution.

In addition to what you said, I think they should cap the number of student entry into grad school a little more tightly. Also I think post-doc should be limited to 3 years (instead of 5 you mentioned) or removed all together and be converted into permanent positions. Permanent but NOT tenured, so you can get fired if you don't meet expectations but can continue working in the given field should you are doing well.

I say that because I enjoy (as a matter of fact love) what I do, but I feel that there is a dagger hanging over my head knowing I am going to have to leave this place and start somewhere new.

I honestly think having someone senior in lab (other than PIs who are busy writing grants or doing university related matters) can really help newer members especially students.

This great nation needs more bright minded scientists rather than PhDs with great potentials who are working as sweat-shop workers 70 hrs a week.



[Guy Havet](#) •Here is a paraphrase of what I said in the discussion by Rob, “Do we actually need PhD programs?”:

Actually, considering the title of this group I was wondering why BS student don't first validate their undergraduate education in industry then consider graduate studies.

Multiple other advantages could be found with this approach among which:

- learning what industry is about
- learning the culture of the company
- learning these "soft" skills that are paramount to industry
- paying their undergraduate loans
- starting a life
- having realistic expectations
- knowing whether you are smart enough to make it in the academia

If the industry needs higher level of education employees then they can sponsor the candidates to learn these skills at no expense of the public system nor at the expenses of the employee.

If the academia needs educated people to do the work then the base salary will be defined by the industry.

This procedure doesn't require 20 years to be implemented.

If one doesn't want to do something it cannot be done.

Plain, simple and fast.



[David Boudreaux](#) •Some interesting ideas from Guy. Although I think there are some other options to consider. I have heard of companies paying for employees to take on degrees such as an MBA because they were already invested in the company, but I am not sure a Ph.D. would work as well. It is more than a full time commitment and the company is not benefitting during all those years the individual is in graduate school. And as far as starting a life first, that would be very hard to get accustomed to a "real" salary, potentially have a spouse and children, and then take a major pay cut to become a grad student. I have seen a number of grad students that

came from industry experience that problem. I would propose a tweak to your proposal that makes science more similar to other professions I have seen people take on. There should be an effort to bring industry and academia together in a collaboration and so that companies can help guide the training of Ph.D. students. PI's should know not every person they bring will have a faculty position waiting for them after completing a degree/post doc. This could be a chance for them to expand their lab to include projects that more directly benefit industry partners, companies could supply funds for students (much cheaper than workers) and look at it as an investment that also has the potential of providing some alternative funding to government grants. In return, schools should look to the needs of companies and provide the training and atmosphere that better prepares students for non-academic careers such as safety, the soft skills we always hear about, GMP, etc. As with most issues, I think the best course will be a balance approach with work from both sides.



[Andrija Finka](#) •Universities "sell" the knowledge, maybe they should start to sell something with a market value.



[Ryan Raver](#) •Thanks for all your comments and insights everyone. Maybe someday change will come as long as we keep trying! I will be using some of these comments, suggestions, and ideas to compile a blog post. You can subscribe here if you want to read it upon release:

<http://www.thegradstudentway.com/blog>

Until then, keep fighting and take care.



[Myron Shekelle](#) •One of the key comments I read here is that from the universities' narrow self-interest, the system is not broken. It's working great. Asking academia to reform itself for the good of its students and post-docs is like asking Walmart to reform itself for the good of its customers. The Walmart analogy is a bit thin, of course, but interestingly, abuse of government subsidies is partially responsible for both, in the American situation, at least. If an increasing number of students default on their Federally guaranteed loans, the American tax payer will be left holding the bill, and that could lead to very unpredictable consequences.

I think information is the key and there are a few keys statistics I would like to see readily available, such that it is as commonplace for people to discuss these as is, say, a school's supposed "ranking":

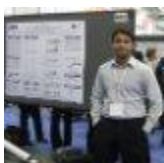
* For a given field, say biology, what percentage of PhDs ever land tenure-track jobs? Is it like, 1 in 2, 1 in 10, or 1 in a 100? What are the projections for 5 or 10 years down the road? If these statistics are made clear to prospective PhD students, the students themselves will do some sorting.

* For a given university, what percentage of tenure-track work is filled by tenure track employees (i.e. if faculty are asked to teach 2 courses per semester, and there are, say 100 courses offered per semester, are there 50 tenure-track faculty members, 40, 30, 20, 10 . . . ?), and to what extent are universities using part-timers? Faculty could get active (even unionize) and demand that universities stop loading up on part-time faculty, and thereby create a few more tenure track jobs, and many fewer part-time jobs that lure PhDs to stay in academia, chasing a tenure-track job, longer than is wise. Tenured faculty won't rock the boat in critical mass, of course, but the non-tenured ones might.

* Undergraduates should be shown a clear metric of the expected value of their undergraduate degree. Forget the for-profits for a moment, I see many degree mills among regional public universities. If a four-year degree from Southeast Pottawattamie State University costs \$48,000 and four years of a person's productive life, how long will it take for, say, a sociology degree to pay for itself? That return on investment should be a critical statistic in the decisions of undergrads, who ultimately control the decisions that fund the largest portion of the pyramid.

There are probably other statistics people can think of, but at the end of the day, if an undergraduate degree is not a ladder for economic advancement, but rather more akin to a "quality of life" achievement, like some sort of mental yoga degree, then universities should be required to make that clearer up front, with statistical data. And when I write, "should be required", I do not mean by themselves, of course, but by us, the consumers. Likewise for a PhD, if say, only 1 in 10 PhDs ever get a tenure track job, and after non-tenure-track jobs and industry scoop up a few more, let's say that 5 in 10 must completely retool or start their own enterprise, then that should be made clear. Again, I am not expecting universities to do this on their own. We are all well-educated enough to realize they are self-interested entities, and it is natural that they will put the best face on things, not the most realistic face, let alone the worst. Walmart succeeds because it successfully entices its customers to spend more in the long-term than the they save in the short-term, and that's kind of an unsettling thought.

Bottom line: undergraduates, graduates, and post-docs need to see cold hard data on the value of what they are doing, as they are all paying for the opportunity, in one form or other.



[Devendra Mistry](#) •Myron,

Those are some great (and honest) suggestions. But that is exactly what this article (and many who commented) are trying to point out.

Going with your Walmart example, when Walmart (or McDonalds or Taco Bell for that matter) has vacancy for employment, they will advertise a low wage job as 'an excellent opportunity for career growth' and 'be a part great organization' with pictures of good looking smiley faces dressed in colorful uniforms.

Unfortunately the same has become true for universities as science/education has become a business. If universities present the potential graduate students with the statistics you shown, do you think they will apply to the universities?

And that is why I see so many graduate students either drop out during grad school, leave science upon completing PhD or after years and years of post-docs. I even know students who were interested in science and would excel at it but choose to do MD or PharmD instead.

And that is why the author is writing this article so this issue is brought to light and we have less waste of talent as well as taxpayer money.



[Yevgeniy Grigoryev, PhD](#) •Myron, you bring up some great points.

Yes, the system is self-serving and as such, fulfills its needs of fresh labor that is recycled and replenished with fresh batch every once in a while.

Yes, these statistics are widely available and numerous studies have demonstrated that fewer than 20%, actually more like 15% of PhD recipients will have a tenured position in academia 5 years after receiving their degree. The system is not trying to hide these facts, it is just not openly advertising them.

Having some sort of metric to gauge the effectiveness of the system in graduating degree recipients that are CURRENTLY in demand is another issue. While increasing the number of tenured positions by a few by slashing the part-time teaching positions won't really solve the problem, a few tenured positions will open up while A LOT of part-time positions will be lost, and these positions are actually filled by the "excess" PhDs who can't get a tenure position.

A starting point is to actively communicate the current lack of employment to undergrads. A meaningful metric for how "employable" you will be after receiving your degree is indeed needed and should be compiled for each institution granting higher degrees.

A challenge, you might say, is how to predict which degrees will be in demand 4-5 years out. However, this is where there is a need to monitor current market trends and employability data for current PhDs. Alternatively, the Federal government could create subsidies to revamp particular economic sectors, such as alternative and bioorganic fuels, for example.

The problem needs to be addressed from the bottom up. Currently, the system is generating "disposable" academics, which results in a real waste of taxpayers' money and more importantly, a waste of talent by depleting a scientific pool of highly trained professionals who are forced to leave research for greener pastures.



[Myron Shekelle](#) • It was not my intent to disagree with the author. I hope that was clear. Her suggestion, to professionalize the post-doc role and turn it into a permanent job, is akin to point I made, converting part-time, non-tenure-track academic jobs into full-time tenure track jobs. I recall at least R1 with a track for post-docs similar to that; they were called "research scientists" I believe, and I think they were tenurable.

Whether the system is broken or not is a matter of perspective, and if it's not broken from the standpoint of the universities then we shouldn't expect a lot of proactive measures on their part to fix it. What I find rather curious is that, to my knowledge, there are no "Centers of Academic Policy", such as there are for other major disciplines, such as health care. Someone please correct me if I am overlooking them.



[Kamrun Zargar](#) • As a postdoc for 2 years, I understand this dilemma and living it. I am fortunate enough to have a position at an institution that is at the boundary of academia and industry...so perhaps when it comes time for me to move on, I like to think, I still have the option between industry or academia. I think this is the best way to head. Providing more positions for post-docs that is at the boundary of academia and industry. I think, this would allow for a better flow of both basic research and applied research.

Best wishes to us all!



[Isabela Aparicio-Erriu](#) • This is an excellent open-eyes article for those who are still not aware of the situation!

For those following this discussion, I would appreciate if you could peek on my discussion topic and giving me some input on my question:

http://www.linkedin.com/groupItem?view=&gid=1844342&item=177165835&type=member&commentID=100884648&trk=hb_ntf COMMENTED ON GROUP DISCUSSION YOU CREATED#commentID_100884648

Thanks!



[David Boudreaux](#) • I am curious as to what the career stage of everyone here is. As some who just graduated and started a post doc, a lot of these realizations and understanding of what the future holds did not become clear till I was past the point of no return. I think most people would feel they had they same experiences I had such as in high school your told you need a degree and "science" was a good choice, after a B.S. your told the "good jobs" require a Ph.D. and that extra training is never a bad, and then before you know it you are wrapping up a Ph.D. and it seems no one hires without a post doc. So while I agree with Myron's comments, I just think we need to add that at some point in the cycle people should be made aware of their career prospects and they can not always be left to find out themselves. College freshman barely have the foresight to know who they are let along be left to predict the future prospects of a chosen degree. I have suggested partnerships between universities and industry to help direct research and open up career possibilities for students. Would a solution be to somehow require universities to have students go through some type of internship or career prospect course earlier in their degree so that these issues can be addressed before its too late?



[Myron Shekelle](#) • Yevgeniy, I am in broad agreement with you. Indeed, I think it might have been you who made the earlier comment I mentioned, namely that the system isn't necessarily broken in the eyes of the universities.

A couple of additional points. If the overall placement rate of PhDs into tenure-track jobs is 15-20%, it must vary greatly from one field to the next. I met a guy in business, and he said academic jobs are comparatively plentiful, partly because people who get advanced degrees in business often want to use their degrees to make money, and thus avoid academia. Perhaps the same is true for other advance degrees with good job prospects, such as medicine and maybe law? On the other hand, anecdotal evidence seems to indicate that the humanities have it far

worse than the life sciences, bad as they are. So, accurate data from a nonprofit, nonpartisan source, broken down by field, and perhaps university, would be valuable. I know my graduate program tries to keep track of their placement rate, and it is good, but they will fudge the numbers in their favor, as many self-interested scientists do.

For undergraduates, I am thinking way back to my days as a junior in high school, and many of us had a good understanding of how our class rank and ACT scores worked on a sliding scale to determine our eligibility for a given major at a given university: e.g. "my scores qualify me for an English major at University of Illinois, but for a Mechanical Engineering major at Illinois State." It would be very helpful if prospective students included one more statistic in their decision-making: how many years will it take for the English degree from U of I to pay for itself versus the ME degree from ISU?

Again, what I find stunning is the lack of serious attention academia pays to studying the policy of itself. Google <center for health care policy> and there are dozens and dozens of such institutions at top and middle tier universities around the world. Change that search to <center for academic policy> and, while there are results, none seem to be actual centers for academic policy. Very strange to me . . .



[Yevgeniy Grigoryev, PhD](#) •Excellent points, Myron.

I should have been clear when I gave the statistics, I was referring to Life Science PhDs, which is what I am familiar with. So, 20-15%, is about 1 in 5 or 1 in 6 will actually get a tenured position 5 years out. In fact, I wrote an post about the current shortage a while back where I was looking at PhD employment by sector: <http://www.benchfly.com/blog/non-academic-careers-are-not-alternative/>

Another point that you and several others mentioned was that, as an undergrad, you really are not necessarily thinking about how "employable" you will be with that particular higher degree, as you are pre-occupied with keeping a high GPA and scores on GREs and such. Afterall, grad schools make such a big show about how competitive admission is. However, if I can get just one point across to undergrads, is that this Grad school interview is a two way street. The program is interviewing you, but you should also be interviewing the program and asking the right questions regarding employment stats, such as, of the recent graduates, how many received tenured positions 4-5 years, how many are still post-docing, how many transitioned away from academia, how many dropped out of research altogether. Each Institution can easily access such data through their Alumni network. As an undergrad, if I see that only 1 in 5 graduates actually managed to get that tenured position, while another 20-30% managed to get employment outside of academia, but the remaining 50% are dredging their way through a maze of post-doc positions or are unemployed 3-5 years out, maybe I will re-consider the utility of such a degree in the current marker.

The system will not change unless there is a pressure for it to change. Maybe if potential students make an educated decision in choosing their program, the system will be forced to take into account the employability of their graduates. Not to sound banal but knowledge IS power.



[Myron Shekelle](#) •Yes. I agree immensely with your last paragraph.

Thanks for the link. This quote from the reader's comments seems particularly apropos.

"I couldn't agree more with this...the earlier you prepare, the better."

For most of us, understanding the basic economics of our post-secondary schooling would be a big help. I can even imagine this working its way into the curriculum at the high school, college, and graduate levels: The economic consequences of my next step.

Frankly, I am partial to the argument that a college education is largely a quality of life thing--mental yoga for those who can afford it; and even graduate school can be viewed as an extension of that, and not merely job training. But it would be hugely helpful if it were clear just how much a person pays for those mental yoga degrees.



[Myron Shekelle](#) •David, my current career stage is: PhD - done; Research post-doc - done; Teaching post-doc - done. Currently, I have one foot in academia, one foot in nonprofits, and like all academics, I work at least 60 hours per week, so my third foot is in entrepreneurial ventures.

Re: "Would a solution be to somehow require universities to have students go through some type of internship or career prospect course earlier in their degree so that these issues can be addressed before its too late?"

Personally I think your suggestion is an interesting one, but I can foresee a snag. In my experience, employment prospects vary enormously depending upon the school at which one got a PhD. The way things seem to work is that two or three top departments in any field can produce enough PhDs to fill nearly all of the jobs open in any given year. Those schools would see your requirement as an odious waste of time that reduces the employability of their graduates within academia. All of the other schools, which offered the course, would wind up being labelled as training grounds for non-academic careers, and the divide between the two or three top departments and all the rest would spread into a chasm. That's my hunch, anyway. Frankly, that is probably how those very clever people who are skilled at perceiving the unwritten rules of

society already see things. To be clear, I am all for your suggestion, and just argued for something very similar in my previous post. But seeing someone else suggest it aroused the dispassionate skeptic in me enough to start anticipating potential snags.



[Andrija Finka](#) • I may just give you only my own skin experience: when you are in academia publish as much as you can and apply to the jobs all over the world if they are suitable



[Guy Havet](#) • It is not yet forbidden to dream. However, it is still forbidden to dream aloud.

Why making things simple when you can make them complicated, right?
If indeed Industry would finance their PhD to be trained in Academia, doesn't that imply a collaboration with Academia?

Why I don't expect that this system is going to change any time soon:

- 1- Because it is an established system and one doesn't change a system that has been proven to be dysfunctional for more than 20 years.
- 2- Because I am a SB scientist more passionate by pursuing knowledge than concerned by people.
- 3- Because I am in position of power and the current system defends well my precious interests.
- 4- Because I am an obscurantist.
- 5- Because I am good enough and this does not concern me.
- 6- Because neither Industry nor Academia nor Society value scientists.
- 7- I have more points but for the time being I will let some other people to make their point.



[Myron Shekelle](#) • How to succeed in academia is a very different subject than how to restructure academia so that it does a better job, Andrija. "Publications cure all ills", is advice that was once

given to me by a person who gets 1000+ citations per year.

Like Guy, I think we can still dream, and like many others here, I think that academia is unlikely to implement reform from the top down on their own. There will need to be a large push from the outside. I think that reforms in the USA--small, medium, and large--are not out of the question in the near-term. The student loan problem now exceeds \$1 trillion, I believe, and seems to be coming to a head. It could rival the subprime loan problem of 2007-2009. The for-profits are already contracting, as if they know the party is over and don't want a high profile when the finger pointing begins.

The banking industry escaped major reform after 2007, partly because they learned from the problems back in the 30's to co-opt the political process before proceeding with their shenanigans. Academia seems like a much easier candidate to become a political strawman, given that something like 95% of academics are politically liberal, and conservatives have fairly embraced anti-science anti-intellectualism as a platform plank. Thus, I have a hunch that reform of academia could easily become a partisan political issue in the near future, perhaps even by the 2016 election cycle.

Let's hope that reform proceeds in the direction we want, or better yet, let's continue discussions like these and become proactive in designing the form that reform should take.



[Andrija Finka](#) • Myron, I am telling how the situation is nowadays and to paraphrase one reviewer : "Science is a gladiatorial contest to death". A book "In the Basement of the Ivory Tower: The Truth About College" tells very well that a fish is rotten, but a fish stinks from the head and tail comes at last. There is an inherent problem with science (and academia) since the age of Babylon: it sticks with money and when the things become tough (like now) then it has to reinvigorate itself and the economy or...scientists will go somewhere else. Knowledge is on the Web, anyhow.

Why do conservatives, that have money, do not support the science?-is almost sociological phenomenon, but anti-intellectualism is spontaneous reaction increasing the entropy...



[Myron Shekelle](#) • Thanks for the tip on the book, Andrija. It looks like a good one. We probably don't disagree much on the way things are, or the way to succeed in academia. I might even broaden your summary to describe the life of a social primate. There is lots of competition within the cooperation that sociality demands.

But even if the statement that science is a gladiatorial contest to the death is an accurate analogy at this moment, it doesn't mean that it cannot be reformed into something that better serves society and itself.



[Andrija Finka](#) • Myron, It may be reformed...by institutionalizing postdoc position like government clerks, but giving them independence like to PIs and not more than 1 PhD student.



[Ryan Raver](#) • This won't solve the problem.. But networking can allow you to skip the post-doc entirely (in my opinion): <http://thegradstudentway.com/blog/?p=548>



[Vladimir Kaigorodov](#) • Interesting discussion.... but I do not see much examples of postdocs doing something totally different. When I found that cannot find job in science anymore , because of age over 35yo, over-qualification and associated with it problems for potential employer, I just went into artistic area with art-science projects that no one person with normal artistic education can do.. It is ideal space without serious competition. And I see it myself, art is a great channel for trained scientists to start a new life and new carrier. After all, what is the difference between scientific publication in Nature and artistic installation in art-museum? Art is very close to research science in its methodology and it also gives personal satisfaction from work process.



[Vladimir Kaigorodov](#) • And , ye... why not to invent special life-long stipends for post-docs after 40yo? . It will solve all problems. Just we should not name it jobless benefits, it is special personal financing that goes directly from state scientific foundation. Its size should be comparable with normal postdoc salary.

So every postdoc can be 100% sure about his future and does not need to care about it... and after 40 he can relax and do whatever he wants to do... There are professions where retirement age is close to 40... why not to give that privilege to all scientists as well?



[Andrija Finka](#) • There is also something about human management that is lost in academia. Seriously, why to throw somebody out of academia who has knowledge, skills and willingness to work? And we are talking about huge input that has been done by individual, academia and society.



[Vladimir Kaigorodov](#) • why to throw somebody out of academia who has knowledge, skills and willingness to work?....

I also asked myself the very same question... and the answer came during meditation. Academy is not an usual job.... it is social institution that has some higher goals , not only scientific research. I believe that the real goal of Academy is to rise cultural and intellectual level of general population, by overproduction of very special type of highly educated people - scientists. Jobless scientists are forced to go into another areas and bring there additional intellectual potential. So, at the end, the all groups of society are gaining from that process of scientific dissipation..



[Andrija Finka](#) • It seems to me like academia have dug out, cut and polished the diamond and then once it is a brilliant they just ditch it. But diamonds are rare...



[Vladimir Kaigorodov](#) • Incorrect, diamonds are not rare at all, It is De Beers who very artificially keep them rare and high in value. They can flood the market and low the price to dirt. They do

not do it, because of greed. Academy does opposite, it does not care about market price of scientists, it wants to bring scientists in every house, in every school, in every company. The society will benefit from that.



[Yevgeniy Grigoryev, PhD](#) • I think the key sentence here is "Academy does opposite, it does not care about market price of scientists". It all sounds very honorable on paper but this is not how academia operates in real life. The system could care less about where the scientists end up, and it surely does not try to "bring scientists in every house, in every school, in every company", as it is not its agenda. If anything, after years of fruitless endeavor, frustration and lack of job growth, most scientists leave research altogether, thus abandoning any hopes of bringing science beyond academia. I doubt the society benefits from such mindless waste of brain and potential. Unfortunately, science is not highly valued, hence the lack of funding for it and low marketability of academic researchers, which is one of the causes of the vicious cycle of academic attrition and competition for limited resources. Just my thoughts, of course.



[Andrija Finka](#) • Vladimir...I was unemployed after PhD, together with forty other PhDs at our local unemployment office...so I don't know how society profits from unemployed highly educated people. And let's not compare 2012 with 1999.



[Andrija Finka](#) • Yevgeniy
"Academic politics is the most vicious and bitter form of politics, because the stakes are so low."
so
"The ends justify the means".



[Yevgeniy Grigoryev, PhD](#) • Exactly, Andrija, I think we are in agreement. Just a quick question, what's the source for these quotes? Thanks.



[Andrija Finka](#) •* On 20 December 1973, the Wall Street Journal quoted Sayre as it was written

http://en.wikipedia.org/wiki/Sayre%27s_law

2) Niccolo Machiavelli



[Vladimir Kaigorodov](#) • well, Andrija, It is a luxury situation you was into.... i dream about it, I was only one person with PhD in an unemployment office, They did not know what to do with me... they are used to work with completely different people. My idea was to bring some of those unemployed PhDs together and start an art-science group. With all that intellectual potential we could easy get nation-wide publicity and project financing from state budget. We could start out our own non-profit cooperative organisation Freedom-of-Choice. As artists. Just think over Monty Python group. Unfortunately I was not able to find here young enthusiastic unemployed scientists at all. They are hiding somewhere from Light.

Of course it is not general solution. Belgium is socialistic state, jobless benefits here are extremely generous and almost unlimited in time. And artists (with diploma from registered art-school that is not so difficult to get) are also included in the system of state paternalism.

May be Academy in general, as an institution, should become paternalistic also.... and even if it cannot provide jobs and carrier perspectives to all post-docs , at least it can provide for them life-long security, a special status in society, so they do not need to think about job and money once they are in Academy. They have job - OK, they do not have job - also OK.



[Myron Shekelle](#) • A very important point is being raised tangentially, which is that the glut of PhDs will be addressed differently in different countries.

In the USA, I think it is not unrealistic to anticipate medium-to-large changes in academia in the

next 5-10 years, but that's not necessarily good news. In my opinion, when reform occurs it will come as a response to industry-wide problems, most likely because of student loans or scandals, not because of some new high-mindedness about the value of academia.

Realistically, with the Democrats currently adopting a political stance that would be considered center-right by international or historical standards, and with the Republicans opposed to virtually all government except for defense, I think it is extremely unlikely that the current political atmosphere will produce some major proactive, "carrot"-style reform for academia, with lots of new money flooding in. It will be the "stick".

That doesn't mean we shouldn't be lending our expertise to help shape academic reform. But in this climate, it will be up to PhDs to do much more than talk about their value to society, we will need to demonstrate it, and any suggestions that appear too self-serving will be smelled-out by the political opposition and nipped off at the bud.



[Andrija Finka](#) • 1984 and Reagan...Déjà vu.



[Andrija Finka](#) • "...it will be up to PhDs to do much more than talk about their value to society..."
300k\$ invested per PhD multiply by 200k PhD in last 10 years makes 60 billion \$.
Given that re-investment is 15% in academia only, and 85% is dead capital or hidden treasure, one should wonder whether academia is social or economical category.



[Myron Shekelle](#) • Andrija, pardon me if I am little bit slow, but let me see if I understand your argument:

1. \$60 billion spent on training PhDs
2. Only 15% will circulate back into Academia
3. Therefore, 85% of the PhDs are either dead capital or hidden treasure?
4. If I got 1-3 correct, then the conclusion is . . . ?

Should society should spend more money to exploit the hidden treasure? Or reduce the \$60 billion down to \$9 billion, because 85% is wasted? Or something different?



[Vladimir Kaigorodov](#) •it will be up to PhDs to do much more than talk about their value to society, we will need to demonstrate it...

And the best way to do it - start up our own freelance businesses with generous support of special state's funds , of course... Only PhDs after 40yo should get access to subsidies from those fund. So they can start whatever they want with 5 years financial support line. That is the way to bring our hidden treasure back into society.



[Myron Shekelle](#) •I'm not sure if you are being serious, Vladimir, but I suspect that plan would look far too self-serving to have a chance, here in the USA. Maybe I'm wrong, who knows? And it might work somewhere else, and good luck if it does.



[Andrija Finka](#) •Myron you got all right, Well the problem is that we do not know whether 85% are wasted or not or they might even generated value higher than 60 billion \$, that other graduate students can be recruited in their name, but somebody needs to asses it.



[Vladimir Kaigorodov](#) •I'm not sure if you are being serious, Vladimir,.....

A bit ironical, but serious. I firmly believe that person smart enough to get PhD and work as postdoc for a number of years just must be able to start his own enterprise.... and succeed in it.

Look around how many stupid people with little education can do own business. The only thing needed is a special programs of state support for those entrepreneurial postdocs., who wish to try it but do not have specific experience in it and start capital as well..

Here we have such programs (not specially for postdocs) , they give 15 000 evro per year (additionally to stipend to live on) almost without interest and without obligations to return it back in case of failure. But they also require an external financial adviser (they give him to you for free) who controls your activities.



[Yevgeniy Grigoryev, PhD](#) •"The only thing needed is a special programs of state support for those ... who wish to try it but do not have specific experience in it and start capital as well ... almost without interest and without obligations to return it back in case of failure."

Is it just me or does this statement eerily describe a model already in place, called ACADEMIA?

I am just curios, how will you justify spending taxpayer's money (this is where state funding comes from) to try things without any promise of return or deliverables? This is exactly why there is no support for science funding, because too many people like to "play" a scientist on someone else's money, without making any contributions or returns to the taxpayers and society who funded them.



[Vladimir Kaigorodov](#) •Yevgeniy, It is a real Belgian system of activating long-term jobless people to start their own small business and become independent. Sweet dream of our socialists who control budget and decide how to spend it.. Success rate indeed is very low... most of those artificially subsidized businesses fail after end of state support line. But you need to see what sort of people can get those opportunity... most of them are pretty low educated, without skills, with drug abuse history or other mental problems ... Obviously it does not work well.... Why not to redirect those funds to people with PhD? I am sure that success rate is going be 50% or more. We also have pretty interesting experiments for employment which is called Social Entrepreneurship. Those organizations can employ only those people with all sort of problems who cannot find job in normal way. They are non-profit and if they go into minus then they can get a subsidies to cover operational losses.

It could be pretty interesting to create similar system for jobless postdocs.. to do some socially important projects.



[Yevgeniy Grigoryev, PhD](#) • Vladimir,

I am not familiar with the system in Belgium, so I'll take your word for it. From what you have mentioned, however, it does not seem like a permanent solution to the current post-doc crisis here in USA. The society will get fed up with shouldering the unemployed post-docs who are minted by the thousand (at least here in USA) resulting in even more post-docs with failed career goals.

The only way I see to revitalize the crumbling and dysfunctional academic system is to industrialize it (gasp!). Yes, that's right! Instead of producing more PhDs for an already oversaturated and underfunded system, PhD and post-doc training should provide a very broad range of training, allowing trainees to get exposure and experience in skills that will make them marketable for all range of careers. Hopefully this could resolve the current flood of PhDs deemed unemployable outside Academia.



[Vladimir Kaigorodov](#) • That is the same thing I am talking about... just I see it from different point... Postdocs and PhDs should not be bound with Academy... they need a range of another employment opportunities ... and some sort of subsidized artificial organizations aimed specifically at PhDs can be a nice solution for that transition period from Academy to somewhere else. There scientist can get some new skills and certificates for access to another job.

And it is not that expensive for taxpayer... anyway most of scientific research is going into waste.



[Yevgeniy Grigoryev, PhD](#) • That is the same thing I am talking about" - I beg to differ. Your argument is that the government should provide unemployed PhDs some special federal subsidy, based solely on their degree, so that they can apply it to pursue whatever project they deem necessary, without any regulation or accountability.

I am against such subsidy as it will not solve the current crisis, it is like installing more sophisticated electronics onto a vessel with a rotten hull, it will sink regardless of how much money you dump into other things that do not make it more sea worthy.

I am advocating a complete overhaul of the current systems to make the graduates more employable.

"most of scientific research is going into waste" - depends how you look at it, without basic research, application driven research would not be possible. I am not arguing to abolish basic science research, I am saying that PhD training should provide a broader scope of training, because, aside from the 20% that might end up in academic research, the remaining 80% should be able to use their training to find employment outside of academia, which currently is just not happening.



[Andrija Finka](#) •PhDs and postdocs positions need to be recognized as JOBS. As I mentioned earlier, postdocs should be institutionalized immediately (subsidized) after their first postdoc, need to pursue research and teaching independently (supervising max 1 PhD) and eventually being promoted on the another university according to the merits or they may choose to leave academia and continue somewhere else. Professors can only train postdocs.



[Vladimir Kaigorodov](#) •postdocs positions need to be recognized as JOBS...

That is the major point... O totally agree. At this moment postdoc position in Academia is not a job, it is a training, and they have no rights for full-size social security as factory workers do. If we could solve that systemic problem then everything is OK... postdoc can work some time on one project , then live on jobless benefits until next project... and so until a pension... anyway those jobless benefits are not much different from salary, financially it is the same... the most valuable thing here is income stability and predictability of the future.



[Vladimir Kaigorodov](#) •he remaining 80% should be able to use their training to find employment outside of academia, which currently is just not happening. ..

Well, it cannot happen inside Academy... we need external transitional organization that will first take those 80% out of Academy on its own account, and specifically help them to find

employment outside of Academy . By providing an additional training aimed to people with academic background and securing apprenticeship contracts with another organizations... Those transitional organizations should be subsidized of course, but not from Academy budget.



[Guy Havet](#) •Hi Andrija,

You have a few good points though I will twist them with my own point of view.

In which career, after graduating, do you actually need extra “training” without getting a starting position?

If a problem cannot be solved by one end maybe one should think looking at it from another end.

As Ryan pointed out, actually you shouldn't need to do a post-doc.

But there are so many PhD who are desperate enough to do a post-doc.

Didn't they get enough training already or is it that the training was not appropriate for them to get a full time position?

Taking care of a younger fellow PhD student actually could be started before graduation under the supervision of a PI.

Also pushing the reasoning of Andrija a little bit further, I have seen many PI with 20+ students.

They have actually not enough time to advise them nor any time to get trained to get themselves some “soft” skills or have a family live and time to think. Therefore there should be quotas for the number of students they can supervise.

This in turn will give some chance for the new PIs to start with fewer students.

However, this approach won't solve the funding issue nor the glut of Ph.D.



[Andrija Finka](#) •But, that is what I am proposing:Post docs should be turned to PIs with max 1 PhD student and professors should train only limited amount of post docs before they get institutionalized.



[Andrija Finka](#) •Of course this will require smaller budgets, necessity for collaborations etc...but people will have jobs. I mean, which industry can throw away 5 billion \$ of investment per

year???

Government certainly can.



[Vladimir Kaigorodov](#) •If there is somewhere overproduction of electricians , they do not ask to stop overproduction... Demand for electric work cannot be artificially pumped up. It depends on housing market... that depends on banking sector...

How can we make more demand for PhDs? In current economy? It became so easy to get PhD that in fact its market cost close to almost nothing.

In fact , as a manager in company , I would like to know how much money that person with PhD can bring into the company... And I will compare it with person without PhD.. and then if I see a serious gain... it is fine... That is the problem - PhD has no real value... in real world outside the Academy.



[Marie Rippen](#) •There's low demand for PhD's right now, but the supply is too high. Therefore, pay and opportunities for advancement are low. The solution is to either increase demand or reduce supply. Since demand is dictated mostly by the amount of money the federal government and the private sector are able to spend on R&D, I think that demand will take a long time to increase. We should try to increase demand as much as possible, but we are more likely to make headway reducing supply. If we reduce the supply to the level that just meets the demand, the job prospects will improve and PhD's will get paid more because employers will have to compete for them.

The way to reduce the supply is to educate the undergraduates and undergraduate advisers of the present situation. In my experience, undergrad advisers are thrilled to hear about a student desiring to go to graduate school, mainly because they think that will lead to good job prospects in academia or industry. Sure, some advisers probably just want to boost their university's statistics on how many students they send to grad school, but most advisers and career counselors want the best for each student. If they knew what the real prospects were, I believe they would do their best to educate the students.

One tangible step we could all take is to email the career centers or advising departments of our universities with some information on current job prospects. Here is a link to an in-depth study by the NIH on the current state of the biomedical workforce:

http://acd.od.nih.gov/bmw_report.pdf



[Myron Shekelle](#) • Yes, Marie, I think you are right on target!

But to be clear, most of us probably agree in a multiple-pronged approach, and we might each have a favored solution. Some are more realistic than others in the current social-political climate.

So, off the top of my head, I recall these suggestions:

- A. Cut down on the supply by educating undergraduates (and Masters students, I argue) of the job prospects.
- B. Encourage universities to convert some post-docs into permanent research scientist positions.
- C. Encourage universities to condense many part-time teaching positions into one or more full-time positions.
- D. Encourage universities to help train their PhD students for jobs outside of academia.
- E. Encourage universities to help market their PhDs as valuable resources for government and industry, rather than scorn them as "failed academics".
- F. Encourage government to provide start-up grants for PhDs (FYI: in the USA it would likely be illegal to put an age qualifier on such grants).

All of the above are good suggestions, in my estimation. Here is my assessment of the realities in the USA:

- A. This would be best accomplished by an independent nonprofit, as I don't think universities will see it as being in their interest to tell prospective customers that their product is not worth the price they will pay.
- B. Not likely that the Federal government will come up with money for this, though some R1s might try this as an experiment.
- C. Parents really need to be proactive here. They could get it done if they squeezed the degree mills. Legislatures could help too if they upped the standards for a given school to qualify for federally-guaranteed student loans.
- D. I can see 2nd and 3rd tier universities doing this. Maybe they already do.
- E. I think universities would be very receptive to this idea. It gives something for their placement

offices to do and makes it seem like they care about the value of their product and the fate of their customers, without really costing them very much.

F. These probably already exist to some degree through NSF, NIH, SBIR, etc.

At the end of the day, if we are honest with ourselves, we should also acknowledge that our cohort is particularly impacted, and there might be no escaping the reality that many of us will never come close to having our job expectations fulfilled. That shouldn't stop us from using our skills and experiences to try to improve the situation, though.



[Yevgeniy Grigoryev, PhD](#) • These are all great suggestions. A few challenges I would like to point out:

1) The influx of foreign PhD students and post-docs currently will make it hard to implement the above state measures locally. There are some countries that had already oversaturated their academic sectors by increasing PhD production, thus making their PhDs virtually unemployable in any sector (Japan is a good example).

2) The above mentioned suggestions are very logical, however, HOW do we go about implementing them? PhD students and post-docs do not have much, if any, sway in dictating academic policies. To really have an impact, these sectors need to have a strong political presence. The only way I see that happening is by unionizing. If anyone in the trainee position ever had to challenge the PI or the program, you know that in 99% of cases, institutions will side with the PI/program, with the PhD or postdoc to boot. As cliché as it sounds, but there's strength in numbers. Not trying to instigate a revolt here, but as a sector perpetually devoid of any control or power, we need someone to represent our rights and voice our concerns.



[Myron Shekelle](#) • Yes, Yevgeniy, I agree with both points. At least I think I do. In point one, are you referring specifically to the USA, or is 'foreign' and 'local' to be interpreted more generally?

Marie made a point about implementation, i.e. that we contact career centers or advising departments. You mention unionizing. I agree that something needs to be done, for the sake of academia if nothing else. But I think you correctly anticipate the blowback if this is not seen within academia as being done in partnership for a better future. If not there is the risk that the leaders would simply be labeled as troublemakers, "failed" ones, at that. It's far too easy to this

all within the parable of Aesop's fable, "The Fox and the Grapes", and that would merely allow academia to put off until another day reforming itself.



[Yevgeniy Grigoryev, PhD](#) •Myron, I am specifically referring to the current situation in the USA, although similar trends are possible in other countries, or had already happened. I think there is a global academic stagnation, which results in people relocating in hopes of more promising career opportunities. I talked to many Japanese colleagues who cited virtual unemployment following PhD completion in their home country. I am also observing the general make up of the US PhD and post-doc populations, which are about 60% foreign nationals from what I have seen. So it would be quite daunting to control the supply of PhDs to create a greater demand.



[Myron Shekelle](#) •I have argued elsewhere in this group that those who are not US citizens, and who do not hold a Green Card, will need to acknowledge the new normal. If at one point in the recent past it might have been rather easy to immigrate to the USA and work here, using a PhD or post-doctoral position as a stepping stone, things have changed. It will become increasingly risky for employers to hire foreigners, with so many similarly qualified Americans and Green Card holders unemployed. I have been an expatriate for many years, and eventually got weary of fighting with "locals" in order to prove my "exceptional" skills, weary of the back-stabbing, weary of the nationalistic chants to "go home", and finally came home to the USA. At some point, if it has not already, nationalism will rear its ugly head in academia, as it has in many other fields in many other countries. That is another unfortunate consequence of the current glut of PhDs. :-)



[Andrija Finka](#) •Myron, these are excellent suggestions. But somehow I am waiting that "PhDs will hit the fan". Freshly undergraduates do not want to go PhD pathways in USA/EU because it does not bring them any personal economic improvement and they are loaded with informations.



[Andrija Finka](#) •And Vladimir "PhD has no real value... in real world outside the Academy."... You are so wrong because the interest of industry in academics start from the point where they see that academic work can be patented and not only published.



[Vladimir Kaigorodov](#) •How many PhD can show a good commercially successful patent? I am one of 500 who did it...It was sold for a few millions, but... the academy rules give me just 1000 euro... thanks you Vladimir for you invaluable income in our prosperity... They do not want to give me at least 10% of it and offer position of PI... Commercial success has no value in Academy... May be that is a problem?



[Andrija Finka](#) •I said industry, not Vladimir. And mine has never been commercialized.

"Commercial success has no value in Academy... May be that is a problem?"

I am comparing funding in academia with that in catholic church: the only thing is that taxpayers are more skeptic than the believers.



[Tracy Terry-Allison](#) •Call me crazy, but institutions rarely see the value in implementing something until they realize what their blindness costs them...rather than seeing the implementation of professional research scientist positions in academia as a 'handout' to help out pitiful PhDs who can't find a job, why not see it as an answer to a problem. New assistant/associate professors are saddled with the herculean burden of becoming instantly scientifically sufficient with limited resources to hire the talent that is supposed to yield the results to publish papers and thus more grant money to sustain them...why not have academia maintain a pool of 'professional hands' for the specific purpose of jump-starting the careers of

new academic hires? Absorbing the cost of the 'professional hands' would not only help out the glut situation, but more importantly, support their (academics) investments in new hire talent. Thus the start-up money would not have to be so robust as the new hire would not have to procure and train techs willing to work for near slave-wages (not to mention the time/resources lost while vetting of 'bench talent')

Ultimately, the place where true revolution required to solve this problem must occur is not any institution, but in the mind. Mindsets of people tasked with training PhDs has to change, and many who have this responsibility have not changed theirs. Many hardcore academics consider any commission of science outside of academia as a 'booby prize' of sorts because the trainee/scientist wasn't 'good enough' to 'win' an academic position. Thus, they don't see anything wrong with the current system, only that this glut and the observed difficulty is but a function of 'scientific Darwinism' at work-unpleasant yes, but necessary to the task of ensuring that places in the hallowed halls of academia are reserved for-and granted to-only the most 'fit'. Though there is some spec of truth in that depiction-not all PhDs are meant to be independent academicians-it doesn't change that fact that there are several viable candidates for each seat. Their inability to get a position is more a function of quantity, not quality. Changing that mindset is key to their acknowledging their impotence in performing their true mission: which is to prepare scientists to contribute in all facets of science, not just academic science. Its key to them valuing and esteeming positions outside the ivory tower as much as they do those inside it. And identifying and valuing students with those skill sets as much as those who will surely be academicians.



[Vladimir Kaigorodov](#) •Well, the short cut.... we are all need to become pseudo- scientists..... it is the way to survive..... in current situation....



[Guy Havet](#) •I would love to read the position of a highly influential and visible man such as Kevin.



[Vladimir Kaigorodov](#) •Why not to explore the power of unemployed scientists and make something that can change our world.

A think about bringing together a team of molecular biologists, who are now jobless thanks to a crisis and make a impossible in normal financing situation project.

Just a genetically modified organism (yeast or bacteria or even ameba) that can induce infertility in humans when consumed with food. It should be reversible of course... with special treatment those who can afford to pay for it or are eligible to enter special fertility programs can still have children.

It is going to have far more impact on our future... Without any sort of war and human suffering we can achieve in 50-70 years substantial reduction of human population , especially in overcrowded regions like China, India, some Arabic nations... and Latin America. It will release a pressure on ecosystem and reduce poverty and prevent wars.

Technically, I personally do not see any substantial problem on the way to such a creation... We can make it in 3 years with limited budget around half million euro... The major question remains who needs it to be done?

May be crowd-funding will help us to find a target auditorium who really appreciates such a project and willing to give donations to bring idea to reality... Is the KickStarter an option?



[Isabela Aparicio-Erriu](#) •@Vladimir: I hope you're joking...



[Vladimir Kaigorodov](#) •No, it can be very exiting art-science project.... First-of-its-kind on crowd-funding platform. I am really wondering how much funding we could possibly collect with such a project.... It can be a great surprise that will be worth of special article in Nature.



[Yevgeniy Grigoryev, PhD](#) •Headline in Nature "Jobless scientists develop a biological weapon that renders world populace sterile... hold world hostage".... and you are asking if there is a Post-Doc crisis? Apparently it is so dire that it is driving some people off the deep end...



[Isabela Aparicio-Erriu](#) •Thanks Yevgeniy, that's about what I had in mind... I still think Vladimir



[Andrija Finka](#) •Erm...there is still a rubber.



[Clifford Mintz](#) •There is actually a group who is trying to create the type of platform that Vladimir is advocating. Also, there is a company called Transparency Life Sciences that is using a crowdsourcing model to reinvent and find new uses for generic drugs and other compounds.

For those of you interested in crowdsourcing as a life sciences research platform check out this article <http://www.lifescienceleader.com/magazine/past-issues3/item/3765-crowdsourcing-pharma-drug-development?list=n>



[Vladimir Kaigorodov](#) •You know... I am really interesting how much money we can collect from crowd-funding... If it will be something close to half million then I do not need it anymore... the private investors would be happy to give me 5 millions for the project.

That is how it works now a days, nothing personal. Digital world takes over reality.



[William Polk](#) • First, post docs will never be permanent positions as from the University perspective that is the equivalent of a staff scientist. Post docs are training appointments and are supported and paid as such. They are meant to be temporary and are treated as such. This is why they can't apply for their own funding. It is not the university system that is the problem in this regard, it is NIH with their special designations and limitations for post docs that creates the issue.

I've run the whole circle academic post doc to industry back to academic post doc and now government post doc. I can say that the unequivocal problem is that post doc training in universities are no longer providing training sufficient to move people on in their careers. Industry have several acute needs at the PhD level, like risk assessors, PBPK scientists, industrial microbiologists, bioinformaticists, pathologists, translational scientists, clinical trial experts and deep sequencing experts. The fragmented system is broken because NIH does not mandate proof of post doctoral training in critical need fields and so many post docs are trained in techniques in which industry already has full capability. I would recommend a completely different tact to funding which would overhaul the system by mandating reports on post doctoral placement as part of grant renewals. PIs that continually hold postdocs or only send them on to other post docs would thus be penalized for failing to prepare their trainees for the outside sector. PIs would adapt in short order and forge connections to fill this aspect of the grant process because their funding depends on it. To believe that reform can come at any other place in the process fundamentally misunderstands the new trend of industrializing the academic institution. Of course, I think the entire system of funding needs an overhaul, as rarely do PIs work alone to complete new grant applications.



[Clifford Mintz](#) • @ William Interesting proposal to keep PIs informed about changing career requirements by pinning their success to the success of their students and trainees. Unfortunately, university administrators would never sign on to that type of agreement with NIH because nobody can guarantee a job for student or person that they train. As you correctly assert, there are simply too many persons being trained to jobs that are already filled. Sadly, most PIs were trained to do the things that they are training their students to do. Unless PIs go out into the market place to determine where the jobs are and are willing to change their programs and research tack to accommodate the needs of industry, then the plan will never work. Put simply, the PIs already have a job (that they want to keep) and finding jobs for their students and postdocs is simply not a priority to them (nor should it be a requirement in my opinion).

Despite the growing postdoc crisis, I recently saw that a group has created a Journal of

Postdoctoral Research. In my opinion, this is a very bad tactic. By creating and legitimizing a publication dedicated to postdoctoral research, the founders of the journal are perhaps mistakenly institutionalizing the postdoc track which will make it harder to change as we move forward. The creation of the journal is a clear indication that the postdoc position is a legitimate one and is here to stay. I think the authors efforts and financial investment would be better served if that they created a journal dedicated to career development and job procurement for postdocs....not their research which is usually not original and conducted under the auspices and funds acquired by their PIs!



[Myron Shekelle](#) •"industrializing the academic institution" Ha, ha! Thanks, William. You may have coined a phrase there.

I was initially put off by your suggestion to rank future NIH proposals by the placement success of postdocs involved in previous grants. My concerns involve "cart and horse" issues. Should the needs of industry by driving academia, or should academic research be spurring new industry? Classic examples would be things like PCR in the late 80's and induced pluripotency twenty years later. Thank goodness those teams were not training their post-docs for the then-current needs of industry.

But I concede that I came around to seeing wisdom in your suggestion. As I see it, every PI wants to train their PhD students and postdocs for academia. To do otherwise in the current environment is to brand oneself as being lower than a first-tier academic. But the reality is that the top labs in the country produce enough PhD students and postdocs to fill almost all the academic jobs, and for better or worse, I don't see that being affected by your proposal. On the other hand, students and postdocs not in one of those top labs have to get quite a bit luckier if they are to get a job in academia, though that doesn't stop their PIs from training them exclusively for an academic career in the current system. So, as I see it, your system would create a positive feedback loop that would help (coerce?) PIs to self-identify their rank and role in academia and they would need to adapt their research program accordingly if they wanted to continue receiving funding.



[William Polk](#) •I'm glad you like the term, but it's pretty widely used when discussing the Hopkins model of fund yourself or be unemployed, or as academic institutions call it "the non-tenure research assistant professor".

As to your points, first, I would argue vehemently that we, as a society, have different funding

vehicles for different goals. NIH sells itself to Congress by stating the number of jobs and the impact on the economy. That's why they get funding increases while NSA, EPA and FDA get cut. As I see it, they should put their money where their mouth is. If that means training post docs in the flavor of the month so the post doc can move into an industry position then so be it. Amazingly, this could start to drive more incubator appointments and a greater push into entrepreneurship. As for the training being too narrow, once you're in industry, its your job to keep learning and find a way to stay employed. That's true for everybody, the post doc is just supposed to get you in the door. Second, the self identification goes farther than just a PI recognizing where they are capable of sending people, but they would also need to recognize the skills of the trainee (and the trainee's placement desire). Since an ideal system would not score differences in permanent placements, every PI would have added interest in identifying the best fit for their trainee. The great PIs already do this. Many of the new research PIs don't.



[William Polk](#) •@ Clifford. I disagree with the idea that universities wouldn't sign on. They need the money to support their infrastructure. They will follow or wither away. The academic side of the institution would be fine, but most Tier 1 universities receive significant parts of their budgets from those indirect costs. If they want more control of their research, then rely heavily on private funds.

And I agree with you about not legitimizing the post doc situation. It's a shame that people feel the need to do that at all.



[Guy Havet](#) •Vladimir,

Indeed one way to get money (the easiest one) has always been to scare people.

Who heard about this quote?

François Rabelais : « Science sans conscience n'est que ruine de l'âme »

This was readapted to

“Science sans conscience n’est que ruine de l’humanité”

I would rather prefer the other way to raise funds: making people dream.



[Vladimir Kaigorodov](#) • Well, I'd rather interesting in art-science research of power of a few people in modern world. Technology development became the major threat to our very existence.

Before it was always inventors of new weapons who did it. Nowadays, a small company of enthusiasts with great ideas and with limited funding obtained directly from individual supporters can change the course of humanity. Is it not a dream of anarchist artist? To be able to change the world and defeat the State? For better or for worse... it does not matter... we cannot predict our future.



[Guy Havet](#) • For those who like perspective, like Alex, you can look back at the history of mankind or look toward possible futures.

At the inception of science, since the world has revolved, scientific work was carried out by people who had the luxury to spend time observing, thinking and eventually understanding instead of spending time finding means to feed themselves and their family.

They were from an upper cast of the society. In France, more than 20 centuries after the Grecs, scientific work seriously started with the “Siècle des Lumières” when some Noble Men had the wealth and interest to do research.

Having a background in chemistry, only last year, I learned a summary of the life of Lavoisier. He is now considered as the father of modern chemistry.

Indeed, you can have great achievements with money but all depends on how you get it.

To summarize in a few words, he was a tax collector under French King Louis XVI.

This helped him to fund his research. He got his head cut in 1794.

This just exemplify how society value scientists and how funding through taxation can lead to extreme cases when scientist are not in phase with the needs of the people.

If you'd like to get a broader picture of the prospect of mankind you may consider Fermi paradox and play around with Drake's equation.

Please, share with us your results.



[Andrija Finka](#) • Yes Guy, except today Lavoisier would feel like Alice in Wonderland.



[David Talaga](#) • The fundamental problem underlying the "post-doc crisis" is that basic science in the USA is funded at a very low level and is primarily researched at universities by low-wage trainees. This model is only sustainable if the low-wage trainees can obtain rewarding high-wage positions after being trained. In many fields, particularly the life sciences, the model is no longer viable. I would suggest that the glut in trainees in the life sciences stems from two driving forces: pre-med washouts and the NIH. The NIH has been funded at a much better level than the NSF for my entire career. People flow to where the near-term resources are. The result is that more people have obtained the Ph.D than are needed to fill Ph.D. roles. There is almost no competition in the USA to enter a science doctoral program at an accredited university and be paid to attend. Reality is that about half of the science doctoral programs should be shuttered or converted to MS programs.



[William Polk](#) • @ David, could you please elaborate on the data driving your opinions? The idea that science is poorly funded in the US is only true at the basic science levels where the research rarely translates into a public good. The money spend in the private sector on clinical trials is well beyond the GDP of many, many nations and dwarfs research spending in almost every other technology category. The idea of NIH and med school drop outs is insulting and inflammatory. I find neither to be applicable to me nor many of my colleagues.

And your idea of sustainability is questionable at best. Many, many positions exist for PhDs in science related disciplines, which are required to compete internationally within the regulatory environment. The ideal degree is PhD+JSD. The 'failure' of the academic institution is to stay relevant to the market. Most of the clinical trial CROs have substantial personnel needs that extend well beyond what MS programs are capable of training for within a two year program. There is no doubt that industry could train people to fill these positions, but that envisions industry investing in individuals, a business model outdated and now a rarity. Most of the people I know, including those NIH trainees (which is not an academic institution and does not have a PhD or MS program), are training for clinical trial career paths on their own time because they know the need. As I see it, programs are generating the degrees that industry needs without the

proper training. Shuttering them would increase the need to go abroad for trained individuals. Instead, we need to retool the programs to provide better training to meet the needs of the industrial sector for some fraction of the graduates. That way, new grads could capitalize on job availability outside the ivory tower. The failure, as I have seen it across three different industrial sectors and multiple levels/disciplines of the academic institution is that academia seems to only train new PhD for academic careers, an increasingly crowded field that generates funds almost exclusively for pandering to the government, an unsustainable model to be sure. If you question such logic, just ask a industry insider how long it takes to replace a trained clinical trial manager, translational scientist, risk assessor or ADME/PBPK scientist, all positions preferentially filled by PhDs, but filled by MS degrees following industry experience.



[David Talaga](#) • I'm analyzing the problem in terms of the forces that drive folks into different paths. My data is anecdotal and/or from C&EN and NAS publications. The glut of Bio and Biochem majors at the BS level stems from the premed phenomenon. The size of Chemistry faculty is, in part, driven by premed service classes. "Top" PhD programs focus on training for academic positions because this is the path to prestige for the department and university.

The migration of PhDs toward clinical research is clearly a matter of funding. If there were more funding for basic science research, many PhDs would stay in basic science. Unfortunately companies have mostly shuttered their basic research operations. Even federal agencies are increasingly focussed on applied research.

If you believe that there is training that doctoral programs should include that is broadly applicable and not tailor-made for a particular short-term industrial needs, I'm all ears. However, the more specific the training, the fewer positions the candidate is "qualified" for. By the time curriculum is developed and students are trained to fill demand, the demand is usually gone.

Traditionally specific training for specific needs is the realm of the MS degree, not the PhD. The PhD is supposed to be someone who generates new knowledge, whereas the MS is supposed to be someone who can apply existing knowledge. Application of existing knowledge is much of the work that CRO's do.

I suggest that the failure here is that the PhD has become too dominant and that the MS is an afterthought in most universities — often it is a consolation prize for students not admitted to PhD candidacy or an add-on for precocious BS students. Many MS programs can be completed in 9 months. The institutional prestige associated with PhD programs and the generation of indirect costs associated with research grants means that there is much more incentive to focus on PhD programs at the expense of MS programs.

I don't see any domestic students going abroad for PhD training because they couldn't get into a PhD program in the USA. Most PhD programs in the bottom half of schools have large — often

majority — enrollments of foreign students of varying quality. Even the top department have large enrollments of foreign students. The argument that a reduction of PhD seats by 10-20% (the bottom half of programs are typically much smaller than the top half) would drive students abroad to get trained is not credible. Most programs struggle to fill their seats with qualified students.

If you examined the bottom 50% of PhD programs (>180 in chemistry in the USA), you might agree that their best students might be better served in a program with more resources. I think that you may not realize how low the qualifications of many students entering those programs are. Shuttering and retooling those PhD programs to be true MS or SciD programs focussed on specific skills needed in practice would better serve those students who are not interested in basic science or academia. Of course my friends and colleagues at such institutions would not agree publicly.

Some universities are creating "Professional Masters" programs that focus on delivering those topics relevant to industrial practitioners. The value of these programs will probably depend on the degree to which faculty commit to developing the right curriculum. If they are successful, I believe that the new courses created for these programs will likely enhance the PhD programs as well by providing "practical" coursework options allowing PhD candidates to flesh out their career preparation. My biggest concern about these programs is that university administrators seem to think that the new Professional MS students are going to be big sources of tuition dollars with little or no investment of additional resources for development of the new curriculum. In other words, do nothing to address the real need.



[William Polk](#) •David, first we must separate intent of career from career interest. I enter my undergrad with the idea of being a "research doctor", not fully understanding the biomedical infrastructure and quickly opted out of the medical tract into the research side. Thus, I could be considered a premed drop out, but this is really incorrect as my aspiration was always research and never medical practice.

Second, I feel the need to point out that the 'top' institutions are generally referred to as those that bring in money. That is the fundamental problem in the entire equation. Basic research in academia, more often than not, is now producing science that can not be turned into a societal benefit. That may not matter to the researcher that turns those 'findings' into publications and more research dollars, but it is playing havoc inside corporations where the work they read is often misleading and costly to reproduce and where the trainees they receive are ill equipped to make the transition. These are not jobs that a new MS is sufficient, as most require the ability to reason through and solve complex issues that is only a part of the PhD and increasing requires additional certifications. The idea that a 9 month program would suffice in my field, toxicology, is completely off base. We barely received the basic training in toxicology in the first year and got little to no advanced training in applications within the field, like risk assessment.

Third, I'm not sure how the MS benefits anyone. That would turn this thread into a "do we have a MS crisis" or "do we have a research technician crisis". The fundamental problem would not change.

And for training that quickly goes out of date; all training quickly dates itself. Ask yourself the simple question of whether you stopped learning after you graduated. We all have to continually leverage our current abilities to gain future training or risk being irrelevant. The very least I ask of current training is to provide me the opportunity to get into my next position. This may redefine the PhD as a professional masters degree, but I know that without the PhD I have no career in my field. Pharma and biotech will hire foreign PhD over national MS because of the perceived reputation boost from such a hire. Thus, to work at the highest levels in bio-research, you either choose to start your own company or to earn the PhD and then get the post doc training. Could a MS be sufficient for industry, sure. Is it, no. And no amount of lamenting that fact will change it. Converting those lower tiered programs will essentially send those companies overseas to fill their perceived needs. The motto for biotech has quickly become to move where there is ample pool to fill the staff. The RTP capitalizes on this during recruitment all the time. And I speak from experience that chemistry PhDs are in high demand along the gulf coast, whereas the MS is not. The companies hand a significant investment to new hires and they believe that the PhD is better equipped than the MS because the PhD has the skills to resolve project issues. Again, the MS is of low value in this instance because of the perception of the company.

And FYI, I've seen the bottom 50% in action. I've seen the top 5 in action. The difference in resources is astonishing. The difference in quality of preparation and degree utility is not as wide of a gap. Do these degrees devalue the top 50%. You'll not convince me that they do because the funding agencies, industry executives and the scientific community at large understands the disparity and treats it accordingly. That is why some grads are sucked up instantly and others find limited utility in their degree. We know the top programs and those people usually get placed accordingly.



[David Talaga](#) • I don't think anyone should be casting "societal benefit" stones at the usefulness of the basic research done at universities. First off "basic research" is not intended to create immediate societal benefit *by definition*. The immediate societal benefit from university research is training new scientists. Second, the amount of money spent on clinical trials that never lead to a useful drug (the ostensible societal benefit) dwarfs any possible lack of societal benefit at the basic research level. Third, many people in pharma believe that the high rate of failure of drug candidate in late stage clinical trials is due to the poor performance of the molecular, cellular, and animal models of the diseases. That conclusion suggests that the level of basic science understanding was inadequate.

On the issue of reputation and research dollars, Rutgers chemistry is currently #1 in federal research funding and has been in the top 10 for at least a decade. However it is something like #90 in PhD program reputation. Anecdotal, yes, but the placement of graduates into faculty positions and number of faculty member in the National Academies is a much bigger driver of academic reputation.

To bring this back to the original topic... If there is a post-doc crisis, one contributing factor is that many academic postdoctoral positions do not provide new training. Having served on NIH study sections evaluating postdoctoral fellowship applications, I can tell you that this problem is well-known. Applications that do not provide significantly new training are typically scored lower. The NSF now requires a postdoctoral training plan to be submitted and evaluated for any proposal that requests funding for a postdoctoral scholar. I am not convinced that these measures are having much effect as they do little to address the structural issue, which is that there are relatively few opportunities for a PhD to earn a reasonable living while pursuing basic research.



[Guy Havet](#) •Hi Andrija,

I am sure Lavoisier would have done wonders with modern tools and could have taught some modern scientists a few lessons (mais pas comment ne pas “perdre la tête” en suivant la raison plutôt que sa passion). One of his student, Du Pont de Nemours, saved his by immigrating to the USA.

One beautiful thing about science is one’s ability to wonder.

Another is the enlightenment.

Yet another is the permanence of what has been discovered. The pitfall is that it makes some scientists somewhat psycho rigid.



[Jayati Chakrabarti](#) •i strongly agree



[Aashir Awan, PhD](#) •I think more should be done to address the postdoc situation in terms of job prospects. And, especially considering the academia to industry transition. Having done 5 years

of postdoc fellowships, I don't want to do the whole grant writing process and entering the rat race of academia, I would prefer either a staff scientist position or something in industry.

But, too frequently, these jobs require either prior industry experience or are reserved for those at the BS/MS level. The frustrating part is that my skills fit the job requirement for a majority of these positions....but, it almost always about having prior industry experience.

I think.that overall, the posdoc position deserves a little more respect than this.



[Raquel Tayar Nogueira](#) •Ryan thanks for the links and articles! Really helpful! Practical ways of changing the path of academic scientists to industry....