Academia and industry: Companies on campus

Illustration by Eliot Wyatt

Pete Mariner works up the hall from his PhD adviser and one floor down from his postdoc adviser, but he does not work in academia. He is a senior scientist at Mosaic Biosciences, a start-up developing synthetic materials to help wounds heal faster, yet his labs are in the University of Colorado Boulder.

They are part of the university's BioFrontiers Institute, an interdisciplinary effort to tackle complex biology and forge connections with companies.

Over the past three decades, academia and industry have been converging philosophically and physically. Thirty-four years ago, the Bayh–Dole Act encouraged US academics to patent their discoveries, work with companies and become entrepreneurs. Policies in Europe have moved in similar directions. Companies increasingly partner with university scientists to enhance their research. In a 2007 survey of life-sciences faculty members from the 50 US universities that receive the most financial support from US National Institutes of Health, just over half of the respondents reported having some relationship with industry.

Successful academia–industry partnerships require common interests, trust and good communication. For each of these, proximity helps.

Many universities have off-campus research parks, but some academic research facilities have gone a step further and brought small companies within their own walls. BioFrontiers (of which J.J.W.-C. is associate director, and T.R.C. is director) is one of the youngest experiments in 'co-location'. More are set to open soon (see 'Within the same walls'). When it is done well, all parties benefit.

Building buddies

Various university offices connect faculty members, students and companies through technology transfer, industrial partnerships, student internships and mentoring. But these centralized resources do not allow for the spontaneous interactions that can arise from shared excitement about solving a problem. Co-location removes the physical separation and the intermediaries between researchers in academia and those in industry, and so allows serendipitous relationships to bloom.

Faculty members benefit from the influx of corporate expertise. Researchers with industrial experience are often more knowledgeable about high-throughput technology and commercial applications than their academic counterparts. Our biomedical faculty members tell us that they value industry collaborations as a way to apply discoveries in ways that eventually benefit patients. Students gain real-world experience and opportunities to work at these companies as they expand. Young companies benefit from access to flexible lab space, core facilities, an invigorating research environment and an educated workforce.

For example, when start-up Archer Dx, based in Boulder, began developing next-generation sequencing kits and software to research cancer treatments, it kept capital expenditures down by renting pre-built lab space at BioFrontiers and buying services from the university's genomics facility. When the company was purchased by a larger diagnostics and reagents company (Enzymatics, headquartered in Beverly, Massachusetts) and moved to a larger space off campus, it hired several former students.

Another example of co-location is the California Institute for Quantitative Biosciences (QB3). This supports two on-campus incubators for University of California spin-out companies, called 'biotech garages' in homage to the early Silicon Valley tech start-ups. One QB3 start-up is Caribou Biosciences, founded on genome-engineering technology from Jennifer Doudna's lab at the University of California, Berkeley. Following a now-familiar pattern, Caribou began operations in the Garage@Berkeley — steps from the Doudna lab — before moving into a larger space as the company grew.

HudsonAlpha Institute for Biotechnology, a non-profit organization in Huntsville, Alabama, brings together principal investigators, postdocs and some students alongside core facilities and independent companies that are developing new genomic technologies. ThermoFisher Scientific, a global biotech company based in Waltham, Massachusetts, bought one of the institute's start-ups in 2008, and retains its operations in Huntsville, citing the importance of proximity to researchers outside their own expertise.

Rules of engagement

Co-location has challenges. Universities are among the last places to prize research for the sake of pure discovery. All co-location leaders, business representatives, university administrators and development officers must help to implement the goals of the programme while protecting blue-sky research.

Ideally, co-location should be financed with funds that would not normally go to basic research, such as rent from tenant companies, philanthropic donations aimed at entrepreneurship and targeted grants. We have furnished several core facilities serving both academics and local companies using infrastructure grants from Colorado's Office of Economic Development and International Trade. HudsonAlpha was founded and largely funded by scientist-entrepreneurs Jim Hudson and Lonnie MacMillan, specifically to house academic faculty members alongside small companies. A*STAR (Agency for Science, Technology and Research) in Singapore is funded mainly by government programmes to boost commercial research and development.

> **“A university must view companies as partners in its research and education mission.”**

Nonetheless, universities need to devote resources to addressing real and perceived conflicts of interest. This requires careful policies on intellectual property, use of university resources, faculty time and conflicts of interest. For example, students cannot be graded and employed part-time by the same person. On-campus companies should explicitly ensure participating students' ability to publish in a timely fashion, a practice already established for sponsored research agreements.

Companies predisposed to open science might be attracted to co-location. Accommodating these companies on campus demands flexibility and clarity. Just as universities need to be up-front about their goals and expectations, they also need mechanisms to remove participants who might be better

off in more conventional settings. For example, we have offered leases on lab space as short as six months, which can be renewed. In the future, lease renewals at BioFrontiers might also depend on how companies interact with academic neighbours, for example through mentoring students.

Letting space to companies puts universities in the sometimes-awkward position of a landlord who needs to evaluate whether potential tenants can fulfil their rental payments and other obligations. Already, we have had a very young company leave a lab space after less than a month because anticipated seed funding did not come through.

Cookie hour

Customs and architecture should stimulate interactions. In the BioFrontiers building, academic and company researchers share a café and common spaces. Labs and offices are arranged so that people must pass through a main corridor to get from one to another, encouraging hallway conversations. Each week, a company or academic lab hosts a 'cookie hour' for anyone in the building. There are also whiteboards in hallways, where a spontaneous interaction can quickly turn into an idea sketch.

Co-location will be most successful in academic settings that explicitly value entrepreneurship and translational research activities (for example, when recruiting faculty members or evaluating them for promotion and tenure), and where resources are available to foster community and to support a leadership team to oversee the programme. Emerging companies will be more likely to take advantage of co-location opportunities if there are grants and seed funds available to subsidize their rent, if core facilities are available and if research collaborations with the university are easy to set up.

Fundamentally, a university must view companies as partners in its research and education mission, not simply as an alternative revenue source.

University ecosystem

We believe that the daily interaction between education, research and enterprise resulting from co-location will connect universities to their communities and make them more relevant to students and parents paying tuition fees. Co-location sites will become magnets for entrepreneurial faculty members, postdocs and students, as well as for companies looking to hire new talent.

The intersection of academia and industry will become more natural as faculty members look for more ways to make their discoveries relevant, as students want more value for their degrees, and as companies want more input into developing their workforce. Industrial inhabitants will be part of the future university ecosystem.