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How Scientists Can Become Entrepreneurs

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Abstract

Translating basic research discoveries through entrepreneurship must be scientist driven and institutionally supported to be successful (not the other way around). Here, we describe why scientists should engage in entrepreneurship, where institutional support for scientist-founders falls short, and how these challenges can be overcome.

Why Should Scientists Elect to Advance a Translational Research Program through Entrepreneurship?

Society has recently begun to ask us, its research scientists, to justify our continued existence by translating our discoveries into commercial products faster. While most of us are open to the idea, the existing incentive structure at most academic institutions is fundamentally misaligned with this commercialization objective. Moreover, there is a critical misconception that institutions should be responsible for translating the basic research discoveries of their scientists when entrepreneurship is, by definition, an inventor-driven process.

While most of us would agree that improving human health and wellbeing is a major driver of our work, the opportunity cost to our academic careers is significant when expectations shift from discovery research to commercialization. As academic scientists, we rely on basic research grants to fund our work, which are evaluated based on innovation and evidence of productivity in our publication record. While innovation is at the heart of any new technology, work that is actively being commercialized requires substantial validation and process optimization to ensure reproducibility (traditionally considered non-innovative by review committees). Translational research is also less likely to be published until it is more mature. Together, this means that putting efforts into commercializing innovation can reduce the likelihood of being awarded future grants and, thus, puts academic careers in jeopardy.

Financial incentives are also skewed heavily in favor of academic institutions, not investigators. For example, inventors at academic institutions typically will collectively own a percentage (25%, split among all inventors) of their intellectual property. However, this

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number is generally just a portion of the royalty rate (typically low single-digit percentage) from the net sales of a product after the employing institution recovers its administrative costs, legal fees, and so on, which usually results in no significant value to the inventor. It is true that the employing institutions assume the cost of filing for the intellectual property rights, but they also recover these costs when intellectual property is licensed. Moreover, if the venture is successful, academic institutions typically also profit from milestone costs and equity ownership that are also structured into the license agreement.

To justify the opportunity cost of engaging in translational research, we scientists should also benefit from the financial upside of successfully commercializing our work. This is best achieved through entrepreneurship, wherein we own a substantial share of the company that is founded to commercialize our technology, and have a major role in its development.

How scientists can become entrepreneurs is neither obvious nor taught. Here, we aim to empower scientists by compensating for our knowledge disparity in pursuing discovery research with economic purpose, and by identifying specific gaps in institutional support that we should lobby our academic and funding organizations to fill.

Availability of Protected Space

One of the most important things we need is protected ‘third-party’ space to advance our discoveries to market, apart from the conflict of interest and intellectual property ownership policies of our parent Institution. Particularly at the earliest stages, startups are mostly virtual companies that have no physical space, no employees (beyond the founders who are typically receiving no salary), and no money, which means that the forced separation of company and institution is not as clear cut as institutional conflict of interest policies would like them to be. The identification of temporary third-party space that is isolated from the financial and legal interests of our academic institution would allow us the flexibility to explore commercially interesting ideas, bring in directors and/or consultants, and hire research scientists, while remaining full-time employees at our parent Institution. The lack of affordable physical space is a major contributor to ‘the valley of death,’ the period of time from launching a venture to when it is mature enough to support itself from revenues or from investment by larger institutional investors. While fully equipped laboratory space is increasingly becoming available through incubators, it is generally expensive, of limited availability, and should be subsidized by translational program grants. These spaces could be offered by academic institutions to their own investigators on highly subsidized 2-year rotating leases to help spin their academic discoveries into commercial ventures; we should be lobbying our academic institutions and funding bodies for this!

Adoption of Standard License Agreements for Federally Funded Research

In the USA, the Bayh-Dole Act of 1980 allows universities, small businesses, or nonprofit institutions to pursue ownership of an invention in preference to the Government (similar practices exist elsewhere). However, academic institutions should not be permitted to leverage this ownership to stifle technological advancement in support of their bottom line. Standard licensing agreements would ensure all academic institutions are negotiating on

clear, equal, and transparent terms for tax payer-funded research. National funding organizations, such as the US National Institutes of Health (NIH), are uniquely positioned to oblige academic institutions to adopt standard licensing agreements for all federally funded research. Greater investor confidence into the expected licensing terms would also allow for licensing agreements to be completed within a shorter period of time (3 months versus 18+ months) and accelerate funding from private investors.

The bloated tech-transfer offices and large number of patents sitting idle at academic institutions should make the need for reform obvious. Ideally, funding agencies should develop standard licensing templates that can be applied to all federally funded research. A great way to encourage adoption at academic institutions is to target their wallets. We should lobby our funding agencies to consider directly tying funding of future awards to the adoption of standard licensing agreements (Box 1). Long term, this will more efficiently allocate billions of dollars in funding and eliminate a significant amount of transaction costs.

Box 1

Directional Recommendations for Restructuring Translational Project Funding

- Restrict to only fund translational programs (translational project grants should not become a mechanism for basic research funding).
- Require inclusion of a commercialization plan and appropriate commercial review by industry experts.
- Time from receipt of proposal to grant award should be limited to <6 months.
- Project funding should comprise approximately one-third of the total value of the grant, alongside space and entrepreneurial training.
- Grants should span 2–3 years to allow time for negotiation and execution of license agreement for intellectual property, completion of preliminary proof-of-concept studies, preparation, submission, and review of follow-on small business research grant funding
- Allow use of funds for nonresearch expenses including: incubator rent (if work must be performed outside of academic lab due to institutional conflict of interest rules), intellectual property costs, contract research organization work, accounting, human resources, and management.
- Budgets should be considered guidelines rather than rules to allow companies maximum flexibility in resource allocation.
- Success of the program should be gauged by: its ability to raise external funding, the execution of the license agreement(s), the establishment of independent space, and when it hires the first full-time employees.

There are several key principles that a standardized licensing agreement or process should adhere to:

- Ensure the inventor(s) (us) retains the final say in the execution of all academic institution out-license agreements.
- Align incentives of all parties; equity is the best tool for this. Early in a venture, there are many risks and many unknowns. It is best to align incentives between licensor and licensee so that they can work together to navigate these challenges.
- Minimize (or eliminate) cash transfers from licensee to licensor. 'Cash is king', particularly for an early-stage venture, where the cost of capital is exorbitant. Any cash transfers early on should be from the licensor to the licensee.
- Incentivize funding from third-party investors. Academic institutions should commit to match funding from founders or third-party investors at a predetermined ratio up to a predetermined threshold. This encourages founders to invest their own capital in their startups and increases the probability of additional private investment.
- Ensure development and deployment of the technology. Academic institutions often cite the risk of the technology being underutilized as their rationale for the excessive criteria built into their licensing agreements. This is a fair concern, and good faith provisions to ensure technology does not sit idle should be included.

The benefits to the company are clear in this structure. However, there are also significant benefits to the academic institution: it will receive higher equity ownership in each venture, there will be more ventures, and the probability of each venture succeeding will increase. While it may miss out on small cash payments from some companies that achieve early success and then fail, these will likely be far offset by the major wins across its portfolio. Furthermore, its transaction costs for each licensing deal will decrease dramatically.

Hiring and Training Students

It is important to emphasize that, for most translational technologies to be successful, either the principal investigator (PI) or the graduate student or post-doc involved with the project will have to leave academia to join the company full time. Therefore, if you are a PI hiring students into translational research programs, you should specifically seek out entrepreneurial-minded candidates for these positions.

Likewise, entrepreneurship programs are better targeted to students and post-docs who are driving the funded work. Although the grant awardees are typically the PIs, and the research programs being translated either represent their direct invention or work developed in their lab over the course of many years, it is rare for PIs to leave their parent institutions to lead the commercialization efforts. Unless you are in the minority of PIs who are disposed to make the jump, it is more useful for entrepreneur mentor-ship programs to be attended by the trainee in your lab who is willing to make the leap. We should also lobby our federal funding agencies not to attempt to establish these programs themselves; there are already many (see Table 1 in [1]) great local incubators and accelerators that excel in this. Funds would be better spent supporting them in exchange for spots at reduced rent that could be

offered to scientists translating federally funded research (more listed here: www.genengnews.com/the-lists/65-us-biotech-and-pharma-incubators/77900440).

Concluding Remarks

For discovery research to yield economic value quicker, scientists must become entrepreneurs. This will require us to educate ourselves in entrepreneurship and work directly with our institutions and funding agencies to realign our incentive structure, create protected translational research space, adopt standard licensing agreements, and rethink how we hire and train our students. This is the future of academic science.

References

1. Kirkpatrick L. Incubators for innovators. *Nat Biotechnol.* 2015; 33:129–132. [PubMed: 25658271]