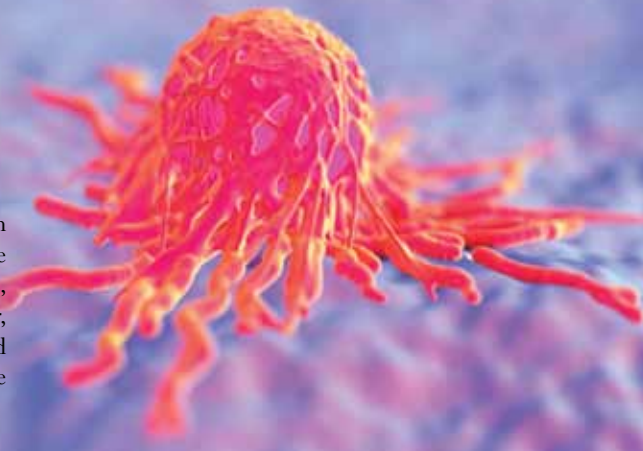


Blurring the Lines Between Academic and Industrial Cancer Research

Once upon a time, there were only two career options for life scientists interested in cancer research: academia or industry. Each had its own culture defined by unique core objectives, and each had distinctive ways of managing systems of research, reputations, and rewards. Freshly minted postdocs may think they can still only do one or the other, but a new paradigm has emerged. Multidisciplinary collaborations across sector and scholarship lines are creating opportunities for ambitious cancer-fighting careers at the junction of the educational and business sectors. **By Alaina G. Levine**



Cancer research is broadly guided by the mission to find treatments and cures, but the way academic and industrial scientists conduct their investigations often diverge. One of the most notable differences is the driving force of the research itself. Academic research seeks to unveil a basic understanding of science, and is “deductive, granular, and mechanistic,” describes **David Sidransky**, director of the Head and Neck Cancer Research Division at Johns Hopkins University (JHU) School of Medicine in Baltimore, Maryland. There is freedom to explore theoretical ideas often with little concern about timelines.

Industry, on the other hand, is very goal-oriented, and even basic research is geared towards being translational, says Sidransky. Priority is placed on developing commercializable cancer therapies. Whereas in academia a typical investigation might entail determining “the affinity of an antibody to its receptor and the effects on signaling,” the commercial question, he clarifies, would focus more on “how antibody binding affects other targets for toxicity and on the overall cellular clinical response to the antibody, rather than on the details of the signaling pathways.”

Scaling up the technology and manufacturing multiple versions of a product are discussed early on in industrial projects, says **Scott Eliasof**, vice president of research at Cerulean Pharma, a Cambridge, Massachusetts-based company with a focus on designing tumor-targeted nanopharmaceutical therapies. “Industry scientists focus more on the nuts-and-bolts of moving a project into the clinic, a skill set not often found in academia.”

“Industry and academia have two different motives for research,” says **Benjamin Y. Clark**, an assistant professor in the Maxine Goodman Levin College of Urban Affairs at Cleveland State University, in Ohio. The private sector is motivated by product development and profit, whereas academia is motivated by intellectual curiosity, he notes.

“They each have a different bottom line and financial support comes from different places.”

It is no surprise that Big Pharma won’t fund a decade’s worth of research on a molecule that can’t be molded into a cancer therapy. “In the private sector you are time-constrained and not resource constrained, while it is the opposite in academia,” says **Jennifer Malin**, an associate clinical professor at the David Geffen School of Medicine at the University of California, Los Angeles (UCLA), and the managing medical director of oncology for WellPoint, an Indianapolis, Indiana-based parent company of 14 health insurance plans.

Indeed, resource availability and diversity are cited differences between the two realms. In industry, especially in large, older corporations, resources are often plentiful. “Big Pharma has an almost infinite amount of resources and lots of expertise,” says Eliasof. However, while a smaller company like his, which only has 33 employees, may not have a wealth of financial resources from which to partake, there is more opportunity to affect agendas and decide company priorities, he notes. This element in particular can be very appealing to academic scientists pondering a move to industry.

“Depending on the type of cancer research, [scientists] can become quite siloed in academia,” says Malin. “But it’s impossible to work in silos in the private sector.” Companies rely on collaboration across disciplines such as cancer biology, oncology, cellular biology, chemistry, and biotechnology. “Industry scientists often work closely with **continued** >

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Jay Strum



Benjamin Y. Clark



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Linda H. Malkas

“Young people today...need to learn that the old cowboy way of doing science where you work by yourself is gone.”
—Linda H. Malkas

the whole continuum of disciplines, whereas in academia ‘multidisciplinary’ means it spans the sciences only,” says Malin, although, more and more, this is changing.

Team-based projects are a mark of industrial cancer research. “The notion that you can work in a larger team and provide improved value for the patient is a central goal for our company,” says **Samuel Levy**, chief scientific officer of Genomic Health, a molecular diagnostics oncology company based in Redwood City, California. Teamwork is essential because in industry “people are evaluated by how well your team does,” says Malin. In fact, training to be a good manager is often a fundamental part of serving as a researcher in industry, she continues.

And then there’s the issue of recognition. Eliasof sums up the spirit of each arena: “Academic scientists are rewarded for publishing novel, cutting-edge research,” he explains, “but the novelty may or may not be practical at the end of the day. In contrast, industry scientists are rewarded for identifying scientifically and financially pragmatic projects and bringing them to the clinic, where they can help cancer patients.”

Mastering Coveted Skills

In most cases, many of the skill sets are the same for cancer researchers in academia and industry, says **Linda H. Malkas**, who serves as the deputy director of basic research, co-leader of the molecular oncology program, and a professor of molecular and cellular biology at City of Hope (COH) in Duarte, California. Leadership potential, creativity, and oral and written communication skills are qualities that both academic and industrial scientists can master in their own environments.

“If you look at the best academic scientists, they are great storytell-

ers,” says Eliasof. Researchers in industry also have to be able to effectively articulate missions and complex scientific problems, although their stakeholders and audiences tend to be more diverse.

Eliasof expresses concern that team building, a universally coveted skill, sometimes doesn’t manifest itself well in universities. “When I bring people in right from academia sometimes they haven’t learned how to function efficiently on teams,” he explains.

And there are other skills that might not be as easy to learn while in an academic setting. Malkas attests that scientists can hone special skills by working alongside clinicians and patients, which is an opportunity that university and business enterprises don’t always provide. At City of Hope, early career scientists learn to think translationally and to always consider how they can apply their knowledge to affect cancer treatment, she says.

Trends and Shifts in Cancer Research

But overall, the culture within both academia and industry is starting to change. “Work environments are becoming more diverse, especially in academia,” says Clark. “If [researchers] want to get anything done, they have to work across disciplines.” **Jay Strum**, president of G1 Therapeutics, a Chapel Hill, North Carolina-based enterprise that focuses on small molecule therapies, regularly collaborates with university researchers and has noticed, for example, that statisticians are playing larger roles in academic cancer research teams. “The trend is moving towards better designed experiments [that incorporate] statistics earlier on,” he says.

Moreover, initiatives like National Science Foundation- and National Cancer Institute-funded research centers at universities, which emphasize cross-disciplinary projects, also “break down barriers between academia and industry, and enable us to bring cures and therapies to the market faster,” says Clark.

In fact, “to a certain extent, the lines between academia and industry are blurring,” says Strum. Hybrid institutes are being launched or expanded to harness the collaborative power that flourishes when industrial and academic scientists work together. COH is similar to an academic setting, yet students and postdocs are able to interact with clinicians, physicians, and sometimes patients, explains Malkas. Ph.D. committees are much more diverse compared with strictly academic institutions. For example, a standard cancer research dissertation committee at COH could include experts in bioinformatics, gene expression, and proteomics, whereas at a university, “the committees are more homogeneous,” she says.

These hybrid institutions play another important role since “the huge, prohibitive costs associated with the clinical development of very early and risky research make it difficult for industry to pursue truly novel and unique molecular targets for cancer therapy, diagnosis, or intervention,” describes Malkas. Organizations like COH recognize the value in this type of science. COH has “set up the infrastructure and resources to absorb the risk of early development...of discoveries not only for our own investigators, but for other institutions as well,” she says.

Universities are also taking the lead in designing new centers that aggregate research goals and accelerate new discoveries to market. The Broad Institute, where Eliasof worked before coming to industry, and the New York Genome Center are two examples. But even within typical academic departments, scholars are becoming savvier **continued**

Featured Participants

CellAct Pharma
www.cellact.eu

Cerulean Pharma
ceruleanrx.com

City of Hope
www.cityofhope.org

Cleveland State University
www.csuohio.edu

**David Geffen School of
Medicine at UCLA**
healthsciences.ucla.edu/
dgsom

G1 Therapeutics
www.g1therapeutics.com/
home.html

Genomic Health
www.genomichalth.com

**Johns Hopkins University
(JHU) School of Medicine**
www.hopkinsmedicine.org/
som

**John Theurer Cancer Center
at Hackensack UMC**
www.jtcancercenter.org

**The University of Texas MD
Anderson Cancer Center**
www.mdanderson.org

WellPoint
www.wellpoint.com



“Researchers in any environment will have to become more outcome based.”

—Andre Goy

questions about the role of genomics in patient care,” he explains. “We are definitely seeing a broad need in medicine to find ways of using genomic techniques to make a clinical difference.”

Andre Goy, chief of the Lymphoma Division and director of the Tissue and Tumor Bank at the John Theurer Cancer Center at Hackensack University Medical Center (UMC), notes that in both academic and industrial labs there is more of a spotlight on understanding cancer cell biology using novel therapies, or “precision medicine” utilizing biomarkers identified through genomics. “The next generation of physicians and scientists will be exposed early on to this progress as we evolve towards a redefinition of the classification of cancers—not only based on the organ of origin but on shared molecular characteristics, hopefully providing a rationale for treatment decisions in a growing number of cancer patients,” he suggests. Furthermore, with an expanding number of

scientists working on both sides of the fence, Goy is seeing a heightened interest in the business of medicine, with an increased number of scientists and physicians pursuing MBAs. “Many factors are reshaping the field of cancer care,” he clarifies. The research techniques, technology, economics, and molecular diagnostics are just some of those moving pieces. Generally “researchers in any environment will have to become more outcome based,” says Goy.

Advice for Scientists in the Changing Landscape

One piece of advice that these experts keep emphasizing is that there is no set course for a career in cancer research. Scientists can now choose industry, academia, a hybrid, or a combination of any of these. Just as the field of cancer research is becoming more diverse and interdisciplinary, so is the profession.

“It’s not like once you make a choice, you’re stuck with that choice forever,” says Eliasof. “You can move from academia to industry and vice versa,” although he admits it can be harder to move from a company back to a university because of the lack of demonstrable publications. But there is a way to make a company-to-university transition easier and more efficient: “Keep interacting with your colleagues in academia so they know about you,” advises **Nalân Utku**, the managing director and co-founder of CellAct, a small German cancer research company who has also spent considerable time in academia.

But the academic setting is experiencing a metamorphosis in more ways than one. For instance, “academia is starting to recruit from industry more,” says Eliasof. And “the choices of direction of cancer research in academia are not as broad as they used to be,” notes Clark. “Academic research is being driven more and more by where the money comes from.”

As more researchers realize that cross-disciplinary and cross-sector investigations are good for science and medicine, leaders predict there will be more collaboration between industry and academia. “We’re discovering that we need each other,” says Malkas. “Young people today...need to learn that the old cowboy way of doing science where you work by yourself is gone.” Indeed, the majority of the time “it’s about ‘group science’ for groundbreaking research,” echoes Clark.

To prepare for a career in cancer research, scientists need a multidimensional skill set to tackle questions from different fronts. “Think big and bold, but focus,” advises Goy. “The old rules of research still apply, but the way we are going to do things will with no doubt change dramatically in the coming years.” Academic scientists should get to know clinicians and their work with patients, and learn business skills. To further enhance one’s marketability, develop a good understanding of data analysis and computational biology—skills which are becoming more and more coveted as technology improves and the amount of data being analyzed increases exponentially, notes **Giulio Draetta**, director of the Institute for Applied Cancer Sciences (IACS) and professor in the Department of Genomic Medicine at the University of Texas MD Anderson Cancer Center.

Above all, attitude is key. “Whether you are in industry or academia, research is a discipline that’s bound to give you 99% failure,” says Draetta. “You have to believe in yourself.”

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