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How Close Is Too Close? Industry Courts Computer Scholars

By Avi Wolfman-Arent

In 2007 Motorola shuttered its operations in Champaign, Ill., leaving behind a team of engineers and an empty office space in the University of Illinois at Urbana-Champaign's research park. The jettisoned employees wanted to stay in Illinois, setting off a scramble for their services. With university officials playing matchmaker, a number of companies jockeyed to win the team—but one quickly took the lead.

"Yahoo moved in the fastest by far," says Catherine Singer, a former Motorola employee who now runs Yahoo's Champaign office. "Back in 2007 there was a real shortage of developers in California. To get a whole group of engineers at one time was very attractive."

Motorola vacated on a Friday. By Monday, Ms. Singer and her colleagues worked for Yahoo.

At the time, Yahoo was simply hoping to score some ready-made talent. Less than a decade later, the company has developed a multifaceted relationship with the university's computer-science department that extends into both student recruitment and coursework. Over the same period, the company has leapt into partnerships with universities nationwide, recently highlighted by a major investment at Carnegie Mellon University. And Yahoo is not alone. Google's extensive university-relations efforts include a visiting-faculty program where professors are embedded with the company for six to 18 months. Last December Facebook's founder, Mark Zuckerberg, turned up at Neural Information Processing Systems, a leading scholarly conference on machine learning, for a Q&A that packed the hall and that struck observers as a deft recruiting move.

Meanwhile, on the university side, nearly all the top computer-science schools have adopted or are adopting industrial-affiliates programs that allow companies to recruit students and chat with faculty for an annual fee, typically in the tens of thousands of dollars. Professors and industry leaders across the computer-science landscape say that their worlds have never been closer and that a new generation of tech giants is leading the push. Some in computer science remain skeptical, but many, if not most, welcome corporate collaboration—some with evangelical zeal.

The reasons are clear. Academics need access to the data and scale that only industry can generate, not to mention the money that large corporations like Google, Facebook, and Yahoo provide in an age of dwindling federal research dollars. Students need to interact with the companies that will eventually employ a growing number of them. Corporations need a line to the talent and ideas percolating inside academe.

It's harder to untangle what the growing overlap means for the discipline. But as the Yahoo-Illinois connection suggests, academe may soon find out.

A Surge in Industry Jobs

There are a number of causes for the evolving intensity of industry-academe collaboration. The first is work-force demand. According to the Computing Research Association's annual Taulbee Survey, about 55 percent of the computer-science Ph.D.'s who graduated in 2013 got jobs in industry, compared with roughly 30 percent a decade earlier. Meanwhile, the number of new Ph.D.'s entering academe has plummeted from more than 60 percent in 2003 to just north of 30 percent in 2013. Overall there are now more computer-research and -information scientists working for software developers (2,860) than for colleges, universities, and professional schools (2,550), according to the Bureau of Labor Statistics—the first time the former has topped the latter since 2009. That shift happened despite the average salary for computer scientists in academe jumping 77 percent over the past decade.

Andrew P. Bernat, executive director of the Computing Research

Association, expects those trends to continue. "The number of Ph.D.'s going on to industry jobs, as opposed to the classic academic jobs, is steadily increasing," he says. "That's a natural connection that makes things closer."

In part, the employment numbers reflect macroeconomic cycles. As tech companies regain ground lost first after the bursting of the dot-com bubble and later after the Great Recession, their employment needs have changed. But so has the nature of industry work, particularly among the Internet giants.

Google and its competitors collect vast amounts of data and confront crucial infrastructure challenges caused by their ever-expanding scale. They're also investing in fields like artificial intelligence and machine learning that represent the next frontier for the Internet tech sector.

As industry's problems have become more intellectual, so too has its hiring bent.

"It used to be if you got a Ph.D., it was a career-limiting move in some ways," says Michael Franklin, chair of the University of California at Berkeley's computer-science department. "The idea was that you weren't practical. [Now] Google realizes they need people with that advanced training and thinking ability. Industry is not looking at academia as just an ivory tower anymore."

Academe, in turn, no longer views industry as frivolous. "It used to be if you moved to industry, it was a step down in terms of the intellectual content of the work you were doing, or at least it seemed to be," says Matt Welsh, a former Harvard University professor who now works at Google. "But over the last few years things have shifted."

The result is a wave of university-industry collaborations that go far deeper than gifts or chats at academic conferences. Ms. Singer, site director of Yahoo's Champaign office, estimates that about two-thirds of her employees are now Illinois graduates. In February, Yahoo broke ground on a new facility inside the research park that will nearly double its square footage and add an

estimated 80 employees over the next two years, raising the headcount to about 250.

Yahoo also works closely with Illinois professors and students. Indranil Gupta, an associate professor in the department of computer science, has worked jointly with Yahoo to develop new applications for an open-source software that processes "real-time streaming data." A Ph.D. student helping with the work splits his time between Mr. Gupta's lab and Yahoo. Last spring Yahoo was the "corporate sponsor" for a course at Illinois on data management. Yahoo provided—you guessed it—the data, as well as a specific problem to solve. Students presented their solutions at the end of the year to a panel that included Yahoo employees. Not only did the winning group receive a prize, but Yahoo hired one of the top students.

Establishing a recruiting pipeline to top institutions like Illinois is crucial for Yahoo. "It's no secret that the entire industry is extremely competitive, especially when you get to some fields that matter particularly to us—for example, machine learning and data science," says Ron Brachman, chief scientist at Yahoo and head of Yahoo labs. "If you can develop a substantive relationship with a student early on in their graduate career, then the hope is they will remember you fondly when they're looking for a job after graduation." Mr. Brachman describes Yahoo's need for Ph.D.'s as "voracious."

The benefits to Illinois are two-pronged. Professors like Mr. Gupta gain access to Yahoo tools and resources. "They're very interested in our problems, our large data sets," says Ms. Singer. "And we're very interested in them helping us." The department can also leverage its corporate relationships to recruit students, many of whom hunger for industry experience to couple with their academic training. "Every year we host prospective Ph.D. students," says Mr. Gupta. "In the past few years I'm increasingly hearing the question, 'How much do you interact with industry?'"

Since Urbana-Champaign lacks the homegrown tech scene of Boston or the Bay Area, forging those bonds becomes an administrative imperative.

In June Phyllis M. Wise, Illinois's chancellor, trekked to Silicon Valley with the head of the computer-science department for talks with a major tech company they declined to identify. Back home, the computer-science department has been working to revamp and formalize Corporate Connection, its industrial-affiliates program. Although Ms. Wise says Illinois could survive as a top computer-science destination without industry connections, she concedes, "I don't think it would be easy."

'Create a Mini-Yahoo'

Corporations, meanwhile, are making major investments in academe. In February, Yahoo announced a five-year, \$10-million partnership with Carnegie Mellon, the highlight of which is a "mobile toolkit" Carnegie Mellon researchers can use to run experiments on real Yahoo data. "The idea in some ways was to allow them to create a mini-Yahoo in a way you normally don't see with corporate-academic partnerships," says Mr. Brachman.

Google's extensive university-relations efforts include a visiting-faculty program where professors are embedded with the company for six to 18 months in clusters of about 30, faculty research awards of up to \$150,000 intended to support a graduate student for a year, and more generous focused research awards, which run for at least two years and are given to faculty members working "in areas of study that are of key interest to Google."

Top computer-science programs are eager to capitalize on this largess. The AMPLab at the University of California at Berkeley, for instance, counts Yahoo, Facebook, Google, Microsoft, Intel, and the Chinese telecom giant Huawei among its sponsors. The lab's annual budget is between \$5-million and \$6-million, half of which comes from industry, according to Mr. Franklin, the computer-science department chair.

In 2012, universities spent \$1.8-billion on research and development in the computer sciences, according to the National Science Foundation. Roughly \$82-million of that came from business, an 8-percent increase over a year earlier.

The University of Washington is so gung ho about forging industry

relations that it encourages faculty to leave the department for leadership roles at top companies. Ed Lazowska, a former chair of Washington's computer-science and engineering department and the founding director of its Microsoft-sponsored eSciences Institute, says the university nudged one professor to become the founding director of Google Seattle and another to help establish the nearby Allen Institute for Artificial Intelligence. In both cases, Mr. Lazowska says, the moves ensured "tight relations."

Sometimes the benefits are more direct. When Steven Seitz, a professor in the department of computer science and engineering, took a two-year leave to start a computer-vision group at Google Seattle in 2010, Google reciprocated with a \$1-million gift to keep his research active, according to Mr. Lazowska. Mr. Seitz now splits his time 50-50 between the university and Google, creating what Mr. Lazowska described in an email as "a HUGE WIN in absolutely every way."

Even departments that used to focus on theory are tilting toward industry. Cornell University, long isolated from corporate tech culture, is creating an applied-sciences campus in Manhattan with a separate co-location space for industry partners. Fred B. Schneider, the newly appointed chairman of the computer-science department on Cornell's main campus, in Ithaca, N.Y., required the university to form an industrial-affiliates program as a condition of his becoming chair. "This isn't one of these things I had to fight for," Mr. Schneider says. "Everybody was very welcoming. There's a pretty widespread agreement in the department on which way we ought to go."

Indeed, most top computer-science departments appear to be leaning in the same direction. Advocates of the shift say pipelines between academe and the outside world will strengthen the discipline as a whole and enable it to solve intricate problems that cannot be cracked by individual institutions, much less individual thinkers. "America is the world leader in information technology because of a complex interplay involving the industry, university, and government sectors," Mr. Lazowska wrote by email. "It is a flourishing interplay that needs to be amplified."

Questions of Influence

Those who are wary of the growing closeness say industry involvement threatens academic openness and independence. In particular, some fear that faculty members will focus on solving Silicon Valley's short-term problems and ignore riskier, blue-sky research. "How much can industry influence academia?" asks Max Welling, a professor at the University of Amsterdam and co-chair of the 2013 NIPS conference that Mark Zuckerberg attended. "Is there a danger? Is there too much influence from the people who have a lot of resources? They may start to determine the research agenda."

Mr. Welsh, the former Harvard professor now working at Google, has a similar concern. "I don't know how as an academic one would do a moon-shot-like project to reinvent the computing platform, like we did in the 90s."

Mr. Welsh's backstory highlights a more immediate threat posed by industry: faculty flight. In 2010, he left his tenured position at Harvard for a job at Google Seattle and announced the move on his blog. The post highlighted Google's computing resources as well as the impact Mr. Welsh felt he could have working at a major company. It garnered more than 80 comments.

Mr. Welsh's reasons for leaving have changed little in the intervening years. "You can't do this kind of work in academia," he says of the large systems he builds at Google. "Full stop." But he'd likely draw less attention if he made the same move today.

"When I started here I never heard of tenured faculty leaving for positions in industry," says Mr. Gupta, the Illinois professor. "It's still sort of rare, but it doesn't surprise me anymore." Some, like Mr. Welling, say there is a "very strong brain drain" flowing from academe to industry.

Others are skeptical of those claims. Yes, a few big names have entered industry—including Yann LeCun, who now splits time between Facebook and New York University; Mike Dahlin, a former University of Texas at Austin professor; and Geoffrey E. Hinton, a distinguished professor of computer science at the


University of Toronto—but that's always been the case.



Besides, the losses tend to come from the few subdisciplines where Internet tech giants have the keenest interest, and there is plenty of talent within the swelling ranks of computer-science students to plug those gaps.


Mr. Brachman, head of Yahoo Labs, is among those who think researchers are leaving academe at a faster clip, driven, he says, by "the fact that what we work on is deep, complex, exciting, and ends up having a very substantial impact on as many as a billion people." He is worried, however, that a substantial outflow of talent from academe will harm Ph.D. programs and ultimately the companies that hire their graduates.

"It's a very, very challenging balancing act," Mr. Brachman says. "If someone is on the fence, my personal inclination is to find a way so they don't leave academia."



Alfred Z. Spector, Google's vice president for research, says industry is trying to balance its needs with those of academe. "We've thought about this and we've been sensitive to this topic," he says. "We want to make sure this ecosystem that produced such a great symbiosis continues to exist."

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