The Making of a Licensing Legend: Stanford University's Office of Technology Licensing

NIGEL PAGE, *Intellectual Asset Management (IAM) Magazine, U.K.*

ABSTRACT

The history of technology transfer at Stanford goes back to an initial pilot program launched by Niels Reimers in 1970, a program that put the university in an excellent position to take advantage of the Bayh-Dole Act. Enacted in 1980, the act gave U.S. universities ownership of any patents developed using federal funds. Today, Stanford University and successful technology transfer are almost synonymous. But success is more than just a matter of timing. Stanford's Office of Technology Licensing (OTL) takes a flexible, broad outlook on the development of its intellectual property that has made Stanford a favorite business partner. This chapter reveals the secrets behind the success of Stanford's OTL.

1. INTRODUCTION

Stanford University's Office of Technology Licensing has a string of blockbuster success stories to its name—from DNA gene splicing to Cisco, Yahoo!, and Sun Microsystems. Since the office was founded in 1970, it has received US$594 million in cumulative gross royalties. No wonder the university is considered a world leader in technology transfer.

Technology transfer is big business in the United States. The concept of taking intellectual property from laboratory to market originated in that country, and the practice is now so institutionalized that the Association of University Technology Managers (AUTM) can regularly attract a cross-section of the world's leading companies, lawyers, and venture capitalists to its annual conference. A number of universities can claim to represent the gold standard in this field, among them M.I.T., Columbia, Stanford, and the University of Wisconsin. But arguably none makes a stronger claim for shaping the global technology transfer market than Stanford, the California powerhouse, which *Fortune* magazine dubbed "the intellectual incubator of the digital age."[1] Credited with kick-starting the Silicon Valley high-tech industry, and subsequently spawning a hugely influential brood of physical- and life-science businesses across the United States and the world, Stanford's technology transfer efforts have clearly transformed our world.

2. BUILDING ON DNA

The brainchild of Niels Reimers, Stanford's Office of Technology Licensing (OTL) was born more than 30 years ago, in 1970. It was Reimers who famously recognized the

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huge potential in gene-splicing research being undertaken by professors Cohen and Boyer (of Stanford and the University of California, respectively). It was Reimers who persuaded them to let Stanford try for a patent (which Stanford did and ultimately secured). And it was Reimers who went on to launch a licensing program that, by the time the so-called Cohen/Boyer DNA patent expired in December 1997, had generated more than US$250 million in royalties (split with the University of California), with Stanford licensing a total of 468 companies on behalf of both universities. Having become an international consultant, Reimers saw merit in Stanford setting up an OTL that would be a marketer—not just a patent office. The office would actively pursue discoveries, market them to potentially interested companies, and collect the royalties on them. Fundamental to its structure would be a preparedness to give its licensing associates the authority and responsibility they needed to do their job effectively, free—so far as that was possible—from the red tape that entangled so many other operations. Reimers' initial pilot program, launched in 1968, produced, in one year, more than ten times the amount received by Stanford in its previous 15 years of licensing through an outside corporation. The idea was clearly a winner. Not surprisingly, M.I.T. would later go on to seek out Reimers' services and effectively transform its own technology licensing office into a global force in its own right, with gross revenues of US$33.52 million in 2002.[2]

Stanford, however, is still out in front. According to the industry-standard 2002 AUTM Licensing Survey, Stanford received US$50.2 million in adjusted gross license income for FY 2002. Even in a tough economic climate, this amount was the second-highest in the OTL's history, including an unexpected US$5.8 million in one-time royalties, with 42 of the OTL's 442 income-generating technologies each producing more than US$100,000 per year (see Box 1 for an overview of the economic impact of Stanford's OTL). Since 2002, things have gotten even better: in 2005, the OTL received on behalf of the university US$384 million.[3]

3. THE RIGHT PLACE AT THE RIGHT TIME

So what is the secret of Stanford's success? The university's symbiotic relationship with Silicon Valley has played a vital role, giving life to many of the OTL's most marketable technologies and providing the all-important local infrastructure of ideas, can-do thinking, and capital. But this climate of entrepreneurship did not grow up overnight. Back in the 1920s, Fred Terman was

Box 1: Economic Impact of Stanford University's OTL

For FY 2001 (latest figures available), the largest companies founded or co-founded by those with a current or former affiliation with Stanford University (as alumni or faculty/staff) were responsible for generating 42% (US$106 billion) of the total revenue of the Silicon Valley 150 (an annual list of the largest Silicon Valley firms).

From FY 1975 to 2005, Stanford's top six cases have been:[a]

- recombinant DNA cloning technology (total royalties US$255 million)
- chimeric receptors (total royalties US$124.7 million)
- fluorescent conjugates for analysis of molecules (total royalties US$46.4 million)
- functional antigen-binding proteins (total royalties US$30.2 million)
- fiber optic amplifier (total royalties US$32.6 million)
- FM sound synthesis (total royalties US$22.9 million)

a Sally Hines, Stanford University, Office of Technology Licensing, (personal communication).

an electrical engineering professor at Stanford. Trained at M.I.T., Terman played a key role in demolishing the ivory tower mentality, unleashing links with business that would ultimately enable Stanford's OTL to market technologies with such phenomenal success. Needing local jobs for his engineering graduates, Terman recognized the importance of attracting companies to the area, and so he introduced the core founders of Varian Associates (the radar and microwave technology business). He encouraged William Shockley, coinventor of the transistor, to come to Palo Alto (before joining Stanford's faculty in 1963). And Shockley brought two of his own students together, William Hewlett and David Packard, who went on famously to launch HP (Hewlett Packard) in a Palo Alto garage. Indeed, it is easy to see why Terman is referred to as the father of Silicon Valley.

Without Terman and Reimers, it is questionable whether Stanford's OTL (and indeed the whole U.S. technology transfer industry) would be even close to where it is today. Of course, a fortuitous geographical position, coupled with a thirst for entrepreneurial activity, is a quintessential prerequisite for success in the field of intellectual property. But without a vehicle to encourage, enable, and market inventions, the bridge from laboratory to market would be rickety indeed. That Stanford was thinking along the right lines back in the 1960s made it ideally positioned to take advantage of the pivotal Bayh-Dole Act passed by Congress in 1980. It gave U.S. universities ownership of any patents developed using federal funds.

4. GETTING IT RIGHT

External circumstances notwithstanding, a key feature of Stanford's success has clearly been the preparedness of its leaders to think long and hard about the best possible means of implementing and running the university's licensing operations. Katharine Ku, Director of the OTL since 1991 and a major international name on the technology transfer circuit, is initially hesitant when asked about Stanford's success:

People often ask me what is our best practice? In some ways, it's hard to know, since on paper our processes and attitudes are similar to those in place at other universities." After reflection, she continues: "*It is people that make the difference. Our team is scientifically trained, but we don't always look for Ph.D.s Our work is, by its nature, very generalist. We have to know a little about a lot of different areas. And this is the opposite of a Ph.D'.s training. And we don't look for lawyers—in fact, on the licensing side, we discriminate against them. Legal training is by its nature risk-averse—whereas to succeed, we have to be risk-takers.*

Ku's department is compact. Although it is one of the most active offices in the technology transfer field (managing more than 1,900 technology dockets), the core team includes fewer than 30 staff members, with no more than seven or eight licensing staff. These licensing associates evaluate technologies that have been disclosed to the OTL, before tailoring licensing strategies to fit the ones that, in their view, have commercial potential. Each associate is given what might appear to an outsider to be a surprising degree of autonomy: he or she assumes full responsibility for a portfolio of dockets, from cradle to grave. The associates each have an area of technical expertise in life sciences, physical sciences, or both. One of Ku's team, senior associate Hans Wiesendanger explained how the process begins: "*First of all, the invention must be disclosed. To encourage disclosures, every research contract stipulates mandatory disclosure (whether from government contracts or industry sponsorships), but that said, academics tend to do what they want. We can try to manage them, but we can't control them.*" (For case studies of the private sector working with Stanford's OTL, see Boxes 2 and 3.)

5. TAKING ON TECHNOLOGY

Once an invention reaches the OTL, it is assigned to a licensing associate who assumes responsibility for it, initially evaluating the technology to identify its technical advantages. "*First, we talk to the inventors,*" explained Wiesendanger. "*They will often, but not always, have a good perspective. We also talk to outside people—colleagues, companies we've worked with in the past and so on. Then*

we decide on the strategy—whether to go for an exclusive or a nonexclusive license and whether to license by territory. Then we assemble a list of potential licensees that we might be interested in contacting." The licensing associate's responsibilities are, at this point, still far from over: "*They remain in charge of the project throughout the life-cycle of the license. They check that the royalties are being paid, which may mean arranging for an audit or a renegotiation of the agreement in line with any changed circumstances.*"

Wiesendanger's explanation gives weight to what Katharine Ku identified as her department's "X Factor." Finding associates who are willing and able to take on this level of responsibility is no small challenge. As mentioned above, Stanford rarely uses lawyers to draw up agreements. As Wiesendanger explained: "*Some of our licensing deals are quite standard—we have boilerplates that can be modified as required and that are clearly very different depending on whether they apply to software or biological material. The licensing associate negotiates these agreements, with the full*

Box 2: Alumnus Case Study 1: Dr. Mark Zdeblick

"*I've been lucky to experience Stanford's technology transfer operation from both sides of the fence*," laughed Mark Zdeblick, founder of Redwood Microsystems, entrepreneur-in-residence with VC firm Spring Ridge Ventures, and CTO of, inter alia, Proteus Biomedical. "*I've worked there as a grad student in a research team developing a blockbuster technology* [atomic resolution microscopy]. *I've set up my own company* [Redwood] *with Stanford licensing the* [micro-valve chip] technology *I'd developed there to the business. And with Proteus, we've approached Stanford to license their technology to the company. Typically professors/inventors hold most of the power, exerting considerable influence over the choice of licensee. But with Stanford's OTL*," he said, "*they have enough understanding to be able to influence the professors. When people have been prepared to trust them to do the right thing, they have done very well*." The fact that the OTL can strike a balance (most of the time) between the professor's desire to tie strings to the license deal (obliging the company to pump research funds back into his or her department), and the logic behind commercializing the technology effectively, is a key variable. Commenting on Stanford's successful management of the "brain drain" experienced elsewhere, Zdeblick commented, "*Stanford often allows its professors the opportunity to take a leave of absence for two years to help spinout such technology. That level of commitment is often necessary to get backing from the private equity community. Most professors return after the two years, in which case they are in many ways much more valuable to the university. Of course, sometimes they don't return*." When Stanford was licensing on his behalf, Zdeblick was impressed with the amount of marketing they took on: "*They made a lot of calls on my behalf, seeking out interest among potential licensees, as well as undertaking a lot of the groundwork to establish the utility of the underlying patents. That's more common now, but it was much rarer 20 years ago.*" Another view of Zdeblick is Stanford's ability to get results out of the more run-of the-mill technologies that come through the OTL's doors: "*It is easy with grand-slam technologies, where you can pull together nonexclusive licenses with everyone. The tricky thing is to get the whole portfolio working well and, as a rule, Stanford seems more willing than most other universities to take a bet and grant an exclusive license for an obscure technology*."

authority to do so. It is only where something new crops up that he or she will consult a lawyer—there is certainly no obligation to get every deal approved by an external lawyer."

6. PATENT OPPORTUNITIES

This practice would hardly seem to be music to the ears of California's finest IP law firms. That said, there is still plenty of work for external law firms (Stanford OTL has annual patent expenses of around US$5 million)—although, as Carol Francis, a name partner with Bozicevic, Field & Francis, LLP (a local law firm with a track record advising on OTL-linked patent prosecution matters) explained, the patenting activity generated by OTL maintains its focus on commercial viability:

Stanford stands out for its ability to make quick assessments on when, and if, to go ahead and file a patent application, or to continue to prosecute an application already filed. Their experience means that

Box 3: Alumnus Case Study 2: Dr. Dari Shalon

Now running Shalon Ventures (an early-stage life-science VC) with his brother, Dari Shalon's experiences with Stanford OTL served him well. A former graduate student at the university, he went on to license his own invention from the OTL to launch Synteni, sold three years later to Incyte Genomics for US$100 million. According to Shalon, "*The technology that ended up being licensed to Synteni was developed by me and Professor Patrick Brown* [an arraying technique that became the basis of DNA microarray technology]." Although the OTL marketed the invention widely, no company expressed any serious interest, leading, in 1995, to Shalon starting his own company to develop the technology. "*I had done an MBA at M.I.T.,*" he explained, "*and then chose Stanford as an interesting entrepreneurial university. My research project was deliberately selected to have commercial application*." Shalon remembered wandering into the OTL as a grad student in ripped t-shirt and jeans asking if he could file a disclosure: "*I had a number of unsuccessful efforts where the technology didn't work, but the OTL guys encouraged me to go back to the lab and keep trying. Finally I got it to the point of commercial feasibility and went ahead and filed*." At that stage, he recalled, he tried to get serious: "*I turned myself into a businessman, with business cards and a suit, thinking I would step straight into the commercial sphere. What I'd failed to understand was Stanford's own fiduciary obligations to its trustees. They had to market the technology to firms that I knew would be competitors further down the line. I held my breath for six months, but to my surprise and relief, no other company had the vision to take it on*." Things went from good to better—Shalon snagged Merck as his first customer, and shortly after pulled in US$5 million in venture financing from Kleiner Perkins Caufield & Byers. "*Had I not held an exclusive license on the technology, there's no way I would have been able to raise the capital I so desperately needed*." Throughout this process, he was impressed with the OTL's flexibility and willingness to take a bet on him as exclusive licensee. "*At the crucial point when Incyte showed interest in us*," he said, "*and our license was key to the sale going through, Stanford was more than happy to transfer the license to the purchaser. And subsequently, when we got involved in litigation with a major competitor relating to our licensed intellectual property, Stanford stood by us. It made a huge difference to know there was a solid partner right behind us*."

they are adept at identifying an invention disclosure's commercial potential early on; it also means that *they're prepared to take a flexible approach to filing, often in negotiation with the ultimate licensee/s. Stanford OTL accomplishes this while at the same time respecting the academic inventors' need to publish or make presentations at meetings. While Stanford OTL may file an application to preserve patent rights that might otherwise be impacted by an imminent public disclosure, they are at the same time particularly mindful that once an application is filed, it tends to take on a life of its own, with all the expense that that entails. This analysis at Stanford OTL benefits from the experience and leadership of its Director Kathy Ku, as well as the insights and connections of the inventors themselves. Stanford OTL's insistence that the inventors be involved—and the level of involvement they receive in response—is, I think, one of the keys to their success*.[4]

(See Box 4 for an overview of how inventions move from ideas to commercial products at Stanford.)

7. NOTHING VENTURED ...

Silicon Valley has no shortage of lawyers—or venture capitalists (VCs). Not surprisingly, both camps frequently visit the corridors of Stanford, taking a keen interest in the activities of the OTL. That said, Ku pointed out that the OTL itself is not there to make contact with VCs: "*Most usually, our researchers will identify their preferred VCs in Silicon Valley and then come to see us together. That's the best approach—for technology transfer to work, where start-ups are concerned, the entrepreneur needs to feel comfortable with her chosen VC. It's up to them to get the chemistry right, which is not always something we can help them with.*" Rob Chaplinsky, a general partner with Sand Hill Road early-stage VC firm Mohr, Davidow Ventures, has had considerable experience working with the OTL, and he characterized the relationship in these terms: "*Because Stanford is bang in the heart of Silicon Valley, we have access to their researchers and professors long before the OTL. By the time we go to see the OTL, it's a matter of looking to see how we can amicably align everyone's interests. In fact, we have a saying here that if you wait until the OTL guys have the patents and call you up, you're way too late.*" Prompted to outline Stanford's formula, Chaplinsky said: "*I get a lot of calls from other institutions asking how they can copy Stanford's program—but it's not as easy as that. Some of their formula is down to geography, they're integrated in the world's venture epicenter and their professors are embedded in the community. Then there's the culture of the university—from the Dean down, they're mostly academics and entrepreneurs. At Stanford you're almost expected to start a company before becoming a tenured professor. There is something special there which can't be replicated in a hurry.*"

8. FLEXIBLE CONTROL

Where negotiations with Stanford OTL are concerned, Chaplinsky has no doubt that terms are getting tougher. Still, he stressed Stanford's willingness to be flexible, with innovative blends of upfront license fees, royalties, and equity splits very much up for discussion: "*Nothing's ever cast in stone with their OTL. There's always a door open to go back and renegotiate.*" That said, an established modus operandi underpins the OTL's position, and, as Ku explained, a big part of its rationale is the necessity to keep getting technologies out into the market: "*Our job is to plant seeds, so—because it's so hard to know which new technologies will eventually succeed—we do as many deals as possible. In some ways we've been helped in this by changing attitudes. Researchers nowadays are more interested in the potential of their technology, so we see more invention disclosures than we used to. We have to be realistic—only about seven inventions here generate US$1 million-plus a year.*" Put bluntly, this means that only about 10% of the inventions taken on by the OTL have the potential to generate significant income. Twenty to thirty percent won't bring in a great deal and the remaining 60–70% will bring in almost nothing.

Depending on the sector and the technology, the technology transfer process can be straightforward or downright complex. Ku pointed out that, as a general rule, pharmaceutical and life-sciences companies have tended to be more in tune with the process: "*They understand the long timelines*

Box 4: From Idea to Market—IP Progression at Stanford

Invention by inventor (INV)

Conception documentation:	lab notebooks, dated papers, or drafts witnessed.
Disclosure:	required by all sponsorship agreements for research; must include description (papers attached), information on who are inventors, what funding was used, when conceived, when first disclosed or published, signature(s) and date, and assignment to Stanford; fill in printed form or use Internet disclosure form; must submit to OTL

Disclosure coming to OTL

Sign in:	OTL logs in, gives docket number, and assigns to specific licensing associate (LA) who now has complete responsibility and authority for handling the invention from evaluation to licensing and monitoring licensee performance
Evaluation:	LA discusses with INV; gets as much information as needed on details of technology, novelty, potential utility, and companies in the field LA also gets similar information from outside sources, usually by contacting sources in the field and supplying confidential data and details after executing a confidential disclosure agreement (CDA)
Strategy:	LA decides how to license: exclusive or nonexclusive, by territory or worldwide, for limited and specific uses and applications or unlimited; sublicensing permitted or not; kind of company to approach and how; key licensing terms to shoot for; suitability for a standard license that can be filled out on the Web site
Contact potential licensees:	LA assembles list and makes first contact (mail, e-mail, fax, telephone, Internet); information on what invention may do, but not how; offers details after execution of CDA
Patent prosecution:	LA decides whether and when to apply for a U.S. patent; selects outside patent attorney and charges him/her with filing (normal or provisional); monitors filing and prosecution, and decides filing of foreign applications; files only if deems reasonable chance of success for licensing or prospect of getting expenses paid (for example, in return for an option to a potential licensee)
Negotiations:	LA negotiates with companies who respond positively; draws up a license agreement (starting with boilerplate and modifying that if/as necessary or advisable); if deemed necessary, consults with attorney for legal advice for special or unusual situations
Executed agreement:	OTL logs into database, documents terms and contact information, and programs database to generate reminders and invoices, as needed

(Continued on Next Page)

Box 4 (continued)

License period:	LA monitors performance: receipt of royalties and reports. OTL sends out automatic computer-generated invoices for fees and earned royalties. If performance deficient, LA follows up with reminders or, in extreme cases, termination. LA may have to renegotiate parts of license agreement if situation has changed significantly since signing (at OTL's request or at licensee's)

involved, whereas physical-sciences companies, because they are more accustomed to a cross-licensing model, can find dealing with us quite demanding. It's really up to universities to work out how they can deal better with this side of the commercial spectrum." Other aspects of the academic/commercial relationship also have potential to complicate negotiations, as Ku said: "*Because physical science companies are major sponsors of university research, some of them expect to own the inventions that flow from that research. I'd always hoped that that battle was over with Bayh-Dole, but perhaps because universities in other parts of the world are still prepared to give up title, some companies are still laboring under a misconception on the IP ownership side when they deal with us.*"

9. REMOVING CONFLICT

Like any university technology transfer office, Stanford has an effective system in place for managing potential conflicts of interest. As Hans Wiesendanger explained, "*Anyone starting a technology transfer program for a university will be concerned about professors undertaking applied research to make money—that can be very damaging to a university's reputation. That said, there is no doubt that you can continue to be one of the world's top research centers while playing a leading role in technology transfer. To do so, however, you do have to recognize that the potential for conflicts of interest does exist. Formal procedures for dealing with conflicts if and when they arise need to be instituted. That said, it is always important to remember that any researcher will be mainly interested in just one thing: his academic standing among his peers. So, in my view, the fear of conflicts can be somewhat overblown.*"

10. IP MANAGEMENT

Patenting is a core activity, handled as necessary by outside patent attorneys. Key issues that come to the fore here are whether the invention can be licensed as *tangible research property*, whether it can be licensed as copyright, whether it is likely to be both patentable and enforceable, and whether the invention has already been publicly disclosed. There's no fixed way of handling this process; Wiesendanger explained, "*It can happen at any time—and that decision is up to the licensing associate involved. But we do have to be careful; it costs a lot and represents an ongoing commitment. Some universities patent everything, but we are under pressure not to do so. Usually we'll sign licenses before we have the patents in place, and we often start negotiations before we have even applied for them. Quite often we'll look to the ultimate licensees to cover the filing expenses in exchange for a six-month option on the technology. That can be very attractive, as that six-month period often represents a very significant competitive advantage.*"

Although Stanford supports entrepreneurs, it does not "encourage" spinouts. Nor does it start companies itself, although comparatively recently the OTL was authorized by the university to take equity as part of license fees or royalties (provided that the licensee did not conduct clinical trials at the university), as well as to license companies in which the inventors have an interest. Stanford currently holds equity in approximately 75 companies with cash-out to date of around US$22

million. Wiesendanger explained, "*Stanford is very concerned about its image and we don't want to be seen to be too involved in business. Just as Stanford has a tradition of encouraging cooperation with industry, we do not want business and university interests to affect each other in an operational way.*"

11. SPLITTING THE REVENUES

Once royalties start flowing, there's a fixed split in operation. Fifteen percent is siphoned off by the OTL to cover its own administrative expenses, although, as Wiesendanger pointed out, not all of that gets used up—the remainder is channeled into a number of funds created by Stanford, including the "birdseed fund" and the "OTL gap fund." The former provides small amounts of money (typically up to US$25,000) to fund prototype development or modest reduction-to-practice experiments for unlicensed technologies; the latter supports development efforts up to US$250,000 for unlicensed technologies with commercial potential. The remaining 85% of incoming royalties divides three ways—between the inventor, the inventor's department, and the inventor's school/faculty. In FY 2001–2002, inventors received personal income of US$11.3 million, departments received US$13.5 million, and schools received US$13.1 million. "*This split is designed to incentivize researchers,*" Wiesendanger explained, "*and some academics can do very well. But often inventors don't take their share—they ask instead for it to be signed over to their personal lab account. Research money with no strings attached is, as you can imagine, very desirable in a university.*"

The nature of the beast means that it would be commercially naïve to set targets—either for licensing deals, or for royalty income. "*On average, we expect to receive five or six new disclosures a week. We file patents on about half of them and license about one-third of them. Of course we look at how many licenses each licensing associate brings in relative to this average,*" said Wiesendanger, "*but there can be no absolute measures; fields vary hugely, and cyclically, in their appetite for new technologies.*"

12. WORK IN PROGRESS

Stanford's model is working, but there has been, and will continue to be, some turbulence. In 1995, for example, a faculty committee released a damning report on the barriers between the medical school and industry, a situation exacerbated by "*a growing mutual distrust.*" A survey of CEOs at Californian pharmaceutical companies underlined the problem when the results came back showing an almost unanimous aversion to dealing with Stanford. In particular, Stanford's attitude towards the ownership/patent status of intellectual property arising from clinical research projects was a source of friction. In response, the university focused on structuring research sponsorships that allowed funding companies to get rights to the technology. Realizing that the federal budget for research funding was in steep decline, the medical faculty had little choice but to be proactive with its industry benefactors.

With hindsight, it's clear that the acid test for Stanford's model came at midnight December 2, 1997—the moment when the (nonrenewable) Cohen/Boyer patent for recombinant DNA expired. This moment, referred to at the time by Stanford officials as "the cliff," might have defeated some operations, but at Stanford the event acted to stimulate several years of intense activity, with the university opening up the campus to industry ideas as it never had before. As Ku said, the OTL was prepared: "*We'd been moving steadily toward being more user-friendly to industry.*" That it took just six years for Stanford to top its record royalty year with Cohen/Boyer underlines the firm foundation set down by Reimers—and points the way forward to an another exciting decade in Silicon Valley. ■

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