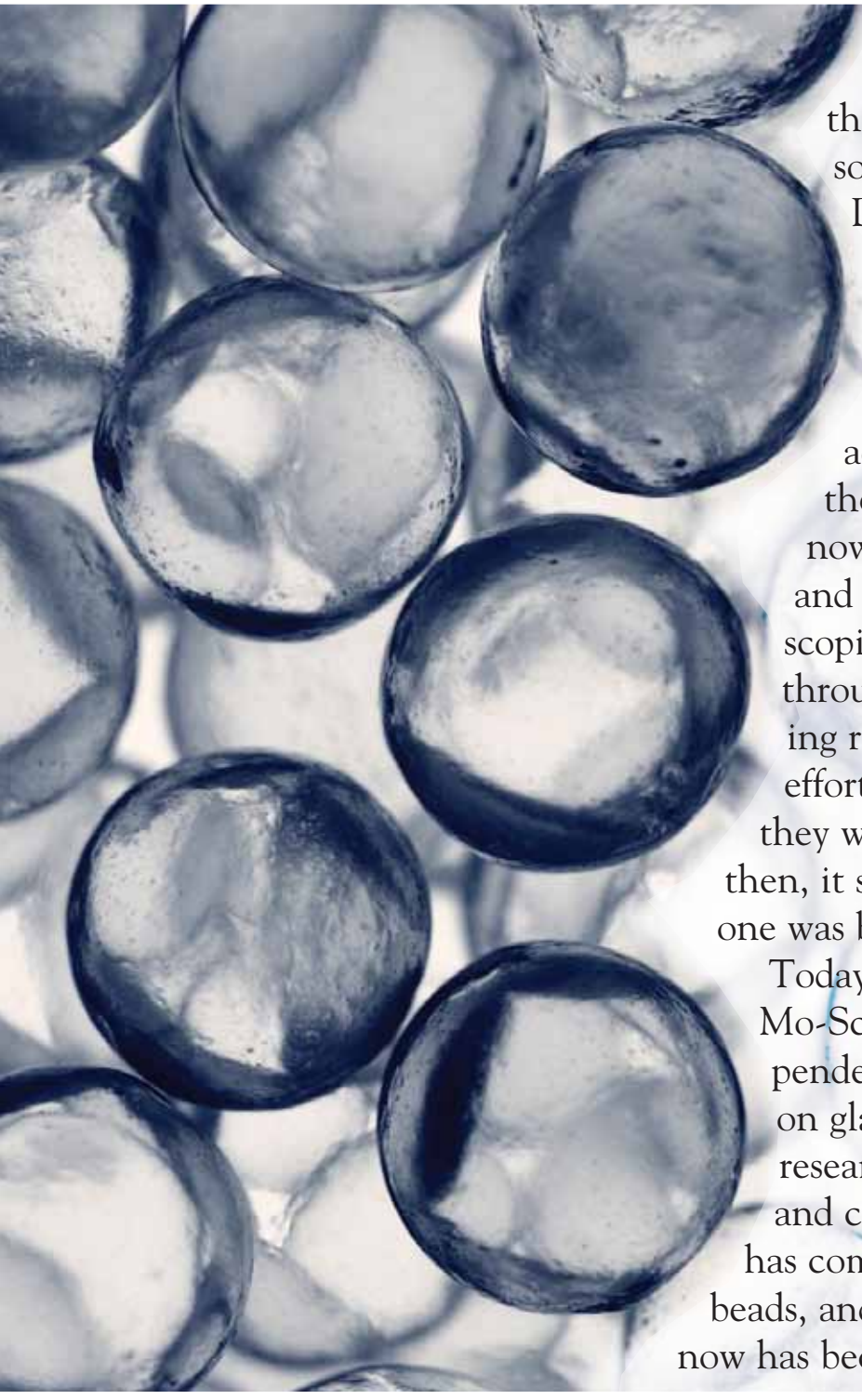
Business, licensing and intellectual property management

by Wendy Hankle



About 26 years ago, glass beads captured the attention of two professors in Missouri, Delbert Day (Missouri University of Science and Technlogy) and Gary Erhardt (University of Missouri-Columbia). No, not the flashy specimens that adorned the regrettable styles of the 1980s. Think smaller. Okay, now even smaller than that. Day and Erhardt's beads were microscopic spheres capable of traveling through the human body, delivering radioactive materials in an effort to stop cancer. They knew they were onto something, but back then, it sounded too far out – and no one was buying it.

Today, the company Day founded, Mo-Sci Corporation, performs independent research and development on glass products plus contractual research for the federal government and commercial companies. Mo-Sci has come a long way from those glass beads, and a once unfathomable idea now has become the basis for a successful,

well-known company. How did it happen? Delbert's son Ted Day explains.

"I don't know if the technology would've gone anywhere if Dad wasn't trying to push it," says Ted, to whom Delbert sold the business in 1998. "So the choice was to let the technology go to waste, or go out and develop it himself."

It's a situation many university and federal lab researchers have found – and still find – themselves encountering: A promising technology is ready for primetime, but … how does it get to center stage?

A long road

Day and Erhardt were not only forward-thinking inventors – they were in the right place at the right time. The 1980s were the beginning of a hot time for technology transfer and saw Congress approve two separate acts: Bayh–Dole and Stevenson–Wydler. The acts, passed in 1980, codified the right for researchers in universities, nonprofits, small businesses and federal labs with intellectual property originating from federal-government-funded research to see financial benefit for their discoveries. The legislation also served to make scientific and technological developments accessible to more users, who were enabled to further develop the technology for financial gain.

Before the acts were implemented, "There was no government-wide policy regarding ownership of inventions made by government contractors and grantees under federal funding," cites a 1999 document by the University of California Council on Governmental Relations. The document continues, "Inconsistencies in policies and practices among the various funding agencies resulted in a very limited flow of government-funded inventions to the private sector."

What this meant from a practical basis was that in 1980, the federal government held title to about 28,000 patents, of which fewer than 5 percent were licensed to industry for development of commercial products, according to a 1999 report of the General Accounting Office. Only rarely – and after a long and arduous process – could the inventing organization gain the ownership of an invention.

More often, the government held the title and made the inventions available through nonexclusive licenses to anyone who wanted them. As one might imagine, companies without exclusive rights under government patents were less than thrilled to make investments in products, given their competitors also could access licenses to manufacture and market like products.

"All of this money goes into technology, but, prior to the act, there was no motivation for anyone to license [it] out," says technology transfer consultant Marti Elder, who works with the TechLink Center at Montana State University. Ultimately, that meant taxpayers funding the federal research didn't receive the benefit of products or economic development that could have stemmed from such research.

The new laws provided for nonprofit organizations (including universities) or small businesses to retain the title to any invention made as a result of federally funded R&D (with a few exceptions). It also addressed the licensing of inventions to which the government retained title. In return for the rights, universities are required to:

- Report disclosed inventions to the funding agency;
- File for patent protection;
- Actively pursue the commercialization of the inventions;
- Share royalties with the inventor and use any remaining income for education and research;
- Give preference to small businesses interested in obtaining licenses; and
- Work to ensure that manufacturing resulting from the inventions occurs in the United States.

And, years later, adjustments to Stevenson–Wydler put finer points on the rights and responsibilities inherent in research done at federal labs. Cooperative research and development agreements, or CRADAs, were created by the Federal Technology Transfer Act of 1986, an amendment to Stevenson–Wydler. CRADAs were initially applicable to government-owned and government-operated laboratories,

Intellectual property resources

One of the biggest tools researchers can arm themselves with when considering the ins and outs of technology transfer is an understanding of intellectual property principles. Here are a few places to gain some knowledge.

- Rolf Claessen's IP Newsflash provides a customizable source for information about intellectual property, including press releases, case law and specific patents. Find it on the Web at www.ipnewsflash.com.
- The United States Trademark and Patent Office's Website is a goldmine. Here, one can find information on patents, trademarks, and law and policy. Dig deep into the site – www.uspto.gov – to find an extensive selection of resources.
- At www.technologytransfertactics.com, current events and quick bites can be found via a blog, while a newsletter provides more in-depth guidance and strategies.
- In a 1993 publication, the potential of a uniform worldwide intellectual property rights system is explored. *Global Dimensions of Intellectual Property Rights in Science and Technology* includes the published proceedings of a major conference in 1992 exploring the topic as well as case studies and a comprehensive view of IP matters around the globe.
- Narrowing the scope a bit, a thorough explanation of IP and technology transfer in this country can be found in *Intellectual Property Experiences in the United States Scientific Community*. This 2007 report by the American Association for the Advancement of Science Project on Science and Intellectual Property in the Public Interest delves into the how-tos of IP.

Fiscal year	Disclosures received	Patent applications filed	Patents issued	Licenses and options signed	Royalty income (000's)
2011YTD	10	11	3	3	$72
2010	34	25	13	10	$430
2009	40	21	4	27	$196
2008	35	16	7	16	$348
2007	21	22	6	7	$379
2006	35	18	4	7	$186
2005	17	13	2	4	$96
2004	24	13	3	9	$82
2003	14	17	0	0	$56
2002	19	5	4	2	$100
2001	12	4	0	1	$11

(Source: Office of Technology Transfer and Economic Development)

Missouri S&T technology transfers activities.

but a fiscal year 1990 Department of Defense Authorization again amended Stevenson–Wydler to extend the right to use CRADAs to government-owned, contractor-operated labs.

"The idea behind the CRADA is that we have this fantastic investment in facilities and personnel funded by the taxpayers," says Elder, whose TechLink group helps DOD labs partner with private-sector companies to solve problems and create new business opportunities. Companies can access such resources, but have to pay for them. Should an invention result, the CRADA protects both parties. "Companies do have the rights to their intellectual property, to license anything new that comes about from it," she says. "It's a really good mechanism for companies to access testing and equipment they may not already have access to."

Finding the right resources

Access to resources – and the benefits that can come from acquiring them – is a huge issue when it comes to moving a technology from bench to market. Work with university, federal and private partners has been at the core of SAGE Electrochromics' efforts to develop reliable high-performance, energy-saving electrochromic technology for commercial and residential buildings. The company's "smart glass" technology helps lower energy bills by allowing users to adjust the tint of windows based on temperature and energy needs. In the summer, users can press a button to tint windows, controlling solar heat gain. In the winter, they can clear the tint to allow more light – and additional heat – in.

The company was founded in 1989 by John Van Dine and initially operated out of a small laboratory in Valley Cottage, N.Y., before moving its operations to the Department of Ceramic Science and Engineering at Rutgers, the State University of New Jersey.

"Rutgers offered some lab space to SAGE at a very reasonable price. I think it was the first time they had tried to nucleate a company at the Center for Ceramic Research" at Rutgers, says Neil Sbar, SAGE's vice president of technology. In 1991, Van Dine submitted a proposal in the National Institute of Standards and Technology's Advanced Technology Program General Competition. That proposal was unsuccessful, but Van Dine, encouraged to strengthen his plan by working with a technology partner, formed a joint R&D venture with the 3M Corporation. (The two companies brought in scientists from Rutgers' center as collaborators.) The plan was to build on SAGE's electrochromic synthesis and processing experience and draw on 3M's module technology, manufacturing and commercialization skills.

The joint venture submitted a successful proposal in the Advanced Technology Program's 1992 General Competition. ATP eventually provided $3.472 million toward research, matched by $3.821 million from 3M and SAGE. The smart windows developed by SAGE, 3M and the Rutgers professors have a series of thin conducting layers that change optical properties with the application of electrical voltage. "This was an important partnership in moving ahead in materials and device structures," says Sbar. Rutgers faculty are on some of SAGE's patents. Rutgers (and other universities) also offered "special capabilities we were able to take advantage of," says Sbar.

In late 1998, after several years of R&D at Rutgers, SAGE moved to its pilot line phase. It made a geographic move as well, taking its operations west to Minnesota. For the next five years, it refined production processes and continued to develop its products. Third-party entities, including the Department of Energy, also took part in the testing.

Sbar says there are pluses and minuses to working with universities such as Rutgers and the University of Minnesota (a more recent partner). "Getting grants, it's nice to have a university to partner with, especially with the [National Science Foundation]," says Sbar. A university partnership is also beneficial to companies needing resources. "On the other hand, I think we contributed a significant amount of money from the university for them to acquire some special analytical tools, so it was a mutually beneficial relationship," says Sbar. "The negative side is the way the university functions. If you have urgent stuff that needs to be done right away, a university is probably not the best place."

SAGE recently announced that Saint-Gobain made an $80 million equity investment in the company. Saint-Gobain is contributing its electrochromic glass intellectual property to SAGE. Both companies' manufacturing and R&D efforts in this arena will be merged to make windows in Faribault, Minn.

(Credit: SAGE)

The development of SAGE's glass-tinting technology involved support from universities, private labs and the NSF.

Working with government partners

Pro-Perma Engineered Coatings is another company navigating the waters of technology transfer with an outside entity – the federal government. The company manufactures a glass-based coating for reinforcement bars, which is an engineered mixture of glass, clay and water that is applied as a slurry to rebar, then heated to more than 1,400 degrees Fahrenheit. The coating sticks fast to steel, promoting bonding with concrete and working to prevent corrosion from water or salt. This coated rebar is expected to be a competitor to polymer-coated and galvanized rebar currently used in the construction industry.

Although the technology is young, the demand for PPEC's product could be great. "There's a $4 billion market just for corrosion-resistant rebar in the U.S.," says Mike Koenigstein, managing partner of PPEC and a Missouri S&T grad with a bachelor's in ceramic engineering. "Worldwide, it's huge."

The technology in use by PPEC was originally developed by the Army Corps of Engineers, which used it to create blast-resistant walls. PPEC gained a license for that original technology through the federal government, but sought help from Missouri S&T researchers to provide more data, says Koenigstein. PPEC has been working with the Corps for six years. Four years ago it contacted the university. "It wasn't until we got to Missouri S&T that things really picked up," he says. It was at S&T that a special formulation of the coating was developed by a team of researchers led by Richard Brow, curators' professor of materials science and engineering and Genda Chen, professor of civil, architectural and environmental engineering and interim director of the Center for Infrastructure Engineering Studies at Missouri S&T. As a party to the invention, PPEC was able to get the exclusive license for the technology.

"We're getting small jobs through the Corps, and that's helping pay the bills. It can really make a difference on a lot of levels," Koenigstein says. For instance, he says, such work also serves to challenge the conception that the ceramic industry is concerned only with whiteware. "One of the things we have to do is make people understand what our products can do," says Koenigstein.

To that end, PPEC also engaged the services of a technology transfer consultant working at Montana State's TechLink center. "There are a lot of pitfalls out there," says Koenigstein. The consultant "was very, very helpful to us and a good sounding board," he says.

Technology transfer offices

Serving the same purpose as a consultant – except in a different setting – is the university technology transfer office. These offices are resources aimed at identifying research with commercial potential and determining the best way to exploit it. The offices deal with the nuts and bolts related to patenting and licensing as well as work to link the products of research with potential commercial users. The commercialization process varies. It can involve licensing agreements, joint ventures, partnerships or spinoffs. Staffers often have business, legal and research background.

So, what's been the result of this type of attention?

According to the Association of University Technology Managers, before 1980, fewer than 250 patents were issued to U.S. universities annually. It was rare that discoveries were commercialized. By Fiscal Year 2002, 5,327 new license agreements were signed. Moreover, according to the AUTM's website (www.autm.net), "Between FY 1991 and FY 2004, annual invention disclosures increased more than 290 percent (to 18,178), new patents filed increased nearly 450 percent (to 11,089) and new licenses and options executed increased about 510 percent (to 5,329)." Also in FY 2002, AUTM members reported 569 new product introductions, and almost 23 percent of members' 26,086 active license agreements saw product sales by licensees. According to AUTM's FY 2007 U.S. Licensing Survey, in 2007, total research expenditures by U.S. universities, hospitals and research institutions was $48.8 billion. Of that amount, industry support for R&D on college campuses represented 7 percent of the overall funding of university research, an amount eclipsed by the 65 percent provided by federal agencies, but not insignificant.

Prior to becoming director of the Office of Technology Transfer and Economic Development at Missouri S&T, Keith Strassner spent 25 years in the chemical industry. "One of the things the university wanted was some-

one who could talk business, who had done licensing and intellectual property management," he says. Strassner came to Missouri S&T about five years ago, after Missouri's system, which previously had such an office only in Columbia, acted to establish technology transfer offices at each of its four campuses. Doing so "gets us a lot closer to the inventors and the laboratories," Strassner says. Early on, staffers in the office meet with faculty and graduate students to educate them on technology transfer, intellectual property and how to best protect their and the university's rights, Strassner says. Staffers also research the marketplace to see what's been patented and if an idea truly is patentable. Should that be the case, the office aids in filing the patent, seeking out potential licensees or partners – or supporting researchers in starting their own businesses, if there is interest in doing so.

The process

Licensing revenues are divided depending on the formula adopted by an individual institution. That said, an equal three-way split among researcher, university department and university as a whole is not uncommon. University revenues often help pay for graduate research assistants, equipment, funding for further research, a portion of the legal fees associated with patenting and licensing as well as the expenses of the technology transfer office staff. Despite the financial benefit the revenue-sharing elements provide, "I don't think it's the primary reason" for faculty members' interest in commercializing their research, says Arundeep S. Pradhan, immediate past president of AUTM and associate vice president for Technology Transfer and Business Development at Oregon Health and Science University. "In talking with faculty and working with faculty over the years ... really, they want to see their research being used in a tangible form that has public benefit."

A university may request equity in a company in exchange for a license. It also could charge up-front fees, milestone fees and due diligence fees, Pradhan says. Licensing agreements combine financial and nonfinancial obligations. Says Pradhan, "The university will stay involved, but it's a hands-off involvement ... we do want to make sure that when we license a technology, that appropriate resources are allocated for the further development of it."

And if there are problems, the university can terminate the agreement. "From one respect, we are stewards of the intellectual property that was created by taxpayer funds, and we're interested in making sure that the technology is getting utilized," Pradhan says.

The deals that the office strikes with licensees vary, according to Strassner. Faculty start ups get a sweeter deal than do outsiders, but the university doesn't want to put too high of an initial burden on a company, he says. "Our real operating philosophy is shared success – we don't want to put them out of business." And once money from the licenses comes in, inventors get one-third of every $1 as a royalty payment. The rest goes to their department and the university system, Strassner says.

Licensing versus spinoff

It's fair to say it's more common for a university researcher to opt for licensing a patent rather than starting a spinoff company. The decision "is made at the technology transfer office level by the faculty member whose invention it is. A large part in guiding the decision is if he or she is saying, 'I really want to establish a company around this,'" Pradhan says. If so, "most technology transfer offices will work with them on business opportunities, marketing, etc.," he says. "Twenty years ago, we would have just given them the license and said, 'good luck,' but now we've learned."

Says Pradhan, faculty "already work 60 hours a week [and] being an entrepreneur is another 50 to 60 hours a week. It's a time commitment, and you have to talk about what's going to happen here. Here are the nuts and bolts and pieces you need to make a company be successful." Along with the technology, those important elements include proper management and sufficient capital, he says. The decision to start a spinoff company or license the technology "depends on the industry, it depends on the technology, on desire – there are many things that go into that decision," Pradhan says. "Sometimes, it's just a lot easier to license it."

The Office of Technology Transfer and Economic Development at Missouri S&T operates a Small Business and Technology Development Centers service location under a contract with the University of Missouri Extension and funded by the Small Business Administration. "We can help them put a business plan together, help them file for business registration, raise capital, all those things," Strassner says. "If you want to start your own business, we're kind of a one-stop shop. ... We made it really easy, so if you want to start your own business, you can start your own business." Strassner continues, "The benefit of a spinoff is you do create jobs, you do create employment opportunities," and those typically remain in the community, a key feature because economic development is one of his office's major goals. That said, he says, "We want to make sure everybody goes into it with their eyes wide open. [A startup] is not one-hour-a-week on the side. It's a lot more complicated than that."

Although "complicated" seems to lend itself effortlessly to technology transfer efforts, the environment has evolved a lot since Delbert Day's day. Moving from the lab bench to selling yourself – and your widget – isn't an easy transition for many researchers to make. Today, however, more resources are available to protect the interests of researchers, license holders, universities and laboratories. It's a good thing, too – although trailblazers such as Day still inspire awe.

"Delbert Day is kind of the one that young faculty on campus look to and say, 'I want to do that with my own business,'" says Strassner. "Delbert is one in a million, though. Usually, you've got either a great engineering mind or a great science mind. But, he knows business too, and that combination is a very unique mindset." ■