Not-So-Lost in Translation
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Research fields may wax and wane but one area seems to be reaching its zenith: translational research. The field has become both multidisciplinary as well as multidirectional. It can go just as easily from bench to bedside as bedside to bench and back to bedside once again.

Adding to its complexity, translational research is now starting to be described as a multistep process—T1, T2, and T3—all of which require input from physicians and scientists alike. The first level, or T1, entails the movement of results from basic science into the first human clinical trial. The transition from this first human trial to a phase 3 trial marks T2, the second level of translational research. The final level, T3, indicates the transfer of results from the phase 3 trial to public health policy and public health improvement.

Just as there are many kinds of translational research so are there many ways to enter it. Academia and industry are meeting each other halfway—some even literally by sharing buildings next to each other—by coming up with programs to help train scientists who are interested in pursuing a career in this field. These programs, much like translational research, all cater to different kinds of scientists that make up the field: physicians, biostatisticians, postdocs, and graduate students.

"I think it’s here to stay. It does fulfill an important bridge between the clinic and getting promising bench discoveries transitioned into product development," says Richard Seabrook, head of business development in the technology transfer division of The Wellcome Trust, a UK-based nonprofit organization that offers programs to assist the symbiosis between academic investigators and biotech companies.

The Do-It-Yourself Route

While not the easiest route, one opportunity available to a postdoc or graduate student interested in pursuing translational research is to start one’s own company while still entrenched in academia. Both sides are aware of what the other has to offer. Academic institutions are starting to realize the potential commercial value of scientific breakthroughs and companies recognize the need for basic research in commercially important innovation. To bolster this relationship, The Wellcome Trust offers translational awards. This funding is given to academic scientists or small companies to “de-risk” product development so that the discovery will become attractive to a follow-on investor or existing company.
Around several major British universities—for example, Cambridge, Edinburgh, and Oxford—are science parks, a cluster of labs where new small companies, sometimes spun out from universities, have an opportunity to get themselves established. These companies first set themselves up for several years in incubator buildings, equipped with core laboratory equipment, until they acquire sufficient data and funding to move to larger facilities in the park.

For one such company, Seabrook recalls, The Wellcome Trust funding stemmed from an idea that Mark Carlton had while he was a research fellow at the University of Cambridge. Carlton devised a way of rapidly developing experimental mouse models, a staple of the translational field, to understand the function of novel genes. With money from The Wellcome Trust and a soft start at the university, he eventually created a company called Paradigm Therapeutics in 1999. His company then moved to one of the science parks around Cambridge and grew to include a subsidiary in Singapore. Both companies were eventually sold to Takeda Pharmaceuticals to form companies called Takeda-Cambridge and Takeda-Singapore.

“I did it in the real world,” says Carlton. “My role was a mix of scientific entrepreneurship together with commercial endeavor.”

He credits both The Wellcome Trust and “business angels”—business professionals who offer free advice to starting business owners—for his head start.

“You can get a lot of things wrong at the early stages while trying to get things right—there is a danger you can grow too quickly and exhaust finances before it’s fully commercially ready,” says Carlton. “If you’re an academic or postdoc trying to start something from one’s own research, try to get some business knowledge. Find someone you can trust as a mentor.”

The Paper/Diploma Route

If you’re not the entrepreneurial, risk-taking type, you can pursue a more standard academic route. To get an extra edge, some scientists are looking to get degrees in clinical and translational research. Several US academic institutions offer Master’s and doctoral programs specifically in this field.

The US National Institutes of Health (NIH) is playing a positive role in this area. As part of its roadmap to reengineer the clinical research enterprise and promote translational research, NIH has established the Clinical and Translational Science Awards (CTSA) program, which funds 24 nationwide academic institutions to set up programs to help train and offer career development in translational research. By 2012, NIH plans to fund 60 awards, with a total cost of about $500 million.

Barbara Alving, director of the National Center for Research Resources (NCRR) at the NIH, the institute which helps fund and sponsor the CTSA program, describes the program as not just a collection of separate institutional awards, but even more important, a “philosophy” of how clinical and translational science should be conducted and of how the next generation of investigators should be trained.

“It’s a way of recognizing that this is how we really need to move forward based on where we are with scientific research. There is a need to interact with biotech and pharma, a need to understand intellectual property and patenting—all of this is really now part of the academic career,” says Alving, who adds “many individuals will have careers in academia, but they may have also spent some time in industry. They may go back and forth. The CTSA program will position them to be more broadly thinking so they can have a series of possible careers.”

Not all CTSA programs bolster translational research in the same way, points out NCRR Division Director of Clinical Research Anthony Hayward. “We have 24 different solutions to that problem right now,” he says, adding that all have the requirement that they work together as a consortium. Both Hayward and Alving...
hope that these institutions will spread their translational research and knowledge to other national and worldwide institutions not in the program.

Of the institutes in the CTSA program that offer degrees in translational research, that of New York–based Columbia University appears to be the most versatile.

"I like to call it intelligent crossover training," says Karina Davidson, associate director of the Irving Institute for Clinical and Translational Research, Columbia’s CTSA program. "These are individually tailored programs. It’s not every scientist in training who requires this kind of knowledge or skills or extra course work."

For five predoctoral students a year, Columbia offers a one-year certificate program. Postdoctoral students are given the opportunity to obtain a Master’s degree in patient-oriented research. Even at the junior faculty level there is a multidisciplinary mentoring program. For the predoctoral and junior faculty members, of whom 10 from each group are accepted each year, they are given the opportunity to do a rotation at a local industry laboratory to see what the intramural scientists are doing, how deals are negotiated, and what sort of applied skills are needed to work with industry.

The program takes a multidisciplinary approach through its seminars covering numerous fields, says Davidson. “Each scientist needs to be an expert and have depth of knowledge in their own field, but the different disciplines will have to learn to work together.”

“It’s really taking my research interests in a whole new direction,” says Russell McBride, a graduate student with a cancer epidemiology background who is working toward his program certificate. “While I might be struggling with a particular problem in my research, it may be one that someone sitting right next to me, working in another field, has already encountered and dealt with. This could be something as mundane as help with writing a grant proposal, or as critical as identifying a fatal methodological flaw.”

This help from people outside one’s own field and the training that the CTSA program offers will allow students “to become more valuable, more knowledgeable, and more marketable because they will know both sides of the problem,” says principal investigator of the Columbia CTSA program, Henry Ginsberg.

McBride is optimistic about his prospects, whether it is in academia or in industry. "I feel that I am very well situated for a range of good postdoc opportunities."

**The Internship Route**

For those who haven’t yet made up their minds about pursuing a career in translational research, some biotech and pharmaceutical companies sponsor translational research internships.

“There are alternate career options besides just doing a postdoc,” says Holly Soares, director of translational medicine at Pfizer Research in Groton, Connecticut, who adds that Pfizer is starting to partner with The Wellcome Trust to offer these kinds of internships. “You can do internships that are focused around trying to develop your experience in drug development, something you might not get with a standard postdoctoral experience.”

A more established internship program is available through Genentech in South San Francisco, California.

In what Vishva Dixit, vice president of early discovery research and director of Genentech’s postdoctoral program, calls an "enlightened viewpoint on industry research," the company does not look for people with translational experience. Rather it feels that this experience can be obtained over time.
“We don’t distinguish between basic fundamental research and translational research,” he says. “We believe someone who is capable of doing good basic research is capable of doing pioneering, translational work.”

About 120 postdocs are currently in this competitive program, which consists of an interview similar to a postdoc interviewing for an assistant professorship and a seminar “chalk talk” that is vetted by a committee. Once accepted, these postdocs work only on basic research and are not allowed to work on product-related research.

“We don’t want the postdoc program impacted by any commercial concern,” Dixit explains, likening his program to a mini–Bell Lab. “The postdocs at Genentech devote their time to doing cutting-edge, basic research that is hopefully published in top-tier journals. The expectation is that we are going to push forward the frontiers of the fields that we are interested in.”

Within this program, about 10 percent go back to academia to become assistant professors, another 10 percent get hired as Genentech scientists, and the rest go on to work as scientists at other corporations or pursue other endeavors such as business development or law school, says Dixit.

Furthermore, for those who decide to pursue an academic career, all published reagents, such as knock-out mice and cell lines, are made freely available to take to their universities.

“It’s a very generous program,” says Dixit.

Second year postdoc Samuel Williams, who works in Dixit’s lab, agrees. “I’m not constrained in the ability to pursue projects that are high risk or that would not be easy to get funded with grants. I am able to attack them in a way that I wouldn’t be able to do in academic labs.”

He also has acquired Genentech’s flexible mindset as to who can do translational research. “My grand ambition is to produce work that ends up finding its way to the clinic. Whether that happens through an academic position or through an industrial position doesn’t make much of a difference to me.”

What It Takes

So what exactly should a postdoc or graduate student do to get some translational research experience? The advice, like the options illustrated above, varies.

“They should follow their own basic interests, whether in biochemistry, microbiology, or training as a physicist, but really think about getting extra training through a degree-granting program in clinical and translational research because this is going to position them to be more forward thinking,” says NCRR’s Alving.

Likewise, Wellcome Trust’s Seabrook encourages “good, solid science training.” Additionally, he suggests working at a small biotech or pharmaceutical company. “They will learn an awful lot more science by being in a small company. They will have to use their initiative and be more creative. Their decision-making skills will be sharper,” he says.

Carlton concurs. “I think one should do a postdoc in academic research before going to industry—certainly in the area of biology. That way, one builds up an academic network that one shapes and revises as one goes throughout one’s entire career.”

He says a researcher should then follow up this postdoc with a one-year placement in a company, whether it’s by “sweat equity”—working for free at an internship—or as a hired hand. “This allows the company to experience the individual and the individual gets a taste to see what it’s like in biotech or big pharma.”
He acknowledges, however, that whether to go directly to industry after grad school or after an academic postdoc is a personal decision. "Either route would work if you’re the right type of person."

So regardless of whether one is a graduate student, postdoctoral fellow, or an academic professor, many roads can be taken to pursue a career in translational research.

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**FEATURED PARTICIPANTS**

**Clinical and Translational Science Awards (CTSA)** - [www.ncrr.nih.gov/clinical_research_resources/clinical_and_translational_science_awards](http://www.ncrr.nih.gov/clinical_research_resources/clinical_and_translational_science_awards)

**Columbia University, Irving Center for Clinical and Translational Research** - [www.irvinginstitute.columbia.edu](http://www.irvinginstitute.columbia.edu)


**Pfizer** - [www.pfizer.com/home/](http://www.pfizer.com/home/)

**The Wellcome Trust** - [www.wellcome.ac.uk/funding/technologytransfer](http://www.wellcome.ac.uk/funding/technologytransfer)

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