Learning the LANGUAGE of Tech Transfer

by Jeff Mortimer
photos by Marcia Ledford

"If you die having discovered a cure for cancer, and do not communicate that discovery, I'm not sure you've necessarily done anybody any good," says Paul Taheri, M.D. That spirit, more or less dramatically expressed, informs the process whereby the results of research reach the marketplace. It's called technology transfer.

"The U-M Medical School receives up to $250 million in research funds every year," says Taheri, associate professor of surgery and associate dean for academic business development. "Invariably, there will be discovery. The question is, what do you do with that discovery? There are scientific purposes, which are a good thing, but the end game is to get some of these discoveries out to the public. The only way to do that is to commercialize the technologies — that's how they get distributed to the population-at-large."

At the University of Michigan, that vehicle may not be leading the Indianapolis 500 yet, but it's an increasingly fine-tuned piece of machinery. Taheri's purview includes oversight of the Medical School's Office of Technology Transfer and Corporate Research — directed by Elaine

Brock — one of two satellite offices (the other is in the College of Engineering) of the University's Office of Technology Transfer. The tech transfer staff at the University assist faculty inventors through a process that many of them may find bewildering or even intimidating.

"We see ourselves as a service group working with investigators to understand the issues and options for getting their research put to use," says Ken Nisbet, who as executive director, heads up the University's overall technology transfer activities. "Our tech transfer specialists guide inventors through the disclosure process and work with them to assess the best options for commercialization. These same specialists are skilled at finding the right set of business partners, understanding the protection of intellectual property and providing hands-on assistance to complete the journey to a product or service for the general public."

The tech transfer journey follows a fairly well defined path. It begins with disclosure, a written notification to the university of a potential commercial device, technique or treatment. If it appears the discovery does indeed have market value, the process is launched and the search for business partners begins. The Office of Technology Transfer not only assists with the matchmaking, but it will also help inventors form startup companies when appropriate, including creating a business plan, identifying management and recruiting funding and investors.

"The technology is often in very early stages, with a lot of unanswered questions, and finding the right outside party to take on the challenge of completing the commercialization process is not always easy," says Nisbet. "But the benefits of having our technology reach the marketplace are worth all the difficulties."

Steve Goldstein, Ph.D., the Henry Ruppenthal Family Professor of Orthopedic Surgery and Bioengineering and associate dean for research and graduate studies, can testify to that. A successful inventor himself, Goldstein has been down both roads: he's patented orthopedic devices that have been licensed to manufacturers, and co-founded a company, now known as Selective Genetics, that hopes to market a gene-based therapy to promote wound repair.

Paul Taheri

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"I think the ultimate goal of most of the faculty is to be able to translate a discovery into real clinical practice, to get it from their bench to the patient's bedside," he says. "The only way that's going to happen is if you can form a partnership of some sort with a manufacturer who will go through all of the necessary development, including the formulary development and regulatory aspects, and the only way that a company can afford to do this is if it can be assured of having some market position to help reimburse and bring value to the company. If a faculty member makes a discovery and does not participate in the technology transfer process of protecting it, that discovery may never get to a patient. A company will not have the incentive to take it into development."

Licensing agreements with existing companies are the most common form of commercialization, but it was a different story when Goldstein and his colleagues made the discovery that led to the wound repair therapy. "Working with the technology transfer office, we developed the idea of creating a spin-off company around this concept," he says. "Because this turned out to be a unique and very broad idea, it appeared that would be the most effective way to get it to clinical utility and really take advantage of what seemed to be a platform technology. Throughout the process, I personally have found the interactions with the technology transfer office, and then with the principals and individuals who were helping with the day-to-day aspects of the company, to be extremely rewarding and interesting."

But the real reward, in his view, will come when the bedside is reached. "The pre-clinical data are nearly finished ➤

market position f

that might lead to clinical trials in the near future in bone repair and defects and in ischemic heart disorders," he says. "I can't say if the company is really going to be a gangbuster success; that will depend on how the clinical trials go. But the potential for it to make a significant impact on health still remains great, and it looks like the technology is really going to start getting to patients. I find that very exciting and really important."

Since the Medical School represents about 40 percent of the technology transfer office's "opportunities," as Nisbet calls them, it seemed both a logical site for a satellite operation and a logical step in tech transfer's evolution at Michigan.

The modern era of technology transfer began in 1980 with the passage of the Bayh-Dole Act, which allowed universities to retain ownership of inventions made by their employees as a result of federally-sponsored research. Michigan opened its first technology transfer office in 1983, and the Medical School satellite office in 1998, two years after the regents passed a resolution affirming the value of technology transfer as a component of the university's mission.

Research, teaching and service are, of course, the core components of that mission, and "the university sees tech transfer as a point in a continuum of service," says Brock of the Medical School's office. "That's a very powerful motivator, particularly for Medical School faculty." Echoing Taheri, Brock adds, "What good does it do to discover a vaccine if no one ever receives it?"

"We measure our work by the quality and intensity of our service to our faculty and researchers, and also by our contribution to the economic development of our community, the state of Michigan and beyond," says Nisbet. "We are making money ($9 million in licensing revenue in fiscal year 2003) but our primary goal is not financial. Our goal is to get as much of our technology to market as possible. If we do that well, the money will follow."

And it doesn't follow just the inventors and investors. Under the Bayh-Dole Act, the university as well as the inventor gets a piece of the pie, so revenues find their way to fund additional research and education in the inventors' departments. Companies often fund grants for further or complementary research on inven-

Steve Goldstein

Elaine Brock

tions they've licensed, so these funds find their way to investigators' labs as well. Somewhere down the line, if all goes well enough, the marketers and distributors and retailers benefit, too.

That benefit, says Marvin Parnes, the university's associate vice president for research and executive director of the Division of Research Development and Administration, is what the Bayh-Dole Act was all about. "It was predicated on the expectation that the universities would then be obligated to disclose the inventions and do technology transfer," he says. "Increasingly, our federal sponsors, as well as the state, look to university research for technology that will stimulate the economy. If you look at the explosion of the knowledge economy over the last 30 years, you will see an enormous increase in both the number of patents coming out of universities and the industries that have relied on their steady flow of technology, either in the form of students or licenses."

Last but not least, a vibrant technology transfer presence provides a competitive edge in attracting and retaining the best and brightest faculty and students. "As a faculty member, I'm always delighted to hear people are excited about encouraging this," says Robert Bartlett (M.D. 1963), a professor of surgery who got excited about technology transfer a long time ago. An internationally recognized leader in the field of technology transfer, Bartlett recently received the American Surgical Association's Medallion for Scientific Achievement and the 2003 Jacobson Innovation Award of the American College of Surgeons. He founded a company in 1991 that now makes cardiac and pulmonary devices for long-term applications.

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"On balance, it's very good for the university," Bartlett says. "You can recruit the best and the most creative people who are involved with things that will eventually lead to products for the benefit of mankind. Our little company, MC3, has been a good example. Over the years, many students in engineering and medicine have gotten involved with MC3, worked in our lab, and had summer jobs with us. There are a lot of very successful people out there in the business world and medical world, probably hundreds by now, who got involved because they came through our enterprise."

"We have to remember that a huge part of what we do is education and training," says Goldstein, "and a significant number of our trainees want to have careers that are associated with the biomedical industry. We would be doing them a disservice if we didn't provide them with some exposure to the process of going from the bench to the bedside."

It would also be a disservice not to point out that there are bumps along the technology transfer road, that it doesn't necessarily lead to riches, and that there are philosophical issues involved that often require a bit of a tightrope act.

"It's important for faculty to understand where the benefit to doing this really is, and where the downside is," says Brock. "If you're looking at the number of disclosed technologies that are ever actually licensed, it's about 40 percent, and a much smaller part of that 40 percent actually produce substantial revenue."

"Nationwide, less than one percent of all tech transfer licenses generate more than a million dollars," says Nisbet. "Most don't generate substantial revenue."

And even if they do, it can take a while, to say the least. "I often start a discussion with an inventor by asking them which of their grandchildren they would like to see the royalty go to," Brock says. "The process can be long and the payoff can be very far away. Another 10 years to get it to the marketplace is not all that bad."

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This is especially true with health-related technology, due to the array of regulatory approvals required of any product that's intended for use in or on human beings. The situation is further complicated by the rapidly evolving nature of modern medical research. "We're solving problems today that might not be the same problems that are identified tomorrow," Brock points out. "The sophistication of our understanding of the body at the subcellular level is increasing so fast, we don't even know what problems we're going to solve in the next few years."

"There's an expectation misalignment," says Taheri. "People experienced with technology transfer know these things take time. You don't get a patent in a day. You don't do due diligence in two days. A lot of stuff has to go on before you even file a patent application, assuming a patent is the kind of protection you want to provide. Investigators have a hard time appreciating the time involved and the amount of work. They think they did the hard part by getting the discovery, and they did. But the government and society puts a premium on these patents when they're awarded. Investigators also need to recognize it's going to take a lot of their time, not only to manage the patent process, but also the ultimate management of the technology, whether it's a license with Merck or Johnson and Johnson or their own start-up company."

Goldstein says his experience has been that many scientists underestimate these factors. "When they do a research project, they really have a good sense of the enormous commitment that they have to put into it to take it from a germ of an idea to great research findings," he says. "Technology transfer is the same way. Once you have the discovery, there's still a long way to go to bring it to commercial fruition. Expecting your work to stop at the end of the discovery is probably not appropriate."

Technology transfer's road to acceptance as a legitimate activity for faculty and the university has also had its share of bumps. Critics fear the rise of what they call the "kept university," where the commercial tail wags the academic dog, resources are steered toward those units that are more likely to produce revenue, and the dissemination of knowledge is circumscribed by whatever entities have a proprietary interest in it.

"The 'kept university' refers to how influenced by corporate need the university's missions are," says Brock. "If you look at corporate-sponsored research as a proxy measure for that, the relative percentage of overall university expenditures that are paid for by industry sponsorship is low. It hovers between six percent and eight percent, and hasn't changed significantly in decades. From that perspective, the influence isn't as great as some people think."

"The risks are sometimes more perception than reality," Nisbet says, "but we're always careful not to have the commercialization process distort our focus and our missions as an institution. ➤

Marvin Parnes

If done properly, it naturally complements the missions and contributes toward the impact our university has on society."

"Properly" is, of course, the key word. Parnes notes that when the university affirmed its commitment to technology transfer in 1996, it also strengthened its conflict-of-interest policy.

"It's a very core value at the university to protect the integrity of our research process and our clinical activity," he says. "A great deal of care is given to ensure that there are no undue influences of a financial nature. We have a conflict-of-interest committee in the Medical School that's recognized nationally and one of the longest-standing such committees in existence. They're very adept at understanding and managing conflicts and providing avenues for insuring that the proper oversight occurs, or even saying that certain activities cannot be managed in the university framework. It's important to recognize that there are limits on what a university can do in its commercial endeavors, and it's always understood that our highest priorities are research, teaching and service."


Ken Nisbet

"Nationwide, less than one percent of all technology transfer licenses generate more than a million dollars," says Ken Nisbet. "Most do not make much money; that's just the fact."

"There has to be a balance," says Goldstein. "A discovery that may be patentable, and makes a company interested in licensing it to create something for the patient, may also be really important information that may lead to further discoveries. In the process of technology transfer and protection, you want to keep that information freely available to other scientists to continue to make advances on it."

Compared to places like MIT, Johns Hopkins and Stanford, Michigan was slow to embrace technology transfer, but the pace has quickened in recent years.

"By all measures, we're certainly not mature yet," says Taheri. "It's not that things are dismal, but we're sort of in the middle of our curve."

Goldstein describes U-M's technology transfer operation as "much more sophisticated, much more knowledgeable, and much larger in scale" than it was when he first became involved in the process. "If you look at what Michigan has accomplished in the time since it got interested in technology transfer, it's a much faster pace than some of the institutions that got into it very early. Part of that is the times, but part of it is that we're learning how to get better at this."

Measures of tech transfer activity at the U-M show this improvement. University-wide measures for 1999-2002, compared to the previous four years, show large increases in invention disclosures, patent applications, license agreements and license revenues. "These activity metrics help us to track our own improvements as well as assess our position relative to our peer institutions," said Nisbet, "Even more important, however, are the improvements in service quality and responsiveness that we continue to try to achieve for our faculty and our business partners."

One area that is not easily quantifiable but nonetheless crucial to continued improvement is the "pre-disclosure process," which simply means getting investigators to recognize when they may have a discovery in the first place, and then contact the technology transfer folks about it.

"You have to rely on faculty inventors," says Brock. "Their participation is critical to the process. The great challenge is to try to convince people who do good science that good science can be turned into good technology. There's still a significant contingent of faculty who don't think at all about technology transfer, and to get to them and get them to think about it is very difficult."

"We need to make it transparent for faculty members, so they understand who to go to and what the issues are," says Taheri. "The process has improved dramatically over the last five years here, but I do think it can be better. This should be a relatively seamless transaction for our investigators."

"We don't want people to wait until they know they have something that is a technology transfer opportunity," says Nisbet. "We help them work through their issues, even if their opportunity is not appropriate for a technology transfer license. We're here to help researchers and faculty members become successful with their research opportunities."

The measure of technology transfer's success, says Goldstein, "is not how many dollars we have but how many lives we've touched. We're all about trying to discover how to improve health care and health care delivery, and this is the avenue to do that." m

RISKY BUSINESS

Supporting the front lines of medical science is the first step from bench to bedside, and Ralph Wilson Jr. is no newcomer to getting things started

They called it the Foolish Club.

When Ralph Wilson Jr. formed the Buffalo Bills and joined with Lamar Hunt and six others to form the American Football League, no one thought the team — or the league — would last. But it was a risk Wilson was willing to take. Within a few years, competitive play between the Bills and a host of other teams led to an AFL-NFL merger, kicking off, as it were, a new and exciting chapter in American sports history.

Today many adjectives might be applied to the ventures of Wilson, who lives in the Detroit area and has enjoyed a long and active business career. "Successful," "fearless," and "inspired" come to mind, but "foolish" isn't among them. Today, in fact, Wilson's willingness to embrace risk is offering hope to people with a variety of debilitating diseases. With the founding of the Ralph C. Wilson Sr. and Ralph C. Wilson Jr. Medical Research Foundation, some of this country's best and brightest medical scientists are being given a chance to explore uncharted approaches to curing disease and treating injury.

This is a foundation with an interesting history. It's just one branch of a philanthropic effort that has touched thousands of lives — food banks, education, the arts, and even animal shelters have been bolstered by gifts from Wilson's foundation. But in 2000, Wilson decided that the time was right for a biomedical sciences funding organization with a difference: one whose specific charge would be determined by those who work at the front lines of biomedical science. He invited representatives from six of the nation's finest medical research organizations — the Mayo Clinic, the Cleveland Clinic, the Miami Project to Cure Paralysis, Wayne State University, Roswell Park Cancer Center, and the University of Michigan — to attend an initial meeting.

"They convened an advisory group to give advice as to how the foundation should work in its mission of supporting biomedical research," says Steve Goldstein, Ph.D., the Henry Ruppenthal Professor of Orthopedic Surgery and Bioengineering and Michigan's emissary to the group. "The first discussions we had were to talk about grant procedures. They were basically asking, 'How can this foundation have an impact on medical science?' The board came up with the concept to support creative, new, riskier research and to do it in a peer review process."

Ralph Wilson Sr. and Ralph Wilson Jr. in 1942

Goldstein stresses what anyone involved in medical research knows all too well: that securing funds for startup projects is as difficult as it is vitally important. "The reality is that agencies like the NIH fund very conservatively," he says. "They have too many applications and not enough money and they end up funding projects they are pretty certain will work. That leaves a big hole when you have an 'out of the box' idea. How do you get started? You need pilot funds to give you the freedom to think innovatively…"

From their initial discussions, the foundation began a first-tier funding program focusing on the six participating institutions. Today, four U-M researchers are among the recipients of this pilot funding. One of them, Daniel J. Goldman, Ph.D., a professor of biological chemistry and senior research scientist in the Mental Health Research Institute, is using transgenic zebrafish to learn more about central nervous system regeneration. "The Wilson Foundation has made a profound impact on our research," Goldman says. "One of the best ways to evaluate this is from our results and the ability of those results to attract additional funding. Our recently awarded state of Michigan Life Sciences Corridor Grant provides over $1 million to support our research for the next three years and attests to our accomplishments. We are very grateful to the Foundation for providing the seed money to get this work off the ground."

Says Ralph Wilson Jr., "We are pleased that all of our 2000 grant program recipients have received follow-up funding to continue their projects, and that the efforts of our Scientific Advisory Committee and our Wilson Fellow research scientists have been recognized. In several cases substantial grants from NIH and state agencies will provide three to five years of continued research. Without the risk of this leading-edge research funding, these rewards would not be possible."

They say every journey begins with a first step — something Ralph Wilson knows all too well. From a risky first step was born one of America's most powerful sports organizations. Now that Wilson's focus is on medicine, one can only imagine the great good that lies around the corner as the daring, new ideas he is funding are given flight: repair of spinal cord injuries, new treatments and cures for arthritis, mental illness, and more.

Sometimes, you just have to take a chance. m

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