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CHART Eureka! licensing and royalties: UMass makes millions off research patents, technology transfers

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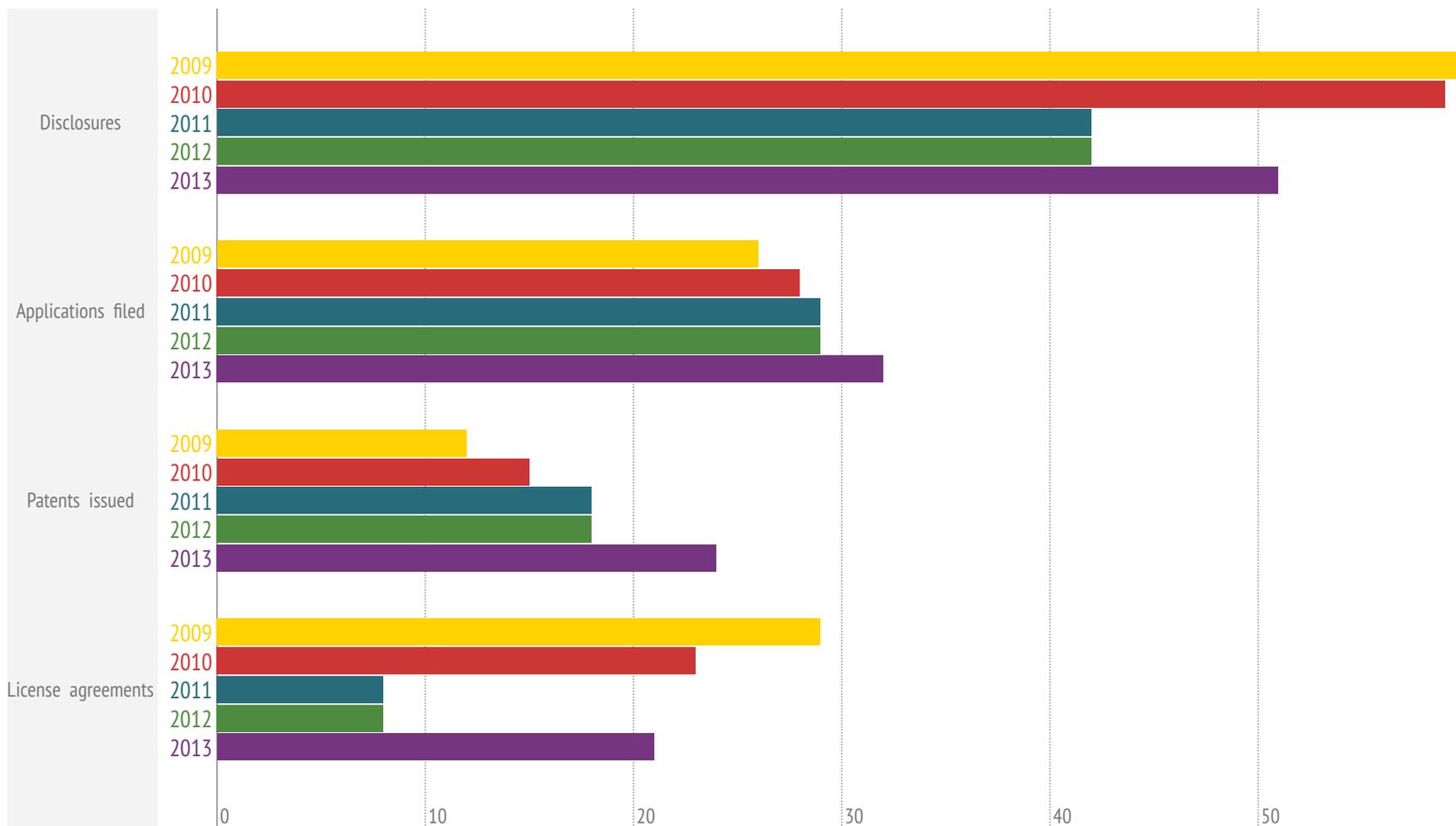
Robert MacWright brings an enthusiasm for the nexus between gee whiz technology, legal logic, and the history of American entrepreneurship to his job as director of commercial ventures and intellectual property at UMass-Amherst.

Yes, his office works hard to make money for the university through the patents and licenses derived from researchers' work, he said. "But one of our most important goals is to improve the odds that science gets out of the lab to benefit the public."

The UMass system as a whole has been bringing in an average of \$39 million a year over the last five years from licensing and royalty deals, according to spokesperson Jan Brogan.

UMass Amherst patents, disclosures, licenses over 5 years

Mouse over bars for totals



Years reported are fiscal years.

SOURCE: UMass Amherst Annual Report on Research, years 2009-2013



UMass Amherst patents, disclosures, licenses over 5 years (<http://infogr.am/umass-amherst-patents-disclosures-licenses-over-5-years>) | Create Infographics (<http://infogr.am>)

Ninety percent of that was from research done at the medical school in Worcester. MacWright is trying to get a broader group of faculty on the Amherst campus to turn the fruits of their research into patents and licenses.

“If I worked at Colgate I might only see toothpaste patents, here I get to see cool inventions in every field of endeavor,” he said.

MacWright makes his office in a small converted dorm room in Arnold House near the north end of campus, which is where most of the hard science takes place. His walls feature a poster of this country’s most famous inventors, including Eli Whitney, Thomas Edison, and Henry Ford.

Sporting a beard that makes him look like Ulysses S. Grant in a crisp suit and tie, MacWright also has a framed copy of the first patent issued in the United States, in 1790. The innovation was an improvement on creating potash, an important industrial chemical of its day used in soap making. Samuel Hopkins licensed his invention to potash manufacturers, charging \$200 for each furnace that used his technique over a five-year period.

Across North Pleasant Street from MacWright’s office, on the 15th floor of the Lederle Graduate Research Center, sits the T-shirt-clad holder of U.S. patent number 8,420,121. Sankaran Thayumanavan (his friends call him “Thai”) is a 46-year-old professor of chemistry who crafts what he calls “designer molecules.”

The patent in question carries the unsexy title of “Drug delivery vehicles, methods of manufacture, and methods of use thereof.” But the discovery is pretty cool: a hydrogel that can “cage” a drug molecule and hold onto it while it circulates through the body—and then release it at just the right time.

Thayumanavan said his work derives from a passion for basic research. He can’t point to an “aha” moment when it struck him that his team had come up with something practical. But he can remember when it became clear that his lab had found a way of locking and unlocking a molecule under specific conditions.

At this point, he had a solution in search of a problem. But it wasn’t a big leap to realize that this invention could be used to fine-tune chemotherapy. A major downside of cancer treatment is the often painful and debilitating side effects of sending a drug through the body that indiscriminately kills healthy cells on its way to target cancer cells.

Thayumanavan’s hydrogels can be imprinted with what he calls a “zip code” that releases them when they have reached their target—but not before.

He went to the office of Commercial Ventures and Intellectual Property with his discovery. It embarked on the process, which can involve years of waiting and negotiating with patent examiners, of obtaining a patent. This one was issued in 2013, three years after the application.

Last year 48 new inventions came through the door at the CVIP and 28 resulted in patent applications, said MacWright.

The University of Massachusetts system as a whole was number 32 in the world among educational institutions in terms of how many U.S. patents its researchers were awarded last year, according to a study by the National Academy of Inventors and the Intellectual Property Owners Association. Those 57 patents included two by microbiologist Derek Lovley, a pioneer in using microorganisms for generating electricity and cleaning up contaminated groundwater.

Patent number 8,277,657, he explains, describes a method of using geobacter—a microorganism Lovley first found in sludge from the Potomac River—for environmental cleanup. It involves feeding electricity through geobacter in a way that strips chlorine molecules from common contaminants. Chlorinated

solvents, once used for cleaning metals in a variety of manufacturing processes, are a major challenge for decontaminating former industrial sites.

For example, if you knock chlorine molecules off a nasty toxin called Trichloroethylene, it eventually breaks down into innocuous substances. As a microbiologist, said Lovley, "I study cool processes that bacteria can do that no one realized they can do before and that have practical applications."

To see the actual patent in all its highly technical glory, you can go to Google Patents and type in the number or other identifying information into the search engine. Every patent ever issued in the United States is there for the reading within in a couple of clicks.

Not every innovation warrants the time and expense of seeking a patent, explains MacWright. Before his office decides to run with a new idea by engaging a patent attorney to start drafting language, he wants to see if there is a market. In other words, if a patent were awarded, would someone pay for permission to use it?

If the answer is "yes," then the U.S. patent office is going to hear from MacWright and his team.

Thayumanavan and Lovley have yet to see any money from these patents because it can take years for new ideas to make it into the marketplace. If licensing deals get closed and royalties start coming in, the CVIP first pays off the attorney costs and filing fees it took to get the patent, which MacWright said typically run \$15,000 to \$20,000. After that the inventor gets 30 percent. The CVIP and the research facility (often the academic department) each get 15 percent and the remaining 40 percent goes to the university's general coffers.

Thayumanavan is going a slightly different route than looking for people who want to buy permission to use his patent, helping to create a startup company. He will serve as a consultant to Cyta Therapeutics, but is barred by university rules from being an officer. That would create a conflict of interest with his role as a UMass faculty member because he would in effect be sitting on both sides of the table as negotiations progress over what the invention is worth. Why wouldn't it be a conflict if a researcher was going out alone?

If the invention makes it through clinical trials and eventually finds a market, the investors stand to profit from it, said Thayumanavan. "But I am getting into this knowing very well that I won't make any money, I am doing it because I want to see the technology move forward."

A successful patent would certainly boost his career and open doors for further research funding, said Thayumanavan. But even if it becomes lucrative he said he would be lucky to have a two percent stake when all is said and done; as his lawyers recently explained to him, investors structure deals in ways that compensate them for their risks by giving themselves the lion's share of any profits.

MacWright said most patents will not earn huge amounts of money for the inventors or the university. But some might. "It's kind of a game of home runs. You have a lot of singles that don't make a lot of money," said MacWright. "You hope to eventually have that out of the park home run that turns out to be a really important thing."

But even the less lucrative patents serve the purpose of more directly linking the lab to society at large. And, said MacWright, you never know when an invention might make it big.

"Unfortunately we don't have a blockbuster revenue maker today," he said, "but that doesn't mean it won't happen."•

Finding the Gold Nuggets of Knowledge

Back in 1790, when Samuel Hopkins got his patent for an improvement on making potash, the task of examining requests for what amounts to a time-limited monopoly fell to Thomas Jefferson in his capacity as secretary of state.

“He and a couple of cabinet members would sit around a table” to evaluate patent applications, said Robert MacWright, director of Commercial Ventures and Intellectual Property at UMass Amherst.

There is a certain irony to this, he added, because when helping to draft the Constitution Jefferson argued against the concept of patents based on a conviction that nobody can own an idea.

Now the patent office consists of several thousand examiners, many with advanced degrees in highly technical fields. And the importance to the American economy of granting inventors a period of exclusivity to profit from their inventions is well established.

MacWright himself holds both a Ph.D. in biochemistry and a law degree. “All the way through graduate school I thought I would become a biochemist,” he said. Then he saw a job opening at Rutgers University for an assistant director in the office for corporate research agreements. Two weeks after he landed that job, his boss suggested he create a patenting and licensing office.

Before Congress amended the patent laws in 1980, researchers receiving federal money were barred from obtaining patents. Companies in other countries, particularly Japan, were taking innovations coming out of American universities, turning them into products and then “selling them back to us,” said MacWright. Today most universities have people like him who are devoted to helping faculty lay claim to promising inventions.

Still, said MacWright, only in the last five years has patenting and licensing at universities gained a higher profile. Before that, faculty in departments like engineering and electronics were very tuned into the practical applications of things they designed, he said. But that wasn’t necessarily true for faculty in departments like chemistry where advancement was determined primarily by how extensively researchers published in academic journals.

That is changing. But forging tangible connections between university labs and industry requires more than just sustained work on writing patent applications, negotiating with patent examiners over their scope, and then hammering out deals with companies and establishing what a particular innovation is worth, according to MacWright. “Part of the challenge is still getting people to recognize when they have an invention.”

That didn’t seem to be a problem for storied inventors of the recent past like Jerome Lemelson for whom actually inventing something was often secondary. By the time he died in 1997 at the age of 74 he held 605 patents. According to MacWright, Lemelson once described himself as a science fiction writer for a very limited audience, namely patent examiners. He would often lay claim to ideas which weren’t real things yet but which he could see happening on the horizon.

A prime example was the idea of an automated warehouse. Before 1980, so-called “submarine patents” could be filed but remain unpublished. So someone like Lemelson could imagine a future innovation and describe it in a patent filing which he would reveal once someone actually came along and did it.

Then, ka-ching, he would claim his share of the financial rewards.

As someone with a passion for both science and the law, MacWright relishes the intellectual adventures he gets to go on at UMass. Every time he meets with an inventor about something new he or she has come up with he has to ask himself, “Is this something that nobody has ever done before?” he said. “It’s a very satisfying thing.”• —EG

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