

# Making Things Happen

Over the decade since it was launched as a “one-stop shop” for Penn faculty and programs seeking to translate research into products—and with a big help from two blockbuster discoveries—the Penn Center for Innovation has achieved record revenues and made the University a leader in forging partnerships “to move ideas from the inside to the outside.”

By JoAnn Greco

**M**asoud Akbarzadeh, an assistant professor of architecture in the Weitzman School of Design, has a great idea. About a decade ago, while pursuing his doctoral studies, he began thinking about how geometric forms, particularly polyhedrons such as prisms and pyramids, might be used in structural design. He has since set out to prove that they can facilitate more sustainable construction by minimizing the mass of materials and thus reducing the amount of carbon emissions and embodied energy in buildings.

Professor of Nursing and van Ameringen Chair in Nursing Excellence Kathryn

H. Bowles Gr'96 already knows her idea has legs. In 2012, she transformed years of research into a new methodology that has become a standard part of the electronic health records used by hospitals. It's helped cut down on readmissions, resulting in cost savings and better outcomes for patients.

When faced with a chronic pain point in his own field—how to better train aspiring educational leaders to deal with tricky interactions with superintendents, parents, and teachers—Michael Johanek, a senior fellow and director of the Mid-Career Doctoral Program in Educational Leadership at Penn's Grad-

uate School of Education, codeveloped a product in 2013 that's now used by schools in 40 states.

These three Penn faculty members, along with hundreds of others—including, most notably, Carl June, who pioneered the development of CAR T cell treatment, the first FDA-approved gene therapy for cancer [“The T-Cell Warriors,” Mar|Apr 2015], and the Nobel Prize-winning team of Drew Weissman and Katalin Kariko, whose research led to the mRNA vaccines against COVID-19 [“The Vaccine Trenches,” May|Jun 2021]—have translated their discoveries and inventions into patentable, marketable, and impactful



products by turning to the Penn Center for Innovation (PCI) for help navigating an often decades-long process to bring transformative ideas to fruition.

“As someone trying to run an academic program while doing my own research, the advice that PCI offered was invaluable,” says Johanek. “They provided a reality check on our thinking about the market and the structure of the company, and basically helped boost our confidence in starting the operation.”

Formerly known as the Center for Technology Transfer (CTT), PCI’s roots as the University’s commercialization arm stretch back to the 1980s, when the passage of the 1980 Bayh-Dole Act allowed universities to own the patents and to pursue commercialization opportunities (and receive royalties) for the work coming out of their labs. The previous framework, dating from after World War II, called for universities and other nonprofits to give up the rights to their intellectual property in return for federal funds. But while the government eventually held 28,000 such patents, fewer than five percent of publicly funded university discoveries had been licensed or brought to market.

Bayh-Dole, it was hoped, would invigorate research and boost the odds that it benefit society at large. Eager universities began setting up technology transfer offices, and today membership in the trade association AUTM (which now just goes by its acronym but was formerly the Association of University Technology Managers) includes more than 3,000 professionals from 800-plus academic institutions. They are a busy group. In 2022, members reported spending \$91.8 billion on research, with nearly 1,000 new startups formed and more than 7,700 patents awarded.

In fiscal 2023, for the second year in a row, PCI reported the highest gross licensing revenue among its peers, with its affiliated spin-outs garnering more than \$1 billion in new investment capital.



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Historically, though, Penn was not a leader in such efforts. (A late 1990s look at the state of the program in the *Gazette* [“Bridging Two Worlds,” March 1998] touted the transformation of “what was once a \$1.2 million deficit to what will be a \$5 million surplus in fiscal 1998.”).

PCI was founded in 2014 as part of a broader effort aimed at increasing entrepreneurship and innovation under the auspices of former President Amy Gutmann Hon’22’s Penn Compact 2020, which also encompassed initiatives such as the \$100,000 President’s Engagement and Innovation Prizes for students (see this issue’s “Gazetteer” for the latest round), and the redevelopment of a 23-acre industrial site at 34th Street and Gray’s Ferry Avenue into the innovation hub Pennovation Works, anchored by the Pennovation Center, which opened in 2016 [“Gazetteer,” Nov|Dec 2016].

PCI was designed to consolidate the operations of the CTT and similar efforts across campus to provide what the new entity’s executive director, John Swartley, at the time called “a one-stop-shop for creating comprehensive and strategic partnerships between faculty and private sector partners.”

“It was a grand experiment,” says Swartley now. After first joining CTT in 2007, he has run PCI since the beginning, and was recently appointed Penn’s first chief innovation officer. In essence, the experiment asked whether the office could go beyond standard operating procedures—securing patents and

selling licenses—to push faculty discoveries and inventions through the so-called “valley of death,” that stagnant stage between patented and useful, and out into the world. “Innovation that stays high in the ivory tower and never provides a public benefit isn’t good enough,” Swartley says.

Although he’s spent the majority of his career advancing others’ ideas in the marketplace, Swartley comes from a background in scientific research. He discovered the world of tech transfers while working in a lab at Emory University, where he earned a PhD in microbial and molecular genetics.

“I was studying infectious diseases,” he says, “and I had to make a decision about joining the faculty or doing something closer to the business side. This was the early ’90s, when leaving academia wasn’t encouraged. But I remember wondering at the time what happened to all of the intellectual property that was being created across the university. Does it just get published and that’s the end of it, or does it become a product?”

His musings took on more urgency once he was involved in an invention himself. “It was a modification to some bacteria that we thought could either be a vaccine

or a diagnostic tool for meningitis,” he explains. “We found out that we needed to go to Emory’s tech transfer office. It was a tiny little thing, with I think two people, and we got to talking to them and realized there’s this whole other side of the world. They’re here to file a patent and find a company that might want to license it.”

It was *that* discovery that helped Swartley make a choice. He decided to pursue an advanced business degree at Emory. (As for the patent, he and his team received one for the diagnostic aspect.) “It was like learning a new language,” he says of his MBA training. “When I finished, I stumbled upon a really interesting program being developed at Yale. It was also a tech transfer group, but with a leader recruited from the pharmaceutical industry who had crazy ideas about how the university should start some kind of relationship with companies to invest in these start-ups. I stalked the guy, flew up to Maine where he was giving a talk, invited him to lunch; we hit it off and he said, ‘Get down to New Haven and interview with my lieutenant and if he likes you, we’ll hire you.’ He did and they created this new position, and that’s how I got out of the lab and into the office.”

He hasn’t looked back since. “I loved the bench research,” he says. “I loved thinking about an experiment, getting the data, analyzing it. I loved all of that. But it was very narrow, and I got the sense that it was going to be very hard to take any discoveries all the way to product status. I thought maybe I could be more useful by helping get other people’s ideas further along.”

Swartley spent six years at Yale’s Office of Cooperative Research, “becoming a fully-fledged licensing person” before following his boss to work for a venture fund that was a for-profit subsidiary of

Baylor College of Medicine. He came to Penn in 2007 as senior director and head of new ventures for the CTT, intrigued by the mandate bestowed upon the center’s then-new executive director, Michael Clear, to reorganize and expand the reach of the office. Swartley would succeed Clear as executive director in 2013.

In 2009, Michael Poisel GEng’92



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WG’97, a mechanical engineer with a background in private equity investing, was brought on to launch UPstart, which aimed to assist entrepreneurial faculty members interested in forming a company out of their research. “Before I came to Penn, almost 100 percent of the time the strategy had been to license inventions out to the large companies because they all had research and devel-

opment teams and could pursue product development in-house,” says Poisel, who is now executive director of PCI Ventures, which incorporated UPstart. “Following the 2008 recession, though, a lot of them jettisoned those departments and no longer had the ability to take on early-stage products.”

Over the years, PCI has increasingly emphasized building relationships. “If your mission is now to move ideas from the inside to the outside, the best way to do that is to find partners,” Swartley says. “Whatever it is that makes the most sense—whether it’s working with a manufacturer or an institutional investor or building a startup—we’ll make it happen.”

“I really think our job is about making connections and building bridges,” says Benjamin Dibling, who has assumed Swartley’s former position as associate vice provost for research and managing director of PCI after having served as deputy managing director. “When we help identify a company interested in sponsoring a faculty member’s research, they have a new funding stream and a presumed marketability available to them,” he continues. “And everyone becomes really passionate about the project.”

Dibling found his passion for the field after relocating from England to the US in 2000 for post-doctoral work on cancer research at the University of Chicago. “I saw firsthand what it takes to become a tenured faculty member at a high caliber research institution,” he says. “While I loved the work, I didn’t love it *that* much. I started exploring alternative career paths and reached out to the tech transfer officer at University of Chicago, and he encouraged me to do a little work with them. I was like, ‘Oh my god, you get paid to do this?’ I jumped ship and I’ve been doing it for 20 years.”

After Chicago, where he started as a marketing intern and eventually became the program manager for oncology, Dib-

ling worked in UCLA's Office of Intellectual Property and Industry Sponsored Research as senior associate director of licensing before joining Penn in 2016, where he initially led PCI's licensing, corporate contracts, and corporate outreach efforts. "I love talking with the faculty and hearing about the things that have worked out—because having been at the bench, I know that *lots* of things don't work," he says. "It's exciting to see these individuals at the leading edge of their fields bring the broad benefit of their discoveries to the public."

**T**he process involved is fairly straightforward. After a faculty member files a disclosure form that lays out the invention—PCI receives about 350 annually—one of the center's licensing officers will be assigned to meet with the faculty member to gather more information on what stage the research is in and how the faculty member would like to proceed. The licensing officer presents those findings to other PCI team members. Maybe someone has a relevant contact at a company or knows an interested venture capitalist; maybe someone else questions whether the idea is marketable at all.

"We evaluate everything that comes to us, and file at least a provisional patent on more than half of them," Swartley says. "That gives us a year before filing for a utility patent to explore how it might be used, who might want it, and to figure out the business relationships: Is it a partnership with a company who can sponsor further research? Is it a startup? Is it a straight license? It's different all the time, and we have to be agnostic about what it is these third parties want. What's important is they want *something*, and we have to figure out how to get it to them." Once the patent is finalized, the University becomes the owner of the intellectual property, but licensing and other revenues are divided among the inventors (including a separate portion for their research activities), their department, their school, the University, and PCI.

According to PCI's commercialization guide, filing a US patent application can cost between \$15,000 and \$30,000. Last year, Penn filed 920 of them (105 of which were issued). The money invested in patent applications is often reimbursed through subsequent licensing fees paid by a commercial partner who will then work to develop the invention further through prototyping, clinical trials, and other steps associated with bringing a product to market.

Right now, most of the 100-plus patents that Penn secures each year come from the Perelman School of Medicine and Penn Engineering—think vaccines, therapeutics, and diagnostic tools and devices, often advanced through the interdisciplinary accelerator Penn Health-Tech, the Center for Health, Devices, and Technology.

The medical school, for example, received more than \$1 billion in total sponsored research funding in fiscal year 2023, and according to Jonathan Epstein, interim executive vice president of the University for the health system and Perelman School dean, about 10 percent of its 600 tenure-track faculty members engage regularly with PCI. "There's been an enormous change of culture in the school," he says. "The faculty believes and understands that they now have the mechanism to see their discoveries transformed into medicines and treatments that make a real impact. There's been more than two dozen new FDA-approved therapies since 2017."

Epstein himself, along with a host of Penn luminaries including Carl June and Drew Weissman, is part of a recent Penn spinout launched with the support of PCI, Capstan Therapeutics, that has raised more than \$300 million in funding. "It's a new approach to CAR T therapy that involves using mRNA therapy to direct cells that will make proteins to prevent or fight disease," Epstein explains. "We hope to bring it to clinical trials within a year or two."

But PCI in its second decade is also looking to broaden the range of Penn schools it works with. The ideas high-

lighted at the beginning of this article provide a sample of potential innovations coming from the schools of design, nursing, education, and other relatively untapped corners of the University.

"I'd like to start meeting with people at these schools—or Wharton or the law school, the fields that I'm just not up to speed on—and make sure I'm not missing something," Swartley says. "I want to learn what innovation means for them and how they measure it. I want them to talk to me about anything that they think has promise. Who knows—maybe it will click with something that's going on at another school. It doesn't have to immediately result in a big financial windfall, but is there a concrete way that we can help increase its visibility, so it sets the stage for something to happen downstream?"

With all the ideas flying around in Penn's "amazingly dense, diverse community" of scholars and scientists, "I'm in a good position to do some air traffic control," Swartley adds. "Every single day I hear of something that I never heard of before. It's the nature of the business: it *has* to be new."

**M**asoud Akbarzadeh, the Weitzman School architect interested in using polyhedral geometries in green building, has actually brought three ideas to PCI. His most recent patent concerns using continuous 3D printing to easily alternate between materials with different properties, such as one that can withstand tension and one that's resilient under compression, for the efficient construction of systems with mixed forces. Another patent involves mimicking the mechanics of a dragonfly to design lighter, more resilient airplane wings. He is also working on designing 3D-printed concrete structures that can absorb carbon.

"Architects and engineers have always innovated by creating new materials and techniques," Akbarzadeh says. "Rafael Guastavino, whose brick vaulting you

see in Grand Central Terminal, received several patents. What's new today is that a lot of attention is on building more efficiently. Steel and concrete are low-tech, but the improvements in processes are high-tech." Working with PCI means he can concentrate on the "fun parts"—the testing, the design, the prototyping—and minimize the attention he has to pay to the business end of things. "PCI has a fantastic foundation and the resources to cover all the legal paperwork related to filing a patent," Akbarzadeh says. "Their involvement makes the patenting process quite efficient."

GSE's Michael Johaneck remembers how helpful PCI was in identifying a target market for the idea of an online simulation program designed to lead aspiring and professional school leaders through the challenges, decisions, and consequences that arise during their workday.

"I'm academically oriented, so I could go off in different directions on it and they'd stop me and say, 'Who would this be targeted to and what need would it serve? What stands out about it, what's different?'" he says. "It helped us realize that what was important was that this is of and by practitioners, and it doesn't skirt difficult topics."

After establishing clarity on those aspects, the team at PCI worked with Johaneck on pricing and other specifics of the product. Today, Johaneck retains an equity stake in and remains on the board of SchoolSims, the company he co-founded with Ken Spero, a computer simulations expert who was a part-time lecturer at GSE and is now president of the company. SchoolSims offers a library of 40 simulations, running an average of 20 minutes each. Some of them have timers and urge the participant forward, but others incorporate interruptions—like someone coming in to report that the basement is flooded, and all of the history books are gone. The simulations can also be modified for workshops or large conferences to incorporate group discussions and polling.

**"If we were going to play in the R&D space, we needed to rethink how we were going to position ourselves for those opportunities," Swartley says.**

Nursing professor Kathryn Bowles' invention, Discharge Decision Support System (D2S2), came out of time spent sifting through research by her mentor—Mary Naylor Gr'82, the Marian S. Ware Professor in Gerontology—on hospital patients 55 and older who were at high risk for readmission. "We noticed that more than half of this cohort had not received an in-home nurse or gone to rehab after being discharged," Bowles says. "Being a nurse, this intrigued me."

She and her team created patient profiles on some of the people in Naylor's study and solicited expert input from nurses, doctors, social workers, and physical therapists to build a predictive algorithm for who might benefit from referral for further care. Testing confirmed that the algorithm decreased readmission. Shortly after publishing the research in 2009, Bowles met with tech transfer officials, who agreed that the risk-scoring tool had potential. In 2012, Bowles and Eric Heil WG'12 co-founded RightCare Solutions, which was acquired three years later by naviHealth.

Bowles is candid about the experience of letting go of her idea. "It felt terrible, like I lost control of it," she says. "I still feel that way. I wasn't allowed to participate in a lot of the decisions." Nevertheless, she says, she wouldn't discourage anyone from taking this route because "it's the best way to disseminate your discoveries broadly and quickly," and in fact she has another idea that she's disclosed to the University and would like to bring through the PCI process. It's based on a much larger sample—the one for D2S2 profiled less than 300 patients and asked six experts to judge the cases; this second sample featured 1,500 patients and 171

experts—and enables a deeper dive into a suite of new data points. "Rather than starting a company, though, this could be a licensing deal," Bowles says. "I hope they can help me wrap it up in a box and put a bow on it."

**C**onsolidating Penn's technology transfer-related activities back in 2014, and making PCI the one door you could open instead of knocking on five, happened because "it was apparent that if we were going to play in the R&D space, we needed to rethink how we were going to position ourselves for those opportunities," Swartley says.

PCI has continued increasing its accessibility and range, offering more community outreach, programming, and education both internally and externally. These days PCI makes its licensing officers readily available to faculty, provides an online disclosure portal to jump-start the commercialization process, stages weekly drop-ins where faculty can talk about their ideas, presents events with outside speakers, and engages in marketing outreach on behalf of its intellectual property.

As PCI moves into its second decade, its leaders know they face a delicate balance. Predicting the future can be fun, but it can also be dangerous. "We want to be receptive to everything, but we can't rely completely on speculations that seem really cool or on things that immediately scream to be commercialized," says Swartley. "I think a lot about mRNA. We got the disclosure 20 years ago, and we didn't exactly know what its application would be. But we knew it was great science from great scientists and we wanted to protect it. So while we definitely have to pay attention to the big shifts that are getting a lot of buzz, like generative AI, we also have to consider real world problems, like climate science. Remember, necessity is the mother of invention."

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