conversations w



vith david Value Value

after four decades and many varied roles in the complex university world, uw-madison's chancellor reflects on the past, the future, and his lifelong passion for higher education.

> by michael penn ma'97 photos by jeff miller

David Ward first arrived in Madison in 1960, on a steamy summer day before the start of the academic year. He was wearing a raincoat.

Having grown up in the north of England, accustomed to its perpetual foggy chill, the geography graduate student wasn't prepared for Madison's quirks. But he quickly grew acclimated. After earning master's and doctorate degrees, he later joined the faculty in the geography department, where — after turns as a department chair, associate dean of the graduate school, provost, and chancellor — he still holds a named professorship.

But Ward's life is about to undergo perhaps the most dramatic change since he boarded a boat from England years ago. He is mere weeks from finishing an eight-year term as chancellor and bringing to a close a long career in the administrative ranks at UW-Madison. So what is next?

To answer that question, and to give some overall context to his tenure as chancellor, Ward sat down for a series of conversations with *On Wisconsin*. People who have worked closely with the chancellor say that, in some ways, this is when you most appreciate his talents: in small groups, widely surveying the past, the future, and the university's role. Ward is reflective, interpretive. He prefers creating an opportunity for others to change, rather than telling them to change.

So we arrived with overarching questions about the future of universities, UW-Madison's unique culture and where it fits among its peers, and what characterizes leadership. He shared his thoughts about these topics — and more.

session one: The Future

WHERE ARE UNIVERSITIES HEADED? What will a college degree mean in the future? Will college still matter?

These are difficult and complex questions, and they seemed a natural place to begin our conversation. In fact, when we asked Ward to reflect on the future, he was silent for a moment, and then observed that such an open-ended question was "like being given a PhD examination."

Very swiftly, though, Ward moved into the subject that, more than any other, has defined his chancellorship. Throughout his eight years at the helm, he has been discussing change - the enormously powerful trends that are bringing new roles and responsibilities to universities. Some of these changes are demographic, such as the growing number of people who are going to college – a factor that is changing the traditional idea of what students expect from a college education. Some are technological, such as computer tools that enable teaching materials to be transmitted over great distances and are transforming learning and communication on campus.

Ward told *On Wisconsin* what he has told countless audiences over the years: the lifetime of knowledge is quickly shrinking. "The knowledge you receive during four or five years of undergraduate education is probably lasting you less time than at any point in the past," he said. "People are going to approach college much more from the point of view of lifetime needs, rather than just from ages eighteen to twenty-four. The real issue is where our institution will fit, and how we will respond to this greatly enlarged demand for higher education."

The chancellor identified several examples of areas in which the traditional ways universities operate are coming into conflict with new realities. With regard to distance education, for example, the chancellor agrees with those who say that universities will have to accept a changing definition of a classroom and deliver campus-based knowledge to others. This could work quite well as a way to administer what Ward called "just-intime education," signifying learning that is meant to augment or update training for people in professional fields.

The College of Engineering and the Medical School already make use of distance education for these purposes. Foreign language instruction, he said, is another area where traditional coursework may need to be modified for people who can't afford the luxury of attending a class for several semesters.

Ward maintains, though, that universities will still be cherished for residential learning. Just as universities will need to determine how best to use technology to deliver learning opportunities off campus. He said that they also will need to emphasize that some aspects of education can't be delivered over a phone line. "We will have to celebrate the residential culture - the culture of engagement in learning that has always been bigger than the classroom," Ward said. Learning has always been about more than just in-class tutelage, he noted. Universities have always been recognized as a place for growth and development as a human being, and that role will not change.

The challenge for universities like UW-Madison, however, will be to honor their traditions, yet be innovative in developing new roles that meet societal needs. Ward has often called this task "niche positioning." And here is where Ward has been particularly active as a manager of change. He has worked during the past eight years to put in place a strategic plan that identifies UW-Madison's unique niche among universities and allocates resources to best advance that core mission.

CHARTING A COURSE



"I believe it is time for the university to start doing some things *differently* not just doing the same things *better*." — David Ward, 1995

Among David Ward's most notable accomplishments as chancellor is the implementation of long-range, strategic planning. As early as his first address to the Faculty Senate, a governance group, in September 1993, he urged "a longer view of the university's future."

After soliciting ideas from throughout the campus, in April 1995 Ward promulgated *A Vision for the Future*, a strategic planning document, which laid the groundwork for many initiatives that followed during the next five years. Central to the vision is a more "horizontal" organizational structure that encourages collaboration among academic departments to create a more fluid learning community.

One of the most visible examples of this collaboration is a strategic hiring program. Launched in 1998 as part of the university's sesquicentennial celebration, over time the program will add more than one hundred faculty members in emerging areas of knowledge such as genomics, international public affairs, and women's health. This interdisciplinary research and teaching initiative spans the biological, physical and social sciences, and the humanities.

"The rate of change in instructional and information technology and the global connectivity of our economy is extremely rapid," Ward said during a 1994 address. "I think in the twenty-first century, it will be those who know how to crosswire knowledge — people who can generalize, people who are comparativists — who will be very important to us."

Given the movement of the knowledge economy toward ever more complex and technical fields, one might expect that Ward's vision for the university might entail the more effective delivery of in-depth knowledge. To some extent, that is true. He believes, for example, that master's degrees can be reformed as certificates of advanced knowledge. "For years we have been treating master's degrees as sort of a consolation prize for the PhD," he said. He anticipates that universities will better exploit this ground between general understanding and in-depth scholarship to educate people in areas of applied knowledge.

But Ward told us that he predicts that this highly sophisticated body of knowledge will actually cause universities to return to emphasizing general education. "After a century or so of thinking of the major - whether in physics or biology or engineering - as a life-defining experience, we may find that specialized knowledge has such a short longevity after college that, in fact, it will be more important to have solid engagement with the liberal arts," he said. "It's celebrating general education all over again. The liberal arts themselves now become in a sense vocational, rather than abstract, because the liberal arts are the coping mechanism that allows you to grow through your life."

So, in essence, the new university will do most of the same things that universities have done for hundreds of years. "It will celebrate with greater conviction what it has historically done, but it will do so by being much more entrepreneurial and sensitive to public needs beyond that traditional niche," Ward said. "Nothing creates change more effectively than the public demanding programs that we don't currently provide."

Not that those changes won't be dramatic in some cases. The structure of departments, for example, may now be too rigid, and Ward has been active in recent years in trying to find new models. But he was quick to emphasize that changing academic culture isn't simple. "You can't just dictate change," he said. In bringing about these changes, Ward has practiced a form of internal bargaining that has been highly successful for him.

A few years ago, he began talking to campus groups about "horizontal mine shafts," by which he meant creating new pathways between the very vertically oriented departments. Most departments, Ward thought, were deep in a vertical mine, developing expertise in highly specialized fields that often had little interaction with one another.

"I think the great scholars of the future won't necessarily be the people who work in depth in the middle of a discipline," Ward said. "The future [Nobel Prizes] will go to the people who

Ward plans to take a year off, spending time at the University of California at Berkeley and in England, and then assume an "elder statesman" role on campus.

can integrate segments of knowledge from separate areas and create a new understanding." Those cross-disciplinary miners are at the root of his efforts to gradually modify boundaries among academic disciplines.

People often say that universities need to act more like businesses. While Ward may agree with that assessment in some cases, he also thinks that there is more entrepreneurship in academia than many people realize. He said his goal as chancellor has been to create opportunities for professors and departments to be creative and agile, rather than requiring them to do so. "It's a matter of how you infect the change that is already within the culture," he said.

The results have been pleasing. Ward noted as an example the new major in general biology, where several life sciences departments are coming together to teach the principles that they all have in common. The newly formed institutes in art and international studies also have been successful.

In research, that culture change means more work in applied areas, and more connections between pure knowledge and real-world applications. "Universities have always been seen as being ivory towers, but now we are becoming something like an oil well in the knowledge economy."

Those changes are well in motion, but they aren't the only changes coming, Ward said. Comparatively little attention has been paid to how information technology may affect the way that professors and students relate in the classroom, an area where Ward can foresee dramatic differences.

As universities enroll an increasing range of students, they will be faced with a group of learners who have varied abilities, backgrounds, learning styles, and levels of motivation, Ward noted. To treat all students the same, he said, is absurdly outdated. He gave an example of a foreign language class, where one student picks up vocabulary remarkably quickly, while another falls behind. "We need to develop more tools that enable students to work at their own pace," he said. CD-ROMs that allow students to guide their own language instruction are part of this trend, which Ward sees crossing into other disciplines and redefining the role that professors have with the material.

"My view is that we have a dated process of dealing with the ability to think and to accumulate knowledge," Ward said. "The classroom will no longer necessarily be the place where you *deliver* the knowledge. It will be the place where you reflect on the knowledge. Right now, we have the high-paid faculty members delivering the knowledge, and teaching assistants in discussion sessions reflecting on the knowledge. We have to reverse that, so that teaching assistants will be helping with the CD-ROM, helping deliver the knowledge, hovering around the computer. And then the classroom will be the place where students reflect on what they've learned."

IN PARTNERSHIP



"I'm a great believer in listening to lots of people. While I have a framework of ideas that I'm committed to, how I implement them depends very heavily on the feedback from the people who are affected." — David Ward, 1993

Partnerships have defined Ward's chancellorship. In one of many efforts to expand global connections, in 1995 he signed the Asian Partnership Initiative to promote joint work in science and science education, and to open up new opportunities for Wisconsin businesses. Ward worked actively in the management of UW-Madison's health enterprise, helping the UW Hospital and Clinics complete a transition to operating as a public authority in 1996. In addition, The Center for World Affairs and the Global Economy was launched to help meet the increasing needs of Wisconsin's public and private sectors for expertise related to the global economy.

On campus, examples of partnership include a new Arts Institute, which brings together artists housed in three separate schools and colleges. A new Humanities Center now acts as a clearinghouse for activities in twenty-three programs encompassing history, philosophy, language, literature, the arts, and culture.

Ward created the university's Technology Transfer Council to bring fresh ideas and updated policies for UW-Madison's programs in technology transfer. One of the greatest contributors to The Wisconsin Idea — the principle of making UW-Madison's resources available to the state and nation — technology transfer has led to the development of more than eighty spin-off companies based on UW-Madison research.

Ward has helped the rapid growth of the nationally recognized University Research Park, which connects the university's research resources with entrepreneurial hightech companies. The park houses eighty-eight companies that employ more than 2,500 people.

And in what is, perhaps, the most telling partnership of all, during Ward's tenure as chancellor, the university raised \$739 million in private funds, placing UW-Madison in first place in private support among public universities.

session two: Culture

IS THERE A UW-MADISON CULTURE? What sets this university apart from other excellent institutions?

Our next series of questions took Ward from the future to the past, probing the historical roots that have allowed UW-Madison to grow into the institution it is. But while we all share the belief that UW-Madison is a special place, it can be more challenging to identify the core values that make it unique. We asked Ward how he knew that UW-Madison was unique.

True to his nature as a professor, he began with history, saying, "I think before we can ask, 'How will the university continue to be unusual in the next ten years?' one needs to go back and ask, 'Why were we unusual in the previous one hundred years?' "

That answer begins, Ward said, with Wisconsin's historical recognition of the value added to society by educated citizens. In particular, Wisconsinites have always recognized the value of applied knowledge — of having advanced learning in agriculture, for example, or in using the power of academic understanding to help bring about economic justice and equality among state citizens.

The fact that UW-Madison was one of the founding members of the American Association of Universities, an elite group of the nation's best universities formed in 1900, demonstrates how remarkable the state's support of the university was, Ward noted. "Relatively few public universities were good enough to be considered," he said. "How did that happen so early? I think that is rather extraordinary."

So what does reputation give to UW-Madison? Primarily, Ward answered, the advantage of foundation. "To be the kind of institution that can adapt to changes requires first this culture, and secondly, the resources to support it," he said. The culture comes from the historical strength of the institution, but resources are trickier. For a state with Wisconsin's limited population, maintaining a university such as UW-Madison at the level of the public universities in Michigan and California could be a challenge. So there has also been a need to find other forms of revenue, such as endowments and grant money, to operate a leading university without overburdening taxpayers or threatening the affordability of tuition.

That is not always an easy mission to achieve. For example, Ward said that in the late 1980s, the university "faced a variety of problems in delivering our mission" - including perceptions that undergraduate students weren't getting the full attention of the university; falling state funding; and a capital budget that made it difficult to update campus facilities. Especially during the first part of his tenure as chancellor, Ward's primary challenge was to ensure that the university remained true to its core missions of teaching, research, and serving the public. An exhaustive effort by the university during the early 1990s brought improvements - and noticeable increases in the regard that students, alumni, and legislators had for the university. The period taught Ward that, to grow and progress as an institution, the core foundation must first be secure.

LEARNING IS CENTRAL



"When we consider our curriculum ten years hence, ought we not better prepare students to think and act on an international scale? To better comprehend that technological and environmental policies and actions here may have global consequences?" — David Ward. 1993

Learning is a central theme in David Ward's "Vision for the Future." First as UW-Madison's provost, then as chancellor, he has championed ways to improve undergraduate education. He has said, "We must take full advantage of an environment in which students will learn from one another, and do so in residential settings and other venues outside the traditional classroom." In 1995, he convened the innovative Bradley Learning Community, which, along with the Chadbourne Residential College, has become a national model for integrated living-and-learning experiences. Today some 1,100 students live in residential learning communities on campus.

Other programs introduced during Ward's tenure as chancellor include expansion of a cross-college advising service; the Hilldale Undergraduate Scholars Program, which has spawned other formal efforts to introduce undergraduates to the world of research; the Teaching Academy, which brings together faculty members who have a special interest in enriching the university's learning environment; PEOPLE, a pre-college program that helps recruit and prepare students of color for admission to UW-Madison; and reinvigorated study-abroad programs.

In recent years, surveys of undergraduates have found consistently that approximately 90 percent of students are "extremely satisfied" or "somewhat satisfied" with their education at UW-Madison.

"There are obviously still improvements that we can make, but I think most people recognize now that we are doing about as well in those areas as we can," Ward said. That has been the groundwork for the second half of his tenure, which has been devoted to finding new ways to enhance the university's reputation as an innovative place.

Interdisciplinary programs are a good example, Ward said. He would like to see a day come when every faculty member on campus has at least two home departments. This would create a unique environment, with professors working on the edges of disciplines to solve new problems and students enjoying broad experiences.

Another storied element of the UW-Madison culture is The Wisconsin Idea, the belief that the university operates in concert with — and for the benefit of state citizens. But here, too, Ward noted that the university is finding new ways to augment its tradition. In the past, he said, there wasn't a clear idea of who was responsible for being a part of The Wisconsin Idea. It was often delivered through a defined outreach division, or the efforts of a few faculty members. But now, he said, faculty are engaging in a more complex set of interactions, such as bringing service learning into the classroom and encouraging student internships.

As we were talking about student experiences, the subject of protests arose. And that led to a natural question: are the famous stories of student activism and protest an important part of UW-Madison's character?

Ward, who was a new professor during the Vietnam protests of the late 1960s and, in recent times, had students twice stage sit-ins in his office to protest sweatshop labor, agreed that activism is a part of what defines UW-Madison. But he also noted that the tradition of political involvement and democratic values belongs equally to the state, not merely the university. "I think much of the student demonstration on this campus has a depth because it involves more than students. Every time that I have been involved with them, these movements have had very strong local political support," Ward said, pointing out the strong community involvement in the civil rights and anti-war movements on campus.

And, he noted, in spite of UW-Madison's reputation as a liberal campus, the real Madison tradition is in engagement, not doctrinal ideology. He pointed out the often-conflicting views over the past three decades of the two student newspapers, the *Daily Cardinal* and the *Badger Herald*. The same dichotomy exists in the faculty, where well-articulated critiques of university policies have come from both the right and the left.

Dealing with such politically engaged students and staff has sometimes made being chancellor a lonely position, he noted. "I think it's true to say that this place has liberal traditions, but that isn't the complete picture any more," he said. "I've tried to remain non-partisan in my role. I've remained firm in my values, but sometimes it's a matter of walking a tightrope."

session three: Priorities

AND SPEAKING OF WALKING A TIGHTROPE, at a university this large, with so many constituents, leadership is often a circus act of balancing priorities. On our next trip to the chancellor's office, we came ready to talk about these priorities. What are they? When do they conflict? And how do we know when the university is doing well?

"If you ask employers, or if you ask other university presidents and deans, [UW-Madison] will be there among the very best public universities," Ward said. "That's a very subjective, reputational measure, but it is a reflection on the ability of our faculty to deliver new knowledge and educate people."

But the chancellor then added that taking such word-of-mouth feedback too seriously can lead to complacency. "You often have to decide how to be more specific about these issues," he said.

That suggests rankings, which can be a source of controversy for university leaders. Ward said that UW-Madison pays close attention to some rankings systems, such as the oncea-decade report of the National Research Council, which evaluates university departments based on the scholarship of their faculty.

There are good reasons why chancellors don't like rankings much, though particularly the popular lists released by U.S. News and World Report. The first factor that troubles him is the ordinality of those lists, which suggest that there is some real difference between the fifth school on the list and the eighth. The other, more serious problem, Ward said, is with the selection of variables. How these magazines choose to define quality often doesn't necessarily highlight UW-Madison's priorities.

The U.S. News rankings, for example, favor universities that enroll students

with very high standardized test scores, a datum that is "probably measuring more the quality of the students coming in than the value added by the institution," he said. "In some undergraduate rankings, we suffer a great deal, because among the measures is the extreme selectivity of the freshman class. Despite what some Wisconsin citizens may think, we are probably more open than any other university of this quality," Ward said. "We see that as a virtue, that we can take more students and take greater risks further down in the high school class."

The university's selectivity has been rising in recent years, although not out of desire for better rank, Ward said. "The reason this has become a problem is that, until recently, many of the best high school students went out of state. They used to go to Cornell, Michigan, or Northwestern. They're now staying here, and that's good for the state," he said. But he hears many critics who believe that UW-Madison shouldn't be turning away as many Wisconsin high school students as it does. "We're at capacity, and there's nothing we can do about that," he said, noting that the university does refer students who can't get into UW-Madison to other worthy UW System schools.

"In spite of all our concerns, I think we shouldn't complain [about rankings], because on the whole we do very well," Ward added.

"The hardest thing to do is to measure the process or experience, as distinct from the ingredients themselves," Ward said. One way that UW-Madison has attempted to get to that harder measure is by asking students themselves, conducting surveys of student satisfaction. The first of those surveys, in 1991, offered a small surprise for university leaders.

Then provost, Ward expected that students might not judge favorably the size of classes or the quality of undergraduate teaching — factors that large schools traditionally have had trouble with. The results showed that students were quite pleased with teaching, but less satisfied with advising. They liked the classes, Ward said, but they didn't feel they had the support structure to select them and build a schedule. Thus, restructuring advising became an important part of Ward's early years as chancellor.

On top of those measures, Ward relies on a subjective sense that things are going well. When he walks around campus, he looks for open doors and vibrant conversations. Across from his office is a large lecture hall, and he frequently pays attention to the atmosphere of the classes held there. "You can't walk by that classroom without knowing that much good is going on," he said.

THE PHYSICAL CAMPUS



"The Campus Master Plan . . . will focus on real visioning and planning, and it's going to be a collective effort that will take some time, some thinking, and a lot of hard work." — David Ward, 1994

Today's campus is undergoing construction, expansion, and renovation under a comprehensive Campus Master Plan developed during Ward's administration.

The number of construction projects — new buildings, additions, or renovations — either completed or launched

under Ward's tenure totals fifty-seven. This includes twentyone major projects of \$5 million or more. Examples of key projects include the Red Gym renovation, additions to the biochemistry and chemistry buildings, and construction of the Kohl Center and the Fluno Center. Projects planned for the next several years include a new Engineering Centers Building and the Health Sciences Learning Center.

The unprecedented physical growth on campus was fostered by a novel public-private partnership to fund new buildings. Ward steered the development of WISTAR and HealthStar, programs that account for more than \$600 million in building projects. The third such partnership, the \$317 million BioStar program, would fund state-of-theart research centers on the campus.

"The proposed BioStar initiative gives us the chance to keep pace with the explosive growth in biotechnology research," noted Ward. "It could also help us maintain our national leadership in the biosciences, where the depth and diversity of our faculty and student talent is second to none." Over the course of our conversation, we had talked about many constituents of the university: alumni, students, businesses, parents, and government. Certainly one of the challenges of being chancellor is balancing all these constituencies and their agendas. How has Ward dealt with all of this feedback?

"That is the most central question that any search committee should ask a potential chancellor," Ward said. "We are a public institution, and we have all sorts of social roles: advancing democracy and social mobility by having reasonable levels of access; serving the public with outreach; solving social problems; meeting the needs of high-tech industry; making sure you have a successful athletic program. At the same time, there is this core value of creating an environment where young minds are transformed. Those values are not always in line, and [a chancellor] is always in sort of an existential angst about how to do it all."

Ward's solution has been to be honest about priorities, to say to constituents that the university can try to accomplish these other goals, but its primary duty must be to educate. Athletic success, he says, is particularly expressive of the conflict. It would be unacceptable to

sacrifice academic virtue to make it easier to achieve success on the field, he said. But it would also be wrong to have athletics teams without giving them the means to excel. "If you're going to be in competitive athletics, you should determine to be competitive. To be content with being average or mediocre would be alien to the spirit of this campus," he said. "We wouldn't agree to that value in academics, so why in athletics?"

session four: Leadership

FORTY YEARS HAVE PASSED SINCE WARD boarded a train in Manchester, England to come to the United States. Having spent the majority of those years in Madison, he is now as much a product of Wisconsin culture and experience as anything else. In our last conversation, the chancellor talked about his personal reflections on his Wisconsin career. What has being chancellor meant to him personally? And where will his next step take him?

American higher education seemed very perplexing to the young graduate student in 1960. The son of a shop owner in northern England, Ward had been the first of his family to finish college. He came to Madison after winning a one-year Fulbright fellowship, and he found the class lectures and grading curves he encountered as foreign as his surroundings.

At the end of his fellowship, Ward faced the first of many opportunities he would have in his life to leave Madison. As he has in almost every case, he chose to stay, and worked toward his doctorate in geography.

His decision was influenced by having met his wife-to-be, Judith, who was studying education and history at UW-Madison when the two met at the Memorial Union. "Through her, I bonded with an American family," Ward said. As he came to know her and her native city, Chicago, he began to feel more at home. The Wards lived briefly in Canada, as David held positions at universities in Ottawa and Vancouver. But

OTHER VOICES



"It is rather remarkable ... that a state of such modest size and wealth has managed to build and maintain for so long a truly world-class institution."

 The North Central Association of Colleges and Schools, in granting reaccreditation for UW-Madison, 1999

Under the leadership of Ward, UW-Madison completed the once-per-decade reaccreditation process. The evaluators' final report praised the university's vastly improved undergraduate education and world-class excellence in research, found significant progress in equity and diversity, singled out administrative leadership in strategic planning, and noted success in attracting private support and collaborating with industry.

It was not the first time that Ward's leadership garnered recognition from those beyond the campus. During his time

as chancellor, for example, federal officials chose UW-Madison as the site for the National Science Foundation's new \$10 million national science education institute. Ward was appointed to serve on the 25-member Kellogg Commission on the Future of State and Land-Grant Universities, a national group dedicated to ensuring that learning is the focus of the university experience. And in 1997, Ward was named to chair the board of trustees for a nonprofit corporation developing Internet2, a collaborative project undertaken by more than 110 U.S. research universities to explore advanced Internet applications for research and education.

On the state level, Ward proposed the Madison Initiative, an innovative, four-year investment plan calling for \$57 million in new funds from the state and students, to be matched with \$40 million in private support. As a solid show of support, the Wisconsin Legislature approved the first phase of the initiative in the current state budget. The university is now seeking approval of the second phase for the 2001-03 state budget.

"The support in the state budget for the Madison Initiative is proof that our state policymakers and Wisconsin citizens understand the importance of reinvesting in higher education — and UW-Madison in particular," Ward said. "They know that what is good for UW-Madison is good for Wisconsin." he was interested even then in returning to Madison. "I was feeling increasingly that I could be American," Ward said.

After returning to Madison in 1966, he began a faculty career that had three stages, initially as an emerging scholar of geography, then as a rising administrator, and finally as a veteran campus leader. The first phase was one of research productivity, family growth (the Wards' two sons were born around this time), and increasing comfort with American ways. By the end of the 1970s, Ward had already turned down a few offers to return to England, feeling that he was "probably going to be an American for life."

He had also gotten a taste for administration, serving as chair of the geography department. That experience led to an associate dean position in the Graduate School, where he helped manage the research mission of the university. Even though he was building an administrative record, he entertained no thoughts of eventually being chancellor. "That seemed implausible, because I was not a person that I felt had the public relations skills to be chancellor," he said.

Yet leadership continued to draw Ward out. Shalala appointed Ward as provost, despite his belief that he wasn't the best candidate for the job. Not long after he took the position, Shalala surprised Ward by calling on him to address a group of school principals at a pre-football game breakfast. "I remember getting some scrambled eggs and hearing her say, 'And now the vice chancellor will tell you about our initiatives in undergraduate education,' " he said.

Although he did not see it in himself, Ward noted, Shalala "recognized that I had the skills as a spontaneous public speaker, and it was a matter of exposure."

As Shalala's successor, Ward has devoted energy to putting a management philosophy behind the reforms that he and Shalala began during the late 1980s. He set about crafting a strategic vision to guide the university, and introduced campus leaders to quality-management



David and Judith Ward have made Madison — and the university — their home for some forty years

concepts for identifying priorities and directions. Although he bears the outward appearance of quiet self-confidence, he claims to have insecurities about his ability to lead. "I still remain reflective about myself in a leadership role," he said. "I think I've overcome it, and I now feel very comfortable doing it. But I still tend to be on the reserved side."

Handling criticism, especially the intensely personal attacks that sometimes are waged on leaders, remains one of the most difficult parts of the job. "I'm much more comfortable advocating my love of the academic side of the institution than I am in responding to these series of random issues surrounding the institution," he said.

Ward believes that many university leaders are probably better than he at managing the day-to-day issues. But where he perceives an overall weakness in higher education leadership is in defining and protecting the core values of education. As he contemplates the next phase of his life, filling that void is one of his top goals. He plans to take a year off, spending time at the University of California at Berkeley and in England, and then assume an "elder statesman" role on campus. He is planning to lead a new UW center examining higher education — the Wisconsin Center for the Advancement of Postsecondary Education.

"I think many of the things that I've done have been both reflective and by the seat of the pants. I would like the opportunity to reflect a little more without the demands of daily pressures," he said. "I have the sense that we have not yet encapsulated what might in retrospect be a revolutionary decade in higher education. I don't really see in public discourse or academic discourse a very good documentation of what we are doing. There is a need for someone to look at that and provide a place where people can talk about these issues."

Ward is planning a book, which he hopes will capture some of the thought behind his tenure at UW-Madison, and also provide some foundation for his new role in higher education. At the moment, he said he feels a bit like Luigi Pirandello, who wrote Six Characters in Search of an Author: He is searching for the right way to tie together anecdotes and examples of successful management. "I think that in academic culture, there are very powerful elements that are perfectly consistent with strategic management, but there are profound differences, as well," he said. "If I can somehow describe that culture in an ethnographic way, maybe I can articulate how to manage something as difficult as a university."

There is still a chance, though, that Ward will be wooed by other opportunities. He already has received some offers from universities and foundations hoping to find experienced and capable leaders, and others will no doubt follow.

"After forty years here, will something outside of Madison seem appealing?" Ward pondered. "Every time it has happened in the past, we have said no. We've always ended up staying." *&*

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peacefulness

The long-forgotten custom of walking labyrinths is regaining popularity, and a UW alumna is among those who are leading the way.

BY JAMES RHEM MA'71, PHD'79 PHOTOS BY BOB RASHID '87

In a world of instant communication, sensory overload, and a chaotic pace that discourages introspection, a trend is quietly catching on. Modern serenity-seekers are reviving an ancient practice of walking on the curving paths of a labyrinth as an aid to slowing down and reflecting on their lives. Advocates say that the physical act of following the intricate paths frees the mind for meditation. They claim that as they walk to the center of these patterns and then come back out again, they may gain insights about a problem that has been gnawing at them, be overcome by healing tears, or simply regain a sense of peace.

The beginnings of the labyrinth are associated with ancient Crete and Greek mythology. To contain the horrible offspring of his lustful wife and a handsome bull (a gift from one of the gods), Minos, the king, commanded the clever inventor Daedalus to build a structure to imprison the Minotaur. Moreover, every nine years a noble youth was sacrificed to feed the beast. But the ugly story has a happy ending. The queen's daughter Ariadne gave her lover, Theseus, a "clew," a thread that would lead him safely out of the maze after he succeeded in slaying the beast. Today, you can open almost any dictionary or encyclopedia to the entry on labyrinths, and you'll find something like this from the *Oxford English Dictionary:*

A structure consisting of a number of intercommunicating passages arranged in bewildering complexity, through which it is difficult or impossible to find one's way without guidance; a maze.

If Adrienne Michel Sager '64, MFA'83 could rewrite these entries, she would add a new definition of labyrinths: one less menacing, but with a thread of connection of its own to the labyrinth's ancient origin. It would probably read, "a winding path patterned after those inlaid in the floors of Gothic cathedrals, walked or traced with the fingers on wooden miniatures as an aid to prayer or meditation."

Sager, an art instructor and painter, stands in the vanguard of a labyrinthwalking movement, one that in many ways recalls the practice and purpose of pilgrimage in the lives of believers in many religious traditions for centuries.

For nearly twenty years, Sager has been leading intensive art history tours to Paris and nearby sites such as Monet's gardens at Giverny and Auvers-sur-Oise, the village where Van Gogh spent his last days. During the mid-1980s, Sager became more and more fascinated with the labyrinth pattern inlaid in tiles on the floor of the cathedral at Chartres.

"At that time it was covered by chairs," she remembers, and when she asked, she was told it was forbidden to take the chairs off. Unlike the more well-known labyrinth-walking pioneer, Lauren Artress of Grace Cathedral in San Francisco, Sager felt too much reverence for the place to push the seating aside to walk the path, something Artress recounts doing in *Walking a Sacred Path: Rediscovering the Labyrinth as a Spiritual Tool* (Riverhead Books). Instead, Sager undertook her own research, quite unaware of Artress and her work. After sending several requests presenting her extensive credentials, her fluency in French, and her experience in leading educational trips, Sager finally received permission to lead groups to Chartres to walk the labyrinth last year. As with Stonehenge, the pyramids, and other ancient sites that seem invested with important spiritual significance, Sager found the lore on labyrinths massive and solid historical evidence sketchy. The *Catholic Encyclopedia*, for example,



"Walking the labyrinth is a really good mirror back to people of the way they function in life."

She'll lead others this July as part of the two art history tours (one for Madison Area Technical College, the other for Edgewood College) that she offers each year to France.

Though the labyrinth-walking movement is relatively new, the practice, it's believed, began at the time of the Crusades. The danger involved in making a pilgrimage to the Holy Land was great, and so, as a substitute, the faithful were encouraged to walk the labyrinths on the floors of certain cathedrals, especially in southern France, as points of pilgrimage they could visit safely and perform a symbolic walk to the center of their faith. Churches in Algeria and Italy also had labyrinths on their floors, and labyrinth patterns have been found for thousands of years, across many civilizations, in countries all over the world.

remains cautious on the subject, saying only that "these labyrinths were supposed to have originated in a symbolical allusion to the Holy City, and certain prayers and devotions doubtless accompanied the perambulation of their intricate mazes." Modern pilgrims remain undeterred by sketchy scholarship.

Indeed, until 1792 when it was melted down, the center of Chartres's labyrinth contained a copper plate believed by some to picture the Minotaur. As with so many other ancient stories, the church had co-opted this one, viewing its doctrines as analogous to Ariadne's "clew" marking the way from the twisted, difficult path of life into a spiritual rebirth.

Although the labyrinth at Reims (which was removed in the 1800s) contained a number of false starts and dead



Adrienne Michel Sager, above, teaches art and other courses for Madison Area Technical College and for Edgewood College's continuing education program. Named "Madison's Best Artist" by Madison Magazine for the last four years, she became interested in labyrinths when leading art tours to Europe. The labyrinth on the right is one of two at in Sinsinawa, Wisconsin.

ends like an ordinary maze, labyrinth walkers like to distance themselves from mazes, precisely because they view the wrong turns and blind alleys as being at odds with the spiritual symbolism represented in Christian floor labyrinths. In contrast to mazes, the modern labyrinth offers one way in and one way out, with no tricks or dead ends intended to confuse the walker.

Beginning in the 1970s, numerous books and articles began appearing on labyrinths, but in the end, those drawn to the phenomenon must fill in the blanks with their own faith and intuition. That's not hard to do, says Sager. She is one



things from my history. I cried through the whole thing, but it's what my spirit

needed to go



who finds Chartres a powerfully spiritual site.

"Walking the labyrinth is a really good mirror back to people of the way they function in life," says Sager. "Some people are very passive and let people pass them — get off the path fast while others are more aggressive and want to be a leader. Some are very

patient and they'll wait, stop, reflect. The patient-impatient aspects of people come out." The experience can also bring "wonderfully releasing tears of sadness or joy," she adds.

Virginia Bores '79, who went on the tour last year, says, "I didn't know what to expect. But after I got back, it was just the beginning of a lot of healing

> to the next level of healing. The whole ambiance of being in such a setting is overwhelming." She's

planning to go on the tour again next year. "I can't wait to see what my experience is next time," she says. Bores, a nurse who is involved in a program that connects nurses with churches, synagogues, and other communities to focus on holistic healing, says that a lot of her fellow nurses in the program find "comfort, healing, and just peace in walking the labyrinth, too."

Anna Marie Carley '98, a UW medical school student, also participated in the Chartes walk with Sager's group. She says that the experience triggered thoughts of her family lineage. "I realized that I was a conglomeration of everything that I had ever experienced and of the lives that my ancestors had led," she wrote in summing up her walk. "Every decision they had made, no matter how trivial, led to my existence, and my life had led me to that moment of realization on the labyrinth. I left feeling that I was much more than myself. I was a living, breathing masterpiece that was thousands of years in the making."

April Hoffman MA'80 was part of the special group that Sager selects to enter with her to light a circle of candles on the perimeter of the labyrinth. She was moved by the honor, though she didn't feel an epiphany on the walk itself.

The candle lighting is one of several ways that Sager enhances the Chartres experience for her travelers. As the group comes into the sanctuary, she has them circle the interior of the cathedral before gathering in stocking feet at the labyrinth. At a little after nine, as the strains of Hildegard von Bingen or other medieval music play in the background, the members of the group begin



"I realized that I was a conglomeration of everything I had ever experienced and of the lives that my ancestors had led."

walking one at a time along the path. When they finish near midnight, Sager brings the group together and asks each member to summarize the experience in a single word.

In her book, Lauren Artress describes a threefold approach espoused in many labyrinth classes today. She calls the walk in toward the center *purgation*. During this phase, the walker is to mentally release preoccupations and distractions. She terms the walker's pause at the center of the labyrinth for meditation or prayer *illumination*. At this point, Artress says, walkers may gain a new sense of clarity or some other revelation. As walkers follow the same path back out, in the portion of the walk she describes as union, they prepare to re-enter the world, empowered by new insights.

Sager says that in her many years of leading tours, she's found that people like to tell her their life stories. "I'm not a counselor," she says, "but I think I teach a lot of these kinds of [life issue] things." When she teaches classes on the labyrinth, she concludes the course with a labyrinth walk. But first, she has her students write down the distractions that get in the way of meditating. To dramatize the need to leave these thoughts behind, she collects the pieces of paper, throws them in the air, and tells the walkers to leave them where they fall.

The labyrinth in the center of the nave at Chartres has a path that exceeds eight hundred feet before arriving at the center, but the circumference is no more than thirteen yards. A pilgrim in a hurry can walk it in fifteen to twenty minutes, but some may

take an hour or more. While pre-Christian labyrinths were seven-circuit patterns, Chartres uses an eleven-circuit pattern.

For those inclined toward "sacred geometry," Chartres offers a feast of numbers. The rosette in the center is a six-petal rose shape, says Sager, and the number six was associated with a lot of



Labyrinths have been created in a variety of settings, including outdoors, indoors, and on large pieces of canvas that can be rolled up and stored when not in use. The walker above may pause in the center as long as she likes, and then follow the same path back out. Contemporary labyrinths are distinct from mazes in that they do not have any dead ends or trick turns.

symbols in medieval times. There are also twenty-eight turns in the pattern, echoing the lunar month. A recent researcher counted the tiles in the Chartres pattern, says Sager, and found that the number equals the number of days in normal human gestation.

"Because of the way the path is laid out," she says, "first you are walking near certain people, and suddenly those same people are far away on the other side of the labyrinth. It's like life, where you have people come and go. You always think you're going toward the center, but every time you make a turn, you're far away again. And then when you least expect it — you're way out here (she says, pointing to a diagram of the pattern) — and you turn around, and you're in the center."

The labyrinth also provides a very individual outlet for Sager, who has devoted herself to its study and artistic depiction. She's currently working on a series of labyrinth paintings.

The words of an old spiritual may offer the most useful insight into walking a labyrinth: "You gotta walk that lonesome valley; you gotta walk it by yourself." Despite the mysteries in the labyrinth's past, for those ready to tread lightly and with an open heart, these winding paths seem to offer an uncanny unwinding to the soul. *K*

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James Rhem MA'71, PhD'79 founded the National Teaching and Learning Forum in 1989. His book on photographer Ralph Eugene Meatyard will be published this winter.

Puttin' on the Fur

A Gorilla Sweats It out with Bucky Badger at Mascot Camp... And Comes of Age All over Again

By PAULA WAGNER APFELBACH '83

must be *insane*. Armed only with a rented gorilla suit, I'm driving onto the UW-Milwaukee campus, facing throngs of buff men and tan, taut-calved women. They're walking around in their

pert, matching cheerleader outfits, or black spandex dance pants and sparkly crop tops. I'm obviously out of my league, and man, am I nervous.

But I digress. I'll start by sharing a strange little fantasy I've had for years: I want to participate in the mascot training camp that Bucky Badger attends. I want to go behind the scenes, to learn the mascots' hows, their whys, their secrets. This isn't about actually *being* Bucky Badger; it's about experiencing what goes *into* being Bucky Badger, and dispelling the myth that it's as easy as putting on a furry costume and blowing kisses.

> My editors give me the thumbs-up for my dream to become a reality, so I do a little research, fill out a little paperwork, and I'm in. I keep thinking that having a dream fulfilled can't possibly be this easy, but this time it is.

Bucky is very cool to hang out with, and his head is amazing. While it looks as though a human head could never wedge through the substantial gear inside Bucky's neck, that construction helps to make his head so stable on his shoulders.

PHOTOS ON PAGE 33 BY BOB RASHID '87. OTHER PHOTOS BY PETE AMLAND, WENZEL DVORNIK, AND PAULA APFELBACH '83.

The Days Prior: Let the Odd-yssey Begin

ell, Virginia, there may be only one Santa Claus, but it takes six people to be Bucky Badger. And, since the six Bucky mascots will be taking only three suits to the mascot camp — held on the UW-Milwaukee campus in the heat of mid-August — I need to find my own version of a mascot suit. Naturally, a field trip to a costume shop is in order.

To approximate the physical dimensions and challenges of the Buckster himself, I need a large, solid, unwieldy head; a hot, furry body; and legs that are free to run. I reject the first option, an alligator, on the basis of snout issues. The second, a stork, has wings instead of hands. There's a light brown dog, too, but his head is made of soft foam, unlike Bucky's solid head.

The last beast — a friendly, gray gorilla — is the ticket: large, relatively unwieldy head (Bucky's hard to beat in that respect); very hot, furry body with molded rubber gloves and "gorilla galoshes" covered with fur; and fur legs that extend all the way to the feet.

The costume shop employee suggests that I try it on and accompanies me out to University Avenue to give it a whirl. Once out at the curb, I discover my first Important Mascot Principle: You can do whatever the heck you please in a suit such as this. My inhibitions fall away as first I wave at passing motorists, and then, like the gopher in $Ca\partial\partialy$ hack, I wiggle my hips and do a little dance. This is good for a few honks, and I'm hooked.

Day One: Acquiring the "Persona"

I'm starting to get cold feet, though. After all, I'm almost thirty-nine years old; I'm a solid introvert outside of my small comfort zones; and right now I'm trying to make sense of this time travel of sorts that I'm about to take back to my own college days. My voice startles me, as I say out loud, "This can't be worth it."

I survive the spandex trauma while driving onto the campus. I park and register. There's some seriously rockin' music coming from the gym, but none of it is the music that *I* rocked out to in college. Then, just as I step inside, as if cued up solely to make me feel better, Bruce Springsteen's "Glory Days" blasts forth.



Finally, something I can identify with and a bit ironic. too. Inside the hot gym, giant fans blow air at the colorful, roaring patchwork of cheerleaders. dance teams, and mascots from Arkansas and Michigan, Nebraska and Mississippi, all

over Wisconsin, and even Puerto Rico.

We are welcomed by the head of the Universal Cheerleaders Association (UCA). He says that, while they host many other spirit camps each year, *thio* one, now in its tenth year, is the largest in the U.S. That means that about fifteen hundred participants have come to perfect their routines, learn new moves, and compete against one other.

After an astounding dance and cheer demonstration, we mascots gather in a hallway for our breakout sessions. I meet my fellow Badgers — Jim, John, Brian, Sam, Dave, and Bob — for the first time. "Oh, *you're* the gorilla!" they say, obviously having heard that I'd be joining



We have the world by the tail as we get into formation for a mascot group photo on the shore of Lake Michigan. Cameras click by the dozen, and we're the stars — just the way we like it.

them. I'm not sure whether I feel better or worse.

I begin to wonder how, exactly, they came to be Bucky Badgers. Jim tells me that, in any given year, between twenty and sixty mascot hopefuls compete to see who will, as he puts it, "put on the fur." By the end of the two-phased tryouts, they will have role-played, danced, demonstrated the use of props, proved their endurance through push-ups and stunts, performed a skit, and survived an interview. According to Spirit Squad Director Geri Mutz Shuler '91, the judges look for creativity, strength, endurance, and the ability to move well.

Then there's the matter of that head. The successful candidate must be able to bear the weight of the wide, top-heavy noggin, which accounts for thirty-some pounds of the forty-five-pound costume.

Jim estimates that each Bucky appears at about one hundred events each year. Every two weeks, the six Buckys get together to schedule their events, which include many athletic competitions, campus and community events, showers, wedding receptions, and banquets. One was even asked to serve as a Bucky Best Man.

But I digress again. As we mascots move into the curiously named Combatives Gym — actually an unpleasantsmelling weight room — we meet our teachers: Adam DeVault, who has been the lone Smokey (a hound dog) at the University of Tennessee, and Mandie Davis, part of the Big Al (an elephant) mascot team from the University of Alabama. These are two of the nation's top mascots. Smokey took first place last year at "nationals" — the UCA's national competition — and Big Al took second.

Adam welcomes us, sixty-seven mascots in all. "We're a special breed of people — a little off," he says knowingly to the crowd of mostly men. (A female Bucky comes along about every four years, Shuler says.) We introduce ourselves, and when I tell them what I'm doing here, they erupt in applause. This is Important Mascot Principle number two: Mascots are a decidedly rowdy sort. I'm still nervous, but this is getting to be pretty fun.

Adam starts off with mascot guidelines such as: standardize your mascot's

> walk so that no one can tell which member of the team is in the suit; stay in character at all times; use giant, exaggerated movements; do not play dead (those around you may think you're actually hurt); never be seen wearing only part of the suit; and *never*; *ever* talk.

Adam pulls real-life stories from his mental archives — tales of a vomiting panther and a spiteful leprechaun — to further illustrate the principles that all mascots must know. He also implores us to drink lots of water, explaining that the temperature inside his Smokey suit, for example, can often be forty degrees warmer than the surrounding air.

Then we go over the UCA's *Mascot Manual*. Its guidelines include meeting the opposing mascot to discuss possible interactions; never being distracting during the national anthem or degrading game officials; being aware of the limitations of the costume; and avoiding carbonated, sugary, and caffeinated drinks, as they can cause cramps and fatigue.

This seems like a lot of rules for something that, after all, isn't real, and I begin to question why people fall for these creatures in the first place. "Everybody wants to believe that mascots are real," Adam says. Chip, the University of Colorado buffalo, concurs that "belief is perception in this case" people want to believe, and so the character becomes real to them. Maybe we just want to be kids again, the Mascot Manual suggests: "There's just something about cuddling a big, furry, animated character that brings an innocently childish grin to almost every face."

Next we head outside to practice our character walks. After each team demonstrates its mascot's characteristic stride and gestures, we all move around in a circle trying to imitate the walk.

When it's Bucky's turn, I dutifully attempt my best Bucky walk, but Mandie stops us with, "Hey, gorilla, you need a walk!" Strangely, I had never considered this. So, on the spot, I start to leap about in an uneven manner, my curved arms swinging side to side as though carrying a barrel, and my knees pointing into the air with each gallop.

Afterward, the critiques of our first efforts are generally positive. "We're a wild bunch," Adam reaffirms. "That's what I love about you guys."

They *are* a wild bunch, a special breed. A profile starts to form in my mind about the nature of these mascot beasts: They love the limelight as only extreme extroverts do. Their confidence allows them to bond quickly. Though crude remarks fly freely, they deal in bravado and fling off-color one-liners right back — it's all part of the game.

Mascots have the dedication necessary to put up with kids pulling their tails and posing for endless photos. They make a very difficult job look easy and convincing through their quick wits and wellsprings of constant creativity. They are heroes to little kids, and they bring nostalgic contentment to longtime

fans and alumni. They are goodwill, spirit, heritage, and pride personified.They embody our love for our alma maters. *They make us believe*.

We end the session with a giant, crushing huddle, piling hands into the center and yelling, "If the fur ain't flyin', you ain't tryin'! Mascots!" With that, we're off to a thankfully early dinner — a mountain of food that this camp is up to the challenge of consuming.

The evening ends with improvisational exercises designed to help us think on our paws, and another huddle and yell: "If you can't take the heat, get out of the fur! Mascots!"

Day Two: The Fur Starts to Fly

relish neither the 5:50 a.m. wake-up call nor the sight of breakfast, but I eat anyway — mostly bland food, as we'd been instructed, and a carbo load.

Zippy, the chipper Akron State kangaroo, is entertaining the crowd in the dining room. He looks so much perkier than I feel, with his fur face permanently affixed in a dreamy smile.

The phoenix from UW-Green Bay, whose nickname is House due to his near-mythical size, walks in and announces, "I don't think you understand how tired I am right now." (He's been celebrating his birthday all week.) House has earned a reputation at past camps for being a born leader of antics, and this year would be no exception.

Entering our home base, I see all manner of collegiate birds, felines, sundry rodents, pumped-up and caricatured humanoids, and

two towering inflatables making their transformations. This can mean only one thing: it's time for the morning field walk.

Feeling very important to be taking part, I cheerfully don my gorilla suit, head outside, march clumsily up the stairs, and gallop into the open yard.

I begin to sweat so much within the first few minutes that I'm utterly astounded. The head, which slops around on my shoulders, feels like a milking pail. Its strange acoustics make it seem as though I'm underwater, but since it's verboten to speak, it's a moot (and mute) point. The mesh screen that covers the eyeholes blurs my vision and severely limits my view, so I must move the entire head downward to see my feet. The suit's fur is scratchy; the molded rubber gloves are floppy; and the foot coverings feel like flippers.

After a few minutes more, the sweat is streaming down my face and into my mouth, but I can't reach inside the head to do anything about it. I shake my

gloved hands and feel the sweat splash around. My hair and clothes are soaked, as though I've just taken a shower.

> Part of the reason is that the gorilla gait I had created under pressure the day before is labor intensive and thus exhausting. Still, I must lope about, *wishing* that I'd chosen the alligator suit instead.

Trying very hard to remember all that I'm supposed to be demonstrating, I interact with the other mascots and cheerleaders in the area. We dance. We hug. We wave and do high-fives. We put up our dukes and play-fight. We run around the field tumbling, hassling, jousting. We scrap in the dirt, and go under a limbo stick. In the end, a makeshift football game comes together, with the Big Ten mascots taking on all the rest. I exercise my right, as the only gorilla, to pound my chest. But then my maternal instinct takes over, and I'm driven instead to tidy the area, to break up mock skirmishes, to soothe and scold.

By now, the torrents of sweat make me realize that I'm trapped inside something akin to a sauna, and I'm so winded that I'm panting out loud inside the head, like a dog in the midday sun. (The others reassure me later that this happens to them, too. "You get used to it," they say. Yeah, *right*.)

I want to stop. I really do. I want to take the head off and gasp for fresh air and catch a breeze to blow through the suit. I want desperately to end the loping about and to walk normally — or at least upright. I'm hurting. But I keep going.

At one point, I'm hoisted into a yellow, wheeled trash can and go for a roll through the open yard. Another time, I'm tackled from behind and find myself sprawled in a heap of mascots. My head flies off, but Goldy, the Minnesota

gopher who's sprawled next to me, shoves it back on before I can get up. His instinctive reaction shows me just how automatic this mascoting becomes for them.

Eventually, I must mentally "cry uncle" and sit down. Even then, though, my brain keeps searching for how to remain in character and stay in constant motion, if only with small gestures. ("Otherwise," Adam has said,



Collegiate mascots do their jobs so well that we begin to believe they're real — and it becomes clear that not everyone has what it takes to be one. As with anything that looks effortless in the hands of a master, the concepts are easy to understand, but a bear to apply and maintain.

"you just look like a person in a suit.") What does a gorilla do while she's sitting around relaxing? I have no idea, but I sway my upper body, swing my leg, scratch at imaginary fleas, and think...

I feel that an eternity must surely have passed by now, but my more realistic side senses that it's actually been somewhere between twenty and fortyfive minutes. Time is irrelevant, though, since I can't see my watch under all the fur, even if I had the courage to break character long enough to look.

Finally, sweet words ring in my faux ears: we may head back inside. This news gives me just enough fresh hope to bounce toward the building, and I see that — principled as they are — no mas-

cot breaks character until we are safely back in the Combatives Gym.

Just inside the door, where a large fan is blowing, I take off my head and flop down onto a blue exercise mat. This apparently scares Mandie, who isn't sure whether I'm sick or just forgetting the rule about not playing dead. She rushes over and asks if I'm all right. Bucky John brings me water, while Mandie coaches me on the "decompression process." She says that I must not take all of the suit's pieces off right away, or I'll cool down too quickly and get chills.

Confident (eventually) that I won't pass out, Mandie asks how I liked my first field walk. "This is *hell*!" I practically shout. "How do you *do* this?!"

How, they assure me, is that you get used to it. I'm very skeptical. Perhaps, in this somewhat uncharacteristic moment of modesty, they're overlooking a few facts: they do it for hours at a time, and they run down football fields carrying giant flags. They churn out push-ups to the chants of fans who always count too fast, and they're hoisted into the air by human pylons of cheerleaders. Yes, they can take breaks, but still...

Why they do it is another matter. "We're kids at heart," Bucky Jim says. "We love the attention." Bucky Dave adds that when tens of thousands of fans are cheering for you, it's naturally an incredible rush. "But they're not cheering for you, the person," I point out. "It's Bucky they love." Dave says that's even better. You can have the glory when you're on the field, but when you come off, you can leave the fur behind and just be yourself. I can see his point: Bucky is loved unabashedly, unconditionally, and few people — as individuals — can say that. You just have to survive the suit.

It's also about the kids, the mascots say. They find great satisfaction in making children happy. And, Dave adds, since the Buckys don't receive money or scholarships, it's about the perks as well - free admission to sporting events, and going to the Rose Bowl and Final Four.

Even though I'm now experiencing the chills that Mandie has warned me about, I'm exhilarated and ready to soak in more enlightenment — this time, about props. Our assignment is to go on a scavenger mission to find props. Then we must improvise three things that we could do with them. Before we set off, Adam makes a plea that he knows is futile: please don't steal stuff.

This forms my third Important Mascot Principle:

This crowd challenges authority. As fans, we adore their wild-andcrazy nature, but telling these risk takers and nonconformists not to do something is tantamount to encouraging them to do that very thing. Adam shares the story of the Auburn University Aubie who "borrowed" an unattended university maintenance vehicle and drove it back to the props session.

We return with our treasures — among them a manhole cover, large folding tables, a shower head, a "wet floor" sign, a huge rock, bubble wrap, and a giant wrench - and the improvisations, ranging from the quotidian to the scatalogical, are all highly creative.

During my carbo-lunch, I conclude that it's a matter of self-preservation to change my leaping gorilla gait to more of a lumbering walk. I ask Adam and Mandie about it, and to my great relief, they agree. I've found my salvation...

Next up? Child psychology and tips for approaching hesitant tykes, such as hugging their parents or playing peekaboo. Adam cautions us never to take a baby into our arms; given most mascot suits' impaired vision, it's just too risky. Kids in the ten- to twelve-year-old range, he continues, can present different challenges. He tells about being cornered as Smokey on Little League day by a group of boys who were wielding baseball bats and hit him in the leg with one.

Sadly, insults and injuries come from a broad group, and now emotions flow along with words, about the not-so-glamorous underbelly of the mascot world.

A Herky, the hawk from the University of Iowa, describes how an object thrown by an opposing team's cheerleader caused damage to some of her vertebrae. Smokey was punched in the groin repeatedly by a little girl whose parents thought it was cute. Goldy Gopher has been pelted with nuts from the stands, and some Marquette fans yell insults at their own mascot, an eagle who has replaced their longtime warrior.

Even our beloved Bucky has been slugged by children, kicked by young soccer players, and grabbed by a drunk hockey fan who tried to rip his shirt off. During the 1999 football season, he was tackled and punched by an opposing team's cheerleader, but did not press charges. A Bucky who is not suiting up can accompany a suited one to act as a "Bucky guard," guiding him through tight crowd situations and pulling him to safety if things get out of hand. But, mascots are most often alone and largely defenseless.

Dinner is more wild and woolly than usual. House is in his glory as he looks out across the large dining room and shouts to cheerleaders, table by table, to climb onto their chairs and "shake your booty!" - which they do. It's a rhythmic taunt that he leads wherever and whenever we're gathered, and it always ends with the mascots erupting in a chorus of "Mascots... Whoop! Whoop! Mascots... Whoop! Whoop!"

Day Three: Hitting My Stride

viven the panting-like-a-dog experience that I'd had during my first character walk, I start to give serious thought to how to avoid vomiting in the suit. In the breakfast line, I ask Grand Valley State's Louie the Laker for a recommendation. "Peanut butter and jelly," he says, as though it's Continued on page 54

The 2000-2001 Bucky Badger Mascots, At Your Service

Brian Adam



the end zone

A senior from Milwaukee, Wisconsin, Brian is majoring in marketing and accounting. In his third year as Bucky, Brian's trademark is doing "the worm" across

Dave Bittorf



Dave is a sophomore from Marshfield Wisconsin, who's majoring in business. This is his first year in the fur. During

the football season, his specialty is "raisin' da roof."

Sam Khazai



A senior from Madison majoring in English and political science, Sam is a first-year Bucky. He planned to unveil his "deadly secret move" to the football crowd this fall.

Bob McFarlane



Bob. a senior from Madison, is majoring in cartography and geographic information systems. In his second

year as Bucky, Bob is the only one who can skate at a level necessary to appear on the ice at Wisconsin's hockey games.

Jim Strode



Now in his third year as Bucky, Jim is a senior from New Lisbon, Wisconsin, majoring in marketing, management,

and human resources. He's known for his creative costumes, props, and skits. Jim is also a member of the UW Homecoming Committee and the Wisconsin Alumni Student Board, both sponsored by the Wisconsin Alumni Association.

John Weiler



John is a junior from Eden Prairie, Minnesota, who's majoring in finance and real estate. A second-year Bucky, he excels at push-

ups and has been known to churn out fifty-nine in a row.

Puttin' on the Fur Continued from page 37

the most natural question in the world. "It won't come up on you." The consensus has been that milk and eggs will, however, so I stay away from those.

As we gather for the morning, I consider the countenance of Bucky Badger. He's irrestible — substantial, yet friendly; cuddly, but not cloyingly cute; a knockout in his red-and-white shirt — and just the kind of fellow I'd want my daughter to marry if she were, say, a six-foot, furry badger herself.

I see how much others love Bucky during our morning activity: a trip to a day care center. Once suited up, we head out into the sunshine and gallumph our way down the streets of the campus. I practice my revised gorilla walk, while others act as police officers who stop traffic and escort our parade through the intersections. The rest just do their best not to hyperventilate or fall down.

At the center, we mingle with the kids, and then Mandie introduces us. One by one, we come forward, perform our best trick, then retreat to the back. I'm introduced, vaguely, as a "special mascot," and the only trick I can think of is the hip-wiggling thing that garnered the honks back in Madison. The kids applaud politely for me, but go ape when their hero, Bucky Badger, takes the floor.

Several mascots admit that this walk to the day care center — now a camp tradition — is a killer, but for me, it was *mucb* easier than the one the day before. Still, when I've stripped down and Bucky Jim observes that I'm thoroughly sweat-drenched once again, he says, "Khakis and a belt? We have to teach you the fine art of wearing mesh shorts."

Later we're on to another tradition: the all-camp cookout at Milwaukee's lakefront. We pack our suits into their boxes and bags, and haul them onto buses. Dressing in the restrooms at the park shelter violates the rule never to be seen partially suited (and startles those who walk in on us), but we don't have a good alternative.

Our roving mascot foolery constitutes our third field walk. We ride bikes,



All mascots, like Goldy Gopher and Herky the Hawk, above, have distinctive walks, gestures, and even signatures. During our autograph clinic, we decide that the gorilla grrrrrl needs a moniker: Hairy-ette. I write it in girly penmanship and add a little heart.

play Red Rover, spray each other with shaken Sprite, throw footballs, harass the cheerleaders and dancers, and try to engage the children who pass by.

My introverted nature makes me shy about interacting with the crowd, so I cruise over to a large Coke truck to see what's up. What's up, it turns out, is me. Two of my fine, feathered friends get the idea that I should climb up on top of the truck to join the Ball State Cardinal and Ohio State's Brutus Buckeye.

Eying the step, gas tank, and door hinge that I will need to scale with my rubberized feet, I'm understandably skeptical. But, after several tries and a whole lot of pushing, I flop up onto the top of the cab like a fish on a beach.

The climb to the top of the truck isn't too bad from there. Once up, I move and groove in the setting sun, try not to slide off the surface that's now covered with Sprite spray, and ponder how bizarre it would be to slip off anyway and die by falling from a Coke truck in a gorilla suit. I'm pretty certain that my initial assessment was correct: I must be insane.

After this stunt, I head out into the crowd and encounter a group of women who have goaded one of their friends into showing me her gorilla imitation. I think fast, stand back, fold my arms in a stance of critical evaluation, and wait expectantly. Despite all of this hard work on my improvised reaction, the woman has the audacity to tell me that I should do *my* gorilla routine first. I reluctantly oblige with my best leaps.

Then it's her turn. She starts into something truly frightening — more a full-fledged ape attack than a gorilla imitation. I feel like running the other way, but my rubber-gloved hand manages to give her a thumbs-up instead.

A group of men wants to know which college I'm from. Enter Important Mascot Principle number four: You can't satisfy everyone when you're not allowed to speak. Since I can't possibly tell my story through gestures, I try to weasel out with the classic "I don't know" shrug, but they hound me more, and I feel like a failure. I'd wander away with my tail between my legs, but I don't have a tail.

I cheer up when the piped-in music starts, as dancing is my forte. I gyrate down the sidewalk in all of my gorilla glory, and beckon others to follow. Envisioning a cast of hundreds gyrating behind me, it's most disappointing to look back and find a following of only two cheerleaders — but for a novice, I figure that's pretty good. I dance and dance and dance, feeling as wholly content with the world as one can feel in a gorilla suit. The words Adam has said — more than once — return to me: "This is *our* world; they're just in it."

After a full hour on the turf, we take off our suits and grab some picnic dinner. The Lake Michigan breezes confirm that I'm drenched for the second time today, but I don't care. Sweat, I conclude, is a mascot's badge of honor, and if there's a strange pride in being soaked to the skin, then I'm positively beaming, both literally and figuratively.

This leads me to my final Important Mascot Principle: This is a love-hate thing. You can't wait to put on the fur because of all the weird, wild, wonderful experiences you'll have in it...but then you can't wait to take it off, because let's face it — it's not pretty in there.

(In case you can't stand any more "sweat talk," Bucky Jim says that he machine-washes the body and gloves after each wearing, and sprays Febreze, a fabric freshener, into the head.)

Back to my mild-mannered-Clark-Kent self again, I reveal my secret identity to the flirtatious, but kindly, dining room supervisor who's been teasing me since meal one. "You're the gorilla?" he says, wide-eyed. He thought I was just a reporter.

We head back to the campus to get ready for the evening's special event: a deejay dance party at the plush Astor Hotel. There, the blinding flashes of light, thundering beat, and sweaty bodies throbbing on the dance floor present quite a contrast to the elegant, highceilinged ballroom. So often during this camp, I've felt a similar contrast. I'm a Rip Van Winkle who has parachuted into an uncannily familiar, yet extraordinarily foreign culture.

This time, though, I'm living in the moment, rocking out in our mascot oasis in the center of the dance floor, feeling the years melt away. When the clock strikes the Cinderella hour, we slowly head for the buses, the combination of sweat and smiles feeling awfully familiar.

The Final Day: Rock da House!

It's rise and shine as before, but this time, it's the last time. By now, we've been through our many skit exercises, videos, and evaluations. We've foraged props, scrounged scenery, and rehearsed repeatedly for the Mascot Follies, the culmination of our camp experience. And, mascots being mascots, we've also done a good deal of goofing off and giving each other backrubs when we should have been working.

We meet in our home away from home, and receive blue ribbons for our three field walks. After Adam announces that we've voted the Goldy Gophers the Camp Champs, he starts to talk about the recipient of a "special" award, and I realize he's talking about me. My prize is a large, gold trophy and — something I cherish even more — sweet compliments about how I've "hung in there."

We split into our Follies skit groups and go off to practice — it's show time in under two hours. Bucky Jim hands me a red-and-white Bucky shirt collar that has been replaced by a new one. He's giving it to me as a souvenir. "Look," he points out, "we even signed it." Sure enough, there is Bucky's signature and a little

paw print.

5

With all that I'm feeling already, he couldn't possibly have given me anything more meaningful, and I practically fall apart right there. I blubber my thanks, and hug him so many times that I'm sure he doesn't know what to think.

What he can't know is how deeply my pride runs for my alma mater and his alma mater-tobe...how this camp has been such a surreal fantasy come true...how rejuvenating the constant laughter and supreme relaxation have been as a respite from

my grown-up world...and how I, like so many others who have come before and after me, have an inexplicable, illogical, but very real affection for Bucky Badger.

We regroup, suit up, and head toward the gym. Adam can't predict exactly when it will be Follies time during the awards ceremony, so it's a hurryup-and-wait situation. It's also really hot, and our collective stench is noticeable. Finally we get the word to put our heads on and move, move, move, move. "We're gonna 'rock da house'!" Adam shouts, as we roar past him onto the gym floor.

Our Mascot Follies consists of skits, musical soundbites, and a full-group number in which we dance in zombie unison to Michael Jackson's "Thriller." It ends fittingly, with all of us running around like nuts to the Looney Tunes theme song. After the Follies, Winona State's Wazoo the Warrior receives the Collegiate Award, and House — no surprise — wins the Leadership Award.

Now it's over. We pack up our furry gloves, our monstrous bird feet, our unwieldy heads. We clean up this smelly room that we've trashed, and do a final huddle and yell. As I leave, Adam admits that he was worried about me at first. He says, "I thought, 'Oh, man. She's never going to make it. She'll prance around a little bit, and that'll be the end of it.' " Mandie adds, "But when we saw you out there doing the character walk, we knew you were going to be okay."

The Aftershock: Back to Reality

I 's hard to go home. I've been allowed into this strange and privileged world, if only for a few days. I've been impressed beyond description about what it takes to make enormous crowds roar, and just as important, what it takes to make a shy child smile. I've been taken under the mascots' wings; they have welcomed me, accepted me.

I've also been given a precious ticket to travel back in time. At times, I've been so thoroughly twenty years old that I've had to remind myself to snap out of it my adult reality could hardly be more different than that of my counterparts, who perch on the cusp of adulthood.

When I return to work on Monday, my co-workers are curious about my trophy and what camp was like — but how can I begin to tell them? Mostly, I just say that I haven't laughed so hard or had so much fun in...well, maybe ever.

As I walk to Memorial Union for a cup of coffee a few days later, a voice behind me calls out, "Hey, it's the gorilla lady!" The fuzzy-at-first realization that I'm most likely the gorilla lady in question pierces a hole in my concentration.

It's a grinning Bucky Dave, and seeing him again reminds me of something. It struck me as odd that so many of the mascots had asked whether the camp was turning out to be a life-altering experience. At first I laughed it off, but you know, in some very special ways, I think it just may have been. **K**

Paula Wagner Apfelbach '83, WAA's communications specialist, wants to know which one of those rodents took her bottle of Febreze and didn't give it back.

THE **BIOTECH**

In the land of milk and cheese, a new industry is forming that has the potential to reshape Wisconsin's economy and deeply affect people's lives.



By Michael Penn MA'97 and Brian Mattmiller '86 Photos by Jeff Miller

f I had to sit down and write the ideal job description, it would be exactly what I am doing now," says Laura Strong PhD'00. And who could argue? At twenty-seven, she is vice president of Quintessence, a nascent company looking to stake a claim in the fast-growing business of biotechnology. Her small office is located in a building at the University Research Park known as the MGE Innovation Center, sort of an incubator for new businesses. She shares office space with about two dozen other people much like herself - young entrepreneurs who spend their days wooing venture capitalists and swapping market strategies.

Strong is one of the thousands of students and faculty at UW-Madison who have become swept up by biotechnology. The biological sciences have always been popular on campus, owing to the university's tradition as a landgrant institution and a knack for useful inventions in the field. But there has never been a point in history like now. Fueled by astounding new advancements, which have led to the capacity to clone animals and read entire genetic structures, biology — and particularly this giant known as biotechnology — is booming. It's booming in labs, with biology and medicine now accounting for about two-thirds of all the new patent applications that result from professors' research. And it's booming in classrooms. The university has been consistently ranked first in the nation in the number of doctorates awarded in science and engineering, and now a survey finds that 28 percent of all incoming students plan to major in a biology-related field.

Strong says she felt the excitement from the day she set foot on campus. "There was a feeling that, wow, these people think what they're doing is really cool, really important. You don't get that feeling everywhere," she says.

Her company was launched in summer 2000 to commercialize the work of the husband-and-wife team of Ron Raines and Laura Kiessling, two star faculty in biochemistry. Both have made some fundamental discoveries that could lead to the development of new drugs to treat cancer, arthritis, and inflammation. Quintessence's goal is to find and market those treatments.

The name of the company comes from an ancient word for the fifth element of matter, along with earth, fire, water, and air. Quintessence makes up the constituent matter of the heavenly bodies. It describes the perfect distilled essence of a substance, perhaps the proper metaphor for a company trying to bridge the ethereal gap between lab work and real-world therapy. As a student, Strong sought her own quintessence, combining her advanced research in biology and chemistry with courses in business development and financial management. She delved into the rules of intellectual property and with Kiessling wrote some of the staggeringly detailed patents coming out of Kiessling's lab. "I told Laura that I didn't want to go into industry and become a bench chemist. I'd like to be in charge," Strong says. "She said, 'Okay, go for it. Here's what you have to do.' "



For students like Strong,

biotechnology is already changing lives. It is kickstarting careers and generating daily doses of excitement. If Benjamin Braddock of *The Graduate* were on campus today, the career advice he'd get would be a single prefix: "bio," as in biochemistry, bioengineering, biostatistics, bioinformatics. And, yes, even bioplastics. There are lucrative jobs and large grants waiting for you if you can figure out how to engineer a plastic that eats itself up after it's used.

Most people, however, are just now coming to grips with biotechnology. The term itself rarely made it into public dialogue, until its twin breakthroughs the cloning of Dolly, the sheep, and the progress made in decoding the human genome. Those stories may have been mileposts, marking Mile One on a long, adventurous journey. "In my opinion, we are ushering in a new age of understanding of how life works — something that happens perhaps once every millennium," says Michael Sussman, director of the UW Biotechnology Center. Already, researchers are routinely doing things that were very recently impossible, he says. Only a few years ago, scientists were looking at a few genes at a time. Now, they can analyze thousands in an afternoon. They've gone from looking at single letters and stabbing at words, to being close to having the whole book of life laid out before them.

It's a revolution of such staggering speed that Sussman describes it this way: "Look at any of the traditional molecular biology, put it on steroids, and it's biotechnology."

At the eye of the hurricane is UW-Madison, with its nearly eight hundred biosciences faculty and an annual research investment of more than \$500 million. The university is well positioned for this revolution, being one of only a few in the nation with the full range of biology-related disciplines on a single campus. It is also one of the leaders in encouraging faculty to work together and to find ways to transfer their work into industry, resulting in one of the most robust university-industry programs in

Amid a sea of genetically altered mustard plants, research associate Yoo-Sun Noh searches for answers to riddles that have puzzled scientists for centuries. Led by Professor Richard Amasino, the research team has removed a single gene from each of the thirty thousand plants, one for each gene in the plant's genome. In the climate-controlled Biotron, they are watching the plants grow, looking for clues about each gene's role. Scientists are taking biotechnology from the plant world to animals and insects, hoping to address social and medical problems. One team, for example, is studying the genetics of a common mosquito, seen on the facing page, to understand its ability to carry and transmit malaria.

the nation — with about fourteen new companies a year being created as the result of work students and professors do in labs. As if it needed more incentive, Wisconsin Governor Tommy Thompson '63, JD'66 upped the ante in his 2000 State of the State address, when he declared biotechnology the foundation for Wisconsin's future economy. He pledged \$317 million to an ambitious plan to build new, high-tech research facilities on campus, making it clear that he expects the university to pave the path toward our biotech future.

That future intrigues scientists, who can foresee biotechnology having a dramatic impact on society, affecting our health, the way we eat, and our environment. It is possible, for example, that genetic diseases could be effectively wiped out with treatments. It is possible that new food crops will eradicate nutritional deficiencies here and abroad.

It is possible, also, that none of this will happen. Everything about biotechnology is uncertain: what it can do, and what it should do.

Before one can survey the

biotech revolution, there is the task of deciding what counts as biotechnology. And that can be a bit like deciding what constitutes art, or what gets included as an Olympic sport. On campus, the "biotech" label has been applied widely, from projects to manipulate the genetic structures of food, to human genetics experiments, to natural processes for cleaning man-made environmental



As a graduate student, Laura Strong told her faculty adviser that she didn't want "to go into industry and become a bench chemist." Now, at 27, she is helping to launch a company, Quintessence, forged from the biochemistry research she participated in on campus. Much of her time these days is spent drumming up excitement about the biotechnology work that Quintessence wants to do — and wooing investors to provide the capital to do it.

messes, to one professor's intriguing attempts to create a "living computer" by harnessing the calculating skills of DNA. Many of these projects involve much more than just pure biology they're also about physics, engineering, computer science, and a number of other disciplines. That has left some observers, including a few scientists themselves, asking, "Just what is biotechnology, anyway?"

A good place to start is in the literal, the sum of biotechnology's lexical parts. Like a lot of science terminology, the word is a combination of Greek terms: "bios," meaning life; "technikos," meaning tools; and "logos," meaning the study or essence of something. So biotechnology is the study of living tools.

That's pretty much what Karl Ereky meant when he first used the term "biotechnology" in 1919. A Hungarian engineer, Ereky foresaw an age when humans would harness life as a tool to produce materials useful to them, similar to stone in the Stone Age or iron in the Iron Age. Thus, biotechnology in the first half of the twentieth century generally meant the processes by which products were made using the aid of living organisms.

Scientists are quick to point out that this definition includes much more than just cloning and genetic engineering, the provocative examples most people know as biotechnology. It also includes bread making, a process that involves introducing yeast to act on grains, and the fermentation of grapes into wine. The use of penicillin, an antibiotic derived from a type of mold, also qualifies. So does fishing with a worm as bait.

In that sense, biotechnology is actually thousands of years old. A fourthousand-year-old Sumerian hymn, for example, contains what anthropologists believe to be the earliest recorded recipe for beer. The instructions detailed — cultivate barley for harvest, combine with other ingredients, ferment — are also among the first examples of a biotechnological experiment. The ancient Sumerians may not have known precisely how microorganisms digested the ingredients and converted them into carbon dioxide gas and alcohol, but they knew that the process resulted in a tasty drink.

The end goal of modern biotechnology is still the same: to produce outcomes that are useful to us. But things have become dramatically more complex since the days of the Sumerian kegger. In part, that's because we now understand many of the processes and activities that were hidden to past generations. And we now have the tools to control those natural phenomena.

The first steps toward our modern understanding of life were taken by an Augustinian monk named Gregor Mendel, who in the latter part of the nineteenth century sought to explain the biological diversity he saw in plant life. He wasn't really a scientist, but he began crossbreeding pea plants in his garden, experiments that led him to observe that offspring retain the physical traits of their parents, the basic rule of heredity.

At first, hardly anyone noticed Mendel's discoveries. But when they did, around the year 1900, the science of genetics grew exponentially. Soon, it was common practice for farmers to breed plants to isolate certain genetic characteristics, and seed banks were established to distribute the strains with the most promising attributes.

Some of the research going on now is essentially Mendel's work writ large. Biochemistry professor Richard Amasino, for example, has a project that involves growing varieties of the plant Arabidopsis thaliana, a type of mustard weed. Like Mendel, he is trying to figure out how different genes control the plant's growth and development. But rather than wait for nature to take its rather slow and unpredictable course, Amasino uses new technology to manipulate individual genes and observe the results. In the controlled surroundings of the university's Biotron research facility, he is growing thirty thousand Arabidopsis

plants, each with one of the plant's thirty thousand genes disabled (or "knocked out," as it is known in genetics lingo). He hopes to identify what individual genes do by observing how the plant grows when one of the genes isn't functioning.

What is different from Mendel's

day is the equipment available to help scientists take advantage of the knowledge they gain. Once the purposes of genes are identified, they can use highly sophisticated tools to isolate and transfer the genes that do certain things. They can knock out the genes that cause diseases and death in plants, or move genes that produce healthy, nutritionally beneficial food into breeds that contain other useful traits, such as the ability to grow in cold temperatures or bad soil.

As a result, the boundaries of biotechnology now extend well beyond agriculture. In the realm of human health and disease, work such as the cultivation of stem cells — which have the capability to develop into virtually any cell made by the human body, including bone marrow, neural tissue, or muscle cells — are opening the door to treating a wide range of cell-based diseases, such as Parkinson's disease and multiple sclerosis.

Researchers who study the genetic basis of aging are exploring how the onset of age-related disease might be delayed. Cancer researchers have identified a class of natural tumor suppressors that might control or stop cancer growth. And a group of scientists working on the massive task of sequencing genomes believe that they are honing in on identifying a "pathogenic genome," a collection of genes common to several food-borne organisms, such as E. coli and Salmonella, that appear to cause people to get sick. That research could lead to a new class of antibiotics that would combat those common illnesses.

There are also interesting environmental applications for biotechnology, such as a technique known as biopulping, which could clean up the production of paper. Biopulping involves using a fungus to break down the fiber of wood chips to create pulp — a process currently done with polluting chemicals.

Some of the projects that researchers are most enthusiastic about are on the boundaries of several disciplines that haven't often collaborated before. Medical researchers, for example, are now working with engineers and their equipment, such as X-ray lithography, to develop new treatments and diagnostic



Environmental solutions: A team of researchers is treating wood chips with fiber-softening fungi, which act naturally to break down the chips into the pulp that makes paper. That process could greatly reduce the need for caustic chemicals currently used by paper plants to degrade wood.

tools. This is a pattern seen across campus, as scientists break down barriers and figure out how they can contribute to each other's endeavors.

Virginia Hinshaw, dean of the Graduate School and the chief research officer for UW-Madison, says that the vast promise of such projects convinces her that people will live better lives with the aid of biotechnology. "I can think of so many ways that it's going to enhance life," she says.

Those attending the second

annual Food for Thought festival on campus during the first week of September heard a different view on biotechnology. The festival's keynote speaker was Jose Bove, a French farmer notorious in Europe for his scathing critiques of biotechnology. Bove, who is probably most famous for bulldozing a McDonald's restaurant in France (an act for which he was recently imprisoned), drew an audience of several hundred for his Madison appearance, indicating that many are still wary of biotechnology and its awesome power.

A 1999 study done by the National Science Foundation found that people have ambivalent feelings about biotechnology and genetic modification of foods, in particular. Only 42 percent of those surveyed said that the benefits of modify-

> ing the genetics of food outweigh the harm. Other polls have found that significant pockets of society are worried about the potential outcome of biotechnology, with concerns that scientists will want to clone human beings at the top of the list.

Jack Kloppenburg, a professor of rural sociology who organized the campus food conference, says that "biotechnology is a tool. Like a hammer, you can hit someone over the head with it, or you can drive a nail." Chief among his concerns and Bove's — is that biotechnology won't be used to solve global problems, but instead will give large corporations more control over the

world's food markets. He doubts, for example, the claims of biotechnology advocates that science will be used to develop more nutritive food crops, which can help feed the world's hungry. "The thing about the poor is that they have no money. [Companies] aren't going to create products for the poor," he says.

Critics and researchers alike acknowledge that ethical quandaries abound with biotechnology's new capabilities. Along with questions about who benefits from biotechnology, there are also worries about potential environmental effects that we don't yet know about. And the ability to capture and store vast amounts of genetic data raises real worries about privacy — who will be able to collect and access this very personal blueprint of ourselves? There are also other, philosophical questions. The new techniques that enable biotechnologists to move genes, for example, mean that it is possible to take genes from one species, say, a fish, and put them in an entirely different species, such as a tomato. It may be true that farmers have crossbred plants and animals for decades, but they have always until this point been bound by the natural integrity of species — laws that say you just can't mate a fish with a tomato.

Lynn Nyhart, a professor in the history of science, says that this is a critical difference with modern biotechnology. "Yes, people have always tried to manipulate nature, but we're not talking about cooking or beer brewing any more," she says of the new, cross-species manipulations. "I think that makes it qualitatively different, because that affects our sense of where the boundaries of an organism are." Indeed, Jeremy Rifkin, one of biotech's most ardent critics, argues that it represents a reductionist view, where life is no more valuable than the sum utility of its parts.

Those at the head of the biotech revolution are well aware of its ethical thorniness. In fact, it's one of the reasons that UW-Madison has put so much effort into expanding the role of ethics in recent years. Two new faculty have been added to the medical ethics department, with one of them, Robert Streiffer, looking specifically at biotechnology. A professor with appointments in both philosophy and medical ethics, Streiffer is planning two courses - one seminar and one overview course for all majors examining the ethical issues of biotechnology, and he is involved with a number of campus boards and committees.

There isn't a clear sense, though, of how public opinion will affect the course of biotechnological research. Streiffer says that it will be difficult for researchers to move ahead and secure government funding for their work without the support of the public. "You don't just need increased information and increased discussion," he says. "Presumably, in a democracy, you need increased sensitivity to the results of those discussions."

Hinshaw and others point out that some of the concerns that people have are the natural side effects of rapid change and may, over time, subside.

"I respect those fears. I don't think anybody should ever diminish the fear of change," she says. But she adds that people's anxieties can be difficult to objectively address, because they are sometimes based on emotion rather than logic. One of the concerns often cited about genetically modified food, for example, is that eating such foods will



Can biotechnologists manufacture human skin? At another company spun from university research, Stratatech, scientists are working to do just that, cultivating a line of skin cells that can be used for product testing and medical applications.

have unforeseen effects on human health. To symbolize the belief that science is tampering with forces that they don't understand, critics call such foods "Frankenfood," suggesting that research has created an uncontrollable monster.

The real basis for such fears is unclear. Most scientists are confident that eating a tomato with fish genes won't adversely affect human health; in fact, they're quick to point out that people already intermingle DNA from different species when they chew and digest meals that mix plants and animals.

The current uncertainty reminds Hinshaw, whose own research involves studying viruses and vaccinations, of an editorial cartoon from 1802, following the discovery of the smallpox vaccine, which was derived from a cow virus. The cartoon portrayed people who received the vaccine in various stages of turning into cows, growing horns and tails. Imagine what would have happened had we given up then, she suggests. Smallpox, which took millions of lives before the vaccine, would have remained unchecked. "That would have been devastating to human health," she says.

We humans are pretty used

to having our worlds shaken. Science has repeatedly flung wrenches into our best-laid plans to interpret the universe around us — from when Copernicus said

that the Earth revolves around the sun and not vice versa, to when Renaissance explorers set out for the ends of the Earth and didn't fall off, to when Darwin said that humans and apes had common ancestors. These moments all challenged societies to bend their beliefs and perceptions to accommodate new knowledge.

Historian Nyhart suggests that biotechnology may be a new chapter in this story of intellectual adaptation. Those past episodes show that the transitions are often not easy. In the time of Darwin, for example, Nyhart says that "evolutionary theory shook humans'

perception of themselves, their virtue, and their capacity for a moral life." Eventually, though, most people got used to the idea — and it became accepted, even moving into the vanguard by the 1910s and '20s. By then, universities were teaching courses in "eugenics" (a term later seized on by Nazi scientists, who manipulated the science to the point of disgrace), and society had grown quite accustomed to the idea of better living through good breeding.

A similar pattern emerged after Louis Pasteur popularized the germ theory of disease in the late nineteenth century, Nyhart says. Once people understood and accepted the theory, they began



Team approach: Professor Nicole Perna, at right, working with postdoctoral student Jeremy Glasner in her lab, is one of the diverse group of scientists hired under a unique university program that brings researchers of different backgrounds together to work on new problems. Perna is an expert in comparative genomics, a field that involves studying the genomes of different organisms side by side to find their similarities and differences. A graph illustrating the genetic structure of *E. coli*, one of the lab's first targets, rests on her desk.

looking to germs to explain all of life's maladies. "A lot of people worked on looking for the germ for X, just like today a lot of people look for the gene for Y," she says. "That's the mental framework that structures a lot of research."

It isn't unusual, says Nyhart, for one discovery to have a ripple effect in the rest of science, and that is basically the case in biology, which over the past several decades has gradually displaced physics as the dominant science. The 1953 discovery by Francis Crick and James Watson of the double-helix structure of DNA signaled that biology would be where most of the truly interesting revelations would occur in the future. Money and talented scientists, Nyhart says, followed the buzz to biology.

After Watson and Crick unmasked DNA, molecular biologists soon began conceiving of ways that they could manipulate those strands of genetic material — an idea that became known as genetic engineering. One of them was Joshua Lederburg, a UW professor and Nobel laureate, who thought genetic engineering had dramatic applications for treating diseases and improving the health and nutritional value of food crops. Sound familiar? It should — those practical and commercial motives were instrumental in moving the biological revolution forward, from academic research to social phenomenon.

In 1972, scientists figured out how to splice together genes from different species, in a process known as recombinant DNA technology. By 1982, nearly 1,600 projects involving recombinant DNA were receiving federal grants worth \$185 million. Private investment, on the belief that the technology could be used to make new pharmaceuticals and other profitable products, was also significant, with \$111 million going in 1982 to new ventures in genetic engineering.

With an opportunity at hand to foster economic growth and protect U.S. intellectual property, Congress and the Reagan administration during the early 1980s made it easier for university researchers to work with businesses, loosening regulations on research and passing new laws to encourage collaboration with private investors. Since that time, researchers have had financial incentives to find practical applications for their work — a culture change that has helped hatch from UW-Madison research a spate of new companies such as Quintessence. The new attitude is symbolized by the coffee mugs given to all employees at the Wisconsin Alumni Research Foundation, the nation's oldest university-affiliated intellectual-property group, which helps professors secure patents on their inventions. The mugs are emblazoned with a Thomas Edison quote: "The value of an idea is in the using of it."

Hinshaw says that "it's a real kick for an investigator to see his or her idea come to fruition in some new product or process." The university has taken an active role in transferring its intellectual property for three basic reasons, she says. Protecting the university's intellectual property rights and realizing some income from its inventions are two important motivations, but the overriding rationale, she says, is to have a beneficial impact on society, by creating jobs and useful products. "University research is the economic engine that drives the nation," she says. "We realize that a part of our social responsibility is to make that happen."

A recent study of university-industry relations found that 178 existing companies trace their roots to faculty research, with more than 6,700 employees and 1999 gross revenues of \$1.01 billion. More than two of every three of these businesses do biotech-related work.

Across the street from Quintessence is one of the brightest success stories. Third Wave Technologies began in 1992 with just one employee and a promising innovation in medical diagnostics. The company develops tests that work like credit-card readers in verifying the presence of genes responsible for disease. Today the company employs 250 people and is poised to go public.

The next Third Wave might be NimbleGen, which is making "DNA chips" that allow scientists to analyze thousands of genes at one time, or Stratatech, a company based on a line of human skin cells cultivated in university labs. The cells mimic the behavior of real human skin, which makes them marketable to companies that want to

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test products for toxicity to skin (much of which is currently done on animals).

A few of these fledgling biotech companies, predicts Sussman, will wind up being the DuPonts and Monsantos of the next generation. If it's Quintessence or NimbleGen or one of the others with Wisconsin ties, the state could stand to make millions and join San Francisco or Boston as the Silicon Valley of the biotech age.

The grand claims being made

about so-called complete sequence of the human genome are a little too grand, says David Schwartz. In truth, genomics professors really are able to navigate only about half of the genome, because those regions have distinct markers that help scientists figure out how everything fits together. The rest, says Schwartz, a professor of genetics and chemistry, is kind of like Kansas — a featureless terrain without much to point the way. But a few scientists are so confident of their progress that they have classified the rest of this genetic material as "junk DNA," implying it's worthless.

Schwartz imagines that it's not, illustrating that the progress in biotechnology is often slower than it appears.

A few genetically modified foods have made their way into the market without tremendous success (including some strains of enhanced corn found in taco shells that weren't supposed to contain any genetically modified food, which has caused a flare-up over the future of biotech-engineered foods in the marketplace). Dolly, the grand spokesmammal for cloning, is a comfortable four-yearold sheep now, but American farms are probably still a few years away from using cloned livestock for any commercial purpose. Biotech may be the world's fastest scientific revolution, but in this case, even fast is slow.

So what corners of our lives will biotechnology come to inhabit? Will it be like the computer revolution, where certain parts of society are completely reorganized and remade because of these remarkable new tools? Or will the results be more ... ordinary? "When people first came up with lasers, no one said the primary use in American society was going to be at the grocery checkout counter," says Deborah Blum '82, a professor of journalism.

Blum, who won a Pulitzer Prize covering science research, says that people should keep a close and skeptical watch on biotechnology research, because many of the promises won't ever pan out. "We always think we understand nature better than we do," she says, pointing out that history is full of mistakes that prove otherwise. "That to me is the big unknown about biotechnology. Are we really, this time, smarter than nature itself?"

More work by scientists and science reporters to explain how and why biotechnology works would help, she says. But it's also incumbent upon people to overcome their natural resistance to what they perceive as egghead material. "The biggest barrier to consumer understanding of science is that people are afraid of it," Blum says. "But quite often, if they just apply basic common sense, they can navigate a lot of this stuff on their own."

Hinshaw agrees that the university community can be doing more to help people grapple with the issues. "It is our job to communicate what we do in an interesting, clear manner. It's not other people's jobs to work hard enough to understand us," she says. "And I think we're paying the price for twenty or thirty years ago, when that wasn't considered as much of our responsibility."

She says that some researchers are working hard to move in the right direction. The Biotechnology Center hosts frequent seminars for the public, including a recent one to help grandparents get their grandchildren interested in science. The UW's cybercampus also provides some good sources of information, including the Biotechnology Center's site (www.biotech.wisc.edu) and The Why Files (www.news.wisc.edu/whyfiles/), a well-regarded, science-in-the-news site for students and teachers, sponsored by the Graduate School.

But there is a role for public universities that goes beyond providing information. Both people within the research community and on the interested edges agree that UW-Madison must be open and receptive to public comment on its role in the biotechnology revolution, or else risk its credibility as a public university. "Unbridled optimism is not going to be all that helpful," says Streiffer. "People are suspicious. They want an honest discussion of risk, and they want issues that are not normally considered scientifically valid to be on the table."

Kloppenburg adds that any debate about the merits of biotechnology should include a real exploration of alternative technologies and even non-technological ways of solving the same problems. "How we use things is a social question. Technology is a social creation, and economies are social creations. They work by our rules. We decide how to use them," he says.

Sussman says those are legitimate questions, and ones that scientists are also anxious to deal with. They're treading into great uncertainty, he says, where it takes some courage and risk tolerance to take the next step forward.

After countless interviews on the subject, Sussman has become quite adept with metaphors for biotechnology. To illustrate his point about the double-edged nature of uncertainty, he wonders what it must have been like to be one of the pioneers in electricity. Quite suddenly, he says, houses were wired with a force that was both tremendously exciting and potentially lethal. Plug an incandescent bulb into this new outlet, and a world of darkness turned to light. Plug your thumb into it, and your world ended. It's a frighteningly effective image.

Michael Penn MA'97 and Brian Mattmiller '86, who write about UW-Madison, and Jeff Miller, who photographs campus people and programs, are members of the University Communications staff.