

2002 ANNUAL REPORT

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From the Vice Provost for Research



Robert C. Richardson

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Were these ordinary times, we would be looking forward to a future with unbridled optimism. These are not ordinary times. There are deeply troubling circumstances in the world around us. We are in a war in Iraq. The United States and New York State economies are very fragile. Furthermore, the consequences of the attacks on the United States on September 11, 2001, are likely to force profound changes in how universities proceed with research and teaching.

The impact of the war in Iraq and the weak state and national economies means less money for research. Federal, state, and private funding have already shown signs of decrease. Some of our ambitions for future development must be curtailed, at least in the short term. We face several difficult years.

After the destruction of the World Trade Center and a portion of the Pentagon on September 11, 2001, our government is anxious to protect the country from terrorist threats. A series of laws has been passed to prevent potential terrorists or terrorist organizations from using the teaching and research capabilities of American universities. The laws (or their implementations) deny access to certain classes of research materials—called select agents—to people from eight terrorist-sponsoring countries. Background investigations are to be made on all individuals with access to select agents. A second set of regulations would impose a new classification, "sensitive but unclassified," on the results of some research. Publication of "sensitive" material will be restricted.

Cornell is an open university. We have long-standing principles related to access to Cornell research. No publication restrictions, other than voluntary ones by faculty, can be accepted. The results of all Cornell research are available to all in the community. The new regulations are in direct conflict with Cornell principles.

In the coming year we face two challenges. The first is how to sustain the important research infrastructure we have built. The second is how to retain our institutional values of access and openness. Both challenges require help from the entire Cornell community.

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06 Measuring hotel safety

Cathy A. Enz, Hotel Administration

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17 Calling for energy conservation

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21 Pulling apart chromatin fiber for observation

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22 Linking nature with children's attention capabilities

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23 Creating a flexible ceramic material

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24 Engineering rice to tolerate environmental stresses

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American Psychological Association, Distinguished Scientific Award for the Applications of Psychology

Stephen J. Ceci, Human Development

The Christopher Columbus Fellowship Foundation, Frank Annunzio Award

Ray J. Wu, Molecular Biology and Genetics

Presidential Early Career Award for Science and Engineering

Raffaello D'Andrea, Mechanical and Aerospace Engineering

National Science Foundation Faculty Early Career Development Program

Paul J. Chirik, Chemistry and Chemical Biology
 Brian Crane, Chemistry and Chemical Biology
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 John A. Marohn, Chemistry and Chemical Biology
 Andrew C. Myers, Computer Science
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New York State Office of Science, Technology and Academic Research, James D. Watson Investigator Program

D. Tyler McQuade, Chemistry and Chemical Biology

American Physical Society / American Institute of Physics, Dannie Heineman Prize for Mathematical Physics

James W. York, Physics

American Academy of Arts and Letters, Goddard Lieberson Fellowship

Steven E. Stucky, Music

Sloan Foundation Research Fellowships

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 Andrew C. Myers, Computer Science

Fulbright Scholar Program

Michael C. Kelley, Electrical and Computer Engineering

John D. and Catherine T. MacArthur Foundation Fellow

Paul H. Ginsparg, Physics

Agilent Technologies Europhysics Prize

Paul L. McEuen, Physics

American Geological Institute, Ian Campbell Medal

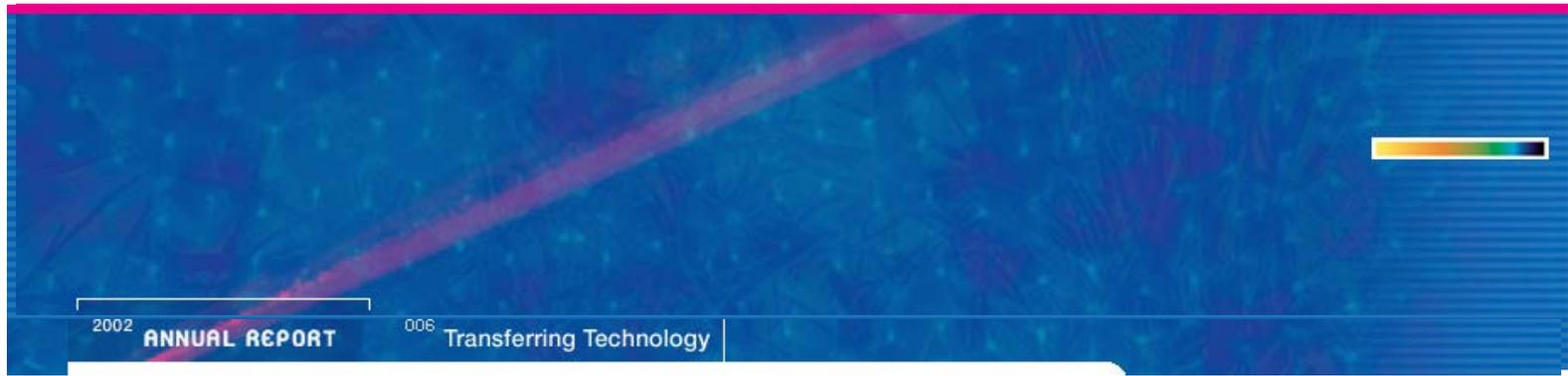
Frank H.T. Rhodes, President Emeritus; Earth and Atmospheric Sciences

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CEA Systems is charged with the development and the deployment of Controlled Environment Agriculture (CEA) technology.

02 Nanofluidics, Inc. (NFI)

NFI is positioned to significantly improve the functionality, availability, and cost of bioanalysis.

03 Transferring Technology, Statistics FY 2002

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Carl Nathan, Weill Cornell Medical College, Microbiology and Immunology

16 Treating cancer with retinoic acid

Noa Noy, Nutritional Sciences

17 Calling for energy conservation

David Pimentel, Ecology and Evolutionary Biology

18 Unlocking evolutionary secrets of insects

Wendell L. Roelofs, Cornell Geneva Campus / Entomology

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 Brian Crane, Chemistry and Chemical Biology
 Johannes E. Gehrke, Computer Science
 John A. Marohn, Chemistry and Chemical Biology
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 Golan E. Yona, Computer Science

New York State Office of Science, Technology and Academic Research, James D. Watson Investigator Program

D. Tyler McQuade, Chemistry and Chemical Biology

American Physical Society / American Institute of Physics, Dannie Heineman Prize for Mathematical Physics

James W. York, Physics

American Academy of Arts and Letters, Goddard Lieberson Fellowship

Steven E. Stucky, Music

Sloan Foundation Research Fellowships

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 Andrew C. Myers, Computer Science

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Michael C. Kelley, Electrical and Computer Engineering

John D. and Catherine T. MacArthur Foundation Fellow

Paul H. Ginsparg, Physics

Agilent Technologies Europhysics Prize

Paul L. McEuen, Physics

American Geological Institute, Ian Campbell Medal

Frank H.T. Rhodes, President Emeritus; Earth and Atmospheric Sciences

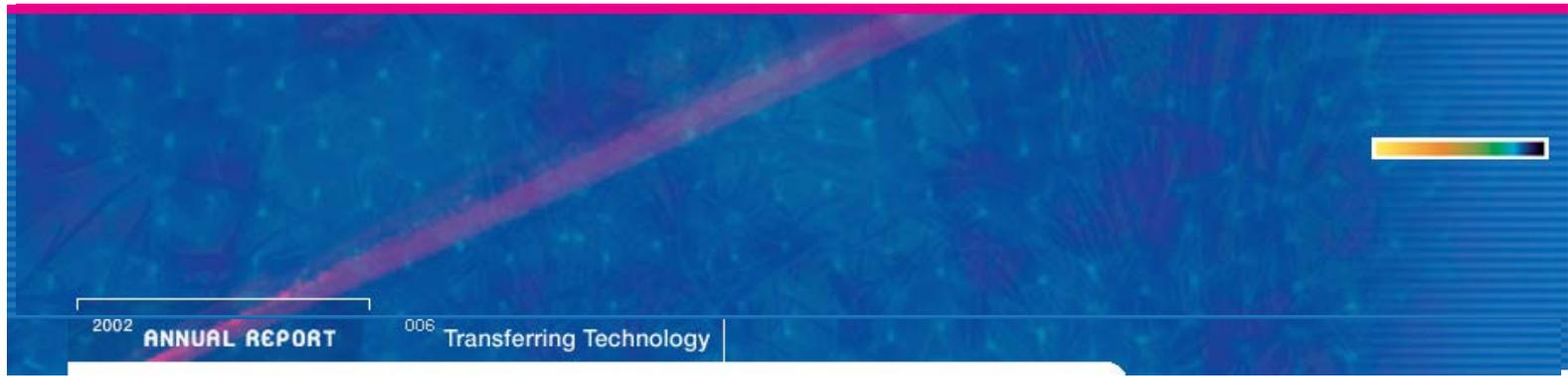
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01 CEA Systems

CEA Systems is charged with the development and the deployment of Controlled Environment Agriculture (CEA) technology.

02 Nanofluidics, Inc. (NFI)

NFI is positioned to significantly improve the functionality, availability, and cost of bioanalysis.

03 Transferring Technology, Statistics FY 2002

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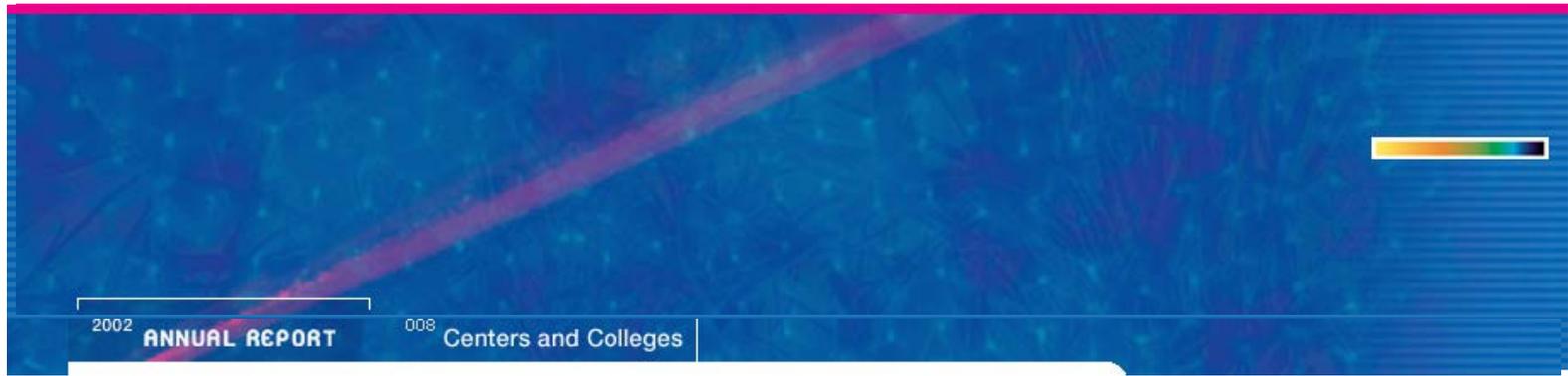
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01 Testing for suggestibility in children



Stephen Ceci

Stephen J. Ceci, Human Development, and research team developed a scientifically reliable test that assesses children's suggestibility. Hundreds of thousands of young children are interviewed every year as eyewitnesses in court cases. At times, some of these children may be swayed by their interviewers. Ceci's Video Suggestibility Scale for Children (VSSC) helps lawyers, police officers, judges, caseworkers, and psychologists identify children who may be highly suggestible and take the proper precautions. These children tend to change their testimonies in response to leading questions or negative feedback. The test consists of watching a video and responding to suggestive questioning. It is reliable for children as young as 4.5 years of age. The VSSC is beneficial for investigators in cases of abuse, neglect, child custody, and persons in need of supervision.

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02 Growing the photonics industry in Rochester, NY



Susan Christopherson

Susan M. Christopherson, City and Regional Planning, revealed that the photonics industry can provide the foundation for the future economy of Rochester, NY. Photonics—the technology of generating and harnessing light and all forms of radiant energy—includes lasers used in many areas from medical microsurgery to precision manufacturing, and in apparatus such as roadside equipment that shows how fast one is driving. The photonics industry would replace the imaging and optical products industries for which Rochester was known between the 1930s and the 1980s. Christopherson and graduate students reported that this emerging industry—with products needed by a range of industries from communication and information processing to national defense—will be more successful in the global economy than the traditional industries because of its exceptional diversification. The researchers found that although the majority of photonics customers are outside the Rochester region, nearly all the photonics firms' suppliers are within the region.

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03 Retiring to care for sick spouses



Marin Clarkberg

Marin E. Clarkberg, Sociology, and graduate student Emma Detinger conducted a study to determine how gender and informal caregiving affect the timing of retirement among late midlife workers. They found that working wives are five times more likely to retire early in order to care for ill or disabled husbands than wives who are not caregivers. In contrast to women, husbands who are caregivers are slower to retire to care for wives than husbands who are not caregivers. Clarkberg and research staff found that the closer the relationship between the caregiver and the person being cared for, the greater the influence on retirement decisions. Caring for a spouse has far more significance for a woman's decision to retire than caring for anyone else, including parents. The decisions of men who are caregivers are closely tied to financial reasons. Families provide as much as 80 percent of care to elderly and disabled Americans. In a rapidly aging society, new struggles emerge as families negotiate informal caregiving roles in relation to retirement decisions.

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04 Speeding up gene sequencing



Harold Craighead

Harold G. Craighead, Applied and Engineering Physics, and his research group—graduate student Mario Cabodi and postdoctoral researcher Stephen W. Turner—demonstrated a new method of separating DNA molecules by length. The approach has great potential for expediting gene sequencing and DNA fingerprinting. The researchers used their own nanofabricated device in the previously discovered process, entropic recoil force, to obtain the best means yet of distinguishing different lengths of DNA strands. Their demonstration revealed that, using their method, it is possible to separate strands of many different lengths. The traditional method of separating DNA is gel electrophoresis: a strand is cut into many pieces and passed through a porous gel, where shorter lengths move faster and farther than longer ones. Information about the genetic content can be determined from the distribution of the fragments. The Craighead group will use their new method in search of ways to create chips or other microscopic devices that can automate the process.

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05 Holding corporate lawyers more accountable



Roger Cramton

Roger C. Cramton, Law, and colleagues analyzed the newly proposed reporting requirements of the U.S. Securities and Exchange Commission (SEC), which make corporate lawyers more accountable for client fraud. They issued the analysis, *The Law and Ethics of Lawyering*, in response to the SEC's draft rules proposing the new standards, and received wide endorsement from law faculty—cutting across all political and academic ideologies—throughout the U.S. The rule requires lawyers who are involved in executing the transactions of a corporation to report any malfeasance—evidence of a material violation—to the corporate officers and board. If there is not an adequate response from the corporate leaders, a lawyer withdraws from representing the client, notifies the SEC of the withdrawal, and repudiates misleading documents with which the lawyer may have assisted.

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06 Measuring hotel safety



Cathy Enz

Cathy A. Enz, Hotel Administration, showed that U.S. airport hotels are the safest, in a study of 2,123 hotels. With graduate student Masako Taylor, Enz devised safety and security indexes in which she measured features such as security camera monitoring systems, secured corridors, electronic locks, sprinkler and smoke detector systems, in-room safety information, and safety videos. The researchers found that a significant proportion of hotels rated 85 percent or higher out of the perfect score of 100 on the indexes. U.S. airport hotels scored the highest followed, in order, by large hotels, luxury hotels of any size, and new hotels. All-suite properties and convention hotels also ranked high in safety and security. Resorts scored low, attributed to amenities such as balconies, and bed-and-breakfast properties and condominiums scored low, attributed to lack of sprinklers and electronic door locks. Motels had the lowest score.

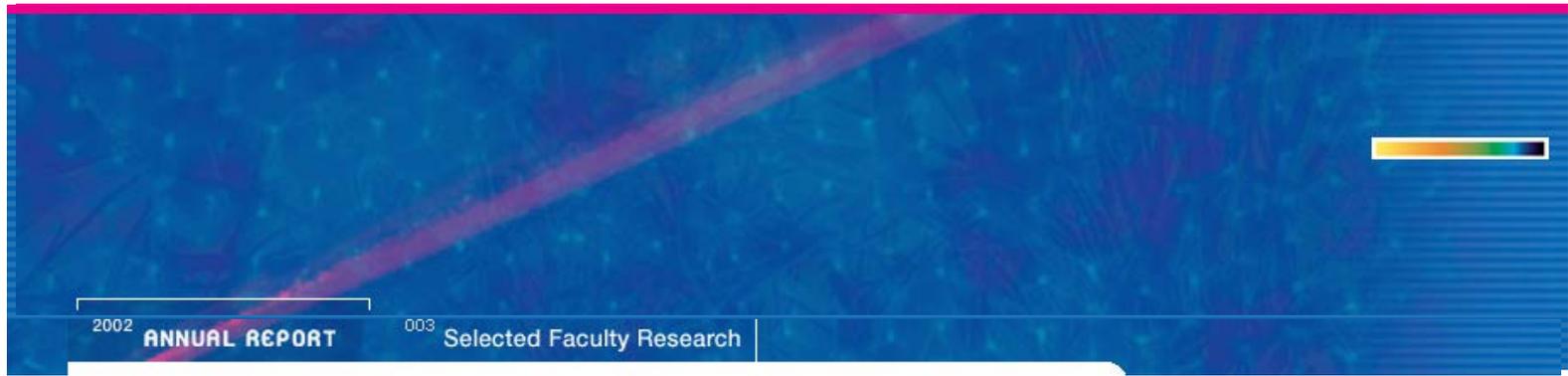
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07 Linking chronic noise and learning impairment



Gary Evans

Gary W. Evans, Design and Environmental Analysis, linked excessive noise with impairment in children's reading ability and long-term memory in a first of its kind study. This long-term study of the same children before and after living near airports in Munich, Germany, established that airport noise adversely affects reading, memory, attention, and speech perception in children. Among several studies, this one provides further and stronger evidence that exposure to chronic noise can have critical health, learning, and motivational effects in children and adults.

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08 Bringing proteins into broader view



Jack Freed

Jack H. Freed, Chemistry and Chemical Biology, and research colleagues discovered a new way to measure—or to see—proteins. The technique determines the protein structure by measuring the distances between atoms in the molecule at greater separations than previously possible. The technique is likened to a way of seeing the whole forest of a protein instead of seeing the trees one after another. It shows how molecules move, react, and interact with each other. This new method uses ESR (electron spin resonance) and is the first major advance at Cornell's National Biomedical Center for Advanced ESR Technology (ACERT), directed by Freed. Prior to this discovery, protein structure has been determined by x-ray crystallography and nuclear magnetic resonance (NMR) spectroscopy, both with significant drawbacks. The new technology will quicken the pace in transforming the human genome sequencing projects' blueprints of life.

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09 Experimenting with a one-of-a-kind x-ray camera



Sol Gruner

Sol M. Gruner, Physics, and research colleagues developed a microsecond-imaging x-ray camera and conducted first experiments with it. Using this one-of-a kind camera, the researchers captured moving images of shock waves from diesel fuel as it emerged at supersonic speeds from an automobile engine fuel injector—a phenomenon never before measured (MacPhee et al., *Science* 295 [2002]). The x-ray camera, the Cornell Pixel Array Detector (PAD) can image phenomena that are hidden from optical cameras, yet visible by x-rays. In its final

form, the camera will be used for major experiments never before possible, for example, x-ray imaging of crack propagation in materials. In the fuel injector experiment, conducted at the Cornell High Energy Synchrotron Source, of which Gruner is director, the researchers were able to penetrate droplets of fuel as they emerged through a fuel injector nozzle of 178 microns across traveling at 345 meters per second. The droplets of fuel formed a fog that causes light to scatter and prevents optical imaging of the fuel. The fuel injection research, a collaboration with Jin Wang's group at Argonne National Laboratory, may suggest ways to make fuel-injected engines more efficient and less polluting.

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10 Identifying restorer genes in plants



Maureen Hanson

Maureen R. Hanson, Molecular Biology and Genetics, and research team identified a gene that restores pollen production to sterile plants. Working with the petunia, a decorative plant, the researchers located the fertility restorer gene in the plant cell nuclei of particular petunia varieties. This gene prevents an abnormal gene in the cells' mitochondria from disrupting pollen production. No other plant gene that can turn off the expression of a defective mitochondrial gene had been previously discovered. Knowing the general location of the gene in one plant

genome helps to pinpoint it in other plants. Identifying a crop plant's natural restorer gene helps plant breeders transfer the gene more quickly to advanced breeding lines either by traditional methods or genetic engineering techniques.

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11 Revealing the role of estrogen in preventing female cardiac disease



Michael Kotlikoff and
Ke-Yu Deng

Michael I. Kotlikoff, Biomedical Sciences, led research that explained estrogen's role in preventing cardiac hypertrophy, an early sign of heart disease, in females. Using genetically engineered mice as models to study enlarged heart muscle, researchers at Cornell and Vanderbilt University discovered how FKBP12.6—the binding protein associated with the heart's ability to pump blood—regulates the release of calcium in muscle-cell signaling. By studying male mice genetically engineered with a predisposition to an enlarged heart and female mice in which they blocked estrogen production, the researchers found that estrogen production protects "FKBP12.6 mice" from cardiac hypertrophy. The research has implications in estrogen replacement therapy for postmenopausal women, for whom studies have shown an increase in cardiomegaly, heart enlargement.

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12 Supplying battery power for nanomachines



Amit Lal

Amit Lal, Electrical and Computer Engineering, and research staff created a battery that powers increasingly smaller electronic circuits and nanomachines such as remote sensors. The microscopic device converts the energy stored in the radioactive material directly into motion, which could move parts of a tiny machine or generate electricity in a form that is more useful for circuits. The device, in which Lal used only radioactive isotopes that emit beta particles, can supply power for decades. Unlike chemical batteries, the device can work in a very wide range of temperatures. Possible applications for the new battery include sensors to monitor the condition of missiles stored in sealed containers, long-term concealed and unattended battlefield sensors, and medical devices implanted in the body. An entire device, including a vacuum enclosure, can be made to fit in less than one cubic millimeter.

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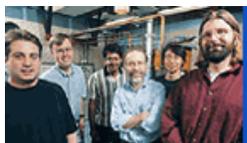
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13 Creating the single-atom transistor



Paul McEuen (far right)
and research colleagues

Paul L. McEuen, Physics, and colleagues at the Cornell Center for Materials Research created a single-atom transistor. The research team, including Daniel C. Ralph, Physics, implanted a "designer" molecule (designed by Héctor D. Abruñtí, Chemistry and Chemical Biology) between two gold electrodes to create a circuit. When the researchers applied voltage to the transistor, electrons flowed through a single cobalt atom. Although the device does not have all the functions of a traditional transistor, such as amplification, it has potential application as a chemical sensor, and it demonstrates the potential for shrinking the size of components far beyond the capability of conventional lithographic techniques for future electronic applications.

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14 Attracting institutional investors



Roni Michaely (l.) and Yaniv Grinstein (r.)

Roni Michaely and Yaniv Grinstein, Johnson Graduate School of Management, found that companies attract more institutional investors—pension funds, mutual funds, banks—by repurchasing shares of their own stock and paying out fewer dividends. This is contrary to the traditional wisdom on how companies capture the interest of new institutional investors (that is, more dividends attract more institutional investors). The study showed that although institutions prefer companies that pay dividends to those that do not, paying fewer dividends is better.

The study suggests that pension funds and banks like dividends mainly because the practice appears more prudent, rather than because of large payouts. Institutional investor groups in the U.S. hold about 50 percent of equity in U.S. public firms. Firms that attract more institutional investors are more likely to thrive.

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15 Battling tuberculosis



Carl Nathan

Carl Nathan, Weill Cornell Medical College, Microbiology and Immunology, and research colleagues discovered one way in which the tubercle bacillus, which causes tuberculosis (TB), persists over the course of a person's lifetime once infected, outsmarting the body's immune system. The researchers found that *Mycobacterium tuberculosis* (Mtb) defends itself against the oxidative stress produced by the immune system by using a "bucket brigade" of proteins, including two proteins that are widely known to have functions in essential metabolism. It is the

first known case of metabolic enzymes that also support antioxidant defenses. The discovery of the new function of three proteins, together with a fourth protein, acting to disarm the peroxide and peroxynitrite produced by the immune system's macrophage cells is a breakthrough. (The proteins are dihydrolipoamide dehydrogenase, Lpd; dihydrolipoamide succinyltransferase, SucB; alkyl hydroperoxide reductase, AhpC; and AhpD, so named because its gene is next to and just downstream of AhpC.) The research has implications for drug targets for Mtb. Tuberculosis is one of the world's leading causes of death by an infectious disease, affecting nearly 2 billion people worldwide, with 16,000 active cases reported in the U.S. in 2001.

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16 Treating cancer with retinoic acid



Noa Noy

Noa Noy, Nutritional Sciences, discovered a way to treat several cancers with retinoic acid (RA), a derivative of vitamin A, with fewer side effects. RA regulates gene transcription and therefore governs many functions in the body, including cell division and the development and spread of cancer cells. The process of turning genes on and off requires high doses of medication, and the side effects of the high levels of RA can be devastating. By making tumor cells up to a thousand times more sensitive to RA, Noy's discovery will enable much smaller doses of RA to be used—even the amount of RA that naturally occurs in the body. Noy found that a protein called cellular RA-binding protein II (CRABP-II) in the cell can enhance the ability of RA to inhibit the proliferation of breast cancer cells, requiring less RA to suppress tumor growth. CRABP-II exerts these effects by activating the transcriptional regulator protein called retinoic acid receptor (RAR), which binds to certain DNA sequences and turns targeted genes on or off. RA has been used to treat prostate cancer and leukemia. Experiments are underway using retinoids to treat breast, head-and-neck cancers, diabetes, arteriosclerosis, and emphysema.

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17 Calling for energy conservation



David Pimentel

David Pimentel, Ecology and Evolutionary Biology, and graduate students analyzed the future energy needs of the U.S. They found that renewable energy resources, even if implemented maximally, would replace only about half of the U.S. consumption of oil, natural gas, and coal. Alternative energy systems, such as hydroelectric, solar and wind power, and biofuels, if fully developed, would take up 17 percent of America's land area. The leading problem is the U.S. rate of energy consumption needed to maintain the current standard of living. Energy conservation is the only proven alternative. The researchers cited two of the 10 alternative energy sources reviewed—geothermal systems and the biofuels, ethanol, methanol, and vegetable oils—as not renewable and sustainable. The researchers recommended a conservation program—for individuals, communities, and industries—that conserves fossil fuel resources by using renewable resources and by reducing consumption. Pimentel's group states that other developed countries have proven that high productivity and high standards of living can be achieved with half of the energy expenditure of the U.S.

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18 Unlocking evolutionary secrets of insects



Wendell Roelofs

Wendell L. Roelofs, Cornell Geneva Campus/Entomology, and research team found an undetected gene, the delta-14, which holds a key to how insects evolve into new species. The Roelofs research team made the discovery while searching for methods to prevent European corn borers from mating, multiplying, and destroying fields of crops. The delta-14 gene regulates the chemicals produced in sex pheromone glands of females to attract males for mating. The researchers found that this mutated gene can be suddenly switched on, changing the pheromone components that the females use to attract males. The mating communication system between rare males (1 in 200) who can respond to the chemical produced by the female carriers of the delta-14 gene become the basis of a new species. As females with the delta-14 gene mate with other rare males, these males and females stabilize their pheromone communication system. This isolates the new population from the parent species. The discovery has significant implications for effective pest control by disrupting the mating of insects.

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19 Dropping out?



John Sipple

John W. Sipple, Education, and colleagues surveyed school superintendents across Upstate New York (excluding New York City) and found that 28 percent of the school superintendents reported an increase in dropouts two years after the New York State Board of Regents implemented the more stringent Regents diplomas for all students. Forty-five percent of the superintendents reported an increase in dropouts among the lower-performing school districts. Because of the new standard for New York State, high school students must pass the Regents courses and exams, get a General Equivalency Development (GED) certification, or drop out. School districts are no longer allowed to give local diplomas. The survey found an increase in the GED option in half of the state's school districts, however, students are reported as transfers rather than dropouts. The survey points to the question: Is the GED a legitimate alternative to the Regents high school diploma? It also has implications for the Academic Intervention Service (AIS) program and for AIS staffing cuts in times of fiscal stress.

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20 Choosing a job candidate



Michael Sturman

Michael C. Sturman, Hotel Administration, and colleagues revealed, in a new study, that promoting the internal job candidate with an above-average (but not exceptional) past performance record, as opposed to the external job candidate with an exceptionally high interview score, is significantly the best choice. Sturman's research found that reliable, valid past performance appraisals are more valid predictors of future job performance than other selection tools, such as structured interviews, cognitive activity tests, and job simulations. This holds particularly true

for professional positions such as managers, and supervisors, but also for jobs such as sales positions, bank tellers, and production workers. The researchers found that employers can expect an employee who has done well in the past to be a good performer for years to come. The study offers mathematical techniques that employers can use to calculate the weight that should be given a particular type or age of an appraisal. Sturman cautions employers to use statistical or other hard evidence rather than emotions or "gut feelings" in hiring decisions, and he reiterates that hiring data should be collected in a consistent manner for both external and internal candidates.

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21 Pulling apart chromatin fiber for observation



Michelle Wang

Michelle D. Wang, Physics, and research team made the first direct observation of the dynamic structure of individual nucleosomes—basic genetic packaging units. Chromosomal DNA is packaged into the compact structure of the nucleosome along with specialized proteins called histones. The DNA complex and histones are called chromatin in the cells of higher organisms. Wang's team used optical tweezers to pull apart individual strands of chromatin. They were able to see how information in nucleosomes becomes accessible to the molecules that read it. The researchers proposed a three-stage model for how nucleosomal units in chromatin open to reveal their DNA to enzymes such as RNA polymerase, which moves along the DNA molecule transcribing the genetic information for use by the cell. Nucleosomes seem to prevent the genetic information-transfer process that happens a million times a day in the cells of our bodies. Researchers want to understand the mechanical barrier presented by the nucleosome and how the nucleosome structure is modified to clear the way for information transfer. Although the basic plan of the system is previous knowledge, the structural and biophysical details of the system have not been clear.

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22 Linking nature with children's attention capabilities



Nancy Wells

Nancy M. Wells, Design and Environmental Analysis, found that children who live in space surrounded by nature have increased attention capabilities. Wells compared the cognitive functioning of children before and after a move from poor-quality housing to better-quality housing with more green spaces—nature in view from rooms or natural yard settings—while accounting for the effects of improved housing. The study showed that the natural environment plays a significant role, more than previously recognized, in the well-being of children within a housing environment. Interventions such as preserving trees, planting new ones, and maintaining grassy areas have a major impact on children's welfare. The finding may encourage legislators and policymakers to promote housing improvements for families with low and moderate incomes.

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23 Creating a flexible ceramic material



Ulrich Wiesner

Ulrich B. Wiesner, Materials Science and Engineering, and research group developed a new class of hybrid materials called flexible ceramics. Wiesner's group was surprised to see, through the transmission electron microscope (TEM), that the molecular structure of the new material, known as a cubic bicontinuous structure, corresponded to age-old mathematical predictions. They named the molecular structure, with its hexagonal symmetry, a "plumber's nightmare." The perfect symmetrical shapes found in nature fascinated the researchers. Working in nanoscale chemistry, they decided to mimic nature by using organic polymers that can self-assemble chemically into nanostructures with different symmetries. Wiesner's group melded the polymer with an inorganic material, a ceramic (silica-type material), to create the hybrid material with a combination of properties—flexibility and structure control from the polymer and functionality from the ceramic. The new hybrid material is transparent and bendable but with substantial strength, and it does not shatter like ceramics. Applications for the new material are wide-ranging, from microelectronics to the separation of macromolecules such as proteins.

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24 Engineering rice to tolerate environmental stresses



Ajay Garg (l.) and Ray Wu (r.)

Ray J. Wu, Molecular Biology and Genetics, and research colleagues demonstrated a strategy for genetically engineering rice and other crops for increased tolerance to major environmental stresses such as drought, salt, and temperature, and at the same time, for improved yields. The researchers added genes to synthesize a naturally occurring sugar called trehalose. Trehalose is found in a variety of organisms, but much less so in plants, except for resurrection plants in which trehalose gears them to survive long desert droughts, coming back to vibrancy when moisture is available. Wu's strategy includes learning how to turn on the trehalose genes in transgenic plants when stresses occur, such as the onset of colder temperatures, as well as learning how to make trehalose in particular parts of the plants such as the leaf, but not the edible grains. Raising the quality and quantity of food for parts of the world with dwindling resources is an important research mission.

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01 James F. Bell, ed., Astronomy



Asteroid Rendezvous: NEAR Shoemaker's Adventures at Eros (Cambridge University Press, 2002). This is a collection of essays and images, brought together by Bell and Jacqueline Mitton, Royal Astronomical Society, of Cornell astronomers and engineers who made the NEAR mission (Near Earth Asteroid Rendezvous) an amazing success. The mission was the first to orbit and land on an asteroid. It was also one of the first tests of NASA's new "better, faster, cheaper" planetary exploration. The mission produced hundreds of thousands of images, spectra, and other measurements. The book tells the story of the mission from conception to culmination.

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02 Francine D. Blau and Lawrence M. Kahn, *Industrial and Labor Relations*



At Home and Abroad: U.S. Labor-Market Performance in International Perspective (Russell Sage Foundation, 2002). The authors examine labor market dissimilarities between the U.S. and other advanced industrialized nations. They assess how the differences affect wage and unemployment levels. Blau and Kahn find, for example, that governments and unions have a more powerful effect on the labor market in Europe than in the U.S. While the U.S. market is more flexible, letting wages adjust to global economic upheavals so that jobs can be maintained, European economies are more rigid, maintaining wages at the cost of losing jobs. The book points to the role institutions can play in creating jobs and maintaining living standards.

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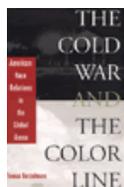


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03 Thomas Borstelmann, History



The Cold War and the Color Line: American Race Relations in the Global Arena (Harvard University Press, 2001). Borstelmann examines how the Cold War intersected with the collapse of global white supremacy. As he explores two "Souths," South Africa and the U.S. South, he recasts the history of American race relations into an international context. The book is the first comprehensive investigation of the topic.

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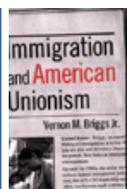


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04 **Vernon M. Briggs, Jr., Industrial and Labor Relations**



Vernon Briggs



Immigration and American Unionism (Cornell University Press, 2001). Briggs examines the shared history of unions and immigration. He explores the contentious relationship between U.S. immigration policies and the U.S. union movement: When immigration increases, unionism flounders and when immigration decreases, unionism thrives. Immigration has been viewed by worker organizations and their leaders as a menace. Briggs shows the intricacies of the relationship of immigration, labor, and unions. He discusses the survival of American unionism, the most reliable and persistent advocate for all American workers, and its incongruence with pro-immigration policy.

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05 Laura S. Brown, English



Laura Brown



Fables of Modernity: Literature and Culture in the English Eighteenth Century (Cornell University Press, 2001). Brown brings forward the concept of cultural fable. She shows how cultural fables emerge from material practices in eighteenth-century England. Recurring themes that are ascribed to a specific aspect of material culture, such as urban sanitation, shipping, the commercial printing industry, or the stock market, help to demystify history and culture. The fables provide a way of analyzing modernity and connecting it with two related paradigms of difference—the woman and the "native" (non-European).

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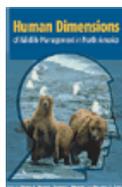


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06 Daniel J. Decker, Tommy L. Brown, and William F. Siemer,
Natural Resources



Daniel Decker



Human Dimensions of Wildlife Management in North America (Wildlife Society, 2001). The authors cover the many aspects of human and wildlife coexistence. For example, are deer-car collisions and encounters with black bears and mountain lions human-created risks? The book defines the term, "human dimensions"; discusses citizen participation in issues of species restoration, agricultural and forest land-use, and urban and suburban environments; and gives a history of wildlife management. The book is a textbook for wildlife management, as well as a resource for professionals.

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07 Matthew P. Drennan, *City and Regional Planning*



Matthew Drennan



The Information Economy and American Cities (Johns Hopkins University Press, 2002). Drennan advocates a national information network as the "railroad of the 21st century" and essential for all American cities and the future economy. Just as the government participated in the building of railroads, telephones and electric power, highways and airports—which led to the modern economy—it must also participate in bringing a high speed, wide-band, fiber-optic network that transmits information rapidly—the same access at the same cost—to all places in the country, including the isolated areas. He shows that places that have invested in the information economy are doing much better than those that still rely on manufacturing and distribution. The book has a wealth of rigorously analyzed econometric data that is valuable to economists, planners, and policymakers with an interest in the future of U.S. cities.

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08 Milton J. Esman and Ronald J. Herring, eds., *Government*



Milton Esman and Ronald Herring

Carrots, Sticks, and Ethnic Conflict: Rethinking Development Assistance (University of Michigan Press, 2001). Esman and Herring reveal the ethnic consequences of foreign aid—the intended and unintended results. The authors present a collection of studies that focus on how wealthy nations and international agencies can deploy assistance in ways that might moderate rather than aggravate ethnic tensions.

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09 Alice Fulton, English



Alice Fulton



Felt (W.W. Norton, 2001). Fulton won the 2002 Rebekah Johnson Bobbitt National Prize for Poetry, sponsored by the Library of Congress, for this collection of poetry. Hailed as a book "blessed with great velocity, great staying-power," *Felt* was also selected by the *Los Angeles Times* as one of the best books of 2001 and a finalist for the *Los Angeles Times* Book Award for Poetry. *Felt* is described as having "direct wiring between sensation and language, feeling and form," with physical, intellectual, and emotional force. The play on the word, felt, as tangled fibers and as the past tense of the word, feel, provides interesting contexts for the poetry.

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10 J. Ellen Gainor, Theatre, Film, and Dance



Susan Glaspell in Context: American Theater, Culture, and Politics, 1915-48 (University of Michigan Press, 2001). Placed in various contexts —Greenwich Village and Provincetown bohemia, the American frontier, and American modernism—Gainor presents the dramatic work of key American author, Susan Glaspell. Gainor considers the theatrical, cultural, political, social, historical, and biographical climates in which Glaspell wrote. Gainor's discussion of these complex and interesting contexts has gained accolades. The book received one of *Choice's* Outstanding Academic Title awards for 2002. It is also the featured work at the "Author Meets Critics" plenary session at the Comparative Drama Conference.

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11 David I. Grossvogel, Romance Studies



Didn't You Used to Be Depardieu? Film as Cultural Marker in France and Hollywood (Peter Lang, 2002). Grossvogel analyzes the cultural differences between France and the U.S. by contrasting American film remakes with their French originals. He identifies misconceptions, dissimilar economic imperatives, and basically, different cultural patterns.

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12 Jonathan B. Monroe, ed., *Comparative Literature*



Jonathan Monroe



Writing and Revising the Disciplines (Cornell University Press, 2002). This collection of essays presents the reflections of prominent Cornell faculty on how their disciplinary contexts and practices have changed in the recent past and continue to evolve. The essays are the result of intellectual exchanges sponsored by Cornell's John S. Knight Institute for Writing in the Disciplines. The faculty covered are Ronald L. Breiger, Sociology; Jonathan

Culler, English; Roald Hoffmann, Chemistry; Isaac Kramnick, Government; Dominick LaCapra, History; N. David Mermin, Physics; Larry I. Palmer, Law; Hunter R. Rawlings III, Classics, President; and Margaret W. Rossiter, Science and Technology Studies.

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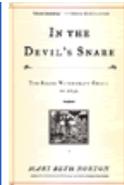
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13 Mary Beth Norton, History



Mary Beth Norton



Devil's Snare: The Salem Witchcraft Crisis of 1692 (Alfred A. Knopf, 2002). Norton presents a unique account of the events surrounding Salem Village, Massachusetts, in January of 1692. Legal action was brought against 144 people, and 20 of them were put to death in the Salem witchcraft trials. She also places the trials in the context of the Indian wars at the time. Norton brings to life this fascinating period, telling the story from the perspective of the people in the seventeenth century. The book has been hailed as "stunning," "dazzling," and Norton is acclaimed as a "master historian-detective."

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14 Don C. Ohadike, Africana Studies and Research Center



Don Ohadike



Pan-African Culture of Resistance: A History of Liberation Struggles in Africa and the Diaspora (Global Publications, 2002). Focusing on culture contacts and their effects, Ohadike defines the Pan-African culture of resistance as a pattern of behavior and a cultural heritage that is shared by all black people. He discusses how the history of black people in Africa was connected to the history of black people in the Americas and how black people as a whole waged a five hundred-year war against European domination. Ohadike explains that the struggle for black liberation began on European-owned slave ships during the Atlantic crossing and continued on the plantations and maroon settlements, giving rise to a Pan-African culture of resistance in the Americas.

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15 David S. Powers, Near Eastern Studies



Law, Society, and Culture in the Maghrib, 1300-1500 (Cambridge University Press, 2002). Powers uses six legal cases that took place in fourteenth- and fifteenth-century Muslim societies in the Maghrib (present-day Morocco and Algeria) in order to illustrate a tradition of rationality and balance in Islamic law. The book presents cases on diverse subjects—paternity, fornication, water rights, family endowments, the slander of the Prophet, and disinheritance. Powers shows that Muslim judges and jurists were highly sensitive to society and cultures and based their judgments on rational thought and argument. Although there may be reasons for the rise of fundamentalist societies in modern times in places such as Iran or Afghanistan under the Taliban, the book clarifies that Islamic legal heritage is closer to Western values than realized.

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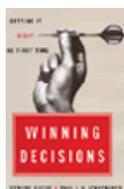
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16 J. Edward Russo, Johnson Graduate School of Management



J. Edward Russo



Winning Decisions: Getting It Right the First Time (Doubleday Currency, 2002). After decades of groundbreaking research and 30 years of consulting with top executives and managers, Russo and co-author, Paul Schoemaker (University of Pennsylvania, Wharton School) offer strategies for making good decisions. They note that the old-fashioned way of making decisions—intuition, common sense, and specialized expertise—is not sufficient for today; the risks are too high. They cite, as example, decision-making and the Challenger space shuttle disaster (studied in a previous book). The authors present a four-step decision-making framework: 1) frame the issues to ensure the real problem is being solved; 2) gather all facts, options, and reasonable evaluations of the "unknowables"; 3) use a systematic approach, rather than an intuitive one; 4) refine your decision using lessons learned from past successes and failures. The book has been hailed by the *Harvard Business Review* as a "comprehensive, well-balanced guide" to decision-making.

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17 **Vilma Santiago-Irizarry, Anthropology**



Vilma Santiago-Irizarry



Medicalizing Ethnicity: The Construction of Latino Identity in a Psychiatric Setting (Cornell University Press, 2001). Cultural sensitivity was introduced in three bilingual, bicultural psychiatric programs for Latino patients at public mental health facilities in New York City. Santiago-Irizarry's book establishes that this act led to an assertion of Anglo-American standards of behavior and negative definitions of Latino culture. It highlights how good

intentions can produce unintended consequences. Santiago-Irizarry questions the definition of multiculturalism used by a variety of institutional settings in an attempt to mandate equality.

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18 Norman T. Uphoff, Government



Norman Uphoff



Agroecological Innovations: Increasing Food Production with Participatory Development (Earthscan Publications, 2002). Uphoff provides 12 case studies of innovative approaches to agricultural development. These successful and diverse approaches apply knowledge, skill, and labor rather than large capital expenditure to increase agricultural productivity in environmentally sustainable and socially desirable ways. The book is a vital guide and

resource for professionals and policymakers in agriculture and food production. It is also an important text for academics and researchers.

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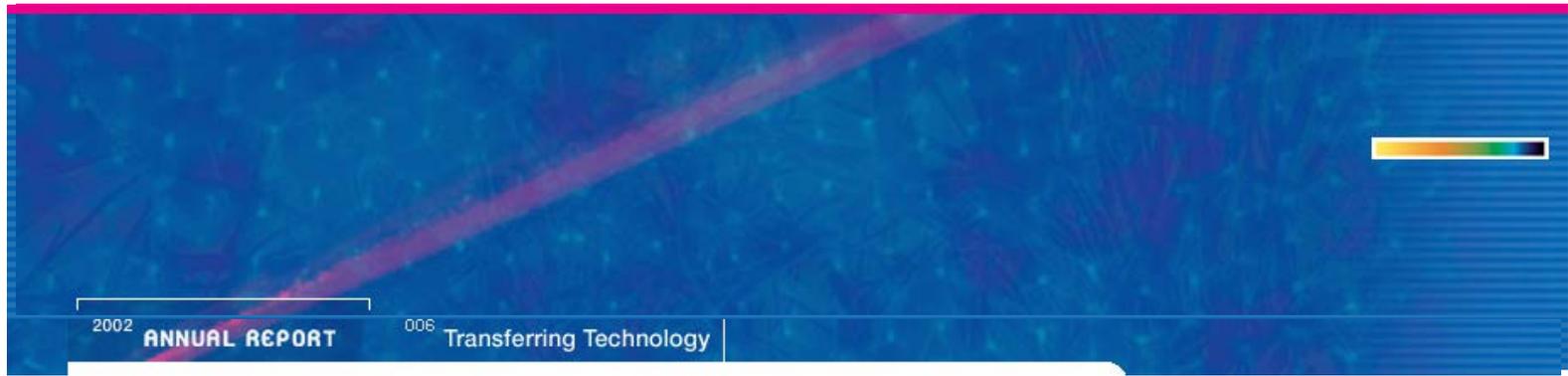
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01 CEA Systems

CEA Systems is charged with the development and the deployment of Controlled Environment Agriculture (CEA) technology.

02 Nanofluidics, Inc. (NFI)

NFI is positioned to significantly improve the functionality, availability, and cost of bioanalysis.

03 Transferring Technology, Statistics FY 2002

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01 CEA Systems



Louis Albright

CEA Systems is a privately held corporation based in Ithaca, NY. CEA Systems, in partnership with the Cornell Research Foundation, is charged with the development and the deployment of Controlled Environment Agriculture (CEA) technology. CEA is based on developments in lighting control and horticultural practices from the research groups of Louis D. Albright, Biological and Environmental Engineering, and Robert W. Langhans, Floriculture and Ornamental Horticulture. CEA is the enabling technology for a new paradigm in twenty-first century agriculture. No

longer limited to searching for a plant adapted to the environment, it is now possible, on a commercial scale, to provide the desired environment for the plant. Cornell University is a leader in this emerging discipline, holding significant intellectual property on the subject.

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02 Nanofluidics, Inc.



Stephen Turner (l.) and Harold Craighead (r.)

Nanofluidics, Inc. (NFI), located in Ithaca, NY, is positioned to significantly improve the functionality, availability, and cost of bioanalysis. NFI pioneers technologies that integrate microcircuitry, optics, and biochemistry and have potential applications for miniaturized fluidics fabrication and single-molecule analysis. Devices that emerge from NFI's technology will raise the price and performance bar in the field of bioanalysis. The company's core technologies were developed in the research group of Harold G. Craighead, Applied and Engineering Physics. Craighead is a founder of NFI along with his former graduate student Stephen W. Turner.

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03 Transferring Technology, FY 2002

Invention Disclosures	
Disclosures Received	213
U.S. Patents	
First-time Applications Filed	87
Applications Pending	483
Patents Issued	59
Patents in Force	518
Foreign Patents	
Applications Filed	49
Applications Pending	652
Patents Issued	21
Patents in Force	200
Licenses	
Licenses and Options	105
Total Equity Deals with Startups	26
Active Licenses	496
Number of Companies Started	7
License Revenue Sources	
License Fees	\$859,200
Patent Reimbursements	\$1,044,000
Royalties	\$980,100
Total License Revenue	\$2,883,300

Source: Cornell Research Foundation, Office of Patents and Technology Marketing

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01 Funding Cornell's Research, FY 2002

Total Research Expenditures	\$465,732
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By Dollars Expended

	FY 2002
Dollars in Thousands	
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Sources	
Total Federal Sources	\$283,277
Sponsored	278,203
Budgeted	5,074
Total Non-Federal Sources	182,456
Sponsored	81,790
State & Local Governments	12,264
Corporations & Trade Associations	24,890
Foundations	16,413
Non-Profit Organizations	22,590
All Others	5,632
Budgeted	100,666
Cornell	65,964
New York State	34,702

Federal Agencies

DHHS	Department of Health & Human Services	\$139,500
NSF	National Science Foundation	84,452
DOD	Department of Defense	21,123
NASA*	National Aeronautics Space Administration	11,601
USDA	Department of Agriculture	13,532
DOE	Department of Energy	4,084
	All Others	3,913

Source: Cornell University, Office of Sponsored Programs.

Discrepancies may occur due to rounding.

*NASA includes JPL funds under subcontract.

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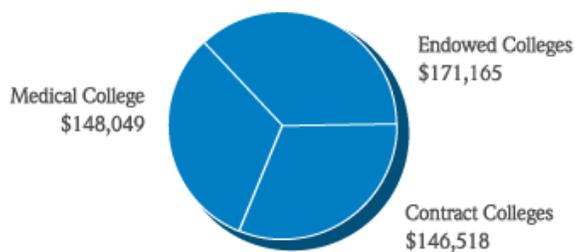
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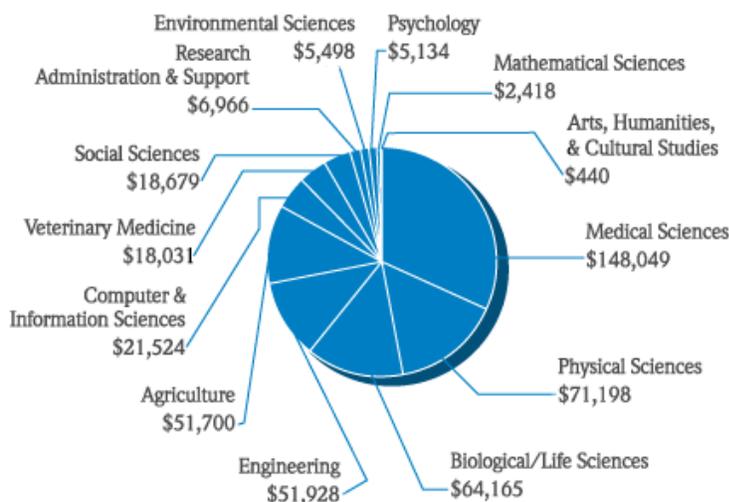
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Total Research Expenditures \$465,732

By Cornell Divisions
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By Disciplines
Dollars in Thousands



Source: Cornell University, Office of Sponsored Programs.
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03 Ranking Cornell Nationally

By Research Expenditures, NSF FY 2001

	Research Expenditures Dollars in Thousands
Johns Hopkins University ¹	\$999,246
University of California, Los Angeles	693,801
University of Wisconsin, Madison	604,143
University of Michigan	600,523
University of Washington	589,626
University of California, San Diego	556,533
University of California, San Francisco	524,975
Stanford University	482,906
University of Pennsylvania	469,852
University of Minnesota	462,011
Pennsylvania State University	458,066
University of California, Berkeley ²	446,273
Cornell University ²	443,828
Massachusetts Institute of Technology ²	435,495
University of California, Davis	432,396

Source: National Science Foundation (NSF adds estimated unrecovered indirect costs, as reported by institutions, to totals.)

¹ Johns Hopkins University includes the Applied Physics Laboratory, with \$482 million in total R&D expenditures.

²These data do not include R&D expenditures at university-associated federally funded research and development centers.

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04 Ranking Cornell in New York

By Research Expenditures, NSF FY 2001

	Research Expenditures Dollars in Thousands
Cornell University ¹	\$443,828
Columbia University	354,497
University of Rochester ¹	234,261
New York University	190,722
SUNY Buffalo	186,829
Mt. Sinai School of Medicine	176,946
SUNY Stony Brook	168,487
Yeshiva University	148,230
The Rockefeller University	145,571
SUNY Albany	70,119

Source: National Science Foundation (NSF adds estimated unrecovered indirect costs, as reported by institutions, to totals.)

¹These data do not include R&D expenditures at university-associated federally funded research and development centers.

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01 Crossing Disciplines

Selected Research Centers at Cornell

[Nanoscale Science and Technology](#)
 Alliance for Nanomedical Technologies
 Center for Biochemical Optoelectronic Microsystems
 Center for Nanoscale Systems
 Cornell Center for Materials Research
 Cornell Nanofabrication Facility*
 Nanobiotechnology Center

Environment

Center for the Environment
 Institute for the Study of the Continents
 Multidisciplinary Center for Earthquake Engineering Research

Medical Research

Center for Aging Research and Clinical Care
 Center for Complementary and Integrative Medicine
 Center for the Study of Hepatitis C
 Center for Vascular Biology
 Howard Gilman Institute for Valvular Heart Diseases
 Institute for Computational Biomedicine
 Institute of Genetic Medicine
 Institute for Reproductive Medicine
 Sackler Institute for Developmental Psychobiology

Life Sciences

Agricultural Experiment Stations (Geneva; Ithaca)
 Baker Institute for Animal Health
 Cancer Protein Expression Laboratory
 Comparative Cancer Program
 Cornell International Institute for Food, Agriculture, and Development
 Institute for Genomic Diversity
 Institute for Biotechnology and Life Science Technologies
 Institute of Food Science
 National Biomedical Center for Advanced ESR Technology
 Plant Science Center

Physical Sciences and Engineering

Center for Applied Mathematics
 Center for Radiophysics and Space Research
 Cornell High Energy Synchrotron Source*
 Cornell Theory Center
 Laboratory of Atomic and Solid State Physics
 Laboratory of Elementary-Particle Physics*
 National Astronomy and Ionosphere Center*

Social Sciences and Humanities

Africana Studies and Research Center
 Bronfenbrenner Life Course Center
 Center for Analytic Economics
 Cornell Institute for Research on Children
 Cornell Institute for Social and Economic Research
 Program on Ethics and Public Life
 Institute for Women and Work
 Einaudi Center for International Studies
 Society for the Humanities

Business/Management

Behavioral Economics and Decision Research Center
 Center for Advanced Human Resource Studies
 Center for Hospitality Research

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Parker Center for Investment Research
Smithers Institute for Alcohol-Related Workplace Studies

*National Center

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02 Cornell's Colleges and Divisions

College of Agriculture and Life Sciences †
College of Architecture, Art, and Planning
College of Arts and Sciences
College of Engineering
College of Human Ecology †
College of Veterinary Medicine †
Division of Nutritional Sciences
Faculty of Computing and Information Science
Graduate School
Johnson Graduate School of Management
Law School
School of Continuing Education and Summer Sessions
School of Hotel Administration
School of Industrial and Labor Relations †
Weill Cornell Graduate School of Medical Sciences (New York City)
Weill Cornell Medical College (New York City)

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† Contract College

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Total Research Expenditures **\$465,732**

By Dollars Expended

	FY 2002
	Dollars in Thousands
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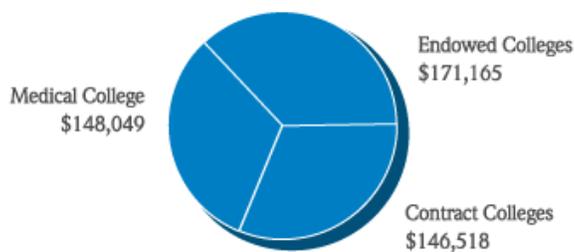
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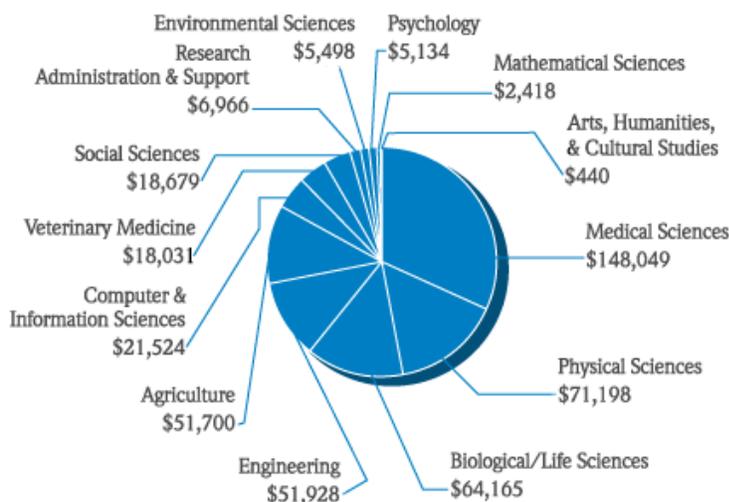
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By Cornell Divisions
Dollars in Thousands



By Disciplines
Dollars in Thousands



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Yeshiva University	148,230
The Rockefeller University	145,571
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01 Testing for suggestibility in children



Stephen Ceci

Stephen J. Ceci, Human Development, and research team developed a scientifically reliable test that assesses children's suggestibility. Hundreds of thousands of young children are interviewed every year as eyewitnesses in court cases. At times, some of these children may be swayed by their interviewers. Ceci's Video Suggestibility Scale for Children (VSSC) helps lawyers, police officers, judges, caseworkers, and psychologists identify children who may be highly suggestible and take the proper precautions. These children tend to change their testimonies

in response to leading questions or negative feedback. The test consists of watching a video and responding to suggestive questioning. It is reliable for children as young as 4.5 years of age. The VSSC is beneficial for investigators in cases of abuse, neglect, child custody, and persons in need of supervision.

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02 Growing the photonics industry in Rochester, NY



Susan Christopherson

Susan M. Christopherson, City and Regional Planning, revealed that the photonics industry can provide the foundation for the future economy of Rochester, NY. Photonics—the technology of generating and harnessing light and all forms of radiant energy—includes lasers used in many areas from medical microsurgery to precision manufacturing, and in apparatus such as roadside equipment that shows how fast one is driving. The photonics industry would replace the imaging and optical products industries for which Rochester was known between the 1930s and the 1980s. Christopherson and graduate students reported that this emerging industry—with products needed by a range of industries from communication and information processing to national defense—will be more successful in the global economy than the traditional industries because of its exceptional diversification. The researchers found that although the majority of photonics customers are outside the Rochester region, nearly all the photonics firms' suppliers are within the region.

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03 Retiring to care for sick spouses



Marin Clarkberg

Marin E. Clarkberg, Sociology, and graduate student Emma Detinger conducted a study to determine how gender and informal caregiving affect the timing of retirement among late midlife workers. They found that working wives are five times more likely to retire early in order to care for ill or disabled husbands than wives who are not caregivers. In contrast to women, husbands who are caregivers are slower to retire to care for wives than husbands who are not caregivers. Clarkberg and research staff found that the closer the relationship between the caregiver and the person being cared for, the greater the influence on retirement decisions. Caring for a spouse has far more significance for a woman's decision to retire than caring for anyone else, including parents. The decisions of men who are caregivers are closely tied to financial reasons. Families provide as much as 80 percent of care to elderly and disabled Americans. In a rapidly aging society, new struggles emerge as families negotiate informal caregiving roles in relation to retirement decisions.

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04 Speeding up gene sequencing



Harold Craighead

Harold G. Craighead, Applied and Engineering Physics, and his research group—graduate student Mario Cabodi and postdoctoral researcher Stephen W. Turner—demonstrated a new method of separating DNA molecules by length. The approach has great potential for expediting gene sequencing and DNA fingerprinting. The researchers used their own nanofabricated device in the previously discovered process, entropic recoil force, to obtain the best means yet of distinguishing different lengths of DNA strands. Their demonstration revealed that, using their method, it is possible to separate strands of many different lengths. The traditional method of separating DNA is gel electrophoresis: a strand is cut into many pieces and passed through a porous gel, where shorter lengths move faster and farther than longer ones. Information about the genetic content can be determined from the distribution of the fragments. The Craighead group will use their new method in search of ways to create chips or other microscopic devices that can automate the process.

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05 Holding corporate lawyers more accountable



Roger Cramton

Roger C. Cramton, Law, and colleagues analyzed the newly proposed reporting requirements of the U.S. Securities and Exchange Commission (SEC), which make corporate lawyers more accountable for client fraud. They issued the analysis, *The Law and Ethics of Lawyering*, in response to the SEC's draft rules proposing the new standards, and received wide endorsement from law faculty—cutting across all political and academic ideologies—throughout the U.S. The rule requires lawyers who are involved in executing the transactions of a corporation to report any malfeasance—evidence of a material violation—to the corporate officers and board. If there is not an adequate response from the corporate leaders, a lawyer withdraws from representing the client, notifies the SEC of the withdrawal, and repudiates misleading documents with which the lawyer may have assisted.

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06 Measuring hotel safety



Cathy Enz

Cathy A. Enz, Hotel Administration, showed that U.S. airport hotels are the safest, in a study of 2,123 hotels. With graduate student Masako Taylor, Enz devised safety and security indexes in which she measured features such as security camera monitoring systems, secured corridors, electronic locks, sprinkler and smoke detector systems, in-room safety information, and safety videos. The researchers found that a significant proportion of hotels rated 85 percent or higher out of the perfect score of 100 on the indexes. U.S. airport hotels scored the highest followed, in order, by large hotels, luxury hotels of any size, and new hotels. All-suite properties and convention hotels also ranked high in safety and security. Resorts scored low, attributed to amenities such as balconies, and bed-and-breakfast properties and condominiums scored low, attributed to lack of sprinklers and electronic door locks. Motels had the lowest score.

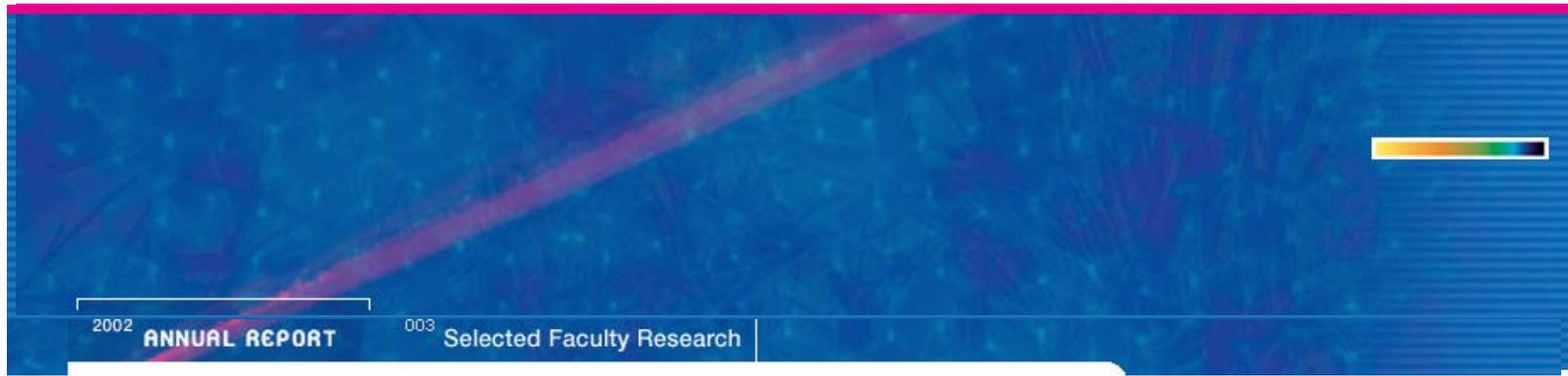
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07 Linking chronic noise and learning impairment



Gary Evans

Gary W. Evans, Design and Environmental Analysis, linked excessive noise with impairment in children's reading ability and long-term memory in a first of its kind study. This long-term study of the same children before and after living near airports in Munich, Germany, established that airport noise adversely affects reading, memory, attention, and speech perception in children. Among several studies, this one provides further and stronger evidence that exposure to chronic noise can have critical health, learning, and motivational effects in children and adults.

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08 Bringing proteins into broader view



Jack Freed

Jack H. Freed, Chemistry and Chemical Biology, and research colleagues discovered a new way to measure—or to see—proteins. The technique determines the protein structure by measuring the distances between atoms in the molecule at greater separations than previously possible. The technique is likened to a way of seeing the whole forest of a protein instead of seeing the trees one after another. It shows how molecules move, react, and interact with each other. This new method uses ESR (electron spin resonance) and is the first major advance at

Cornell's National Biomedical Center for Advanced ESR Technology (ACERT), directed by Freed. Prior to this discovery, protein structure has been determined by x-ray crystallography and nuclear magnetic resonance (NMR) spectroscopy, both with significant drawbacks. The new technology will quicken the pace in transforming the human genome sequencing projects' blueprints of life.

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09 Experimenting with a one-of-a-kind x-ray camera



Sol Gruner

Sol M. Gruner, Physics, and research colleagues developed a microsecond-imaging x-ray camera and conducted first experiments with it. Using this one-of-a kind camera, the researchers captured moving images of shock waves from diesel fuel as it emerged at supersonic speeds from an automobile engine fuel injector—a phenomenon never before measured (MacPhee et al., *Science* 295 [2002]). The x-ray camera, the Cornell Pixel Array Detector (PAD) can image phenomena that are hidden from optical cameras, yet visible by x-rays. In its final

form, the camera will be used for major experiments never before possible, for example, x-ray imaging of crack propagation in materials. In the fuel injector experiment, conducted at the Cornell High Energy Synchrotron Source, of which Gruner is director, the researchers were able to penetrate droplets of fuel as they emerged through a fuel injector nozzle of 178 microns across traveling at 345 meters per second. The droplets of fuel formed a fog that causes light to scatter and prevents optical imaging of the fuel. The fuel injection research, a collaboration with Jin Wang's group at Argonne National Laboratory, may suggest ways to make fuel-injected engines more efficient and less polluting.

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10 Identifying restorer genes in plants



Maureen Hanson

Maureen R. Hanson, Molecular Biology and Genetics, and research team identified a gene that restores pollen production to sterile plants. Working with the petunia, a decorative plant, the researchers located the fertility restorer gene in the plant cell nuclei of particular petunia varieties. This gene prevents an abnormal gene in the cells' mitochondria from disrupting pollen production. No other plant gene that can turn off the expression of a defective mitochondrial gene had been previously discovered. Knowing the general location of the gene in one plant genome helps to pinpoint it in other plants. Identifying a crop plant's natural restorer gene helps plant breeders transfer the gene more quickly to advanced breeding lines either by traditional methods or genetic engineering techniques.

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11 Revealing the role of estrogen in preventing female cardiac disease



Michael Kotlikoff and
Ke-Yu Deng

Michael I. Kotlikoff, Biomedical Sciences, led research that explained estrogen's role in preventing cardiac hypertrophy, an early sign of heart disease, in females. Using genetically engineered mice as models to study enlarged heart muscle, researchers at Cornell and Vanderbilt University discovered how FKBP12.6—the binding protein associated with the heart's ability to pump blood—regulates the release of calcium in muscle-cell signaling. By studying male mice genetically engineered with a predisposition to an enlarged heart and female mice in which they blocked estrogen production, the researchers found that estrogen production protects "FKBP12.6 mice" from cardiac hypertrophy. The research has implications in estrogen replacement therapy for postmenopausal women, for whom studies have shown an increase in cardiomegaly, heart enlargement.

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12 Supplying battery power for nanomachines



Amit Lal

Amit Lal, Electrical and Computer Engineering, and research staff created a battery that powers increasingly smaller electronic circuits and nanomachines such as remote sensors. The microscopic device converts the energy stored in the radioactive material directly into motion, which could move parts of a tiny machine or generate electricity in a form that is more useful for circuits. The device, in which Lal used only radioactive isotopes that emit beta particles, can supply power for decades. Unlike chemical batteries, the device can work in a very wide range of temperatures. Possible applications for the new battery include sensors to monitor the condition of missiles stored in sealed containers, long-term concealed and unattended battlefield sensors, and medical devices implanted in the body. An entire device, including a vacuum enclosure, can be made to fit in less than one cubic millimeter.

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13 Creating the single-atom transistor



Paul McEuen (far right)
and research colleagues

Paul L. McEuen, Physics, and colleagues at the Cornell Center for Materials Research created a single-atom transistor. The research team, including Daniel C. Ralph, Physics, implanted a "designer" molecule (designed by Héctor D. Abruñtí, Chemistry and Chemical Biology) between two gold electrodes to create a circuit. When the researchers applied voltage to the transistor, electrons flowed through a single cobalt atom. Although the device does not have all the functions of a traditional transistor, such as amplification, it has potential application as a chemical sensor, and it demonstrates the potential for shrinking the size of components far beyond the capability of conventional lithographic techniques for future electronic applications.

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14 Attracting institutional investors



Roni Michaely (l.) and Yaniv Grinstein (r.)

Roni Michaely and Yaniv Grinstein, Johnson Graduate School of Management, found that companies attract more institutional investors—pension funds, mutual funds, banks—by repurchasing shares of their own stock and paying out fewer dividends. This is contrary to the traditional wisdom on how companies capture the interest of new institutional investors (that is, more dividends attract more institutional investors). The study showed that although institutions prefer companies that pay dividends to those that do not, paying fewer dividends is better.

The study suggests that pension funds and banks like dividends mainly because the practice appears more prudent, rather than because of large payouts. Institutional investor groups in the U.S. hold about 50 percent of equity in U.S. public firms. Firms that attract more institutional investors are more likely to thrive.

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15 Battling tuberculosis



Carl Nathan

Carl Nathan, Weill Cornell Medical College, Microbiology and Immunology, and research colleagues discovered one way in which the tubercle bacillus, which causes tuberculosis (TB), persists over the course of a person's lifetime once infected, outsmarting the body's immune system. The researchers found that *Mycobacterium tuberculosis* (Mtb) defends itself against the oxidative stress produced by the immune system by using a "bucket brigade" of proteins, including two proteins that are widely known to have functions in essential metabolism. It is the

first known case of metabolic enzymes that also support antioxidant defenses. The discovery of the new function of three proteins, together with a fourth protein, acting to disarm the peroxide and peroxynitrite produced by the immune system's macrophage cells is a breakthrough. (The proteins are dihydrolipoamide dehydrogenase, Lpd; dihydrolipoamide succinyltransferase, SucB; alkyl hydroperoxide reductase, AhpC; and AhpD, so named because its gene is next to and just downstream of AhpC.) The research has implications for drug targets for Mtb. Tuberculosis is one of the world's leading causes of death by an infectious disease, affecting nearly 2 billion people worldwide, with 16,000 active cases reported in the U.S. in 2001.

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16 Treating cancer with retinoic acid



Noa Noy

Noa Noy, Nutritional Sciences, discovered a way to treat several cancers with retinoic acid (RA), a derivative of vitamin A, with fewer side effects. RA regulates gene transcription and therefore governs many functions in the body, including cell division and the development and spread of cancer cells. The process of turning genes on and off requires high doses of medication, and the side effects of the high levels of RA can be devastating. By making tumor cells up to a thousand times more sensitive to RA, Noy's discovery will enable much smaller doses of RA to be used—even the amount of RA that naturally occurs in the body. Noy found that a protein called cellular RA-binding protein II (CRABP-II) in the cell can enhance the ability of RA to inhibit the proliferation of breast cancer cells, requiring less RA to suppress tumor growth. CRABP-II exerts these effects by activating the transcriptional regulator protein called retinoic acid receptor (RAR), which binds to certain DNA sequences and turns targeted genes on or off. RA has been used to treat prostate cancer and leukemia. Experiments are underway using retinoids to treat breast, head-and-neck cancers, diabetes, arteriosclerosis, and emphysema.

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17 Calling for energy conservation



David Pimentel

David Pimentel, Ecology and Evolutionary Biology, and graduate students analyzed the future energy needs of the U.S. They found that renewable energy resources, even if implemented maximally, would replace only about half of the U.S. consumption of oil, natural gas, and coal. Alternative energy systems, such as hydroelectric, solar and wind power, and biofuels, if fully developed, would take up 17 percent of America's land area. The leading problem is the U.S. rate of energy consumption needed to maintain the current standard of living. Energy conservation is the only proven alternative. The researchers cited two of the 10 alternative energy sources reviewed—geothermal systems and the biofuels, ethanol, methanol, and vegetable oils—as not renewable and sustainable. The researchers recommended a conservation program—for individuals, communities, and industries—that conserves fossil fuel resources by using renewable resources and by reducing consumption. Pimentel's group states that other developed countries have proven that high productivity and high standards of living can be achieved with half of the energy expenditure of the U.S.

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18 Unlocking evolutionary secrets of insects



Wendell Roelofs

Wendell L. Roelofs, Cornell Geneva Campus/Entomology, and research team found an undetected gene, the delta-14, which holds a key to how insects evolve into new species. The Roelofs research team made the discovery while searching for methods to prevent European corn borers from mating, multiplying, and destroying fields of crops. The delta-14 gene regulates the chemicals produced in sex pheromone glands of females to attract males for mating. The researchers found that this mutated gene can be suddenly switched on, changing the pheromone components that the females use to attract males. The mating communication system between rare males (1 in 200) who can respond to the chemical produced by the female carriers of the delta-14 gene become the basis of a new species. As females with the delta-14 gene mate with other rare males, these males and females stabilize their pheromone communication system. This isolates the new population from the parent species. The discovery has significant implications for effective pest control by disrupting the mating of insects.

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19 Dropping out?



John Sipple

John W. Sipple, Education, and colleagues surveyed school superintendents across Upstate New York (excluding New York City) and found that 28 percent of the school superintendents reported an increase in dropouts two years after the New York State Board of Regents implemented the more stringent Regents diplomas for all students. Forty-five percent of the superintendents reported an increase in dropouts among the lower-performing school districts. Because of the new standard for New York State, high school students must pass the Regents courses and exams, get a General Equivalency Development (GED) certification, or drop out. School districts are no longer allowed to give local diplomas. The survey found an increase in the GED option in half of the state's school districts, however, students are reported as transfers rather than dropouts. The survey points to the question: Is the GED a legitimate alternative to the Regents high school diploma? It also has implications for the Academic Intervention Service (AIS) program and for AIS staffing cuts in times of fiscal stress.

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20 Choosing a job candidate



Michael Sturman

Michael C. Sturman, Hotel Administration, and colleagues revealed, in a new study, that promoting the internal job candidate with an above-average (but not exceptional) past performance record, as opposed to the external job candidate with an exceptionally high interview score, is significantly the best choice. Sturman's research found that reliable, valid past performance appraisals are more valid predictors of future job performance than other selection tools, such as structured interviews, cognitive activity tests, and job simulations. This holds particularly true

for professional positions such as managers, and supervisors, but also for jobs such as sales positions, bank tellers, and production workers. The researchers found that employers can expect an employee who has done well in the past to be a good performer for years to come. The study offers mathematical techniques that employers can use to calculate the weight that should be given a particular type or age of an appraisal. Sturman cautions employers to use statistical or other hard evidence rather than emotions or "gut feelings" in hiring decisions, and he reiterates that hiring data should be collected in a consistent manner for both external and internal candidates.

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21 Pulling apart chromatin fiber for observation



Michelle Wang

Michelle D. Wang, Physics, and research team made the first direct observation of the dynamic structure of individual nucleosomes—basic genetic packaging units. Chromosomal DNA is packaged into the compact structure of the nucleosome along with specialized proteins called histones. The DNA complex and histones are called chromatin in the cells of higher organisms. Wang's team used optical tweezers to pull apart individual strands of chromatin. They were able to see how information in nucleosomes becomes accessible to the molecules that read it. The researchers proposed a three-stage model for how nucleosomal units in chromatin open to reveal their DNA to enzymes such as RNA polymerase, which moves along the DNA molecule transcribing the genetic information for use by the cell. Nucleosomes seem to prevent the genetic information-transfer process that happens a million times a day in the cells of our bodies. Researchers want to understand the mechanical barrier presented by the nucleosome and how the nucleosome structure is modified to clear the way for information transfer. Although the basic plan of the system is previous knowledge, the structural and biophysical details of the system have not been clear.

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22 Linking nature with children's attention capabilities



Nancy Wells

Nancy M. Wells, Design and Environmental Analysis, found that children who live in space surrounded by nature have increased attention capabilities. Wells compared the cognitive functioning of children before and after a move from poor-quality housing to better-quality housing with more green spaces—nature in view from rooms or natural yard settings—while accounting for the effects of improved housing. The study showed that the natural environment plays a significant role, more than previously recognized, in the well-being of children within a housing environment. Interventions such as preserving trees, planting new ones, and maintaining grassy areas have a major impact on children's welfare. The finding may encourage legislators and policymakers to promote housing improvements for families with low and moderate incomes.

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23 Creating a flexible ceramic material



Ulrich Wiesner

Ulrich B. Wiesner, Materials Science and Engineering, and research group developed a new class of hybrid materials called flexible ceramics. Wiesner's group was surprised to see, through the transmission electron microscope (TEM), that the molecular structure of the new material, known as a cubic bicontinuous structure, corresponded to age-old mathematical predictions. They named the molecular structure, with its hexagonal symmetry, a "plumber's nightmare." The perfect symmetrical shapes found in nature fascinated the researchers. Working in nanoscale chemistry, they decided to mimic nature by using organic polymers that can self-assemble chemically into nanostructures with different symmetries. Wiesner's group melded the polymer with an inorganic material, a ceramic (silica-type material), to create the hybrid material with a combination of properties—flexibility and structure control from the polymer and functionality from the ceramic. The new hybrid material is transparent and bendable but with substantial strength, and it does not shatter like ceramics. Applications for the new material are wide-ranging, from microelectronics to the separation of macromolecules such as proteins.

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24 Engineering rice to tolerate environmental stresses



Ajay Garg (l.) and
Ray Wu (r.)

Ray J. Wu, Molecular Biology and Genetics, and research colleagues demonstrated a strategy for genetically engineering rice and other crops for increased tolerance to major environmental stresses such as drought, salt, and temperature, and at the same time, for improved yields. The researchers added genes to synthesize a naturally occurring sugar called trehalose. Trehalose is found in a variety of organisms, but much less so in plants, except for resurrection plants in which trehalose gears them to survive long desert droughts, coming back to vibrancy when moisture is available. Wu's strategy includes learning how to turn on the trehalose genes in transgenic plants when stresses occur, such as the onset of colder temperatures, as well as learning how to make trehalose in particular parts of the plants such as the leaf, but not the edible grains. Raising the quality and quantity of food for parts of the world with dwindling resources is an important research mission.

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01 James F. Bell, ed., Astronomy



Asteroid Rendezvous: NEAR Shoemaker's Adventures at Eros (Cambridge University Press, 2002). This is a collection of essays and images, brought together by Bell and Jacqueline Mitton, Royal Astronomical Society, of Cornell astronomers and engineers who made the NEAR mission (Near Earth Asteroid Rendezvous) an amazing success. The mission was the first to orbit and land on an asteroid. It was also one of the first tests of NASA's new "better, faster, cheaper" planetary exploration. The mission produced hundreds of thousands of images, spectra, and other measurements. The book tells the story of the mission from conception to culmination.

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02 Francine D. Blau and Lawrence M. Kahn, *Industrial and Labor Relations*



At Home and Abroad: U.S. Labor-Market Performance in International Perspective (Russell Sage Foundation, 2002). The authors examine labor market dissimilarities between the U.S. and other advanced industrialized nations. They assess how the differences affect wage and unemployment levels. Blau and Kahn find, for example, that governments and unions have a more powerful effect on the labor market in Europe than in the U.S. While the U.S. market is more flexible, letting wages adjust to global economic upheavals so that jobs can be maintained, European economies are more rigid, maintaining wages at the cost of losing jobs. The book points to the role institutions can play in creating jobs and maintaining living standards.

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03 Thomas Borstelmann, History



The Cold War and the Color Line: American Race Relations in the Global Arena (Harvard University Press, 2001). Borstelmann examines how the Cold War intersected with the collapse of global white supremacy. As he explores two "Souths," South Africa and the U.S. South, he recasts the history of American race relations into an international context. The book is the first comprehensive investigation of the topic.

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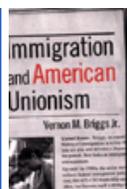


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04 **Vernon M. Briggs, Jr., Industrial and Labor Relations**



Vernon Briggs



Immigration and American Unionism (Cornell University Press, 2001). Briggs examines the shared history of unions and immigration. He explores the contentious relationship between U.S. immigration policies and the U.S. union movement: When immigration increases, unionism flounders and when immigration decreases, unionism thrives. Immigration has been viewed by worker organizations and their leaders as a menace. Briggs shows the intricacies of the relationship of immigration, labor, and unions. He discusses the survival of American unionism, the most reliable and persistent advocate for all American workers, and its incongruence with pro-immigration policy.

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05 Laura S. Brown, English



Laura Brown



Fables of Modernity: Literature and Culture in the English Eighteenth Century (Cornell University Press, 2001). Brown brings forward the concept of cultural fable. She shows how cultural fables emerge from material practices in eighteenth-century England. Recurring themes that are ascribed to a specific aspect of material culture, such as urban sanitation, shipping, the commercial printing industry, or the stock market, help to demystify history and culture. The fables provide a way of analyzing modernity and connecting it with two related paradigms of difference—the woman and the "native" (non-European).

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06 Daniel J. Decker, Tommy L. Brown, and William F. Siemer,
Natural Resources



Daniel Decker



Human Dimensions of Wildlife Management in North America (Wildlife Society, 2001). The authors cover the many aspects of human and wildlife coexistence. For example, are deer-car collisions and encounters with black bears and mountain lions human-created risks? The book defines the term, "human dimensions"; discusses citizen participation in issues of species restoration, agricultural and forest land-use, and urban and suburban environments; and gives a history of wildlife management. The book is a textbook for wildlife management, as well as a resource for professionals.

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07 Matthew P. Drennan, *City and Regional Planning*



Matthew Drennan



The Information Economy and American Cities (Johns Hopkins University Press, 2002). Drennan advocates a national information network as the "railroad of the 21st century" and essential for all American cities and the future economy. Just as the government participated in the building of railroads, telephones and electric power, highways and airports—which led to the modern economy—it must also participate in bringing a high speed, wide-band, fiber-optic network that transmits information rapidly—the same access at the same cost—to all places in the country, including the isolated areas. He shows that places that have invested in the information economy are doing much better than those that still rely on manufacturing and distribution. The book has a wealth of rigorously analyzed econometric data that is valuable to economists, planners, and policymakers with an interest in the future of U.S. cities.

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08 Milton J. Esman and Ronald J. Herring, eds., *Government*



Milton Esman and Ronald Herring

Carrots, Sticks, and Ethnic Conflict: Rethinking Development Assistance (University of Michigan Press, 2001). Esman and Herring reveal the ethnic consequences of foreign aid—the intended and unintended results. The authors present a collection of studies that focus on how wealthy nations and international agencies can deploy assistance in ways that might moderate rather than aggravate ethnic tensions.

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09 Alice Fulton, English



Felt (W.W. Norton, 2001). Fulton won the 2002 Rebekah Johnson Bobbitt National Prize for Poetry, sponsored by the Library of Congress, for this collection of poetry. Hailed as a book "blessed with great velocity, great staying-power," *Felt* was also selected by the *Los Angeles Times* as one of the best books of 2001 and a finalist for the *Los Angeles Times* Book Award for Poetry. *Felt* is described as having "direct wiring between sensation and language, feeling and form," with physical, intellectual, and emotional force. The play on the word, felt, as tangled fibers and as the past tense of the word, feel, provides interesting contexts for the poetry.

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10 J. Ellen Gainor, Theatre, Film, and Dance



Susan Glaspell in Context: American Theater, Culture, and Politics, 1915-48 (University of Michigan Press, 2001). Placed in various contexts —Greenwich Village and Provincetown bohemia, the American frontier, and American modernism—Gainor presents the dramatic work of key American author, Susan Glaspell. Gainor considers the theatrical, cultural, political, social, historical, and biographical climates in which Glaspell wrote. Gainor's discussion of these complex and interesting contexts has gained accolades. The book received one of *Choice's* Outstanding Academic Title awards for 2002. It is also the featured work at the "Author Meets Critics" plenary session at the Comparative Drama Conference.

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11 David I. Grossvogel, Romance Studies



Didn't You Used to Be Depardieu? Film as Cultural Marker in France and Hollywood (Peter Lang, 2002). Grossvogel analyzes the cultural differences between France and the U.S. by contrasting American film remakes with their French originals. He identifies misconceptions, dissimilar economic imperatives, and basically, different cultural patterns.

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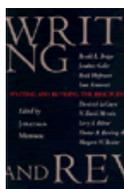


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12 Jonathan B. Monroe, ed., *Comparative Literature*



Jonathan Monroe



Writing and Revising the Disciplines (Cornell University Press, 2002). This collection of essays presents the reflections of prominent Cornell faculty on how their disciplinary contexts and practices have changed in the recent past and continue to evolve. The essays are the result of intellectual exchanges sponsored by Cornell's John S. Knight Institute for Writing in the Disciplines. The faculty covered are Ronald L. Breiger, Sociology; Jonathan

Culler, English; Roald Hoffmann, Chemistry; Isaac Kramnick, Government; Dominick LaCapra, History; N. David Mermin, Physics; Larry I. Palmer, Law; Hunter R. Rawlings III, Classics, President; and Margaret W. Rossiter, Science and Technology Studies.

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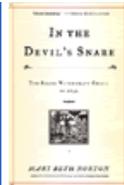
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13 Mary Beth Norton, History



Mary Beth Norton



Devil's Snare: The Salem Witchcraft Crisis of 1692 (Alfred A. Knopf, 2002). Norton presents a unique account of the events surrounding Salem Village, Massachusetts, in January of 1692. Legal action was brought against 144 people, and 20 of them were put to death in the Salem witchcraft trials. She also places the trials in the context of the Indian wars at the time. Norton brings to life this fascinating period, telling the story from the perspective of the people in the seventeenth century. The book has been hailed as "stunning," "dazzling," and Norton is acclaimed as a "master historian-detective."

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14 Don C. Ohadike, Africana Studies and Research Center



Don Ohadike



Pan-African Culture of Resistance: A History of Liberation Struggles in Africa and the Diaspora (Global Publications, 2002). Focusing on culture contacts and their effects, Ohadike defines the Pan-African culture of resistance as a pattern of behavior and a cultural heritage that is shared by all black people. He discusses how the history of black people in Africa was connected to the history of black people in the Americas and how black people as a whole waged a five hundred-year war against European domination. Ohadike explains that the struggle for black liberation began on European-owned slave ships during the Atlantic crossing and continued on the plantations and maroon settlements, giving rise to a Pan-African culture of resistance in the Americas.

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15 David S. Powers, Near Eastern Studies



Law, Society, and Culture in the Maghrib, 1300-1500 (Cambridge University Press, 2002). Powers uses six legal cases that took place in fourteenth- and fifteenth-century Muslim societies in the Maghrib (present-day Morocco and Algeria) in order to illustrate a tradition of rationality and balance in Islamic law. The book presents cases on diverse subjects—paternity, fornication, water rights, family endowments, the slander of the Prophet, and disinheritance. Powers shows that Muslim judges and jurists were highly sensitive to society and cultures and based their judgments on rational thought and argument. Although there may be reasons for the rise of fundamentalist societies in modern times in places such as Iran or Afghanistan under the Taliban, the book clarifies that Islamic legal heritage is closer to Western values than realized.

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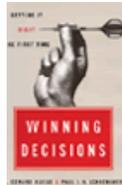
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16 J. Edward Russo, Johnson Graduate School of Management



J. Edward Russo



Winning Decisions: Getting It Right the First Time (Doubleday Currency, 2002). After decades of groundbreaking research and 30 years of consulting with top executives and managers, Russo and co-author, Paul Schoemaker (University of Pennsylvania, Wharton School) offer strategies for making good decisions. They note that the old-fashioned way of making decisions—intuition, common sense, and specialized expertise—is not sufficient for today; the risks are too high. They cite, as example, decision-making and the Challenger space shuttle disaster (studied in a previous book). The authors present a four-step decision-making framework: 1) frame the issues to ensure the real problem is being solved; 2) gather all facts, options, and reasonable evaluations of the "unknowables"; 3) use a systematic approach, rather than an intuitive one; 4) refine your decision using lessons learned from past successes and failures. The book has been hailed by the *Harvard Business Review* as a "comprehensive, well-balanced guide" to decision-making.

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17 **Vilma Santiago-Irizarry, Anthropology**



Vilma Santiago-Irizarry



Medicalizing Ethnicity: The Construction of Latino Identity in a Psychiatric Setting (Cornell University Press, 2001). Cultural sensitivity was introduced in three bilingual, bicultural psychiatric programs for Latino patients at public mental health facilities in New York City. Santiago-Irizarry's book establishes that this act led to an assertion of Anglo-American standards of behavior and negative definitions of Latino culture. It highlights how good

intentions can produce unintended consequences. Santiago-Irizarry questions the definition of multiculturalism used by a variety of institutional settings in an attempt to mandate equality.

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18 Norman T. Uphoff, Government



Norman Uphoff



Agroecological Innovations: Increasing Food Production with Participatory Development (Earthscan Publications, 2002). Uphoff provides 12 case studies of innovative approaches to agricultural development. These successful and diverse approaches apply knowledge, skill, and labor rather than large capital expenditure to increase agricultural productivity in environmentally sustainable and socially desirable ways. The book is a vital guide and

resource for professionals and policymakers in agriculture and food production. It is also an important text for academics and researchers.

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01 CEA Systems



Louis Albright

CEA Systems is a privately held corporation based in Ithaca, NY. CEA Systems, in partnership with the Cornell Research Foundation, is charged with the development and the deployment of Controlled Environment Agriculture (CEA) technology. CEA is based on developments in lighting control and horticultural practices from the research groups of Louis D. Albright, Biological and Environmental Engineering, and Robert W. Langhans, Floriculture and Ornamental Horticulture. CEA is the enabling technology for a new paradigm in twenty-first century agriculture. No

longer limited to searching for a plant adapted to the environment, it is now possible, on a commercial scale, to provide the desired environment for the plant. Cornell University is a leader in this emerging discipline, holding significant intellectual property on the subject.

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02 Nanofluidics, Inc.



Stephen Turner (l.) and Harold Craighead (r.)

Nanofluidics, Inc. (NFI), located in Ithaca, NY, is positioned to significantly improve the functionality, availability, and cost of bioanalysis. NFI pioneers technologies that integrate microcircuitry, optics, and biochemistry and have potential applications for miniaturized fluidics fabrication and single-molecule analysis. Devices that emerge from NFI's technology will raise the price and performance bar in the field of bioanalysis. The company's core technologies were developed in the research group of Harold G. Craighead, Applied and Engineering Physics. Craighead is a founder of NFI along with his former graduate student Stephen W. Turner.

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03 Transferring Technology, FY 2002

Invention Disclosures

Disclosures Received	213
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U.S. Patents

First-time Applications Filed	87
Applications Pending	483
Patents Issued	59
Patents in Force	518

Foreign Patents

Applications Filed	49
Applications Pending	652
Patents Issued	21
Patents in Force	200

Licenses

Licenses and Options	105
Total Equity Deals with Startups	26
Active Licenses	496
Number of Companies Started	7

License Revenue Sources

License Fees	\$859,200
Patent Reimbursements	\$1,044,000
Royalties	\$980,100

Total License Revenue	\$2,883,300
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Source: Cornell Research Foundation, Office of Patents and Technology Marketing

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01 Crossing Disciplines

Selected Research Centers at Cornell

Nanoscale Science and Technology
 Alliance for Nanomedical Technologies
 Center for Biochemical Optoelectronic Microsystems
 Center for Nanoscale Systems
 Cornell Center for Materials Research
 Cornell Nanofabrication Facility*
 Nanobiotechnology Center

Environment

Center for the Environment
 Institute for the Study of the Continents
 Multidisciplinary Center for Earthquake Engineering Research

Medical Research

Center for Aging Research and Clinical Care
 Center for Complementary and Integrative Medicine
 Center for the Study of Hepatitis C
 Center for Vascular Biology
 Howard Gilman Institute for Valvular Heart Diseases
 Institute for Computational Biomedicine
 Institute of Genetic Medicine
 Institute for Reproductive Medicine
 Sackler Institute for Developmental Psychobiology

Life Sciences

Agricultural Experiment Stations (Geneva; Ithaca)
 Baker Institute for Animal Health
 Cancer Protein Expression Laboratory
 Comparative Cancer Program
 Cornell International Institute for Food, Agriculture, and Development
 Institute for Genomic Diversity
 Institute for Biotechnology and Life Science Technologies
 Institute of Food Science
 National Biomedical Center for Advanced ESR Technology
 Plant Science Center

Physical Sciences and Engineering

Center for Applied Mathematics
 Center for Radiophysics and Space Research
 Cornell High Energy Synchrotron Source*
 Cornell Theory Center
 Laboratory of Atomic and Solid State Physics
 Laboratory of Elementary-Particle Physics*
 National Astronomy and Ionosphere Center*

Social Sciences and Humanities

Africana Studies and Research Center
 Bronfenbrenner Life Course Center
 Center for Analytic Economics
 Cornell Institute for Research on Children
 Cornell Institute for Social and Economic Research
 Program on Ethics and Public Life
 Institute for Women and Work
 Einaudi Center for International Studies
 Society for the Humanities

Business/Management

Behavioral Economics and Decision Research Center
 Center for Advanced Human Resource Studies
 Center for Hospitality Research

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Parker Center for Investment Research
Smithers Institute for Alcohol-Related Workplace Studies

*National Center

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02 Cornell's Colleges and Divisions

College of Agriculture and Life Sciences †
College of Architecture, Art, and Planning
College of Arts and Sciences
College of Engineering
College of Human Ecology †
College of Veterinary Medicine †
Division of Nutritional Sciences
Faculty of Computing and Information Science
Graduate School
Johnson Graduate School of Management
Law School
School of Continuing Education and Summer Sessions
School of Hotel Administration
School of Industrial and Labor Relations †
Weill Cornell Graduate School of Medical Sciences (New York City)
Weill Cornell Medical College (New York City)

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† Contract College

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