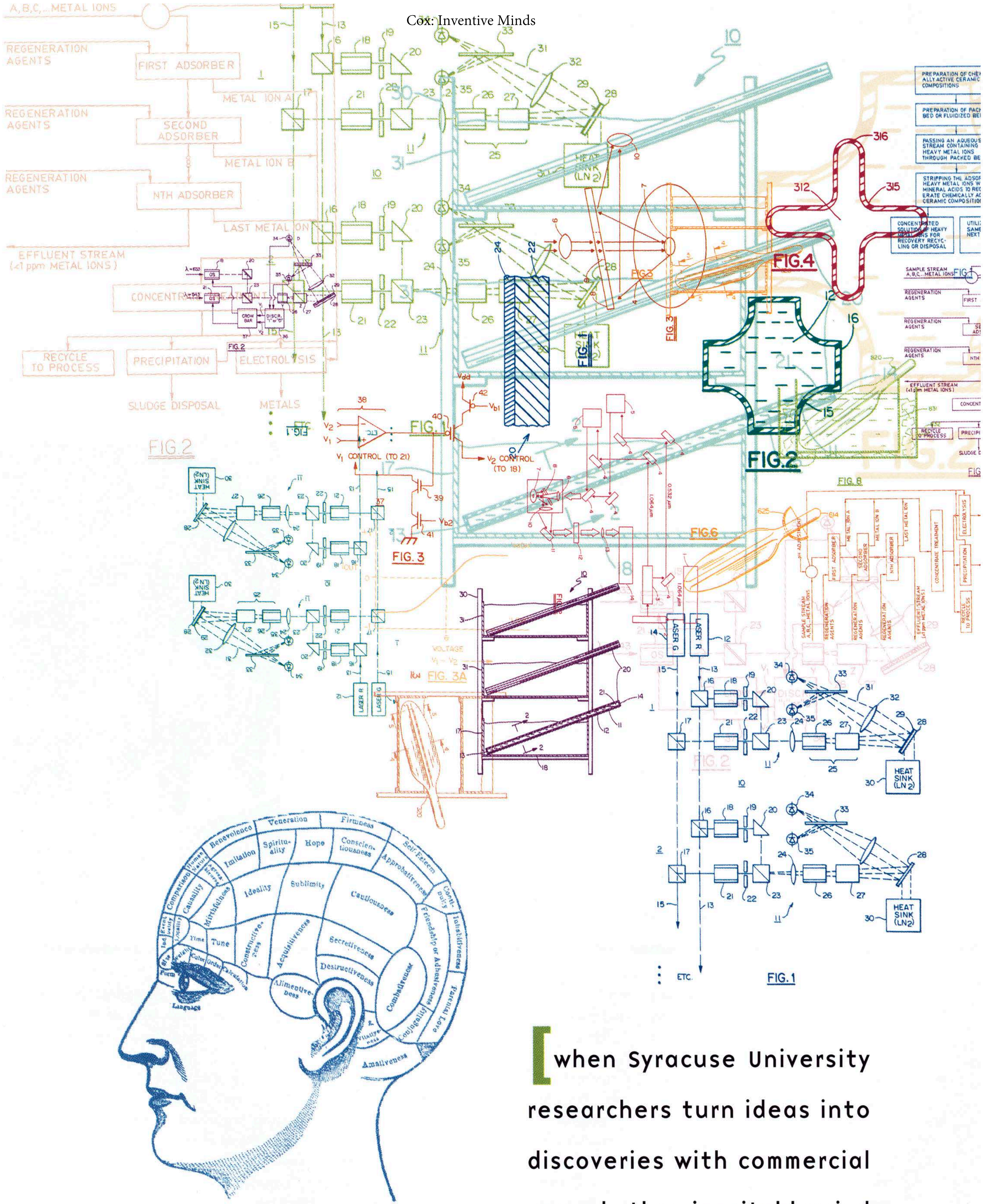
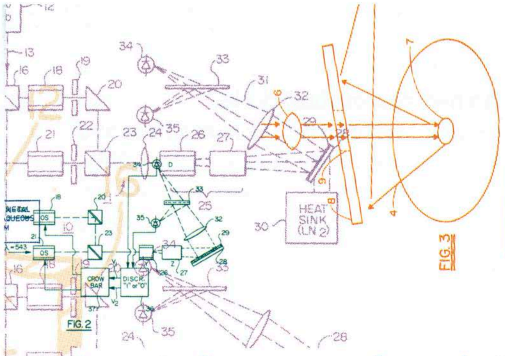


[when Syracuse University researchers turn ideas into discoveries with commercial appeal, they inevitably wind up playing the patent game]



[breakthroughs]

by Jay Cox

let's admit it:

Without the inventive mind, we might still be dawdling in the Stone Age. But, thankfully, once our brains are sparked by imaginative ideas and motivation, there's no telling what territory we'll traverse. Ideas abound—sometimes as the result of intricate labored thinking; other times, seemingly falling from the sky unannounced. And, of course, ideas also stall. "You can have a good idea and know it's needed—that's the research and design side of an invention," says inventor Norm Faiola G'94, chair of the Department of Restaurant and Foodservice Management in the College for Human Development. "But then there's the reality—a great idea can sit in a drawer, and I'm sure there are thousands of great ideas lingering in drawers."

Joseph Chaiken, professor of chemistry in The College of Arts and Sciences, knows both sides of that story. While trying to develop optical switches using tungsten-oxide, a unique thin-film material, time and again he found himself frustrated. However, just before he threw up his hands, serendipity stepped in and tugged him down a different path, one employing the material for computer memory storage. And bang—he was off and running in a whole new realm. "It was like walking across an empty pasture with a golf club in my hand and coming upon a teed-up ball," he says. "Nobody's looking, so do you hit it? Sure, especially since no one is around and I don't know who teed it up, but it's mine now."

Welcome to Patent Place, a world where ideas can evolve into astounding inventions that advance civilization or slump back into the obscurity of desk-drawer disarray. Researchers often launch explorations in directions dictated by funding. No grants, no gain, no glory. And when breakthroughs produce inventions and patents, researchers sometimes pair scholarly endeavor with entrepreneurship, creating start-up companies based on their creations. "I would just as soon avoid patents," Chaiken says, echoing the sentiments of others familiar with the complicated and time-consuming process of obtaining them. "But this one here...."

When potentially patentable ideas pop up at Syracuse University, they ignite a process of examination and information exchange that can lead to the U.S. Patent and Trademark Office and, ultimately, a place in the commercial market. True, this may not be what the researcher has in mind initially when developing a new piece of knowledge, but it's usually the result if the creation is novel, useful, has the potential for market appeal, and needs to be protected as intellectual property. "It's a gamble for the University when we make the decision to go ahead and try to patent a technology," says Lorrie Anthony, assistant to the director of the Office of Sponsored Programs (OSP), which oversees SU's Technology Transfer Program. "We try to make decisions based on the knowledge we have of what the market will bear and the way the technology is going."

Under the Bayh-Dole Act of 1980, universities hold the title to all patentable inventions developed through federally funded research projects. In addition, the sponsoring university decides whether to protect the invention and license it for commercial development. The federal government, in turn, receives a royalty-free license to use the invention if it chooses. At SU, any invention derived through the support of a grant, federal or otherwise, must be disclosed to OSP, which then works with the inventor to determine the best way to protect and develop the technology.

If a patent is pursued, the creator is in for a hefty amount of paperwork. Before a patent application is submitted, patent attorneys must be consulted and a search conducted to ensure that the new technology has not been previously patented or suggested in prior patents and such literature as professional journals. Almost without fail, a patent application is rejected on its first submission to the federal patent office, experts say. "You have to look at the domain that's staked out in that area—reference all these other patents, citing similarities and differences," says Professor Don Carr, who has received several design patents and guided a team of students seeking a patent (see "Flying Hands," page 45). "From a territorial standpoint, you try to construct a fence—in words—that comes right up to the next fence."

Engineering professor James A. Schwarz holds 14 patents, and likens the energy required in obtaining one to writing five research papers. "A lot of work goes into explaining the invention in legalese, so the patent examiner can shoot it down the first time, second time, and third time," Schwarz says. "Then he says, 'Aha, I see! We'll award you this patent.'"

The process can take anywhere from 18 months to 3 years, and costs about $10,000, Anthony says. If the patent is scooped up by a company and pays off, the University splits royalties 50-50 with the inventor after recovering such expenses as legal fees and marketing costs, and also deducting 15 percent to support the Technology Transfer Program. "There are wonderful inventions that add to the knowledge base," Anthony says. "But we have to ask if there's a value to having them patented—are they commercially viable? There are also times when we've patented something in its early stages because we wanted to protect the technology, since we knew that somewhere down the line it would be commercially viable."

The University's intellectual property portfolio includes 36 active U.S. patents. Of those, 14 are licensed and generating royalties for SU. Recent patents have contributed to fields ranging from food safety, information technology, and industrial production monitoring to creating materials to store alternative fuels and remove pollutants from waste streams. "A big plus of working at a research university is having all these resources," Faiola says. "It's unbelievable when you think about what's happening around this campus."

A BLINDING FLASH [of the obvious]

Faiola's enthusiasm for the University's resources is readily apparent. Since 1991 he has acquired two patents and currently has two more pending. To develop these products, he worked with students from the University's Soling Program, a multidisciplinary initiative that pairs students with staff and faculty on creative projects. "It's always rewarding to work with students because they bring such a fresh approach," says Faiola, a self-described "master tinkerer."

His first patented product—a rapid-chilling system—was designed to safely cool such liquid-based foods as chilis, soups, and sauces, and combat what Faiola calls "time-temperature abuse specifically related to the slow cooling of food"—a danger zone between 40 and 140 degrees where bacteria can grow and cause food-borne illnesses like salmonella. Any time foods are cooked and then cooled for future use, there's a risk of food-borne illness if the food isn't chilled quickly enough. "I wanted to create something that was simple and practical and could be used without much problem," Faiola says. "This is just a tool—another utensil like having a knife or a spoon. Certainly it's specialized, but it doesn't take up the space of a blast chiller (high-speed refrigerator), and you can wash it, rinse it, and sanitize it effectively."

The Rapi-Kool, as it's now known, is a large hollow plastic container with a handle. It is filled with water, frozen, and then stirred in the food. Jack Kennamer, president of KatchAll Industries International Inc., a Cincinnati-based company that specializes in food-safety products, was immediately attracted to the invention and obtained a license to commercialize it. "It didn't take me long to realize the product was unique," Kennamer says. "We did take a huge gamble because it was considered pretty cutting edge at the time, but it seemed so simple and made so much sense that we went ahead and took a shot at it." And that shot is now paying off. In the past year, Wendy's International Inc. ordered a specially designed version of Rapi-Kool for all its franchises to cool chili.

Faiola then turned to improving the Rapi-Kool—namely, automating it to increase the device's efficiency and eliminate the drudgery of stirring by hand. The result: the Stir Station, a motorized attachment that turns the Rapi-Kool.

In creating the Stir Station, Faiola teamed up with Chris Crase '97, who, at the time, was an aerospace engineering major and Soling Program participant. Crase, now a software engineer in Colorado, had a background in restaurant cooking, and understood what Faiola wanted to create. The two brainstormed on the design and Crase went to work building the device. He ultimately came up with two versions—one motorized, the other spring-driven. "I started tearing apart clocks and all sorts of things to figure out how spring-driven ones work," says Crase, who is credited as a co-inventor. "I learned a lot of things from the project—how the patent process works, and a heck of a lot about clocks."

Faiola and Crase also worked with Richard Chave and John Kotlarz, senior experimental machinists in the College of Engineering and Computer Science who built the Stir Station prototype. "They helped us out immensely, especially machining the cap and with the electronic circuit we needed," Crase says. "They were very patient with us."

On the board above his desk, Faiola has several more ideas listed for food-safety products. Last spring, a four-member Soling Program team helped Faiola devise a wireless temperature monitoring system. With some assistance from Crase, he also conjured up an innovative flatware soaker. There are now working prototypes of both inventions and he has filed the paperwork for patents. Faiola constantly mines such ideas through his past experiences in the restaurant industry and as a caterer. He also spends time during summers in the food-service industry, working and observing. "I always ask myself if there's a better way to do something. There's a tremendous amount of technology, and you have to figure out a way to bring the complexity down and make it simple," he says. "A lot of people look at the Rapi-Kool and are amazed by how simple it is. I like to call it a blinding flash of the obvious."

> [“A BIG PLUS OF WORKING AT A RESEARCH UNIVERSITY IS HAVING ALL THESE RESOURCES. IT'S UNBELIEVABLE WHEN YOU THINK ABOUT WHAT'S HAPPENING AROUND THIS CAMPUS.”] — NORM FAIOLA G'94

VISIONS [of the future]

Walk into the Center for Science and Technology and the future is now. After all, consider the research of professors Robert Birge, Joseph Chaiken, and Elizabeth D. Liddy. While Birge and Chaiken explore revolutionary ways to store information in computers, Liddy advances the field of information-retrieval technology.

Birge's vision of the future evolved out of a Cold War technology first investigated by scientists from the former Soviet Union. It centers on a complex, light-absorbing protein known as bacteriorhodopsin (bR). Found in the membrane of a salt-marsh bacterium, bR is incredibly efficient at converting light into chemical energy and has real-time holographic properties. Birge's fascination with the protein dates back to the late seventies, when he was at the University of California at Riverside studying a similar protein, rhodopsin, found in the retina. Two decades and three patents later, Birge and his team of researchers at the W.M. Keck Center for Molecular Electronics are on the verge of introducing the computer world to a three-dimensional memory employing the purple protein packaged in a cuvette. It is an intensive task that requires melding technology on several fronts, ranging from genetic engineering and computer interfacing to laser technology. The protein has even been sent up on space shuttle flights to probe how it responds to low-gravity manufacturing.

While Birge cautiously emphasizes that this technology is still in the developmental stage, its success several years down the road could increase computer memory 300-fold, succeeding the silicon chip as the optimal storage medium. The significance of this advance has not gone unnoticed—*Time Digital* named Birge to its top 50 Cyber Elite list in 1997. Birge's key patent, issued last year, is for a branched photocycle optical memory device, in which a laser-activated process triggers the protein through a series of states, including one state that has a long lifetime and is capable of storing data. A follow-up patent, currently pending, focuses on optimizing a modified version of the protein for the application. "As far as I know, we are the only researchers aggressively pursuing the three-dimensional protein memory," says Birge, Distinguished Professor of Chemistry in The College of Arts and Sciences, who serves as director of the W.M. Keck Center for Molecular Electronics and research director of the Computer Applications and Software Engineering (CASE) Center.

Birge credits a group of creative graduate students who've worked with him through the years in advancing the technology. "I let them loose and see what they develop," he says. "They've been very successful at making devices, and the most important device they're working on now is the 3-D memory."

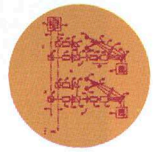
One of those doctoral students, Jeff Stuart G'98, is director of the Advanced Prototyping Laboratory at the Keck Center. "Our goal is to understand the protein and use its unique properties to create a commercially viable product," says Stuart, a biochemist. "Dr. Birge's design represents the culmination of a lot of research by different scientists, but he's the one who figured out how to use bR as a memory medium in three dimensions."

In the lab Stuart points to a prototype, complete with lasers, on a tabletop. He explains the branched photocycle, which represents changes in the protein as it's hit with lasers of varying intensity. The whole sequence—from the initial resting state through stages where information is written and stored—happens in a flash: 10 milliseconds. "It's really quite an elegant process," Stuart says. "There are many potential applications for this protein in the way it interacts with light. It's also great to be involved in such a project. Many scientists never get to work on a project as exciting as this."

Down the road, the rugged little protein may get a workout in parallel-processing computing and even associative memory, based on bR's holographic properties. Like many new technologies, it spawned a start-up company based at the CASE Center that acquired a license to some of the technology. While Birge remains focused on the research, he isn't interested in becoming a high-tech entrepreneur. "In about two years, we'll know whether this technology is going to fly. If it looks like it's really going to take off, a large company may have to come in and buy the technology and pursue it," he says. "I have no interest in the commercialization of this technology beyond what we can do in the lab."

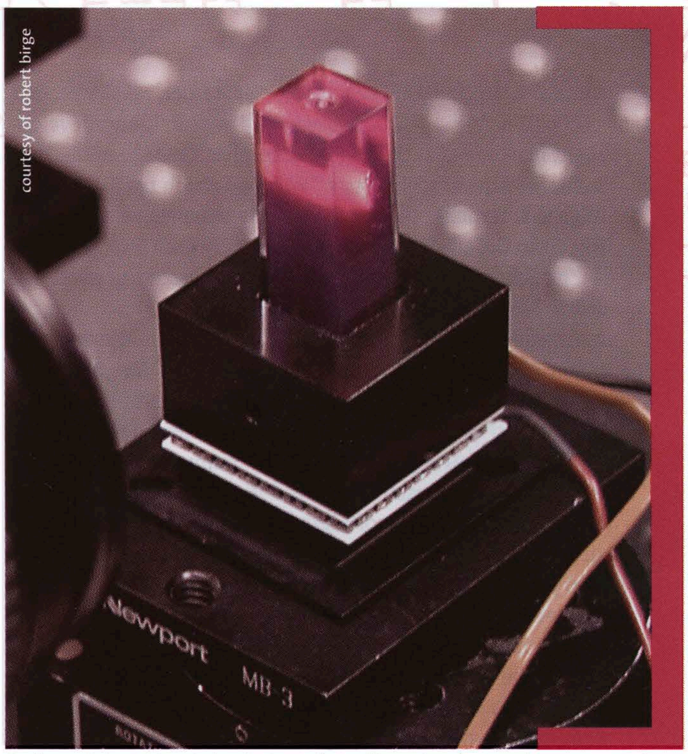
Chaiken, Birge's Keck Center colleague, takes a different approach, enjoying a mix of research and entrepreneurship. "The need for memory is insatiable," he says. If his vision pans out, a new high-capacity storage device he's developing could be introduced in a couple of years to a targeted market. Sitting in his office early one Monday morning, he flashes a blue laser beam against the wall. "There haven't really been any blue lasers this small until now," says Chaiken, who launched Laser Chemical Corporation to commercialize the technology. "And they're needed to produce new drives and other products."

The blue laser—which is also of interest to Birge's team for use in the erasing process—is produced by Nanolambda Corporation, an upstate New York company that is collaborating with Chaiken's Laser Chemical Corporation to make prototype drives. The laser is a component in a Photochromic Optical Memory System (POMS) created by Chaiken and scientist Joseph Osman of the Air Force Research Laboratory in Rome, New York. They developed POMS out of their patented data storage process. By switching between blue and infrared lasers on a layer of tungsten-oxide—for which Chaiken has a separate patent—data can be written, stored, and erased. Basically, the interaction with the lasers alters the material's color, thus distinguishing between written and unwritten spots. Chaiken, who also holds a patent relating to transparent metal films, says the key to the system is its ability to store large volumes of information. "We're shooting for a capacity of at least 2,000 gigabytes on a single slab (1 foot by 2 feet by 1/2 inch)," he says. "Everybody is going for density these days, but what's important is capacity, in my opinion and reading of the market. The POMS technical advantage derives from the fact that other media, i.e., magneto-optic, phase change (DVD), and conventional magnetic material, can't be manufactured in such large pieces."



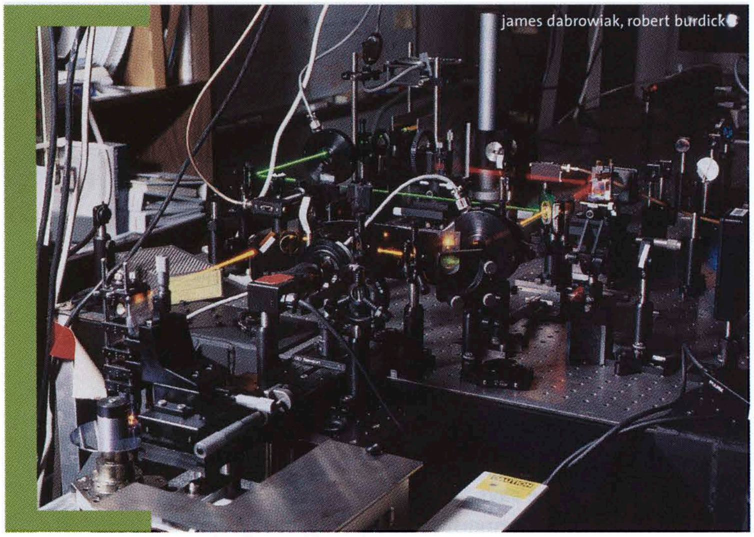
Rather than fumbling with zip drives or dozens of disks, he wants to store huge amounts of information in one place. "We hope to get away from the round spinning disk paradigm and use simple rectilinear motion instead. The whole paradigm will be different," he says. "Our first generation product will be simply recordable, and on the second generation we'll introduce erasability."

Chaiken, of course, doesn't plan on burying the CD-ROM or floppy disk markets. Instead, he's after a niche market, envisioning such customers as government agencies and hospitals—any place that files away warehouses of information and can benefit from replacing filing cabinets with an easily searched high-capacity medium. "Just as the transportation



courtesy of robert birge

Professor Robert Birge is developing a three-dimensional computer memory using the light-absorbing protein bacteriorhodopsin packaged in a cuvette.



Professor Joseph Chaiken helped create the Photochromic Optical Memory System (a working prototype is pictured above), based on a patented data storage process that uses lasers.

market supports many types of products and models, you're going to look out on the parking lot of storage devices and see lots of different ones. There's plenty of room in the market for them, and I wish them luck because I'll want those other products for my own applications. But when you want a lot of capacity on a single volume, very often you'll want to come to us instead of using magnetic tape," he says. "We're trying to produce prototypes of a product that could be on the market as soon as possible to get a good grip on the particular market share we're targeting."

Like Chaiken, Elizabeth D. Liddy G'88 loves the balance between pedagogical and entrepreneurial pursuits. "They're mutually supportive," says Liddy, co-founder, president, and CEO of TextWise LLC, a five-year-old research-and-development firm based at the CASE Center that specializes in information-retrieval technology. "We're so much on the leading edge that it makes teaching, from my perspective, and learning, from the students' perspective, really exciting."

The School of Information Studies professor has good reason to be excited. A former reference librarian, she turned her frustrations with online searches for information into a booming business venture based on a natural language processing (NLP) system. This system adds a human-like understanding to queries by employing several levels of linguistic analysis in retrieving text. While many Internet search engines merely match words and yield a flood of unrelated material, Liddy's NLP software system, known as DR-LINK, sifts through documents with an analytical touch that can do everything from evaluate commentaries to match euphemisms with their unpleasant counterparts. "The goal is to help users make sense of the information glut," she says. "Language is quite ambiguous; we take language at all of these levels at which humans extract meaning and have the computer do the same thing."

Liddy currently has seven patents in the works connected to DR-LINK and related technologies. In fact, DR-LINK, which evolved out of Liddy's doctoral degree work at Syracuse University and earned her three national and international awards, includes among its users the U.S. Patent and Trademark Office, the government's intelligence community, and major corporations. Liddy launched TextWise to commercialize DR-LINK in 1993 with her research partners, computer and information science doctoral student Edmund Yu and IST doctoral student Woojin Paik, who serve as the company's directors of engineering and research, respectively. TextWise, with about 30 employees, is a sister company to Manning & Napier Information Services, which handles product marketing, sales, and customer service for TextWise. Along with DR-LINK, the range of TextWise software in the works or on the market includes: MAPIT (searches and analyzes patent databases); CHESS (extracts requested information, builds an expanding knowledge base of it, and tracks it chronologically over time); CINDOR (retrieves information in different languages and includes a translation); EVA (acts as an "intelligent agent" system by learning a user's interests and sources and providing updated information, including maps and other visuals, on specific topics); and KNOW-IT (gathers and organizes information in a knowledge base with visual displays).

On a recent day, Liddy had just returned from California, where she'd dazzled Department of Defense and military officials with demonstrations of TextWise's information-retrieval technology. A board on the wall read: "Congrats 98K grant from NIH." Yes, the National Institutes of Health had awarded TextWise a grant to create a DR-LINK medical application. Seemingly in constant motion, she motored between the company's administrative and research floors in the CASE Center, answering questions on the fly. When asked where all this technology will lead, she cites the information boom of e-mail, voice mail, faxes, and the Internet. "My hope is it will become more and more second nature, so you think about what you're doing instead of the technology. The technology should become so transparent that you're not aware of it," she says. "When you need information, it will be there. And the important thing is it's the right information. That's why we need natural language processing technology, because it can get you very precise results without all the unnecessary excesses."

["THE GOAL IS TO HELP USERS MAKE SENSE OF THE INFORMATION GLUT."]

—ELIZABETH D. LIDDY G'88

NEEDS FOR [neural networks]

The importance of precision should never be ignored. Take aluminum production, for instance. Several years ago, Alcan Rolled Products Company in Oswego, New York, offered engineering professor Can Isik a challenge: It wanted to more accurately control the thickness of aluminum during the production process, which involves rolling large coils of aluminum to thin it out. The control system in use relied on actual measurements taken near the end of the process, so when variations occurred there was often a delay in correcting thickness. "By the time you'd find out there was something wrong, it was almost too late," Isik says.

To eliminate the control-system delay, Isik worked with doctoral student Mete Cakmakci G'93, G'98, and an Alcan team headed by engineer Joseph Zagrobelny '88, to devise a more efficient system, an adaptive one based on estimations. The result was a patented process that controls output without delay using a neural network system. "Think of a neural network as a whole bunch of interconnected artificial neurons," Isik explains. "Each one does something simple, but when they're put together, they exhibit very complicated behavior."

The system incorporates about 20 measured groups, or modules, of such variables as pressures, voltages, and speeds throughout the process. "We estimated the thickness as the aluminum was rolled and based our control action on that estimate rather than an actual measurement. This is an adaptive process that initially knows nothing, and then it tweaks internal constants based on delay measurements and learns how the rolling process occurs," Isik explains. "Once the estimates are close enough, control is switched from the measured quantity to the estimated quantity while we still keep adapting it to possible changes in the process."

By grouping different elements in the system into modules, problems can be isolated and prevented from spreading through the entire system, Cakmakci says. "When an error occurs, you don't want it to go to different modules and push them away from the proper outcome."

For Cakmakci, the project was a blessing. "I felt very fortunate to be involved in a project like this. Dr. Isik took me to meetings and on-site visits and I had great interactions with Joe Zagrobelny and the other engineers," says the electrical engineering major. "Dr. Isik encouraged me to share my ideas. I love factories, so this was a very good experience for me."

Zagrobelny is now attempting to commercialize similar neural network technology through Modspec, a start-up company based at the CASE Center. "We're looking at other areas where this kind of technology might be applicable. As engineers we can think it's a great idea, but you have to look at it from a business perspective," he says.

Among areas he's exploring are the aerospace and military industries. "There's a frustration when you know something can save a company money, but it has to take the first step," he says. "Even as engineers we have to be good salespeople."

ADVANCING [molecular engineering]

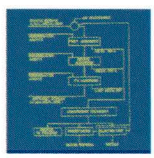
As chemical engineering professor Lawrence Tavlarides points out: "One never knows when patents will be useful to industry unless you're out there trying to exploit them."

Tavlarides believes any potentially valuable technology should be patented, and his experiences support this belief. He received his first patent nearly two decades ago—and a company is just now signing on to use it. Tavlarides, who has nine patents with three pending, has also seen what can happen when patents aren't sought. After publishing a paper on a process employed to make more gasoline through the use of an improved catalyst, he found himself testifying as an expert witness in an oil company feud over a patent—a patent, it turns out, that was based on discoveries revealed in Tavlarides' paper. "At the time, we didn't realize the value of our discovery," he says.

In 1997 Tavlarides and research associate Nandu Deorkar secured five patents dealing with the synthesis of chemically active inorganic particles that can be used to remove various heavy metals and complexes of these metals from aqueous streams. The materials, which selectively separate one metal from another, have manufacturing and environmental applications. In hydrometallurgical processing, for example, a mining company could remove cadmium from a zinc-cadmium concentrate, resulting in a high-purity zinc solution. On the environmental front, the materials could be used to treat highly acidic waste solutions that accumulate in mining pits filled with water. In fact, Tavlarides has proposed a process involving the materials in a series of sequential beds to clean up a gigantic pit in Butte, Montana. "Each material would take out a different metal based on its selectivity," he says. "The stream would trickle from one bed to the next, selectively removing such metals as iron, copper, and zinc. This process would also adjust the pH of the stream to near neutral."

When Tavlarides and Deorkar initially embarked on this research, they were interested in what he calls the "classic liquid-liquid solvent extraction methodology" in which chelation acids—organic molecules with acid properties—are mixed in a solution that ultimately leads to removing a targeted metal ion. "The problem with that is you're processing large volumes of liquids and it's very complex," he says. "We followed the lead of other people, thinking that if we could take that chelation molecule, attach it to a glass particle, and have it fixed on a solid support, then all you have to do is pass the aqueous stream over this bed of particles. This way, you only have to worry about capturing the metal ion on the inorganic particle. After the particles are saturated with the metal, you switch the stream to another bed and strip the metal from the loaded bed. The process is then repeated."

This solid-liquid processing, Tavlarides says, provides the desired separation, especially when synthesized permutations of chelation molecules are used. These synthesized molecules further enhance the selectivity for the particular metal. "New methods of molecular modeling and dynamics can help us judge which would be the best molecular structure of the chelation acid," Tavlarides says. "We have to be assured that the chemistry being applied doesn't destroy the functionality of the chelation acid."



Tavlarides and Deorkar are currently exploring ways to embed chelation molecules within a glass matrix to create a denser packing of the molecules, rather than tacking them onto an already developed glass surface. For Tavlarides, who operates Mostav Technologies to commercialize any potential opportunities from his research, there's great excitement in finding a way to solve processing dilemmas and environmental problems. "Things like this generate enthusiasm that you can spin off to students and colleagues," he says. "There's an excitement about it; you're searching for the holy grail of some new way to improve the capability of industry and treat contaminated streams, making life better for all of us."

If anyone has experience playing the patent game, it's Professor James A. Schwarz, a colleague of Tavlarides in the chemical engineering and materials science department.

Schwarz has received 14 patents, ranging from the invention and testing of different conductors to devising molecularly engineered carbons for fuel gas storage. Like many of his fellow inventors, Schwarz shifts focus depending on where research funding flows. He also attributes much of his success to the creative efforts produced by working with teams of undergraduate and graduate students and postdoctoral researchers, many of whom are credited as co-inventors of the patents. "If good ideas come on," he says, "I can't turn my mind off."

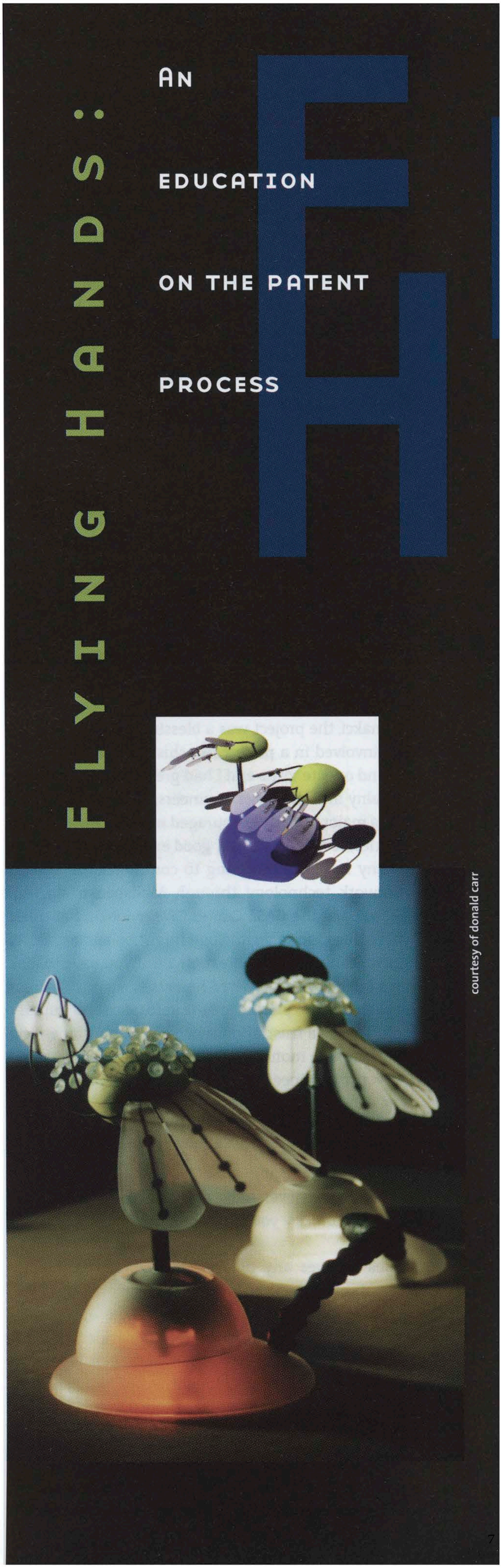
During the past several years, Schwarz worked closely with a group of postdoctoral researchers from Poland, Slovakia, Romania, and Ghana. It was a highly productive time that led to a variety of patents and dozens of publications. "The teamwork allowed it to happen. I rarely tell somebody to do something—I let them be creative," he says. "I act as a sounding board; I encourage them and point them to people they should talk to. Once you get to know people, you learn what their fortes are. I'm like a traffic cop who steers everybody so they're all going the same way on the road."

Aside from teamwork, Schwarz touts cross-disciplinary experience as a major factor. "It is extremely valuable in developing novel materials, processes, and inventions. Chemistry is chemistry and physics is physics," he says. "The names might change, but the rules don't. As a professor at a university where you're teaching courses that run across disciplines, you have an advantage over someone in industry who tends to be myopic."

In 1997 Schwarz and his team of researchers patented a method of creating a microporous carbon material to store such fuel gases as methane and hydrogen. It's one of a series of patents Schwarz received connected to carbons and alternative fuel storage. "Think of carbon in terms of a sponge. These materials are highly porous and access to the inside of the materials is via very fine pores that are nanodimensional in size," he says. "This contributes to a tremendous amount of internal surface."

A benefit to creating molecularly engineered carbons is they don't have the variability of natural materials. Traditionally, Schwarz says, activated carbons are made by burning wood, peat, or coal at high temperatures. "One problem with using a natural material is that its history in many ways controls properties of the resulting carbon—so you get variability," he says. "If you start with pure materials and have the appropriate synthesis strategies, then you can create a material that is reproducible. From a commercial point of view, that's desirable."

No matter the field, there's certainly a thrill to advancing technology. For one thing, as OSP's Anthony points out, "You're seeing the future." And the future would be rather staid if scientists didn't challenge each other and closed their minds to creative thoughts that bend established boundaries. "It's critical for all scientists to have that ability to shift and as you get older it gets more and more difficult," says chemist Birge. In fields like chemistry, he says, a process of integration is involved. When this melded experience fuses with a shot of creativity, technology can move forward. Of course, whether such an advance becomes a patented commercial success depends on a boatload of factors that are far from predictable. "It's a puzzle," Schwarz says. "A lot of science is like a giant crossword puzzle."



This past year, five 1998 graduates of the College of Visual and Performing Arts' Industrial Design program nearly parlayed an award-winning project into a patent.

"The patent process—whether you go all the way through it and receive a patent or not—is a valuable learning experience for students," says Don Carr, professor of industrial design and the group's advisor.

In the case of Chris Cotsonas, Aaron Double, Matt Heller, Kevin Lindberg, and Chris McCullough, a design called "Flying Hands" seemed to take on a life of its own, carrying the quintet through a series of experiences that culminated with a patent search and a trip to Germany.

In the fall 1996 semester, Carr assigned the fourth-year industrial design students to improve on the idea of the traditional computer keyboard. The project, which the students called Biolink, required them to develop a product that would work within the constraints of the computer marketplace and be a viable alternative to existing products. "As a designer, you have to ask questions of objects that we take for granted and struggle with every day," he says. "How we interrelate with information sets up all kinds of potentials for the evolution of interaction with information."

Flying Hands—one of several design concepts that emerged from the class—capitalizes on a range of three-dimensional movements, providing oval-like resting spaces with sensors for the palms and pad-like switch attachments for the fingers. The design evolved from appearance model to working prototype when it was recognized as one of the top 34 entries in an international student design contest sponsored by Audi. The team was awarded $3,000, which it used to further develop the design. They also received an honorable mention citation from *I.D.*, an international design magazine; and netted a bronze prize and $2,000 in the LG Electronics Design Competition last fall—the only American entry to do so. Last spring the team traveled together to Germany for the Audi award. During the process, they consulted with Dr. David Warner of the Center for Really Neat Research at SU, who provided them with feedback and helped them interface the model with a personal computer. They also sought advice from ergonomics experts at the Rochester Institute of Technology.

"The Audi competition was our first taste of success for the project and we realized other people were enthusiastic about it and saw a future for it," says Lindberg '98. "It was two years of taking an idea and exploring it as far as we could. It was very much an evolution—one thing leading to another. When we got to the point of looking into patenting it—that became a very real experience. We weren't as concerned with getting it patented as we were with going through the experience and seeing how everything was done. It made us realize how specific and complicated the real world is, and we also realized how a lot of people have ideas that touch upon the same areas."

The Office of Sponsored Programs supported the patent search and assessment through the University's patent attorneys. The search turned up enough similar prior art to prompt the University not to pursue protection rights, but the investment was well worth it, says Lorrie Anthony of OSP. "We had five student inventors who got one heck of an education. These kids are very creative; somewhere down the line they will undoubtedly be involved in decisions of whether to patent a product. Now they have a leg up on the process and know what decisions have to be made."

Carr knows what the students will face in the future. He has received numerous design patents while working in the corporate world. And, prior to joining the SU faculty, he sold the rights to an electronic sensor to K2, which the company now uses in skis and snowboards. To enhance the classroom experience, Carr invites a patent attorney to talk to students about the different forms of protection, including various kinds of patents and copyrights. "For the Flying Hands patent process, the students had to describe their idea and explain its novelty in layman's terms, writing up a description so the search could be conducted," Carr says. "After that, they read through all the existing patents that related in any way. This really helps them understand the process and they begin to see if they have something truly unique.

"The world has its constraints," he adds. "But if designers don't develop concepts such as Flying Hands, we'll all be banging away on the same old keyboards forever."

—Jay Cox