

Insights

Research Results
and Noteworthy Creations



Definite Destinations

As they say, it's all about being in the right place at the right time. The same holds for the molecular particles that make up our bodies. A team of University of Iowa researchers has discovered the mechanism that explains how components of our cells arrive where they're supposed to be, when they're supposed to be there.

Scientists have known about the compartments and structures inside our cells called organelles that perform varied and vital functions, including energy production, storage, and transportation of important substances and removal of waste products. Normal cellular function requires that organelles be positioned in specific locations in a cell. Thus, movement of the organelles to their appropriate destinations is critical, according to Lois Weisman, associate professor of biochemistry.

In research findings that appear in the Feb. 16 *Nature Advance Online Publication*, Weisman explains that understanding how organelles get to their assigned cellular locations will improve understanding of embryonic development and may have implications for understanding many diseases, including cancer and diabetes. Weisman and her colleagues identified a protein (called Vac17p) involved in a transport system that acts like a cable car, with motor molecules transporting organelles through the cell along cable-like structures. The protein discovered by the UI team specifically couples vacuoles to a motor molecule. Their study also suggests that when the vacuole arrives at its correct destination, the coupling protein is degraded, causing the vacuole to be dropped off in the right location.



No Place Like Home

Wearing blue jeans meant I was a local. The gray in my hair meant I'd been away. Word of my impending return spread throughout the county. Some stories would have me moving in with my folks because one of them was very sick. Another had me purchasing my old grade school and converting it into an art colony. I was living in a houseboat on Cave Run Lake. I had AIDS and came home to die. My wife left me and I was back to hunt another. One story said it wasn't Chris Offutt but his younger brother who was investing in the new mall. When the truth finally outed, everyone knew I had bought that old Jackson place, which meant I must be doing pretty well for myself because they were asking a pretty penny for it. On top of that, somebody else said I was teaching at the college, but no one believed the college would ever allow that.

And so Chris Offutt invites the reader into the Kentucky hollows of his youth, where, at 40, the author has gone back for a teaching stint at his alma mater, Morehead State University.

In *No Heroes: A Memoir of Coming Home*, the Iowa visiting professor of creative writing reiterates what Thomas Wolfe found out about not going home again. He also writes about just how difficult it is to let go of the idea that you can.

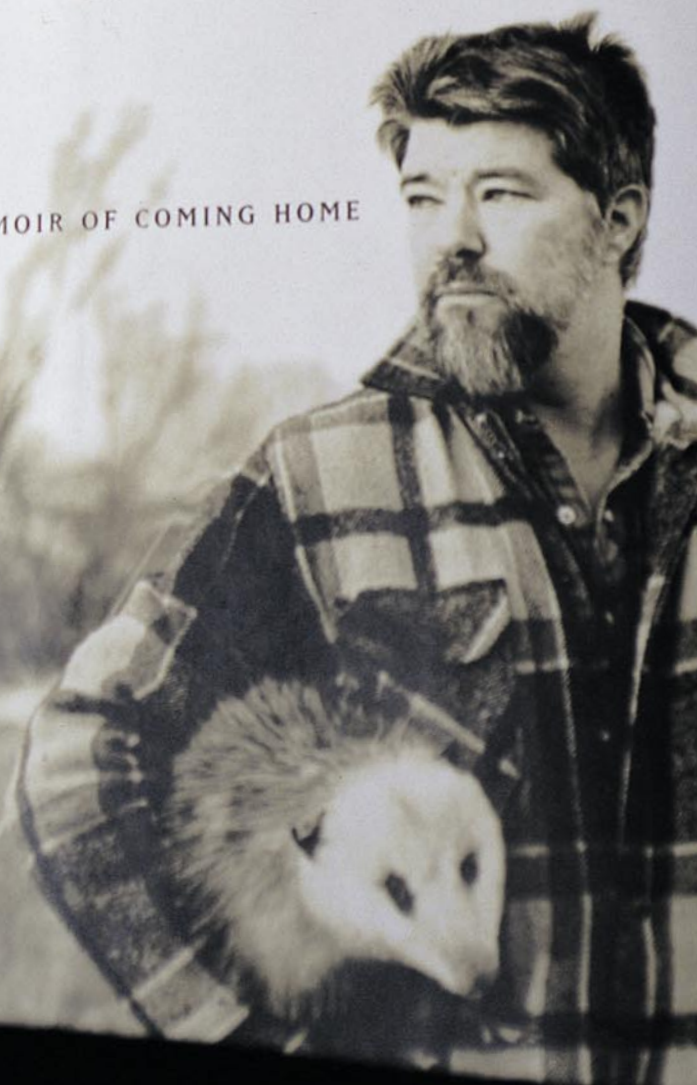
Interwoven into Offutt's personal story is the tale of his in-laws, two Holocaust survivors. Offutt's father-in-law tells him about the prewar Poland he grew up in and how he came to accept that this Poland no longer existed. Through the juxtaposition of this man's story with his own, Offutt glimpses the truth.

"Home is a feeling, nothing more," he writes. "Home is illusory, like love, then it disappears. Once you leave, you become a stranger."

CHRIS OFFUTT

NO HEROES

A MEMOIR OF COMING HOME



Mighty Mouse Muscles

If doctors one day find a way to beat muscular dystrophy, they may owe their breakthrough at least in part to the work of mice on the campus of The University of Iowa.

When Kevin Campbell, professor of neurology and the Roy J. Carver Chair of Physiology and Biophysics, and his team removed a protein called dystroglycan from the muscle tissue of their lab mice, the mice developed muscular dystrophy. But the mice also appeared to be protected from the muscle-wasting consequences of the disease. The investigators discovered that satellite cells—cells acting like stem cells in the muscle—were producing dystroglycan and repairing muscle damage caused by the disease. What's more, the power of these cells to regenerate muscles did not diminish as the mice grew older. That finding challenges the conventional wisdom that ongoing muscle destruction in muscular dystrophy exhausts the satellite-cell pool.

"To our surprise, the mice regenerated muscle very well," says Campbell, who believes the findings could help scientists hone in on a therapeutic target for muscular dystrophy and other diseases of the muscle. "In fact, the mice developed muscle hypertrophy—their muscles actually were bigger than in normal mice."

Too Much, Too Soon

Women who suffer heart attacks need to go easier on the housework, according to a University of Iowa investigator.

That may seem obvious. But, in two studies, Jerry Suls, professor of psychology, found a big difference between men and women who were recovering from a heart attack. After their return home from the hospital, women tend to overexert themselves more than do men. The reason: the kind of household chores that typically fall to women, like cleaning and laundry.

Dividing the housework along gender lines might be not only sexist, but, in this situation at least, also dangerous. Suls found that women who had been sent home from the hospital after a heart attack took on chores like cleaning and cooking and laundry, but that men recovering from a heart attack went to work on things like repairs and the yard. Women and men expend about the same amount of energy on these different tasks. But tasks like washing dishes and folding laundry (what the study shows to be work done primarily by women) take continuous and disproportionate work by the muscles of the arm. This type of isometric activity poses a risk of complications in the initial weeks of recovery.



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Study Offers Hope in Fight Against Cancer

An experimental vaccine appears to inhibit a virus linked to cervical cancer. A recent study found that the vaccine appears to prevent infection from a form of human papillomavirus (HPV), called HPV-16. The virus tends to reside in the genital tract, where, besides causing a lesion, it can be transmitted to sexual partners. It is linked each year to more than half of the approximately 500,000 cases of cervical cancer reported worldwide.

“A successful vaccine could save thousands of lives,” says Kevin Ault, assistant professor of obstetrics and gynecology, co-author of the study, and principal investigator at the Iowa site, where 250 women participated through the University’s Family Planning Clinic. The national investigation involved nearly 2,400 female participants ages 16 to 23 at 16 centers across the country.

Participants in the study received either a placebo or the vaccine. Among the women receiving the placebo, there were 41 cases of infection from HPV-16, a virus that affects approximately 20 percent of the adult population. In the study, there was no infection among women receiving the vaccine. The researchers plan to track the health of participants for two more years and develop a vaccine that targets other types of HPV.



Bad News Bearers

Telling someone that he or she has cancer or that a loved one has died can be a daunting and stressful task for even the best physician. But teaching medical students how to deliver bad news could make a difference.

“Until recently, most practicing physicians did not have training in delivering bad news,” says Marcy E. Rosenbaum, assistant professor of family medicine.

Rosenbaum has been studying how best to provide this training. In a recent project, she assigned third-year medical students to small groups and had them practice presenting bad news in five different scenarios to volunteers trained to act in hospital scenarios. The scenarios included having to tell a patient that he or she has cancer, that the patient has contracted a sexually transmitted disease, that a loved one has died, and that cancer has returned to a young patient. Students also practiced discussing hospice care with a patient’s family member. Surveys administered to 341 students (before, four weeks after, and one year after Rosenbaum’s training class) indicated that the training had made the students more comfortable about delivering bad news.



Weathering the Storm

What if we knew with absolute certainty that two inches of rain would fall on our house, starting at exactly 12:15 p.m. on Tuesday? Or what if a warning could go out weeks in advance of a life-threatening flood destined for a village in France?

“If you just want to know what to wear to work in the morning, NEXRAD on the television weather news can tell you what you need to know,” says Witold Krajewski, the Joseph and Rose Summers Professor of Water Resources Engineering.

But it might not tell weather scientists like Krajewski what they need to know to develop better flood-prediction models. That’s because radar images can be fooled by raindrop size and distribution. Small drops have weaker radar reflectivity than do large drops. So, on a rainy day, radar might pick up two different storm systems and represent one as weak and one as strong, because of differences in what their raindrops look like—even though in reality the storms may both drench their areas with the same amount of rain. Satellite data can be sketchier still. Whereas NEXRAD provides data every six minutes, weather satellites often pass overhead only once or twice a day.

Krajewski has made it his life’s work to study rain. He has spent the last two decades keeping data on when and where it falls, and what it looks like when it does fall. He uses his data in comparison with the data generated by existing weather prediction technology. The goal is to make real-time severe weather forecasts more timely and reliable.

Admission: Impossible?

As the U.S. Supreme Court was preparing to hear challenges to the University of Michigan affirmative action admission policies, an Iowa professor lent support to a finding that at least one suggested alternative to affirmative action does not work as a substitute.

Kevin Leicht, professor of sociology, recently evaluated a Texas plan that guarantees college admission to all high school students who graduated in the top 10 percent of their class. Texas implemented its 10 Percent Plan after a federal court ruled in the 1996 *Hopwood v. Texas* case that race could not be used as a factor in college admissions.

Leicht joined Princeton University sociology professor Marta Tienda in analyzing application, admission, and enrollment data from 1990 to 2000 for the University of Texas at Austin and Texas A&M University. Those schools were the only public Texas universities that practiced affirmative action prior to the 1996 *Hopwood* decision.

Leicht and Tienda collaborated on a report called “Closing the Gap? Texas College Enrollments Before and After Affirmative Action.” Their findings show that rates of admission and enrollment for minority applicants at the Texas flagship institutions declined significantly after the ban on affirmative action. They also show that students in the top 10 percent of their classes were nearly certain to be admitted to the flagship institutions even before the *Hopwood* decision.

“Clearly, the 10 Percent Plan is not a substitute for affirmative action,” Leicht says. “If the goal is to maintain and increase racial and ethnic diversity, it is clear that this is not an effective alternative.”



What's on Your Plate? American Cuisine and Culture

The people in the American studies department do a lot of thinking about the American way of life. And, as with many citizens, food seems to be on their mind a good deal of the time—often enough, at least, to produce a cookbook that offers a bunch of recipes as well as insights into the history and traditions of food in this country and around the world.

Where did Jell-O come from? Why do some oats cook in one minute while others take 20? When did popcorn start appearing in movie theaters? And just who is Betty Crocker? Answers to these and other food mysteries are disclosed inside *The American Studies Cookbook*, a

project to help raise funds for American studies programs.

Published last winter by the department, the book has its genesis in a seminar about food and American culture. The book features recipes and insights about American cuisine from the seminar's graduate students and from faculty, staff, and friends of the department. It also shares recipes from the Chef Louis Szathmáry Collection of Culinary Arts, held in the Special Collections department of University Libraries. The Szathmáry collection is considered one of the most important culinary collections in the world.

"In the best tradition of American studies, *The American Studies Cookbook* highlights the range and diversity of American life in the past and present—in this case cooking and food—and celebrates a rich mix of community, individual, and industrial histories of the roles that food has played in American culture," says Lauren Rabinovitz, American studies department chair and the book's coeditor with department staff member Laura Kastens. "It is in the mix of recipes and interesting facts that these themes are conveyed about the important roles that food and cooking have played in American life."



A Sound Solution to a Stinky Problem

For more than two years, David Soll, professor of biological sciences, has been finding especially noisome deliveries left on the doorstep of his campus laboratory—hog manure. But it's no practical joke—and it may lead to some practical answers for farmers and other midwesterners who have been putting up a stink about hog lots.

The biologist, in his own way, has been sounding off about the problem of large pork production facilities. Soll is developing a device that transmits ultrahigh-frequency sound waves that control the emission of hog lot gases, with the added benefit of eliminating or reducing odors. In lab tests on small amounts of frozen manure,

Soll first found that ultrasound increased the solubility of the sludge, slowed production of ammonia and other potentially harmful gases, and hastened the oxidation process. Soll then completed a successful large-scale test at a 1,300-head confinement barn south of the small town of Alden, in the heart of hog country in central Iowa.

Long a leading pork producer, Iowa farmland has seen a reduction in the number of small-business hog farmers and a corresponding increase in the number of large-scale pork lots over the past several years. Decomposing animal wastes in pits and lagoons at the large swine processing facilities release noxious gases that have

raised a mighty stink for zoning commissioners and neighboring communities. While no answer to the problem of the vanishing family farm, Soll's invention could mollify some the controversy the hog lots have created. Soll hopes to market the odor-fighting technology to farmers.

Using acoustic waves in agricultural research is nothing new, Soll notes. For years, scientists have been experimenting with high-frequency sound to induce and hasten biological and chemical changes at the molecular level. Soll began working with ultrasound to infuse pesticides into seeds to eliminate the need to spray crops with chemicals after planting.

Fuel Hardy

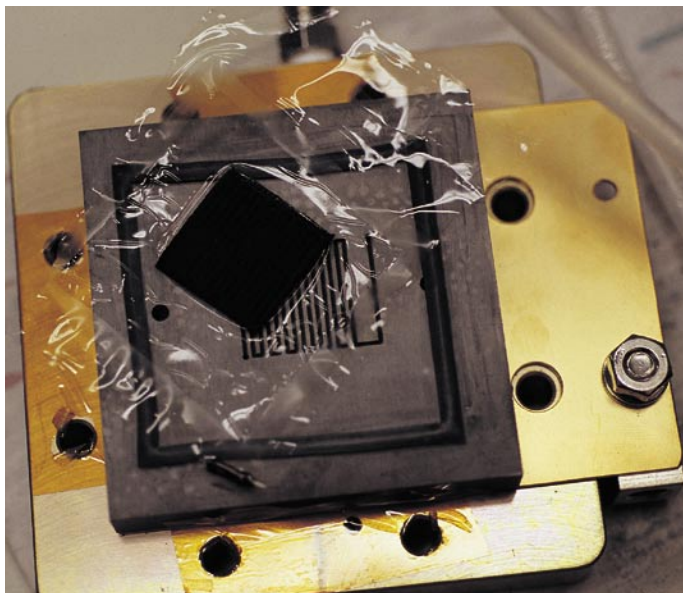
Someday, millions of homes around the world might get their electricity from paper-thin batteries that create no pollution and require no power lines.

Fuel cells, the electrochemical generators now used in spacecraft, could revolutionize the way homeowners get their power, say exponents like Drew Dunwoody and Wayne Gellett, two University of Iowa students who were among 16 finalists in a competition sponsored by New York City's National Inventors Hall of Fame. Students in Iowa's doctoral program in analytical chemistry, Dunwoody and Gellett won the distinction for their work on an improved hydrogen fuel cell (shown below) that could make the technology a more commercially viable form of generating power.

Fuel cells have been around since 1839. In the 1950s and 1960s, scientists turned to the technology to provide a primary electrical power source for spacecraft. In the decades since, inventors like Dunwoody and Gellett have been looking for ways to make the cells efficient and practical enough for widespread public use.

"Fuel cells represent a technology that is well proven and has environmental benefits," says Johna Leddy, associate professor of chemistry and collaborator on the Dunwoody-Gellett project.

One major obstacle precludes their widespread residential use: high manufacturing costs. Current fuel cell power systems cost about seven times as much as traditional batteries or combustion engines. However, the modifications that Leddy, Dunwoody, and Gellett dreamed up could cut their price in half. The Iowa-made fuel cell's difference is that it has been magnetically modified. The use of magnetic particles gives the cell enough power to operate in practical applications, like cars and Walkman disc players—about two to three times the power of most other fuel cells.



Cold War

Their ability to spread from person to person makes viral infections, even those as benign as the common cold, a large public health problem.

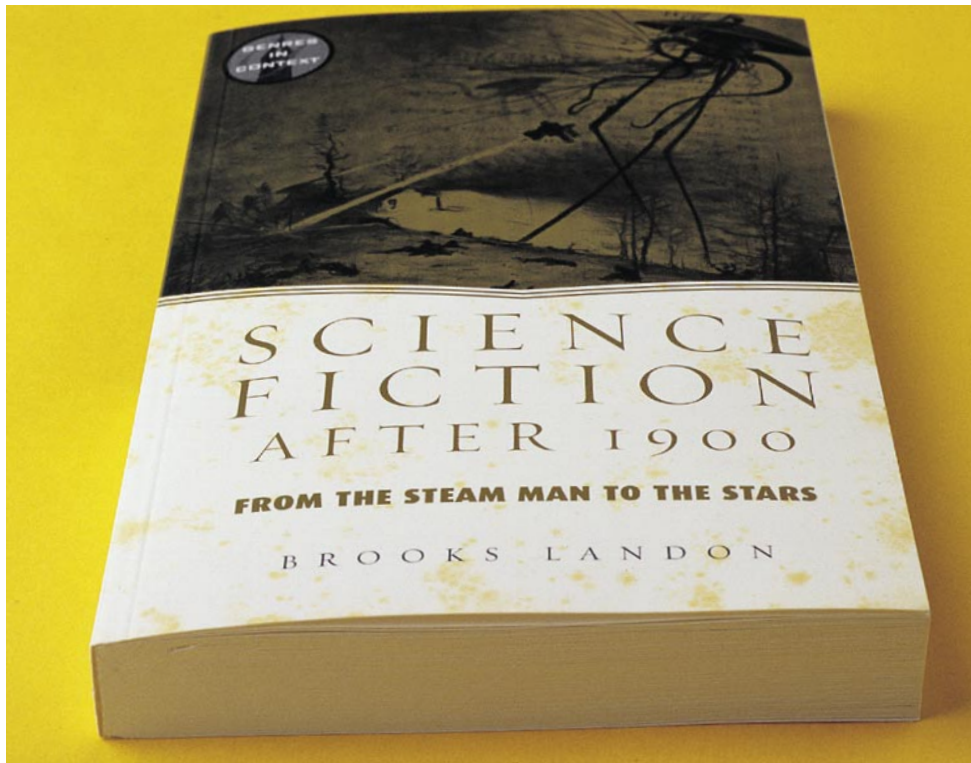
Robert Walters, a student in The University of Iowa's Medical Scientist Training Program, is the lead author of a study whose findings could help prevent the spread of infection among people in close quarters, such as office buildings, military barracks, and grade schools.

Scientists have understood that protective cells, known as epithelia, line the skin and airways. The epithelia cells protect people from the environment and airborne diseases. The virus that causes colds and pneumonia, called adenovirus, attacks epithelial cells in order to infect the respiratory tract. Walters and his colleagues have discovered that the adenovirus unzips the CAR molecules that connect the protective epithelial cells together. The result is gaps between the cells, and these gaps end up serving as an escape route for the germs to spread to other people. When the molecules become unzipped, the body is left vulnerable to infection.

The investigators also identified a fiber produced by the virus that could be responsible for the spread of the virus. When the fiber binds to the CAR protein, CAR does not form a barrier to the outside.

"So, when you cough or sneeze, that virus gets out into the environment and on to the next person," Walters says.

When that fiber is blocked, the virus fails to leave the body to spread to other people, according to Walters, who notes that the finding could lead to medicines that prevent the spread of the virus.



Following the Science Fiction Method

It might seem like an undertaking of Herculean scope. Or, maybe more appropriately, it might seem like the kind of intellectual task fit for a supercomputer of the future like Hal in Arthur C. Clarke's *2001: A Space Odyssey*. But, for an Iowa English professor, a scholarly study of 100 years of science fiction writing in the United States, England, Eastern Europe, and the former Soviet Union was a labor of love.

It helps to be a fan, of course. Brooks Landon, professor and chair of the English department, has amassed a significant body of research and writing on science fiction, science fiction movies, and 20th-century American fiction. But his latest effort in this line of inquiry, *Science Fiction After 1900: From the Steam Man to the Stars* (Routledge), abounds with the kind of thoroughness that could come only from an enthusiast devoted to the cause.

Landon celebrates the glory of the cause in lucid prose. Writing for students, teachers, or scholars interested in exploring science fiction, he describes the fascinating historical and cultural markers that dot the course of this genre over the last century. Landon traces the genre's evolution from dime-store paperbacks through its golden age of the 1950s and 1960s and into the

cyberpunk era of the 1980s and beyond. He looks at a galaxy of writers surprising for the names that shine out, like E. M. Forster, Alexei Tolstoy, Vladimir Nabokov, and Mark Twain, and satisfying for the names that every fan admires, like Philip K. Dick, Ursula K. Le Guin, Ray Bradbury, and Kurt Vonnegut. He also looks at the large body of criticism that has grown up around the genre and includes a bibliographic essay and a list of recommended titles.

In his acknowledgments, Landon foreshadows the fan's excitement that fills the book: "[M]ost important have been the hundreds of times from junior high through the army to the present when I've discovered that someone I was with also read SF and we started to share our favorite authors and reads. 'What if' may be the operating heuristic for science fiction, but 'Have you read the one where...?' is surely its most rewarding refrain."

Even if you're not a fan, Landon will make you wish you'd hung on to your Tom Swift novels or have you scouring vintage stores for tattered copies of *Amazing Stories* and *Galaxy* pulp digests. At the very least, you'll have a deeper appreciation for the history behind the scenes of the next *Star Trek* sequel that comes to town.

A New Spin on Spinoza Throws Light on Feelings

Neuroscientists study the brain. They analyze sensory processes, investigate how thoughts are put together, and research how humans learn and memorize. Largely ignored by such scientists, however, have been feelings.

Until *Looking for Spinoza: Joy, Sorrow, and the Feeling Brain*.

In this book published in February by Harcourt, Inc., University of Iowa neurology professor Antonio Damasio delves into the mysterious realm of feelings. He attempts to map the biology of feelings: what are they and what do they provide? He argues that feelings are to be distinguished from emotions.

Emotions, Damasio writes, are un-

learned reactions to changes in one's environment. They have a biological basis; experiencing pain or pleasure is conducive to survival. For example, one may run away in fear when confronted by a bear.

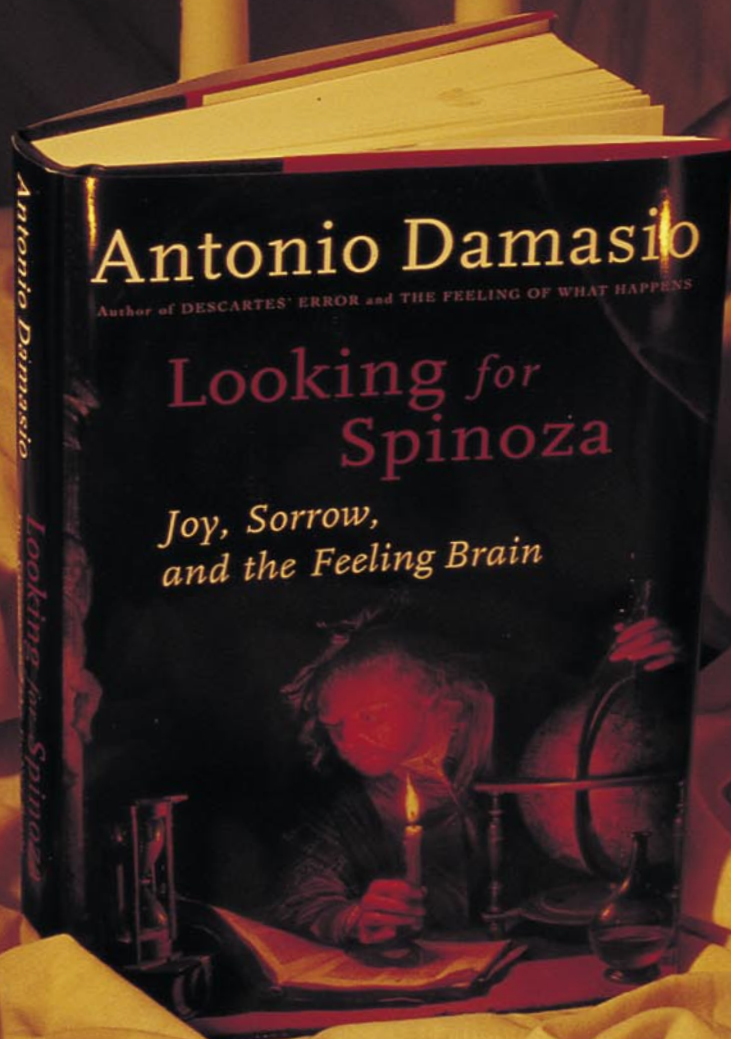
Feelings, on the other hand, are the brain's way of mapping emotions—a kind of control panel for how the body is operating, according to Damasio.

"Certain pathways in the brain are engaged when one is in fear," he said during a discussion of the book on the University's WSUI radio station. "A feeling is a signal of what has been changed during the process of emotion."

Recent developments in the field

of neuroscience, some of which originated in Damasio's laboratory, inspired Damasio to write the book—the third in a trilogy that includes *Descartes' Error* and *The Feeling of What Happens*. Understanding emotion and feelings, he says, may prove extremely helpful in treating not only brain damage but also pain and depression. It also might prove helpful in dealing with social conflicts.

The name of his book comes from Damasio's inquiry into the work of Benedict de Spinoza, a 17th-century Dutch philosopher who proposed that feelings, namely joy and sorrow, are central to humanity.



Insights

Medical Mesmerism

A voice can be said to hypnotize listeners, freeway miles mesmerize drivers, and a swinging pendulum make shy men stand up and strut and crow. But could doctors charm patients into forsaking the pain-numbing drugs of anesthesia?

Hypnosis under the knife was a reality for 48 elective-surgery patients in a study at Aachen University in Germany, where Sebastian Schulz-Stübner, a University of Iowa assistant professor of anesthesia, found that the power of suggestion might be a safe and reliable alternative for drug-induced sedation.

“The word hypnosis carries negative connotations,” Schulz-Stübner says. “Many people wrongly think it means giving up control to someone else. But, as we practice it in clinical hypnosis, at least, the patient must do most of the work.”

Schulz-Stübner’s technique takes advantage of a hypnotist’s stock-in-trade: the moving object (the doctor waves a pen or a finger in front of the patient’s face). But the technique also takes some work from the patient, who must dream up an image peaceful or pleasant enough to focus on for the duration of the surgery. For patients not ready to give up the knockout drops, hypnosis won’t work; you have to be willing, the doctor says. And the method is not practical for emergency cases. The surgery also must be relatively minor and short, not more than an hour long—the necessary trance usually doesn’t last much longer than that.



Scoliosis Diagnosis

A half-century of research by two generations of Iowa researchers shows that an untreated curvature of the spine does not negatively impact a person’s health.

The findings challenge the common misconception that late-onset idiopathic scoliosis, the condition that causes an S-like curvature of the spine, inevitably leads to severe disability.

“There’s been considerable misinformation that patients with late-onset scoliosis will be crippled and won’t be able to have kids or get married, and this study shows that this is not the case,” says Stuart Weinstein, the Ignacio V. Ponseti Professor of Orthopaedic Surgery and principal author of the study.

The University of Iowa study tracked 117 patients who were diagnosed with scoliosis between 1932 and 1948 by world-famous doctor Arthur Steindler. Most of the patients are doing well and are living completely normal lives, according to Weinstein, who conducted follow-up studies of the patients in 1978 and 1992.

Late-onset idiopathic scoliosis, thought to be genetic, affects two to three percent of children between ages 8 and 16—about 60,000. Some curves increase in severity over time, but those that are less than 30 degrees usually remain under 30 degrees, Weinstein says.

More than half of all states mandate scoliosis screening by law. Weinstein worries that increased efforts to screen children, coupled with ignorance of the long-term outcomes of this type of scoliosis, could lead to unnecessary tests and anxiety for children and parents faced with the grim prognosis often associated with late-onset scoliosis. He and his colleagues hope that their findings will provide physicians with information about the disorder so they are better educated about the likely outcomes and process of the condition.

Weinstein inherited the study from 88-year-old Ignacio Ponseti, an orthopaedic surgeon famous for research that debunked another myth—the need for surgery for patients who have clubfoot.