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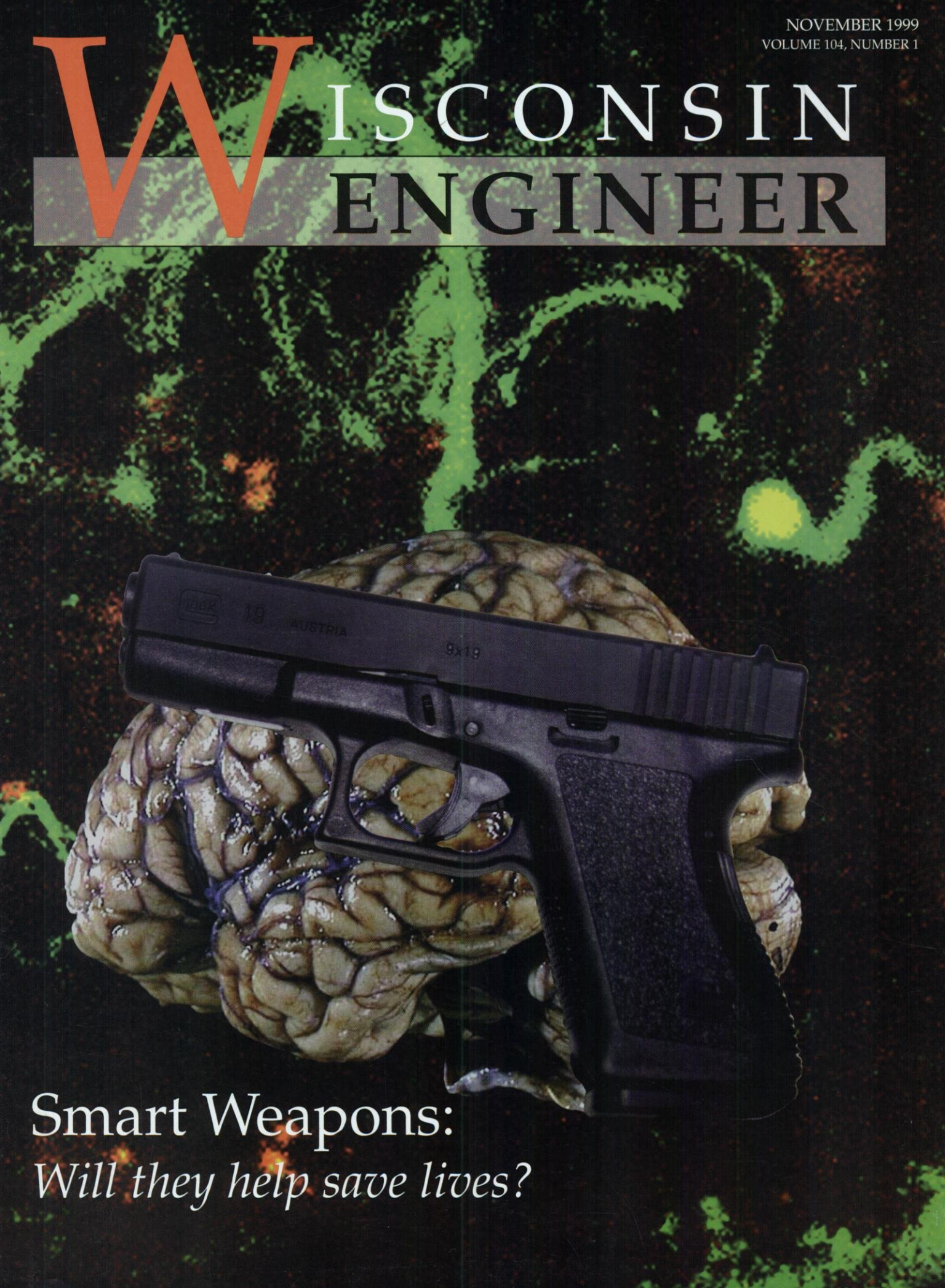
VOLUME 104, NUMBER 1

WISCONSIN ENGINEER



Smart Weapons:
Will they help save lives?

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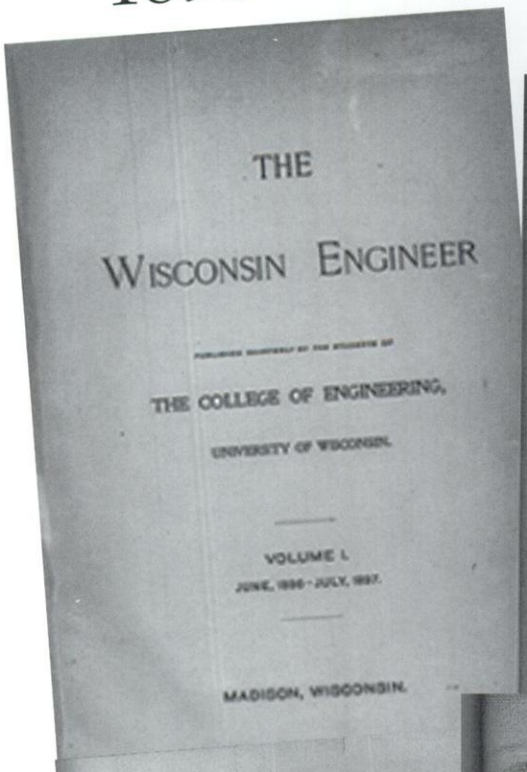

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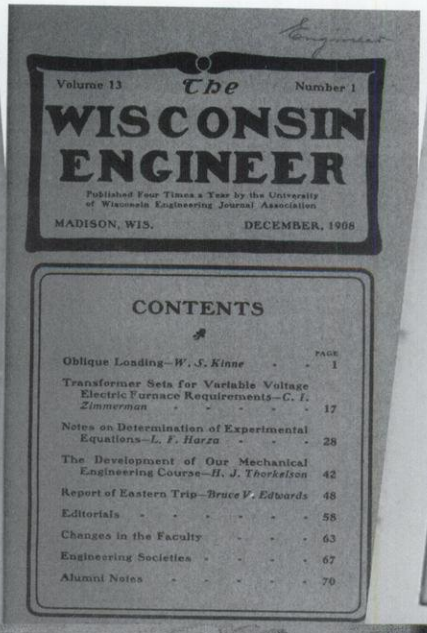

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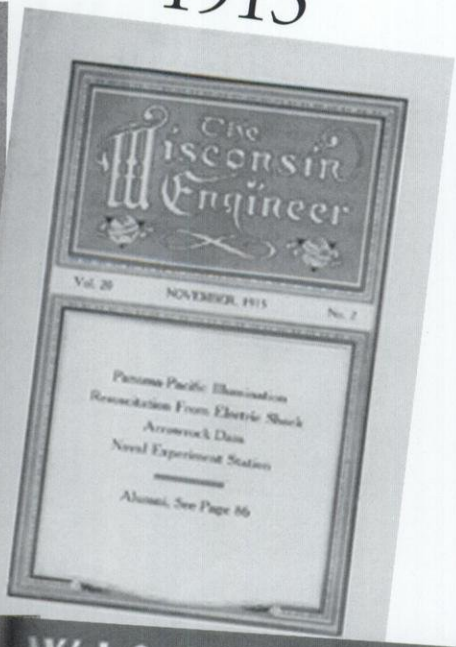

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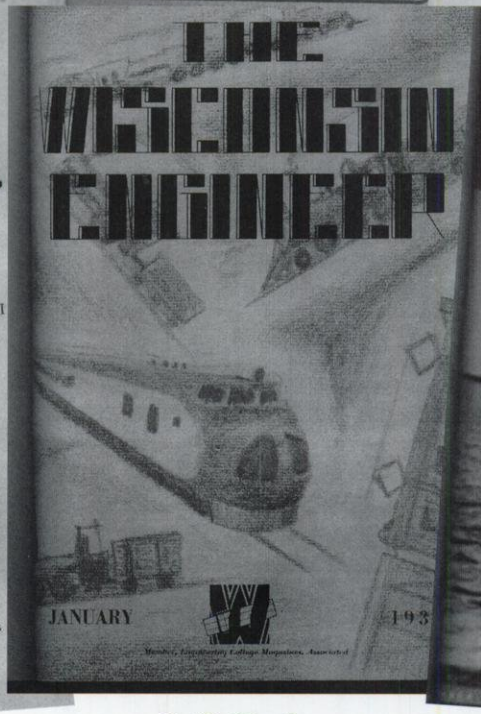

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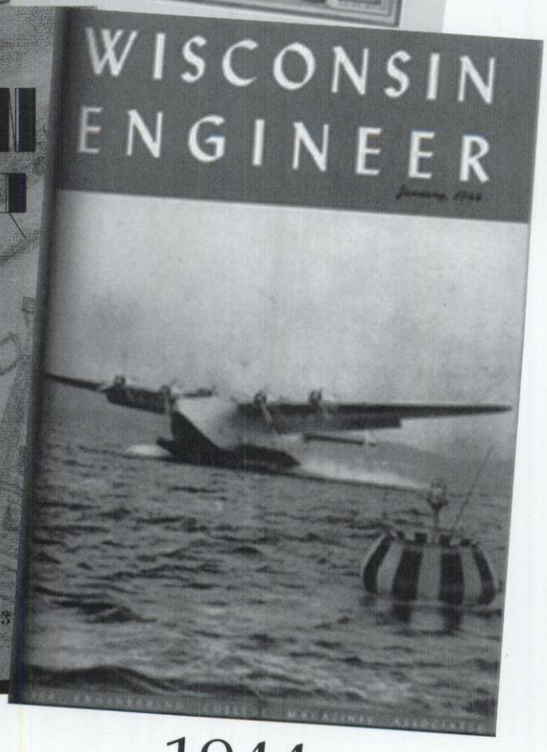

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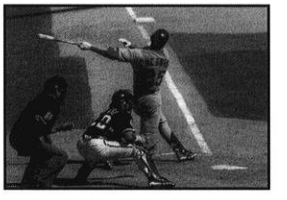
FOR THE PAST 104 YEARS, THE WISCONSIN ENGINEER HAS CARRIED ON A STORIED TRADITION...

WISCONSIN ENGINEER

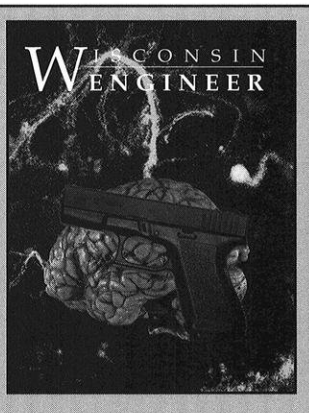
Published by the Students of the University of Wisconsin-Madison VOLUME 104, NUMBER 1 November 1999

TABLE OF CONTENTS

FEATURES



On the Cover:



Smart Guns:
Using engineering to prevent violence in the home and on the streets.
Cover designed by Victor Chen

DEPARTMENTS

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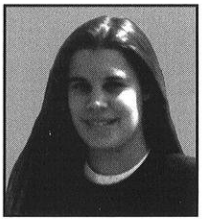

Like a Speeding Bullet

Somewhere along the way, a second became too slow. Today, it seems we are impatient with anything that isn't instantaneous. We are a society constantly checking our watches, marking our calendars and believing if we time it just right, we can fit it all in. We exchange the slow sound of blues for a driving techno beat to accompany us on our race to seize the day. We are in constant search of technologies that can get us through faster—accelerate our experiences — for we are looking to do more before 9 A.M. than our grandparents ever thought possible. You see, daily we fight to cram more into 24 hours than the kids next door, all the while hoping we don't forget to breathe. But in all this hectic chasing, have we forgotten something? When we abandoned the pace that now only painters, poets and postal employees follow, did we begin missing things? In our attempt to fit it all in, have we started to overlook those pleasures that require patience?

When is the last time you slowly, inadvertently let go of you restlessness and took the time to contemplate the path of falling leaves, daydream about goldfish or appreciate the dots of a Serat? Can you describe the last time you truly listened to a story—the whole thing—waited for the hidden truths and pauses to find an end that wasn't cut short by a listener's look of boredom? Try to remember the last time someone said to you, "go slow," and you listened.

What if one day, time took on an agenda of its own, failed to be universal, stopped its uniform push forward and began to slow down? In his novel, *Einstein's Dreams*, Alan Lightman, an MIT professor, describes just what we could see if time stopped.

"Raindrops hang motionless in air…At this place where time stands still, one sees lovers kissing in the shadows of buildings, in a frozen embrace that will never let go…One must consider that these statues are illuminated by only the most feeble red light, for light is diminished almost to nothing at the center of time, its vibrations slowed to echoes in vast canyons, its intensity reduced to the faint glow of fireflies…" This, though, is just the fiction of a physicist; we cannot stop time. However, if we slow ourselves down a bit, I have to believe a faint red light, similar to that at the center of time, can be found in the shades of a sunrise. So, patiently wait for daybreak, sigh and slowly, listlessly, languidly take it all in.

Tanya Kosmo

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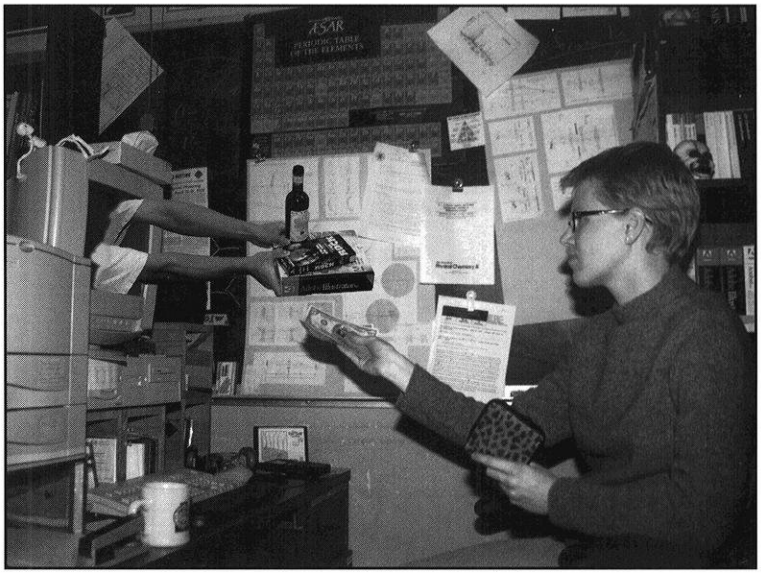
E-Commerce: Where is it Headed?

By Katherine Johnson

Technological experts are fervently speculating the future of e-commerce. On-line retail sites have found success with early adopters of technology and with those who regularly shop by catalogue. The general public, however, has yet to be convinced of the value of e-commerce. The success of e-tailing (as e-commerce is also known as), is entirely dependent upon the response of the public. E-commerce has reached the critical point recognized by Geoff Moore (*Crossing the Chasm*) in the technological product life cycle, known as "the chasm." It is at this juncture that the novelty wears off, causing early-user sales to drop slightly, yet the general public still has not fully embraced the technology. For the success of e-commerce, it is imperative that e-tailers build upon the benefits of brick-and-mortar retailing, while capitalizing on the unique qualities of Internet technology. Public education of e-commerce, combined with retailer response to consumer demands, will provide the bridge to success over the chasm e-commerce is now tottering on the brink of.

The success of traditional retail establishments is founded upon the following two factors: good customer service and intuitive, easy-to-navigate layout, both of which are easily translated to Internet retail.

The Internet doesn't need to be impersonal and heartless. In fact, its very nature encourages interaction. Retailers can easily take advantage of this by providing services to customers before, during and after the sale. For example, an e-tailer can provide pertinent information that may have nothing to do with what is offered by the company (shoe-care or sizing tips on a footwear sale page). Also, customer service representatives answer questions and aide in site navigation, especially when customers are searching for a specific product or brand. During the sale, offering various ways to order the product (by e-mail, snail mail, or telephone) will help persuade those hesitant to send a credit card number over the Internet navigator. After the sale, continued e-mail contact with the customer will help the business better understand the on-going needs of its clientele, while also providing an opportunity to target specific promotions to customers with a known purchase pattern.



Source: Victor Chen

From movies, to computer software, to fine Italian wine, one can purchase just about anything on the Internet these days.

E-tail establishments are not exempt from easy navigation simply because there is no physical store. There is a natural tendency to make web sites complicated and difficult to casually browse. The efficient merging of site maps and the use of customer service representatives can help assuage this, and quickly down-loaded pages and intuitive link-paths within the site saves the customer time and perhaps even embarrassment from asking for directions.

In addition to traditional techniques, the very nature of Internet technology allows for tremendous improvements upon customer services, direct marketing and product availability and affordability. Purchases are easily recorded, since they can only be made by check or credit card, and a database may be stored for better servicing and highly targeted marketing strategies. Made-to-order products will only become more affordable as on-hand inventories will become less necessary. The on-line bookstores have already taken advantage of this, offering books that would traditionally not have the market to be published in mass quantities. Instead, each book can be printed as it is ordered. Personalized CD's may also be ordered on the Internet, simply by choosing preferred songs from a list and placing an order.

Yet, no matter how efficiently an e-tailer establishes these practices, if the general public is not convinced of the timesaving, ease and affordability of e-commerce, there will be no market for the services. Many of the topics already covered come into play here again. Easily and quickly downloaded pages are a must, and shipping costs cannot greatly exceed the price one would spend travelling to the nearest shopping center. Marketing and advertising of the site is also imperative. Internet search engines are difficult for novice users to use efficiently; e-tailers cannot rely upon these to bring in the traffic. Direct mail campaigns, Internet, television and print advertising are all very important in establishing site awareness.

Internet commerce calls for new approaches to retail, while still adhering to the basic rules of good customer service. The e-tailer that capably embraces the advantages of the Internet while aggressively seeking potential customers will find great success in e-commerce.

Author Bio: Katherine Johnson is a senior majoring in journalism and mass communications. After graduation in May, she plans to work in London.

The Opportunity to Experience Engineering

Freshmen Solve Real-World Problems in EPD 160

By Katherine Friedrich

"Fifty percent of engineering students at the UW-Madison drop out or switch to non-engineering majors," says a study done by the College of Engineering. Luckily, a new course is helping change that statistic. Students who take this freshman design course, Engineering Professional Development (EPD) 160, are more likely to complete their engineering degrees. Surveys by the Engineering Learning Center (ELC) hint at the true successes of the course; the students' growth in confidence and their new understanding of what it means to be an engineer.

So, why do students who take EPD 160 get excited about engineering?

In EPD 160, student teams work together on solving real-world problems. First, customers, ranging from fire departments to organic farmers, prepare a wish list of projects. Then, the students are given one semester and a $200 to $300 budget to design and build a piece of equipment according to specific requirements from their customer.

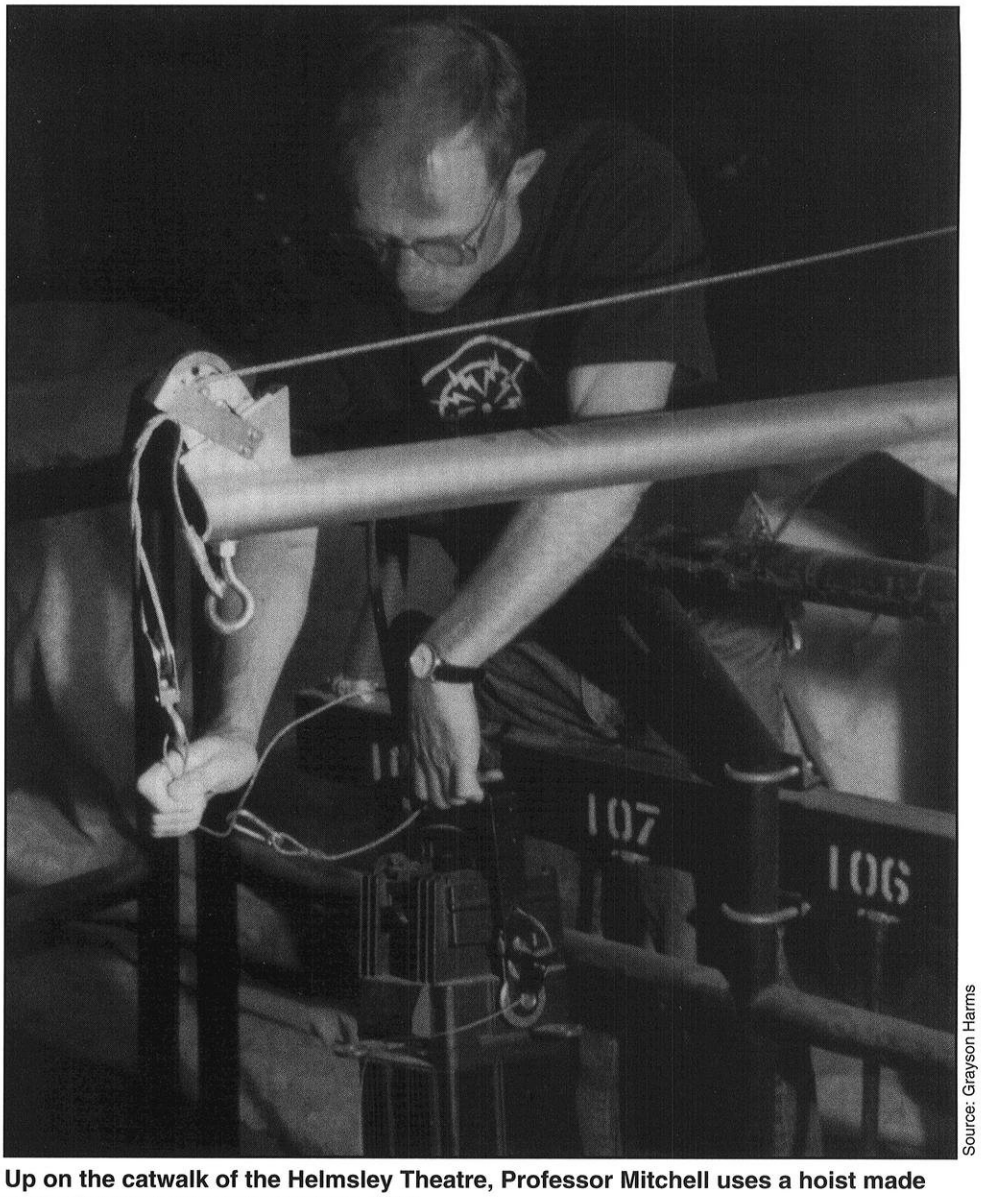
"A few years down the line, we can say, 'We did that... that's us'"

Many of the student projects focus on "one-of-a-kind devices, custom designs for people with physical limitations, that would be impossible to find or exorbitantly expensive," says Professor Patrick Farrell. Professor Jay Martin recalls a seat built for a child with osteogenesis imperfecta, a brittle bone disease. When the chair was completed and given to the child's mother, it "was pretty amazing to see... everyone was crying."

Working with disabled people can have an eye-opening effect on students. One student who worked on a wheelchair ramp enjoyed "getting to know wheelchair users...[and] learning something different about [a] facet of society that [I] normally didn't think that much about."

Besides designing for people with disabilities, students also build labor saving devices for small-scale farmers. Popular projects from past years include equipment to dig holes for seeds, water seedlings and wash vegetables. There is "no commercial market" for these helpful devices, says Farrell, and the farms in question are "not big enough to have a large machine-driven plow."

EPD 160 students have also simplified the task of moving stage equipment around the Helmsley Theater. The two most successful

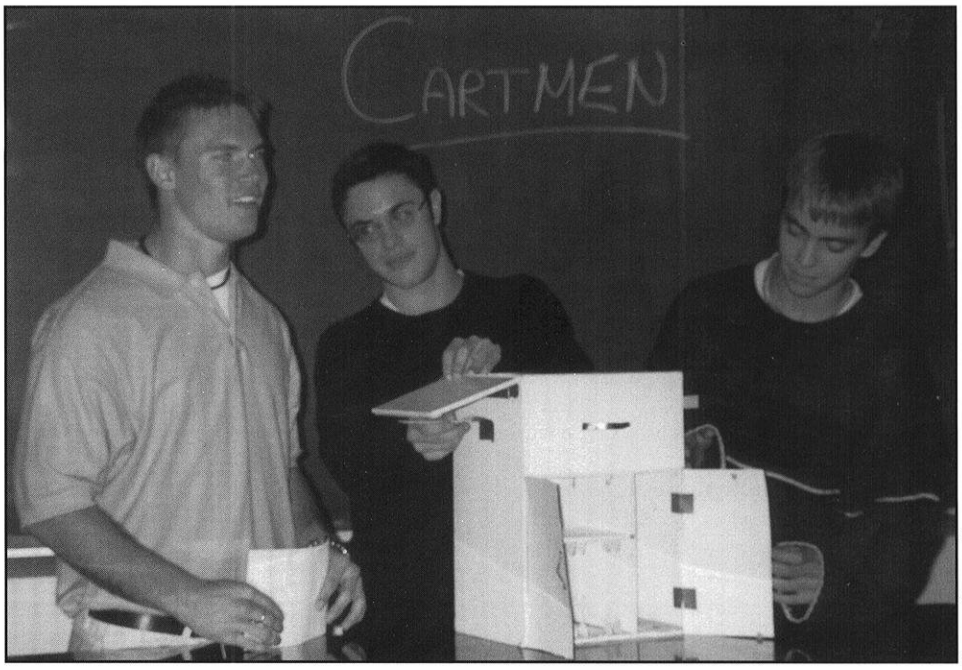


Source: Grayson Harms

Up on the catwalk of the Helmsley Theatre, Professor Mitchell uses a hoist made by EPD 160 students to lower a light.

projects for the theater department are a chair dolly and a hoist. The new chair dolly is stronger than the old one was, carries more chairs, rolls over bumps and works even when its supports are partially disconnected. The hoist raises and lowers speakers (and other stage equipment) from the catwalk above the audience. Theater professor Chuck Mitchell says that the hoist, which allows one to hold a speaker at the right height while setting up its rigging, provides "comfortable, safe handling for everybody."

"The best thing you can do is to teach them to become problem solvers who aren't afraid to find answers... It's real rewarding to see the final projects come through"



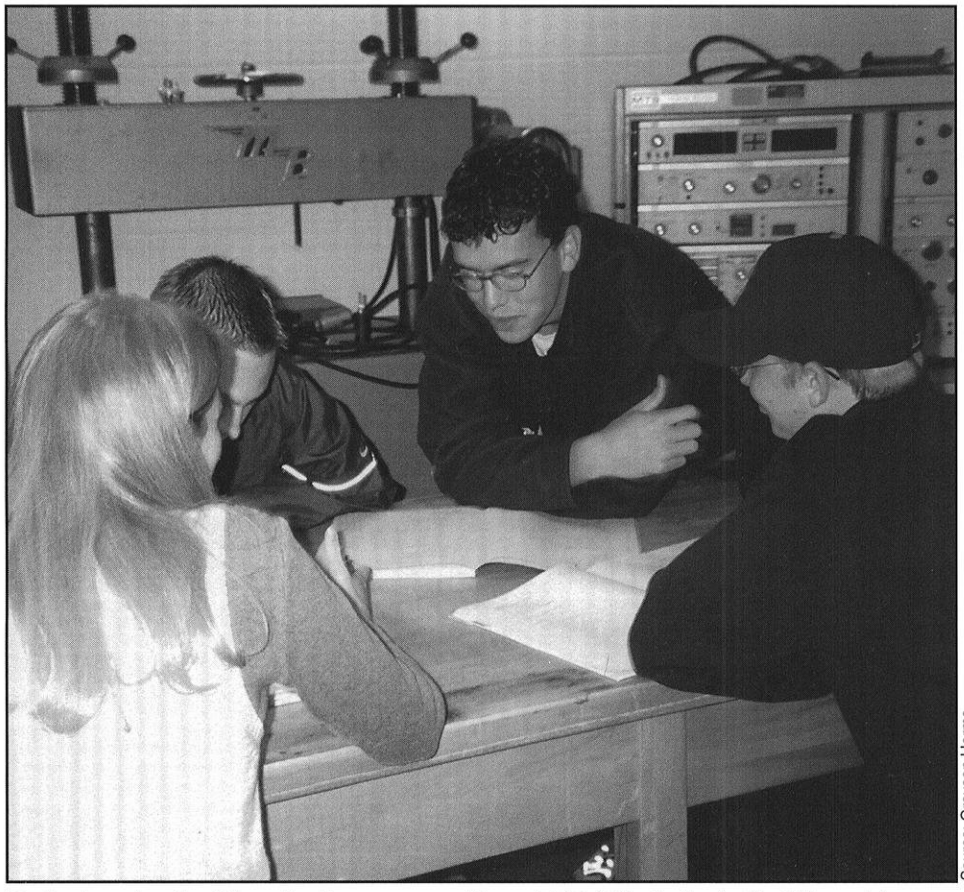
Source: Grayson Harms

EPD 160 students explain their model of a cart to be used for moving a professor's supplies from one classroom to another.

Of course, since EPD 160 is a course for freshmen, the customers and instructors do not expect perfect results. Some of the projects perform their function, however, many do not. The course is intended to give students exposure to engineering design principles as well as experience working on teams. The teamwork experience increases students' confidence, and it gives them the opportunity to get to know other engineering students. As one freshman told Professor Sandy Courter, "I was... one of those shy people to begin with... but I made myself get involved, and it's a lot more fun when you get involved!"

Students who take EPD 160 gain "the opportunity to experience engineering early in their academic career, [and to learn] that engineering involves people with lots of different talents," says Martin. One student expressed satisfaction that he was "actually doing a project that's affecting real life... A few years down the line, we can say, 'We did that... that's us.'"

For customers who are open to working with students, mistakes and all, the process is rewarding. "The positive thing about students is seeing their eyes open," says Mitchell. "The best thing you can do is to teach them to become problem solvers who aren't afraid to find answers... It's real rewarding to see the final projects come through."

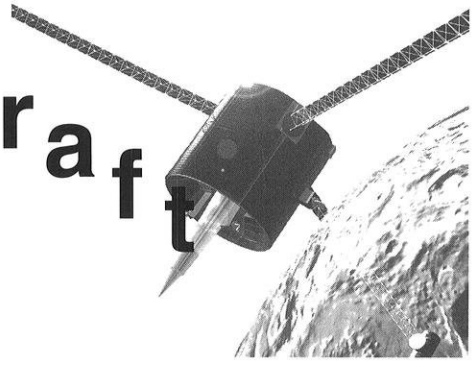


Source: Grayson Harms

Brainstorming for ideas isn't as easy as these EPD 160 students first thought. From left to right: Julie Grahm, Kris Reuter, Anthony Steffek, Andrew Jepsen.

Author Bio: This fall, Katherine Friedrich is teaching a lab section of EPD 160. She is working on her B.S. in mechanical engineering and wants to combine engineering with her interests in nature and the arts.

Sacrificing a Spacecraft in the Name of Science



By Molly Mitten

In the early hours of July 31, 1999 scientists looked on with glee as their $63 million space probe crashed into the surface of the moon. Were these truly "mad scientists" or is there more to this story?

This once existent spacecraft, the Lunar Prospector, has been called one of the most successful missions ever flown. The Lunar Prospector was the first lunar mission in 25 years and was the first of NASA's "better, faster, cheaper" missions. Lockheed Martin built the Lunar Prospector in less than 22 months and it was launched into space in January 1998. From the time the Lunar Prospector began orbiting the moon, scientific data flooded back to earth. Scientists received the results they needed to map the concentrations of various elements on the moon as well as map gravity and magnetic fields.

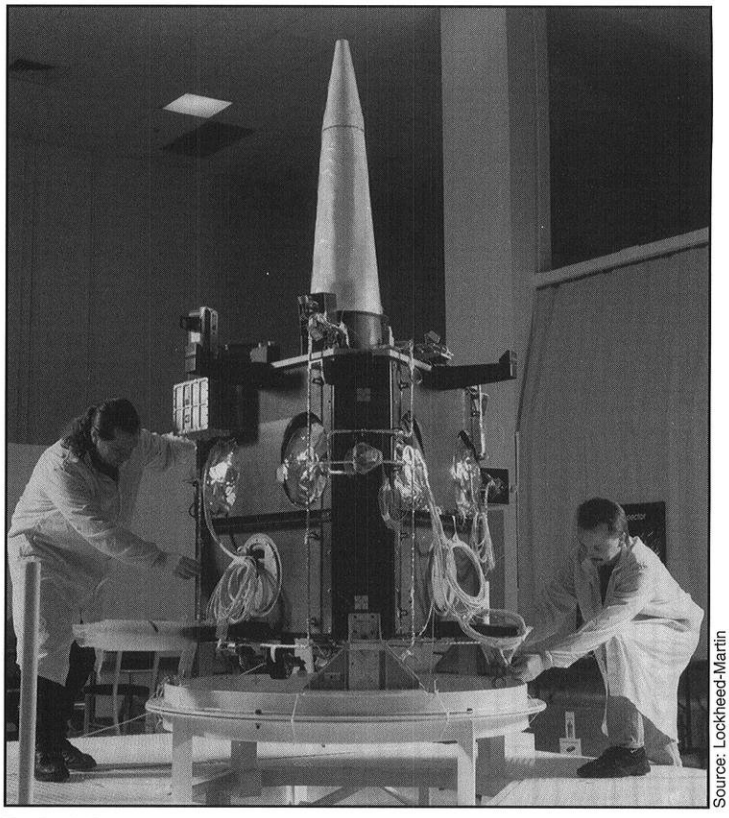
The Lunar Prospector has been called one of the most successful missions ever flown

The Lunar Prospector's demise was an intentional act designed to give scientists more evidence supporting lunar ice. When the mission was first planned, the Lunar Prospector was to orbit the moon until it ran out of power and crashed onto the surface. In mid-mission, scientists changed the plans. They decided to let the Lunar Prospector orbit the moon until close to the end of its useful life, then use the remaining power for a controlled crash onto the South Pole of the moon. The target was the inside of a 50-km wide permanently shaded crater. The crash of the 354 lb (weight at mission end) spacecraft has been called the equivalent of crashing a two-ton car at more than 1,100 MPH. If the Lunar Prospector managed to hit the target, which was more difficult than it may seem, scientists believed the cloud of vaporized lunar material, if visible from earth, could give evidence of ice. The crash into the crater was only 10% likely to work, but if successful, the data would be well worth it. Even though no dust plume was seen after the crash, scientists believe Prospector did impact the crater. Water vapor was also not visible with the naked eye, so the real evidence was hidden in the data remaining to be analyzed. This elemental data returned indicated large deposits of hydrogen at the moon's poles. These hydrogen deposits are proof that there is ice on the moon! This was some of best news scientists could have heard.

Why was this ice (frozen water) such a big deal? Well, water is more valuable than gold when it is 200,000 miles above the earth. Every shuttle that blasts into space has to carry an enormous amount of fuel. This fuel adds considerable weight to the shuttle. Right now it costs about $10,000 for every pound launched into space, not including the cost of travel through space. If the amount of fuel in a shuttle's tank is cut in half, the shuttle can carry a lot more cargo. If the moon's water is separated into hydrogen and oxygen gasses, space shuttles can fill up with enough hydrogen and oxygen gas to get back to earth. Shuttles could also stop for gas on the way to Mars or even more distant places. Lunar water can be used for other applications too. A lunar base may soon become a reality. In fact, an entire lunar colony could even sprout up in the next century. The residents of the moon will need water for drinking and growing food as well as many other applications, from mixing cement to cooling power generators.

One problem remaining is that the lunar ice is not exactly in a big ocean anywhere on the moon. It is mixed up with soil and other elements and buried 18 inches underground. The water is frozen into permanently shaded craters spread out over the polar areas of the moon. Scientists and engineers are currently working on cost-effective ways to extract the ice and turn it into rocket propellant.

Another problem is the limited amount of ice. It is believed that there could be as much as 600 billion tons of ice on the moon, which may sound like a lot, but lunar ice is nevertheless a limited resource. If the water is used as hydrogen and oxygen gas propellant, it will be used up.



Source: Lockheed-Martin

Technicians at Lockheed-Martin worked long and hard to prepare the Lunar Prospector for its mission.

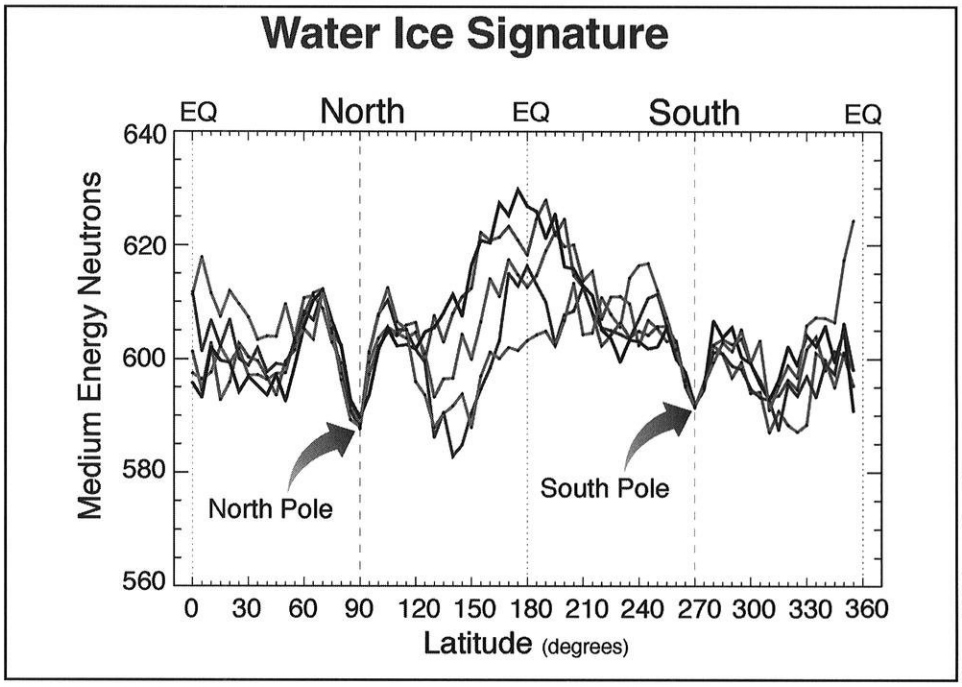
The moon is constantly being showered by meteorites, and in the past many comets have also hit the surface. The comets and many of the meteorites contain water ice. The lunar impact vaporizes most of the water and it escapes into space. The water molecules that remain on the surface are

Water is more valuable than gold when it is 200,000 miles above the earth

those that landed in permanently shaded craters. These craters never rise above –280 degrees F, so the ice can be stable for billions of years.

Scientists are very excited about both the success of NASA's first "better, faster, cheaper" mission and the scientific data it sent back. The Lunar Prospector will likely be followed by robotic and manned missions to physically look for and analyze the ice. This lunar resource and the related missions are working to make space travel easier and cheaper. These missions are also preparing for the day when man can return to the moon -- and stay.

Author Bio: Molly Mitten is a sophomore in Mechanical Engineering who wouldn't mind moving to a lunar colony some day.



Source: NASA Ames Home Page

Neutron spectroscopy, the method which Lunar Prospector mission scientists used to search for water ice on the Moon, hinged upon the detection of -- not surprisingly -- small particles of energy called neutrons which continually emanate from the lunar surface. In this graphic, note the coincident dips in medium-energy neutrons at both lunar poles (see arrows). This is a definitive signature for water. Based on the extent of the dips, mission scientists estimated that the total amount of water on the Moon could have been anywhere from 10 to 300 million metric tons (2.6 to 26 billion gallons).

Modern Neuroscience: Exploring the Brain's Mysterious Depths

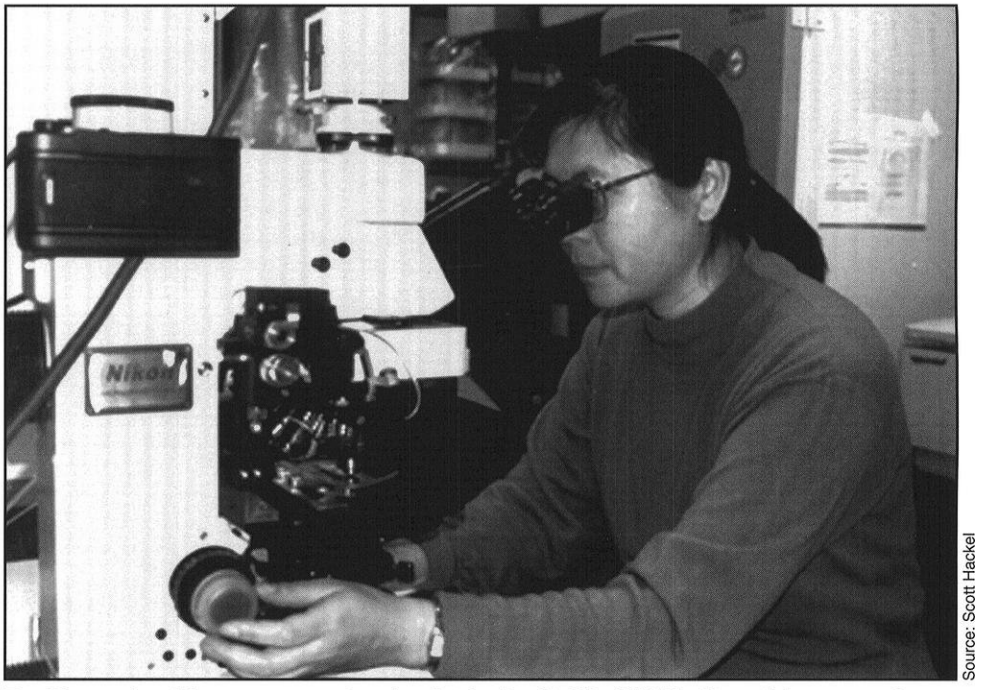
By Ryan Sydnor

Like a vast uncharted planet, the brain remains a grand mystery to scientists. "The brain is the last great bastion in biology," states Chris Fibiger, vice president of neuroscience discovery and clinical investigation at Eli Lilly & Co., Indianapolis, IN. That is not to say that we are totally in the dark. Many of the esoteric secrets of the brain have been revealed over the past ten years, which has been dubbed the "Decade of the Brain." At this very moment, we know that visual receptor cells in your eyes are sending impulses to your brain. Your brain processes the markings on this page into comprehensible language. You scratch an itch on your leg with one hand while reaching for your coffee with the other. Receptors in your nasal passages and on the surface of your tongue allow you to perceive the coffee's bold aroma and flavor. This familiar sensation immediately recalls to mind a pleasant past experience. You hear the phone ring, but this article has you so riveted that you decide to let the machine get it. All of this is made possible by interactions among more than one trillion neurons (nerve cells) that make up your nervous system. Your brain itself functions as a complex web of smaller systems of neuronal ensembles, or groups of brain cells.

What if scientists could figure out how to actually *regenerate* lost brain cells? Perhaps they can

Alas, the brain is more than just a "noodle," as some have maintained. While technical advances and breakthroughs have shed light on the riddle of the brain, they have also led scientists to better comprehend how little is actually known. This fact, along with the ever-increasing susceptibility of the aging population to neurological disease, has resulted in a spectacular expansion of neuroscientific research across the globe. At the close of the "Decade of the Brain," we find the field of neuroscience at the dawn of an exciting new era.

Here's a frightening thought: As you continue with your life, you are losing brain cells that will never be replaced. Considering the devastating and irreversible effects of a stroke, severe head trauma or neurological disease, it is a very troubling thought. What if scientists could figure out how to actually *regenerate* lost brain cells? Perhaps they can. Until recently, it was generally accepted that the adult brain is left with a finite number of neurons, which slowly but inevitably diminishes with time. Researchers now know a great deal about the proteins that determine nerve cell growth. It seems that brain cells, like other cells of the body, may be regenerated when placed under the right growth conditions. Now, scientists have set out to identify the cellular receptors and pathways that lead to brain cell regeneration. Another challenging task will be to design small-molecule drugs that can penetrate the blood-brain barrier, a natural mechanism that regulates the passage of materials from the blood to the brain. If scientists are successful in these pursuits, they will find a way to stimulate the replacement of lost brain cells – a feat once considered virtually impossible. Perhaps even more promising than the latest findings on neural *regeneration* are those on neural *transplantation*— the transfer of cells from one brain to another. Scientists at Rockefeller University have recently identified a population of cells in the medial ganglionic eminence (MGE) of the ventral forebrain that have an astonishing ability. MGE precursors are capable of migrating throughout the adult brain and integrating themselves into regions needing new cells. In other words, these cells can move to a desired region of the brain and start growing as if they belonged there. These findings suggest the possibility of actually transferring cells from one brain to another. While therapy and repair through neural transplantation is currently only possible in young, developing brains, MGE precursors may allow such procedures to be performed on adult brains as well. The latest studies are

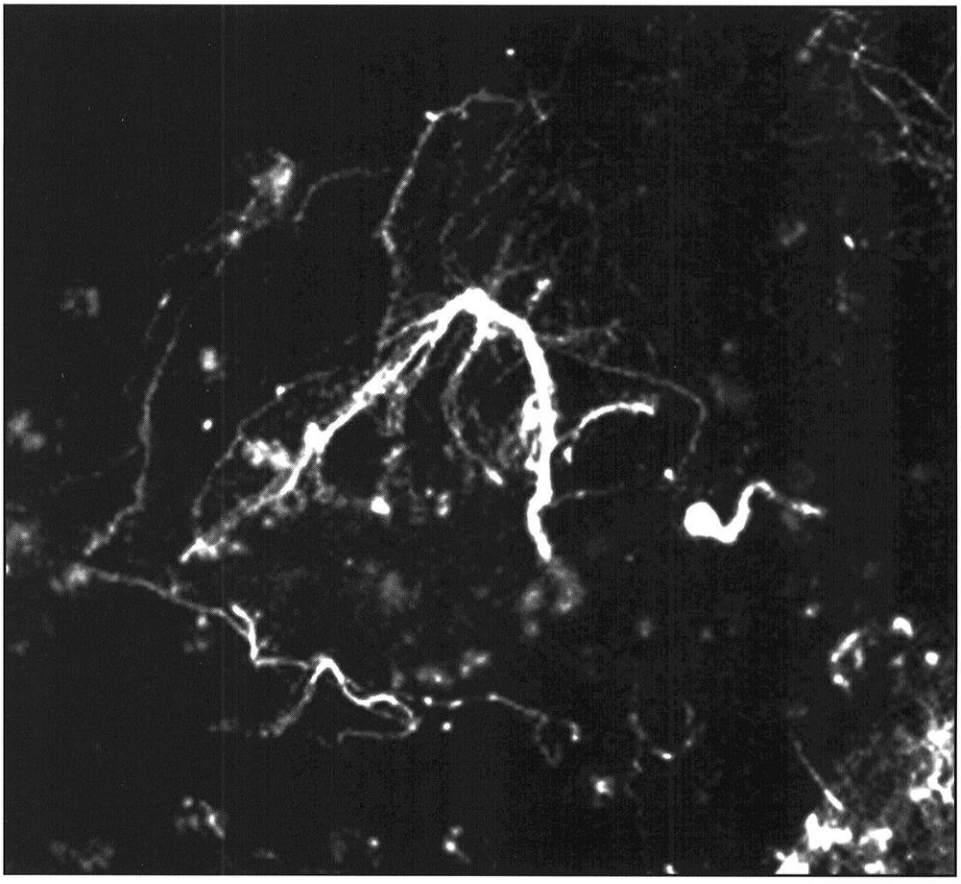


Source: Scott Hackel

Dr. Changying Ling, a research scientist in Dr. Kalil's UW-Madison laboratory, has spearheaded research showing that embryonic neural stem cells can be transplanted successfully into the adult brain.

not the first to show that transplanted cells may grow successfully in the adult brain. However, they are the first to show that transplanted neurons may actually *travel* to a damaged region of the brain. Doctor Ronald Kalil, UW-Madison professor of neuroscience, ophthalmology and visual science has researched neural transplantation for about two years. Discussing the significance of the findings at Rockefeller University, he explains, "People have transplanted cells to the brain before now... but frequently they stay in the vicinity of where they are transplanted." Kalil compares neurons used in these previous attempts to a person who "grows up, moves only a small distance from home, and dies in the same small town." The cells of the MGE, however, are going places. The implications of these findings are profound. If neuroscientists can develop an effective technique for such transplantation, it may be applied in the treatment of disorders such as Huntington's disease and epilepsy. Of course, now that scientists have witnessed the phenomenon of neural migration, their curiosity has only deepened. As Kalil says, "*Why*—that's the new set of questions that comes up."

Years of research and discovery are now culminating in the production of a man-made brain—a "thinking machine" actually capable of reproducing human consciousness



Source: Dr. Ronald Kalil

Images taken from the laboratory of Dr. Ronald Kalil show stem cells from the embryonic rat brain capable of developing into young neurons.

Over the past few years, researchers have also gained insight into the brain's "wiring" mechanism. As the brain develops, neurons make axonal networks by sending growth cones in all different directions. The result is a kind of neuron "tree," with axons forming the branches. For quite some time, scientists have known that the direction of a brain cell's growth is based on a delicate balance of attractive and repulsive forces. However, recently scientists have begun to actually understand the mechanisms behind these forces. They have now identified some of the genes and proteins that determine the fate of growing neurons. The implications of such findings are unclear. Could scientists eventually manipulate the paths in which neurons will grow? Even if such bold feats are beyond the capacity of neuroscience, this newfound knowledge may help scientists achieve a better overall understanding of the mind's complex network.

With seemingly limitless possibilities of research, neuroscience is drawing from an increasingly broader base of knowledge. Today, neuroscientists come from diverse backgrounds, each bringing something special to contribute to the pursuit. A prime example of this is seen in the collaboration of engineers and molecular biologists to develop an artificial model of the brain. The ultimate goal of this project is to put our knowledge of the brain's molecular processes into the framework of biological reality. Years of research and discovery are now culminating in the production of a man-made brain—a "thinking machine" actually capable of reproducing human consciousness. Biologists could use such a model in translating molecular mechanisms into the physical functions they produce. The project has benefited greatly from the combination of two very different ways of thinking. While the biologist looks at the brain from a bottom-up perspective, analyzing the various pieces and trying to fit them together, the engineer takes the opposite approach, beginning with the functions of the brain and working down. Neuroscientists hope to gain a more complete understanding through the integration of such viewpoints, as each day they venture further into the profound depths of the human brain.

Author Bio: Ryan Sydnor is a freshman in biomedical engineering who aspires to play like Hendrix, think like Einstein, and fight like Bruce Lee — despite the fact that he is incapable of actually doing so.

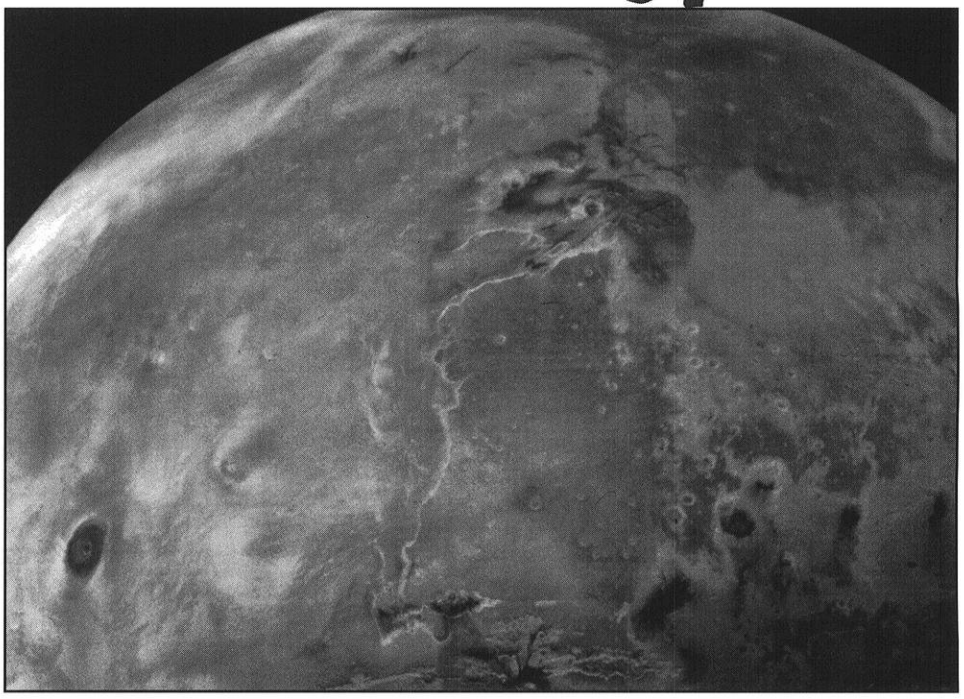
Life on Mars

By Lynn Weinberger

Science fiction enthusiasts have always hoped that life exists on other planets. For years, popular culture has bombarded us with stories about aliens and Martians. What if these stories are true? According to Professor Churchwell, who teaches Extraterrestrial Life, an astronomy course at UW-Madison, the probability that life has existed on Mars is "non-zero." However, this extraterrestrial life would not look like the gray and green aliens you see on TV.

Two main pieces of evidence point to the existence of extraterrestrial life, the being that Mars used to be very wet. Photographic evidence of landforms that look like riverbeds and floodplains support this hypothesis. Geologists believe that water, which is made of common elements available within the universe, is the only substance that could carve out the landscape in such a way. Water facilitated the development of life on Earth, and scientists presume that life would originate the same way on Mars. The other piece of evidence pointing to life on Mars came from meteorites that have crashed into Earth from our planetary neighbor. The meteorites were pieces of Mars that were blasted into space by a meteoroid impact. These meteorite pieces are igneous formed by volcanic activity. Scientists from NASA know that these meteorites are from Mars because the gases trapped inside them match measurements taken by Viking Probe of the Martian atmosphere.

The meteorites from Mars show evidence of fossilized organisms, which are one-hundred times smaller than terrestrial cyanobacteria. Cyanobacteria are single-celled bacteria that are capable of photosynthesis, and they are microscopic, approximately two microns in diameter. The fossils alone are not the only evidence of life from these Martian meteorites. There are localized deposits of hydrogen cyanide and polycyclic aromatic hydrocarbons (PAHs) within the meteorites as well. According to Professor Churchwell, these chemical substances indicate life.



A photograph showing the barren surface of Mars. Is it possible that this icy planet ever supported life?

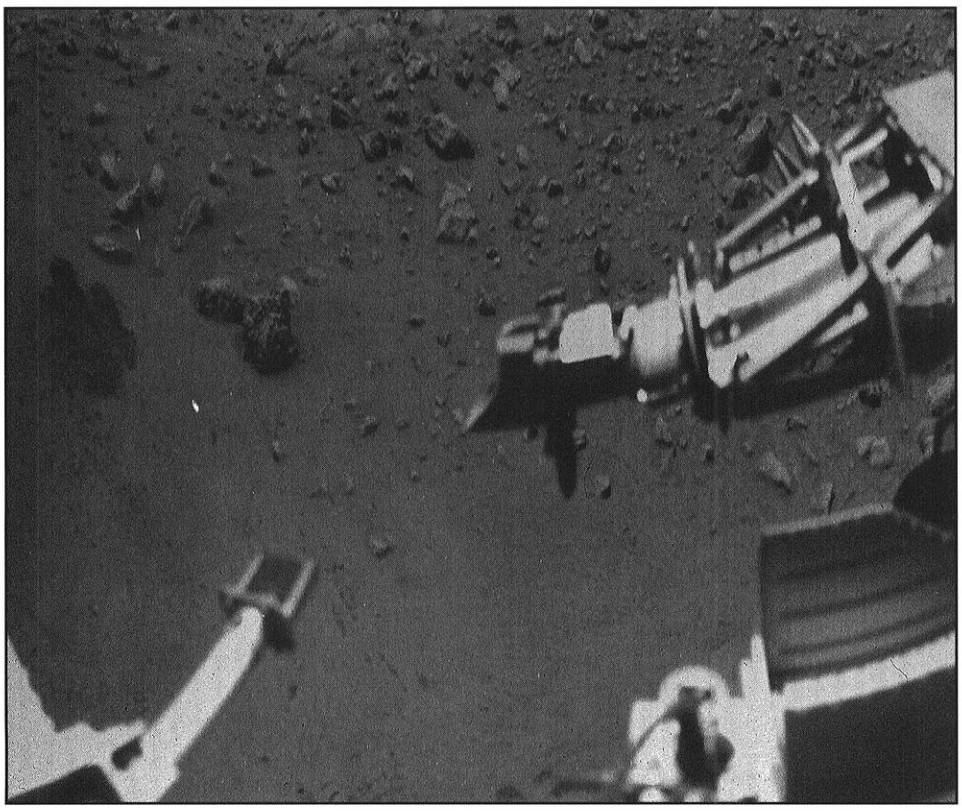
All life on Earth is based on hydrogen, carbon, oxygen and nitrogen, all of which are common elements in the universe. In order to form other substances, energy, such as sunlight, lightning or volcanic activity must be present. Then, carbon dioxide, nitrogen gas, methane, hydrogen gas, oxygen gas, ammonia and water—all substances that make up Earth's atmosphere—can form.

The meteorites from Mars show evidence of fossilized organisms

After millions of years and the continued fueling by a natural energy source, molecules that are more complex, such as hydrogen cyanide and aldehydes, can form. Add more time and energy and even more complicated things can form, such as amino acids, purines and pyrimdines. These form the bases for DNA, which happens to be a PAH, similar to what was found in the meteorites. If you have DNA and pre-biotic substances, like hydrogen cyanide, in a rock, then that rock most likely came from a place where life existed.

According to Churchwell, this meteorite evidence, along with the ten to fifteen percent probability that there is life in the universe outside Earth, shows a fairly high probability that life existed on Mars. However, the Martian life forms would be single-celled organisms, such as bacteria. It is unlikely that higher life forms ever lived on Mars because it would have taken an incredibly long time for them to develop.

On Earth, eukaryotic cells took about two billion years to form. An eukaryotic cell is more advanced than a bacterial cell because it has a nucleus. All life forms more complex than bacteria are composed of eukaryotic cells. Although Earth has complex organisms, evolution does not necessarily have to result in more complicated creatures. The reason, as Churchwell explains, is that the more complicated the organism, the lower the chance it has for survival.



A closer view of Mars, this time from the eye of a probe.

Although Mars may have once supported life, it no longer can because it is frozen. Mars is approximately one half the size of Earth and has a lower mass. Therefore, its gravitational pull is smaller, and it can't hold onto the atmospheric gases. The loss of an atmosphere made Mars cool down because it could no longer retain heat. The rest of the water on the planet probably froze. This caused a runaway ice age on the planet, so now, it can no longer support life.

Venus had the opposite problem and had a runaway greenhouse effect, making the planet too hot to support life. This means that Earth is in a very narrow range between too hot and too cold—just the right temperature to support life.

It is not extremely likely that a planet like Mars could support a water-based atmosphere for a long enough period to develop advanced life forms. For this reason, the probability of advanced life elsewhere in the universe is quite low. Nevertheless, scientists are still intrigued by the slight possibility of life on other planets to continue their research.

Author Bio: Lynn Weinberger is an English major at UW-Madison.

"I want to get involved...
I want to get involved...
I want to get involved..."

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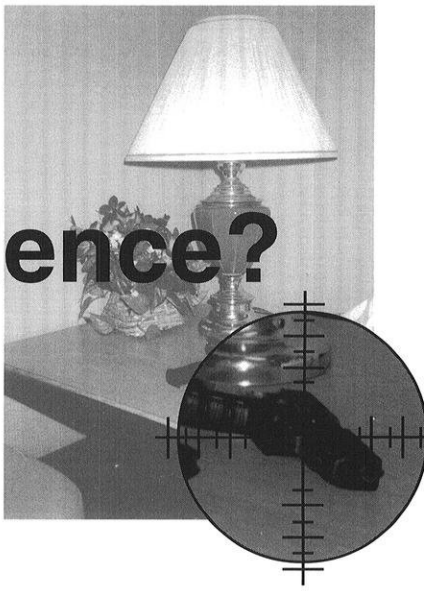
Smart Guns: The Next Attempt to Reduce Violence?



By Dave Buechl

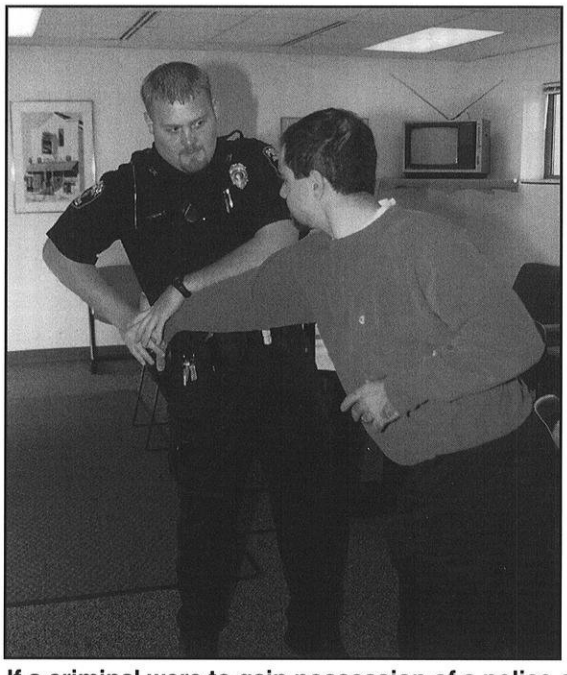
Can you imagine a gun that is so "smart" that it cannot be discharged unless it recognizes its owner's presence? In anyone else's hands, the gun is useless, preventing unauthorized use of the firearm. Engineers are currently developing a "smart" gun that authenticates the bearer as an authorized user. With initial funding provided by the government, several private gun manufacturers have begun the research, development and production process to make this "childproof" handgun a reality.

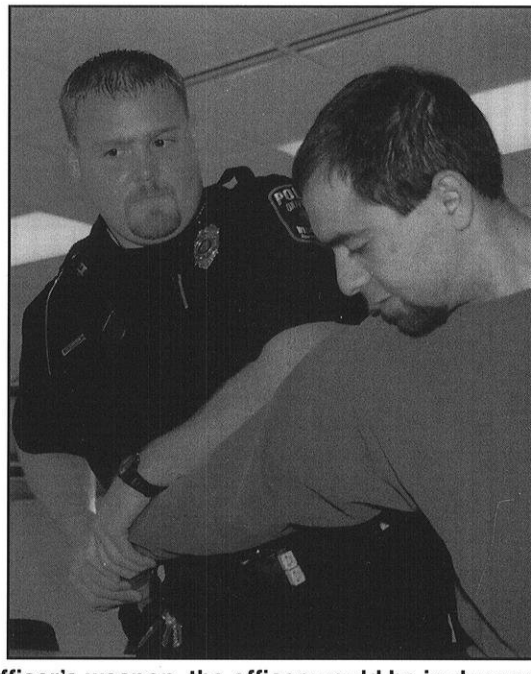
Initially, the government conceived the gun as a safety measure to protect law enforcement officers from being shot by their own service weapons if wrestled away during scuffles with criminals. Soon afterwards, it was stated that "personalized" or "childproof" guns would offer even more protection by reducing gun-related deaths and injuries due to accidental discharges and attempted suicides. The gun would also provide protection for civilians seeking home protection from the criminal who steals the homeowner's gun and uses it in crimes and homicides.[1]

To produce the "smart gun" technology, the increased integration of electronics into the traditional mechanical platform of civilian and law enforcement handguns is necessary. This technology can be used to improve firearm reliability, performance and safety. "Smart gun" technology includes a variety of possible sensors to activate the use of the firearm. Such sensors include surface acoustic wave tagging, passive radio frequency coding, magnetic encoding, capacitive-sensor/encoding, touch memory and voice recognition. Activated by the users magnetic ring, fingerprint or other activator, each sensor ensures that only the authorized user of the gun can fire the weapon. The radio frequency controlled sensor, which was designed for police use, emits a radio signal which is recognized by a transponder worn by the authorized user, and in turn emits a coded radio signal back to the gun. When the gun recognizes the coded signal, a blocking pin is removed from the trigger mechanism, which enables the gun to fire.[2] Guns using fingerprint recognition have fingerprint sensors on the trigger, which are coded to distinguish the authorized user from one person's trigger fingerprint. The magnetic encoder sensor sends a signal from a magnetic ring worn by the authorized user to a decoder in the weapon, which deactivates an internal locking mechanism and allows the weapon to fire. The touch memory system is located in the pistol grip of the firearm and operates only in response to a preprogrammed hand grip pressure from the hand of an authorized user. The voice recognition system is integrated with combination locks built into the trigger mechanism.[3]

To implement the new smart gun technology, the reliability and safety of the product must be fully addressed before police consider its use. According to Joseph Hornbeck of the UW-Madison University Police Department, "Everything police officers do is revolved around officer safety." Sergeant Hornbeck added that he needs to maintain a high level a confidence in his equipment in order to use it. Thus, for him to use new technology, he needs some quality proof that it is reliable.

For example, when the creator of "2nd Chance Body Armor" was trying to convince police departments to purchase a new bulletproof vest design and discontinue use of their cur-





If a criminal were to gain possession of a police officer's weapon, the officer would be in danger of being shot by his or her own weapon. Smart guns might prevent such an event from happening if they were used by police forces. But without the added measure of having a

rent brand, Sergeant Hornbeck said that "the manufacturer needed to do something dramatic to prove its reliability." So in order to prove the bulletproof vest's reliability, the creator of "2nd Chance Body Armor" pointed a .357 Magnum at himself while wearing the armor and fired the weapon into his bulletproof vest. Sergeant Hornbeck said that "not until then were police officers willing to wear the new body armor, and he did a fine job of selling the product."

In order to prove the reliability of the smart gun, Sergeant Hornbeck said "the manufacturer would have to do something like take off the magnetic ring, point his gun at his own head, pull the trigger and have the gun not fire to prove the point." Once they have achieved this reliability, then he said, "I might be convinced to use the gun." The biggest obstacle the manufacturers will have to overcome, according to Sergeant Hornbeck, is "that cops are the worst skeptics in the world." Sergeant Hornbeck said that cost is also a factor. He added that "at the UW-Madison University Police Department, officers have to purchase their own guns." Sergeant Hornbeck said that if the guns were in the $1000-$2000 range, he would want that level of quality out of the gun.

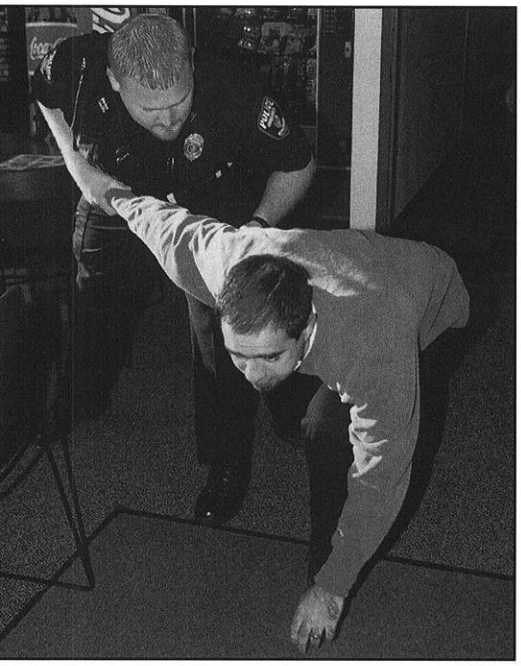
Sergeant Hornbeck also thought that the new guns could have a huge effect on corrections operations. Currently, corrections officers do not carry firearms inside correction facilities. There could be a huge change in safety in prisons if officers were to carry firearms with smart technology. However, as Sergeant Hornbeck explains, "Prisoners are very resourceful people and they could come up with some way to combat this change."

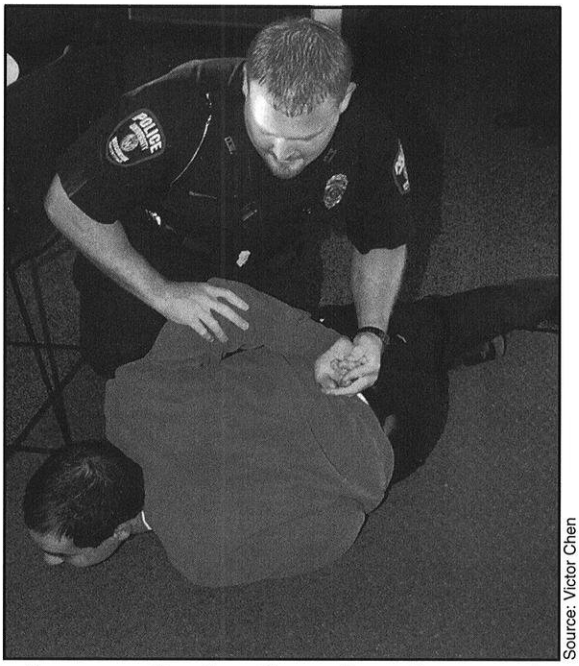
Source: Victor Chen

While smart weapons might make their way into law enforcement some day, police forces currently rely on smart operators, such as this Dane County police officer shown during a firearm certification session.

Despite the high levels of technology being utilized in the smart guns, there are some possible drawbacks. Some concerned people worry that the use of "smart" guns might reduce firearm safety education and training in the household or create a false sense of security that could make people more apt to leave a gun loaded within the reach of children. Other civilian owners question the smart gun's reliability and safety in an emergency situation. However, smart gun advocates claim that people are more likely to be saved by a "smarter" gun.

The politics of "smart gun" technology is also gathering momentum. However, the issues of the feasibility and the "real intentions" of manufacturing this "smart gun" technology has questionable outcomes. A few states are contemplating legislation, which would mandate that all new gun sales utilize "smart gun" technology. While many people support this idea, many gun owners and police departments don't want to be forced to purchase a certain type of gun. It could even be possible that the real agenda of "smart" gun supporters may be a scheme to confiscate or ban firearms, which would conflict with a citizen's right to own or use firearms.





Source: Victor Chen

riminal-proof" weapon, officers know what to do if anyone other than themselves tries to reach their gun. Officers Jake Trussoni (uniform) and Ben Newman (plain clothes) of the UW-dison Police Department demonstrate how they would react if someone reached for their gun.

[1] http://www.usnews.com/usnews/issue/2guns.html
[2] http://www.colt.com/colt/html/z_njmandatetestimoney.html
[3] http://www.berettausa.com/smartgun.html

Author Bio: Dave Buechl is a senior in civil engineering trying to decide what to do after graduation. He also believes that "smart" guns should be an option and not a requirement for all new firearms sold.

*Photo by title taken by Anthony Gomez

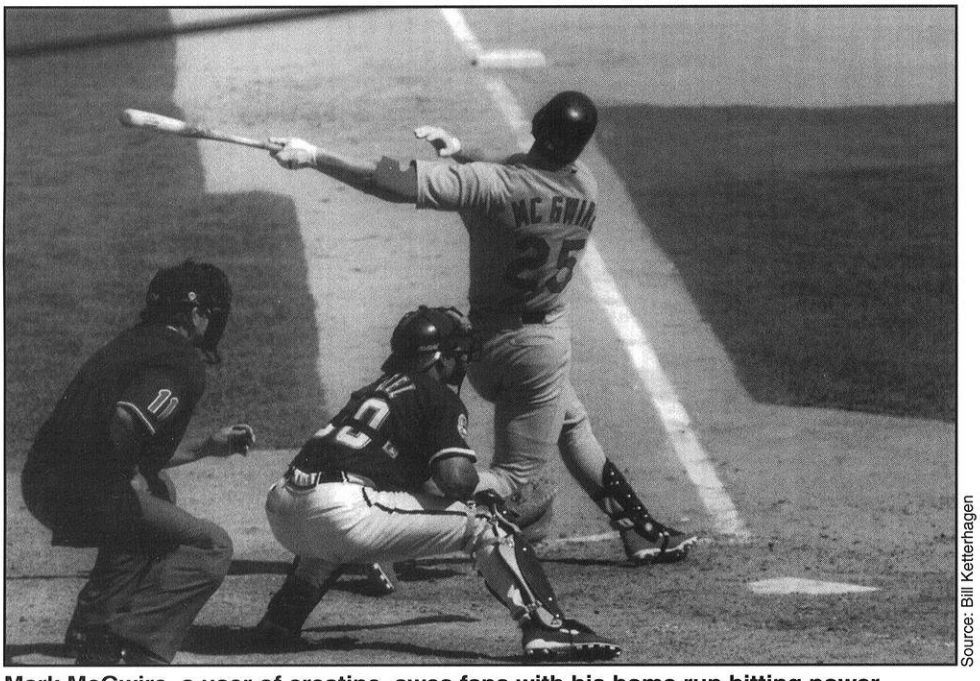
Creatine: The Breakfast of Champions?

By Kari Cox

The power and majesty of a Mark McGwire home run awes all who experience it. The home run chase of the summer of 1998 captured the attention of people all around the world. McGwire's unbelievable achievement of destroying the home run record set by Roger Maris brought many fans back to America's pastime. People may wonder how a man can consistently hit a baseball so far and hard. Despite the fairytale ending of this baseball story, one fact almost blemished the breaking of baseball's most coveted record. McGwire admitted using performance-enhancing supplements to improve his game, including creatine. Creatine has become a very popular supplement among athletes of all ages, but the question remains as to whether creatine really makes a significant difference in an athlete's performance.

Creatine is a natural amino acid that aids in the regeneration of adenosine triphosphate (ATP), the major energy source in muscle contraction. Also found in meat products, creatine is produced in the liver, kidneys and pancreas. Creatine becomes creatine phosphate in a chemical reaction aided by the enzyme creatine kinase. The creatine phosphate then reacts in the muscle cells with adenosine diphosphate (ADP) to form ATP. The ATP fuels the contraction of the muscle for a short duration or "burst" of time. The creatine phosphate, at the end of this cycle, becomes creatinine and is excreted through the urinary system. Because natural creatine is only produced in small amounts in the body, athletes are tempted to ingest extra creatine through synthetic supplements.

As a result of creatine's energy-enhancing capabilities, synthetic supplements are becoming incredibly popular in professional and collegiate athletics. By taking an oral dose of this powder, an athlete can replenish his or her energy and, therefore, get in that extra lap around the track or extra repetition in the weight room. The most popular method of ingesting creatine is through "cycling," where an athlete is on creatine for a period of several weeks and off for another period of weeks called the "washout period." For the first few weeks, the athlete may go through a "loading" period during which he or she takes 20 to 30 grams of creatine. Afterwards, he or she usually continues to take 3 to 5 grams daily. John Dettman, Head Strength Coach for UW-Madison Athletics, describes creatine usage for the football team as "filling the gas tank." After practice, the player's energy reservoir may be half empty, and creatine will restore his energy level. Creatine serves as a back-up energy source for the explosive components of a sport. It is best suited for sports that need a spark of energy during small periods of time, not for long-endurance sports.



Source: Bill Ketterhagen

Mark McGwire, a user of creatine, awes fans with his home run hitting power.

Besides the energy boost, athletes, such as football players and body builders, take creatine for weight gain. Questions arise, though, on whether or not creatine really aids in increasing muscle mass. The most prevalent sign of weight gain takes place in the first few weeks of creatine use and is most likely due to water retention. Creatine absorbs water directly from the bloodstream and displaces it into muscle cells.

According to Dr. Greg Landry, Head Medical Team Physician for UW-Madison Athletics, muscle mass is increased because the athlete receives the energy to perform extra weight training and exercise to naturally build muscle. When asked if creatine directly increases muscle mass, Dr. Landry replied, "[Creatine] is not a steroid...only an energy source, and that is an important distinction."

On the other hand, creatine's ability to indirectly increase muscle mass is not consistent in all athletes. Jude Sullivan, a clinical exercise physiologist at UW-Madison Sports Medicine Center, conducted a study using female rowers who were put on creatine for a period of 8 to 12 weeks. None of these athletes reported any weight gain. Of course, in this study, a "loading" dose was not used. The athletes maintained a 3 to 5 gram daily dose. Therefore, creatine-induced weight gain may only affect certain athletes in certain sports.

The use of creatine in athletics has brought about many questions about the side effects of this supplement. Nausea, muscle cramps and muscle strains are a few of the common side effects of daily use. In Sullivan's study, though, none of his subjects experienced these side effects, possibly because of the low maintenance doses that were used. He states that it is "virtually impossible" to get a complete view of creatine's effects because you

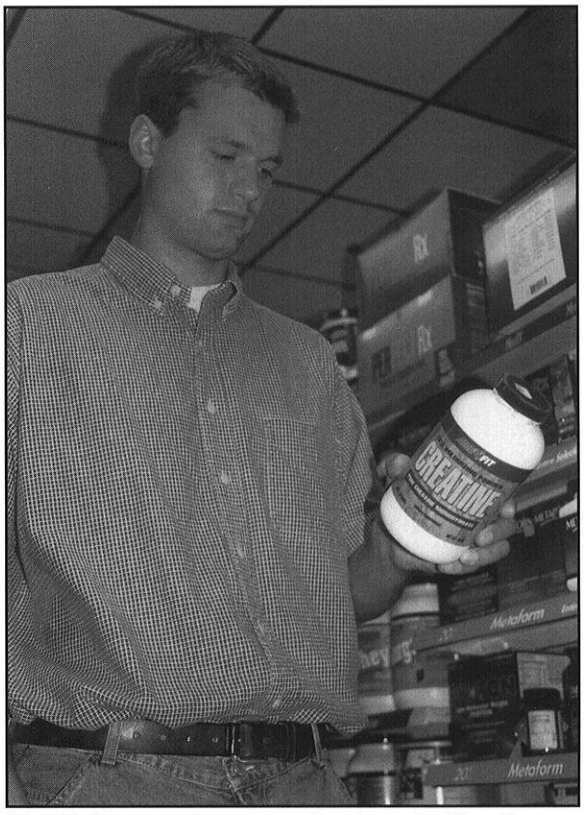
[Creatine] is not a steroid...only an energy source, and that is an important distinction

"rely on the athlete's testimony." Dehydration is the major problem with creatine use. Coach Dettman will not use creatine during the hot months of training camp because of the threat of dehydration. Long-term effects, though, are unknown at this time. Dr. Landry expressed that excessive use over a lifetime may result in kidney failure due to the increased strain on the kidneys to excrete the excess creatine.

Recently, creatine has been one the most researched supplements, yet not much information about its effect on the body is known. Because of its widespread and publicized use by some of the most beloved professional athletes, high school athletes are tempted to begin taking this supplement. Unfortunately, not much research has been performed on the effects of creatine on these young bodies, even though they are the ones most attracted to the substance right now.

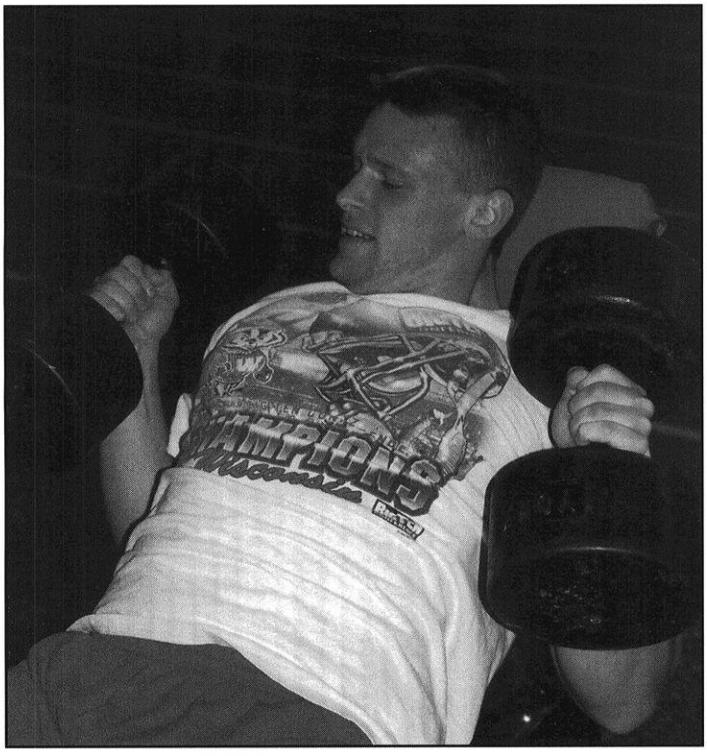
Why people would take a substance that experts still do not know much about is a major concern. Sullivan explains it best by saying, "It's not going to go away...it's completely legal and will be used no matter what." It is hard to tell whether or not creatine actually enhances the performance of an athlete. Until we know for sure, athletes, including those in high school, will continue to believe in the power of creatine, not knowing what it is doing to their bodies.

Author Bio: Kari Cox is a junior majoring in English and Technical Communication. She is a die-hard Cubs fan and believes that Slammin' Sammy is still "The Man."



Source: Bill Ketterhagen

Alex Palmer contemplates buying a bottle of creatine found at GNC in hopes of receiving that extra boost of energy in his workouts.



Source: Bill Ketterhagen

Creatine is popular in explosive-energy sports such as weightlifting. UW-Madison student Craig Barrett has used creatine in the past to improve his athletic performance.

Improving Underwater Research:

Unmanned Submarines Search the Seven Seas

By Soma Ghorai

A late summer day is gorgeous, especially if you are sitting on the terrace of Memorial Union. The beautiful shoreline of Lake Mendota is full of people socializing. As the sunlight creates dazzling patterns on the water, sailboats gracefully skim over the lake. It is a scene worthy of a postcard. This is not, however, the full picture. There is a whole other scene that is just as beautiful beneath the water's surface. But, unlike the Memorial Union, this underwater scene is probably only seen by the members of the Hoofers Scuba Club. The watery treasures of lakes, seas and oceans have always been the secrets of the few people skilled enough to get there. Soon, an Autonomous Underwater Vehicle (AUV) – a vehicle that explores the underwater scene with very little human direction— might be able to show everybody what the seas and oceans have to offer.

Conducting underwater research has always been a big and costly event. Human divers and smaller research vessels have always needed a large support vessel close by and several people had to be around to monitor the divers. When divers were not used, a remote operated (tethered) vehicle (ROTV) was most often used. ROTVs also required an operator to be present. Recently, the technology of AUVs has made underwater research much more feasible. These vehicles are autonomous because they follow a preprogrammed path without direct input from an operator. Since AUVs are much smaller than the old vehicles, they can access many more underwater areas. Another characteristic of AUVs that increases the range over which research can be conducted is that they do not need any cables or remote controls creating connections to the main operator. These are some of the advantages of using an AUV rather than the ROTVs that researchers used before.[1]

One of the uses of an AUV is conducting underwater surveys. Before AUVs, divers or ROTVs surveyed sea and ocean floors. These costly and inefficient methods were limited to areas divers could explore or areas support vessels could access. These methods were also slow and did not retrieve quality data. Since AUVs do not need cables, they can access all kinds of areas underwater. AUVs function in very shallow water (one to five meters), deep water (1000 meters or deeper), close to fixed structures, under ice and in tunnels. When several AUVs run in parallel along the same path, the survey time dramatically decreases. Another advantage of using AUVs for underwater surveys is the improved data quality. Surface waves do not interfere with the functions of the AUV, like they did with the old technology. Several types of equipment can be attached to the AUV to speed up the data collection process.[2]

The MARTIN 200 is a Danish AUV that is used primarily for surveys. One upcoming survey MARTIN has on its schedule is of an archaeological site in Danish territorial waters. The directors of this project expect to find many new archaeological sites buried in the seabed since MARTIN can be programmed to float one meter over the sea floor. Since most AUVs also have obstacle avoidance features, the pre-programmed path does not have to account for any minor interference. In addition to obstacle avoidance features, three other types of instruments will be used on the survey: a side-scanning sonar, a sub-bottom profiling sonar and some digital video equipment to make a visual record. The two sonars conduct the actual survey.[3]

Three sites are being considered for the initial survey. The first site is a medieval shipwreck. At this site, MARTIN would map the site before a full-scale excavation is set in motion. The second site is a Stone Age settlement where MARTIN would determine the area and depth. The third site is a river mouth where MARTIN would explore the location of prehistoric coastlines. All three of the sites test the range and suitability of MARTIN in a variety of conditions.

One of the limits to the capabilities of an AUV is the fact that the path must be preprogrammed. Although this is ideal for surveys along well-defined routes, such as pipelines and cable inspections, it is not helpful in unknown areas. Research labs at MIT have been developing different levels of control for AUVs with varying degrees of human control. The lowest level of control, user override mode, allows the operator to direct it from land. Although the AUV does mostly as it is directed, it has just enough intelligence to override commands that would put it in danger. This mode requires little delay between the transmission of the AUV and the operator.

"If the sea is sick, we feel it. If it dies, we die. Our future and the state of the oceans are one"

In the second level of control, behavior modification mode, the AUV operates as if autonomous. If needed, the operator can change the path while the AUV is active. This mode can work despite long delays between the AUV and the operator. The third level of

Source: http://www.maridan.uk

The Maridan A/S team performs status checks on MARTIN.

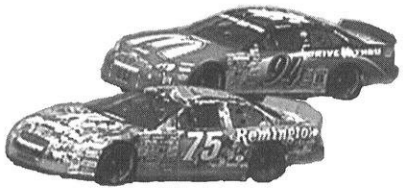
control, mission modification mode, requires a low rate of communication between the operator and the AUV. The operator can activate and deactivate certain behaviors, but generally, the vehicle runs autonomously.[4] The Sea Grant College Program at MIT uses AUVs and their various levels of control to observe the basin scale evolution in the Arctic. The goal of this project is to develop AUVs capable of oceanographic and mapping sensors. Research will also be done to improve the communication between the AUV and operators. An AUV is ideal for this project because the researchers can modify the systems for expeditions under the ice. The vehicles will monitor changes occurring in the Arctic Ocean and learn about its impact on global warming.[5]

The data that is being collected from the MIT labs can be used to develop AUVs to explore other oceanographic elements, such as deep sea vents, sea floor spreading and the Antarctic ice shelf. Other projects are dedicated to studying marine biotechnology and coastal management and utilization. All of these studies are important for their scientific applications, but ultimately researchers hope that a greater understanding of the seas and oceans will help the world appreciate their importance. As the oceanographer Sylvia Earle says, "If the sea is sick, we feel it. If it dies, we die. Our future and the state of the oceans are one."[6]

[1]http://www.maridan.dk/products/
[2]http://www.maridan.dk/products/
[3]http://www.maridan.dk/news/
[4]http://auvserv.mit.edu/Bandwidt.html
[5]http://auvserv.mit.edu/Miscellaneous/altex98.htm
[6]http://www.msnbc.com/news/261811.asp
Source of graphic: http://www.maridan.uk

Author Bio: Soma Ghorai is a junior majoring in electrical engineering. One day she hopes to be a fish so she can see the treasures of the seas and oceans in the way they were meant to be seen.

From Pole Positions to Polygons:
The Great Video Game Race



By Michael Hsu

We grew up with our hands on the gearshift, watching and waiting for the light to turn green. Beep, beep, beep, biiiiiiing! With tires squealing, we sped down the track until we crashed in a fiery, pixelized conflagration.

"Pole Position" by Atari was one of the many pitstops on video gaming's evolutionary road. With the September 9th release of the new Sega Dreamcast, game systems have zoomed into a new era. In the next salvo of this video game arms race, Sony is planning to release Playstation 2 next year.

Before you race to Best Buy to purchase these new systems, take a test drive on four exciting test tracks, through video game lands of imagination and innovation.

Track 1: The Silicon Valley

We begin at the most basic level—a quick spin through the highways and byways that make up a video game console (see Figure 1, page 20).

The game cartridge holds the game program which is accessed via the I/O (input/output) interface through the I/O bus. From there, an internal bus facilitates communication between the main brains of the system—the main memory unit, the CPU and the graphics engine.

The CPU and graphics engine process the data stored in the main memory. Within the CPU, a cache speeds up the process by storing "recently used" image data within "easy reach." Under overall control of the CPU, the graphics engine crunches 3-dimensional scenes into the moving 2-dimensional images which are stored in the graphic interface's video memory. The monitor refreshes out of the video memory at about 60 images per second. Each frame is like a still shot from a movie (say, a Ferrari) and when frames are strung together at a high rate, the human sees the illusion of a movement (the Ferrari exploding into a wall).

Like a sports car, speed and visual appeal are important to the success of a video game system. First, processing speed can be estimated by two critical statistics—the number of bits of information that are processed in a single operation and the clock frequency (which determines the rate at which operations can be performed). Game systems have evolved from the 8 bit original Nintendo to Dreamcast's 128 bit. In one "clock cycle," each component of the Hitachi CPU can crunch 128 bits (or 16 bytes). A fancy term to express the clock cycles per second is "Megahertz." So when 16 bytes is multiplied by 200 MHz, processor speed comes out to be 32 gigabytes per second (refer to Table 1).

Second, the visuals depend upon a system's rendering capacity. This affects the detail "drawn" within a particular scene. Polygons (usually triangles) constitute the objects on a screen, so more polygons processed in a second means more detail.

"Take a symbolic 3-D image—part of rendering is the process of changing something that is 3-D into something 2-D and flat," explains James Smith, professor in the Electrical and Computer Engineering (ECE) department. "Then, as the scene changes and the viewer's line of sight changes, the corresponding 2-D image on the screen has to change."

Track 2: The Realms of Richness and Realism

From the inner city within the console, we journey into a beautiful field of colorful pixels. We are awestruck by graphics represented on the monitor.

"The key thing right now is to provide a compelling visual approach," said Michael Gleicher, an assistant professor in the Computer Science department specializing in computer graphics and animation. "There's a real emphasis on realism and [for technology] to be flexible enough to convey the artist's vision....so that the limiting factor is not the technology but the artist's imagination."

There is no doubt that the new wave of 128 bit systems will give game designers unprecedented artistic freedom. ECE Assistant Professor Charlie Chen, who has worked at

Source: Victor Chen

While Ben Rothschild is amazed at the graphic quality of the Dreamcast system. . .

Source: Victor Chen

. . . he thinks he'll stick to upgrading his current Playstation system, whose games will be compatible with the upcoming Playstation 2 system.

Intel, said that the Merced chip (the successor to the Pentium) is only 64 bit at the server level. However, he stressed that the 128 bit CPU is not necessarily "better."

Invoking everyone's favorite computer metaphor, he said: "Just because your car eats more gas, it doesn't mean your car will necessarily be running faster." The chips used for video games and PCs have different specialties—systems like Dreamcast specialize in awesome graphic capabilities.

"As the technology improves and processors become more powerful, they can do so much more computation that you can render very complex images at 60 images per second," Smith said. "Each of those 60 frames is going to look better and better, with shading, light effects and realistic textures."

In other words, a wall is no longer represented as just a solid gray rectangle. With ever-improving processing speed and polygon rendering capabilities, you would be able to see individual bricks within each wall, the tiny bumps on each brick, the shadows cast by each bump and the ants hiding in each shadow.

Track 3: The Fun Factory

While a Ferrari may be nice to look at, if it has a blender motor under the hood, you'll just end up with a $45,000 fruit juice maker. In other words, a meticulously drawn wall, by itself, is not too much fun.

"The Play Station 2 was able to do things that two years ago, you needed a $20,000 computer to do," Gleicher said, recalling his observations of a Playstation 2 prototype. "But I didn't see it do anything that I haven't seen before....yes, there were extra details like smoke and fog, but did that make it more fun? Or if you see the faces in the cheering crowd, does this suspend your disbelief more? Video games, like the cinema, are about the suspension of disbelief."

Richard Marks, a software engineer at Sony Computer Entertainment America, is trying to make game enthusiasts a believer in the Playstation 2.

"Every day I go to work and sit at my desk next to one of the most powerful machines ever made, and I try to make it do something really cool," Marks said. "So that next year, when millions of people have one of the most powerful machines ever made in their living room, they might say 'Wow, that's really cool.'"

For example, the next time you crash your race car through that wall and are sent flying out the window, wouldn't it be "cool" if gravity worked on your mangled body in a

Table 1: Comparison of the Three Systems

	Dreamcast	Playstation 2 (initial speculations)	Nintendo 64
Bit System	128	128	64
Clock Frequency	200 MHz	294.912 MHz	93.75 MHz
Rendering Capacity	3 million polygons/sec.	20 million polygons/sec.	150,000 polygons/sec.
Main Memory	16 MByte (total of 26 Mb)	32 MByte	4 MByte
Video Memory	8 Mb	4 Mb	640 x 480
Resolution	1600 x 1200	-	–
Channels of Sound	64	48	–

perfectly natural manner? Making objects move with physical accuracy is seen as a new frontier.

"With the next generation of consoles, we will have reached the point in graphics capability such that we are not really 'polygon-limited,'" Marks said. "Instead, things such as more realistic physics, more interesting character behaviors and more dynamic game environments are going to be where major advances will occur."

Track 4: The Finish Line?

A pretty picture may be worth a thousand words, but are a thousand pretty pictures worth several hundred dollars? The folks at Nintendo, Sega and Sony certainly think so.

"It costs thousands of dollars to manufacture a console," Chen said, "and then they are sold for only a few hundred [dollars]. When you buy a machine, you make money. Manufacturers earn money from the cartridges you buy."

While the average fan may not notice the differences in graphic and sound quality, Playstation 2 holds one distinct advantage. In this case, despite Marks' obvious bias, he makes a good case for the Sony model.

"One of the best things about the Playstation 2 is that it is backwards compatible with the Playstation, so it already has thousands of available titles and hundreds of game developers," he explained. "This year $250 buys you a Dreamcast and 1 good game or a Playstation and 6 good games (that will also work on Playstation 2). Next year, nobody will even be asking which one to buy."

Track 5: Hitting the Wall?

But what about the year after that? Should we wait for "the next big thing" or will technology hit the proverbial wall? Is this the end of our journey to the farthest reaches of video game capability?

Some, like Chen, question the worth of pushing to a 256 bit system. "I don't think there are any big benefits after 128 bits," Chen said. "The overall system performance depends on many other factors—like clock speed, bus speed, memory interface and pipeline design. These are all important factors which need to be taken into consideration. So I don't know if 256 bit will happen."

Even if it did, the average gamer probably would not even care about tiny improvements to graphical aesthetics.

"I think there is a question of diminishing returns—there will always be something the system can't do....but at that point the question is: 'Will you care?'" pointed out Gleicher. "In the Play Station 2 game I saw, you can see exhaust coming out of tailpipes. Will it matter whether or not the artist can convey what type of gas is being burnt? Probably not."

In the end, the only thing that maters is whether or not we get the same thrill we did so many years ago. . . watching and waiting for the green light.

Tentative US release date for Playstation2: September, 2000
Suggested retail price: $369

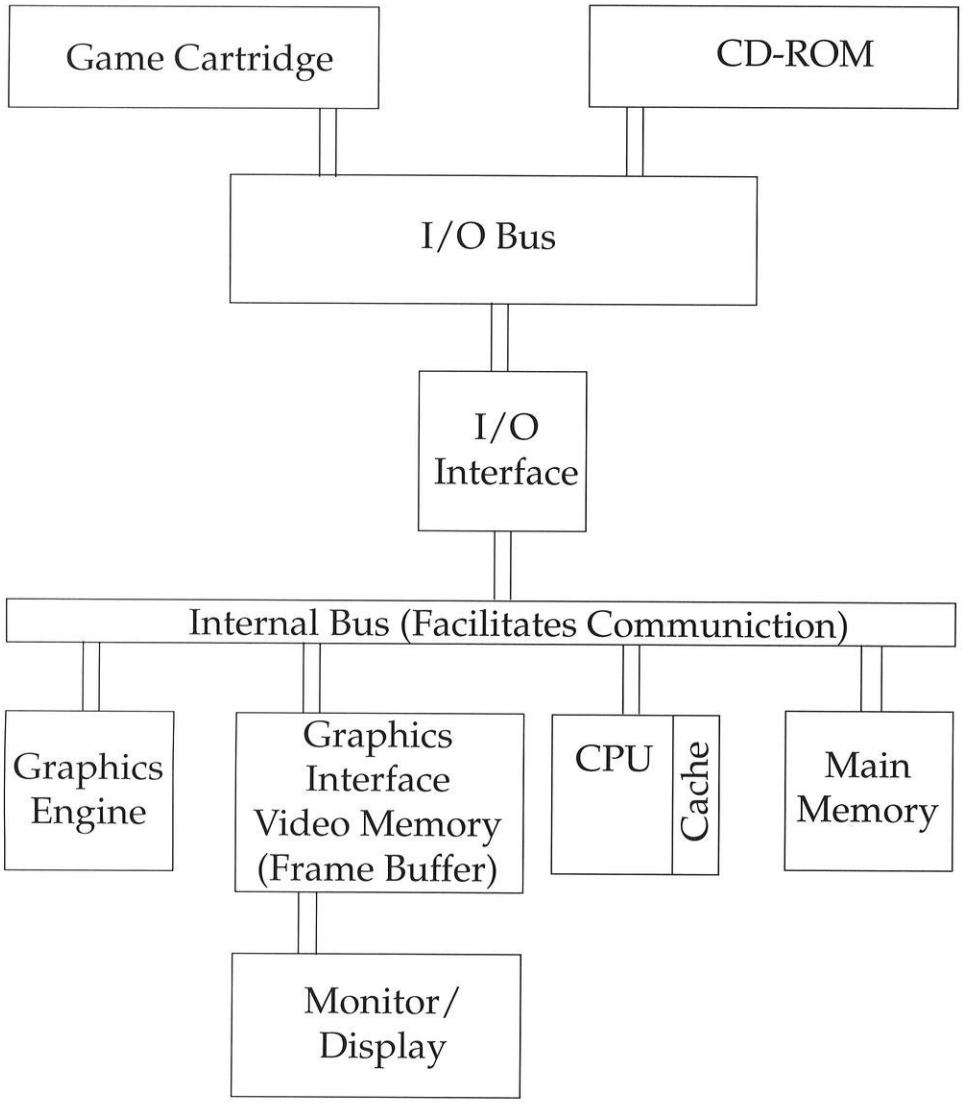


Figure 1. A flowchart of a typical video game system. Basic layout provided by Professor James Smith.

Author Bio: Michael Hsu is a sophomore majoring in journalism. The last video game he bought was "Tecmo Super Bowl III" for Super Nintendo.

To find out more about your favorite video game system, see these web sites:

http://www.sega.com/e3
http://psx.ign.com/news/8450.html
http://www.nintendo.com/n64/hardware.com

Ronald E. McNair Postbaccalaureate Achievement Program

The Ronald E. McNair Postbaccalaureate Achievement program is designed to provide information and enriching experiences, which will prepare undergraduate students to enter and excel in graduate school. Students who are considering study beyond the bachelor's level in either the biological or physical sciences (including engineering, business, psychology or mathematics) are encouraged to submit an application. Eligible students must meet the following criteria:
(1) First-generation college student (parent or guardian does not have a bachelor's degree) **and** from a low-income background as defined by the U.S. Department of Education, or a member of an under-represented group in graduate education, (2) Junior or senior student with a GPA of 2.75 or higher, (3) Student interested in pursuing a degree beyond the bachelor's level, (4) Student who is a U.S. citizen or a permanent resident.

The McNair Scholars program provides the following activities/seminars:
(1) Graduate school application seminars covering graduate school selection, statement of purpose, obtaining financial support, and improving GRE scores, (2) Individual tutoring and academic advising, (3) Assistance in selecting a faculty member to serve as research and career mentor, (4) Funded research experiences, (5) Support for participation in regional and national research symposia and conferences, (6) Opportunity to participate in educational visits to various institutions nationwide, (7) Potential to obtain financial assistance for graduate school application fees, (8) Opportunity to present research findings at both regional and national conferences.

For further information, please contact Greg Markee, Program Coordinator (262-0631, gmarkee@mail.bascom.wisc.edu) or Laurie Mayberry, Program Director (mayberry@mail.bascom.wisc.edu).

Person of the Century Contest

To celebrate the ending of the 20th Century, the *Wisconsin Engineer* magazine had an essay contest among UW-Madison students to decide who has been the most influential person of this century. Two essays were selected and the following awards were given: first place, $250; second place, $100.

Philo Farnsworth Takes First Place

By Neil Kolatkar

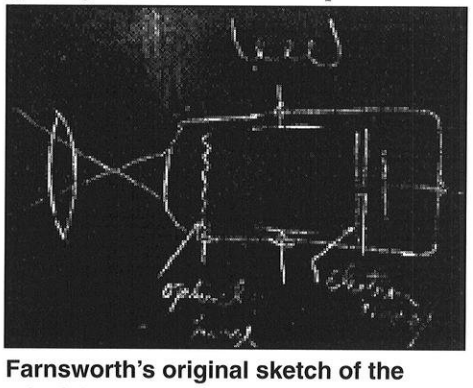
In my opinion, Philo Farnsworth should be named "Person of the Century." Born on August 19, 1906 in Indian Creek, Utah, Farnsworth is the inventor of the television, one of the greatest mass communication tools in history. From an early age, Farnsworth displayed a great interest and talent in the electronics field. As a youth, he invented small machines to help him with household chores. These machines gave Farnsworth time to think about more complex structures. At age fourteen, Farnsworth conceived his greatest invention - the electronic television. His idea was to trap light in an empty jar and transmit it one-line-at-a-time on a magnetically deflected beam of electrons, which is still the principle of modern television.

At age fourteen, Farnsworth conceived his greatest invention - the electronic television

A mass communication tool is defined as having delayed and attenuated feedback, one-to-many broadcast, a large public heterogeneous audience and a mechanical medium. Television is a great mass communication tool and was different from earlier mass communication tools, such as radios, because people could see the information they were receiving. The arrival of television in the early 1930's forced other mass com munication devices to change in order to compete.

Another distinguishing feature of the television is its adaptability to the Internet, the newest mass communication tool. An available product, Web TV allows a user to receive World Wide Web pages on a television screen and navigate the Internet without a personal computer. Web TV is only the beginning. In the future, most experts feel that the computer and television will merge to form a versatile home-information appliance that would provide news, data and expanded communication channels to viewers. People will be able to surf the web, watch sitcoms, send e-mails, pay bills, make videophone calls, watch tapes and discs and play games on their televisions. The adaptability of television will be extremely beneficial, as the internet becomes a larger part of mass communication.

Philo Farnsworth tuning to his favorite frequency with one his picture tubes.



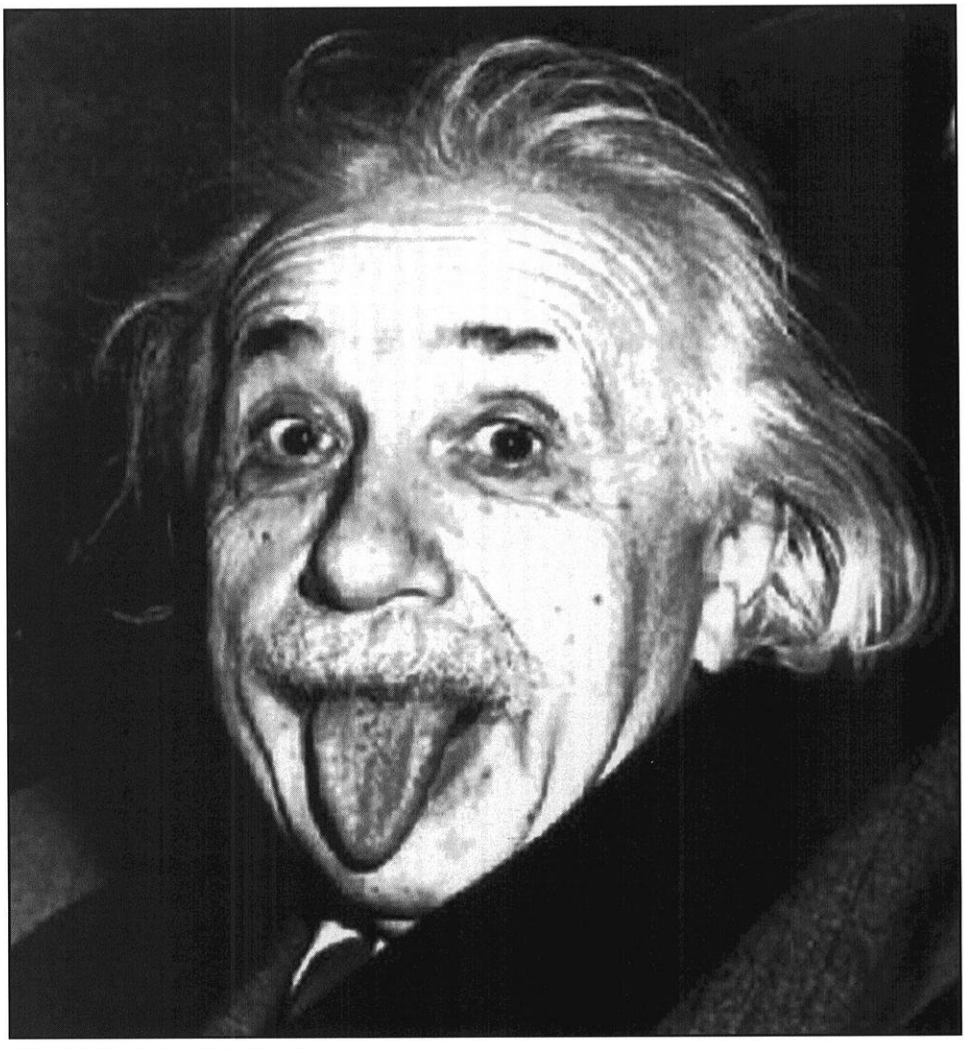
Farnsworth's original sketch of the television.

In conclusion, I feel Philo Farnsworth is "The Person of the Century" because of his invention of one of the greatest mass communication tools of history. The television has unique characteristics that will allow it to integrate with future mass communication tools in centuries to come.

Albert Einstein Not Far Behind with a Second Place Finish

By Mark Nels Ludwigson

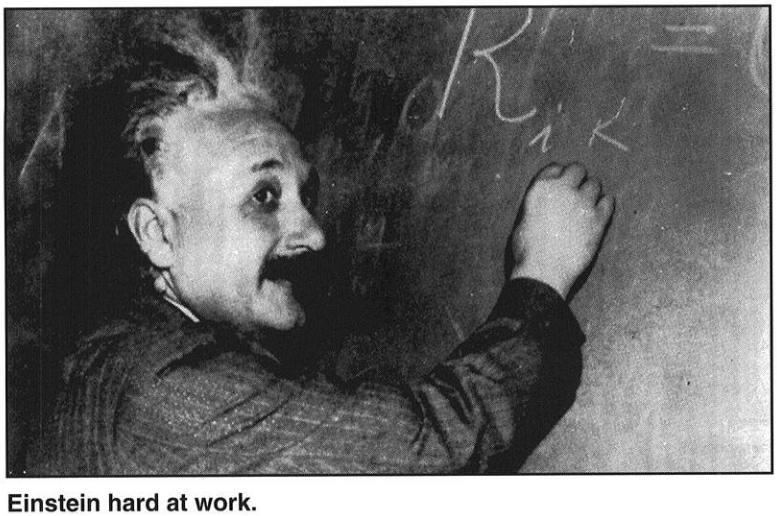
In the past century, there were many battles fought, many revolutions carried out and many innovations imparted. Across the globe, many cultures and religions have been forgotten while others have been embraced to new levels. There is no doubt that the people of the 20th Century have been as active in society as those of preceding centuries, if not more active. What distinguishes the people of the 20th Century from others is their movement to technology, such as blood transfusions, automobiles, airplanes, spacecraft, and computers. This surge of technology was due to an understanding and interest in the science of the universe we live in. So, it seems natural that if we were to choose one person to represent the last century, it should be someone involved in science and technology. This person should have positively affected the lives of others throughout the century, giving inspiration with good intentions. This person should be Albert Einstein.



Albert Einstein at his best.

For a good reason, Albert Einstein has become a household name in nearly every country in the world. In 1905, before Ford came out with the Model T and before Edison invented the storage battery, Einstein sparked life in the scientific community of Europe with three impressive papers: the first explaining the photoelectric effect, the second introducing his special theory of relativity and the third introducing the electrodynamics of moving bodies. At the young age of 26, he was inspiring many students and professors to venture further into unknown areas of science.

Scientists were not the only people inspired by his works. In 1921, his name and accomplishments spread fast via newspapers and reporters after he received the Nobel Prize. Einstein used his fame to encourage people to use their imaginations to better understand the world around them. As Einstein said, "Imagination is more important than knowledge." This attitude helped spur the already growing interest in the future of technology. By the 1930's it was clear that technology was only limited by peoples' imaginations.



Einstein hard at work.

Throughout the century, Einstein was so highly thought of that his name alone stood for intelligence. Even after his death, his name and characteristics lived on in the minds of the people. His discoveries in quantum mechanics, relativity and cosmology were taught, and are still taught, to Physics, Chemistry and Engineering students across the world. Altogether, the 20th century was filled with major advances in science and technology, and at the heart of them stands the image of Albert Einstein.

"Imagination is more important than knowledge"

Top 20 Engineers' Terminologies

1. **A number of different approaches are being tried.**
We still have no idea what we are doing.

2. **Extensive report is being prepared on a fresh approach to the problem.**
We just hired three kids fresh out of college.

3. **Close project coordination.**
We know who to blame.

4. **Major technological breakthrough.**
It works OK, but looks very high-tech.

5. **Customer satisfaction is delivered assured.**
We are so far behind schedule the customer is happy to get it delivered.

6. **Preliminary operational tests were inconclusive.**
The darn thing blew up when we threw the switch.

7. **Test results were extremely gratifying.**
We are so surprised that the darn thing works.

8. **The entire concept will have to be abandoned.**
The only person who understood the thing quit.

9. **It is in the process.**
It is so wrapped up in red tape that the situation is about hopeless.

10. **We will look into it.**
Forget it! We have enough problems for now.

11. **Please note and initial.**
Let's spread the responsibility for the screw up.

12. **Give us the benefit of your thinking.**
We'll listen to what you have to say as long as it doesn't interfere with what we've already done.

13. **Give us your interpretation.**
I can't wait to hear this bull!

14. **See me** or **Let's discuss.**
Come into my office. I'm lonely.

15. **All new.**
Parts not interchangeable with the previous design.

16. **Rugged.**
Too darn heavy to lift!

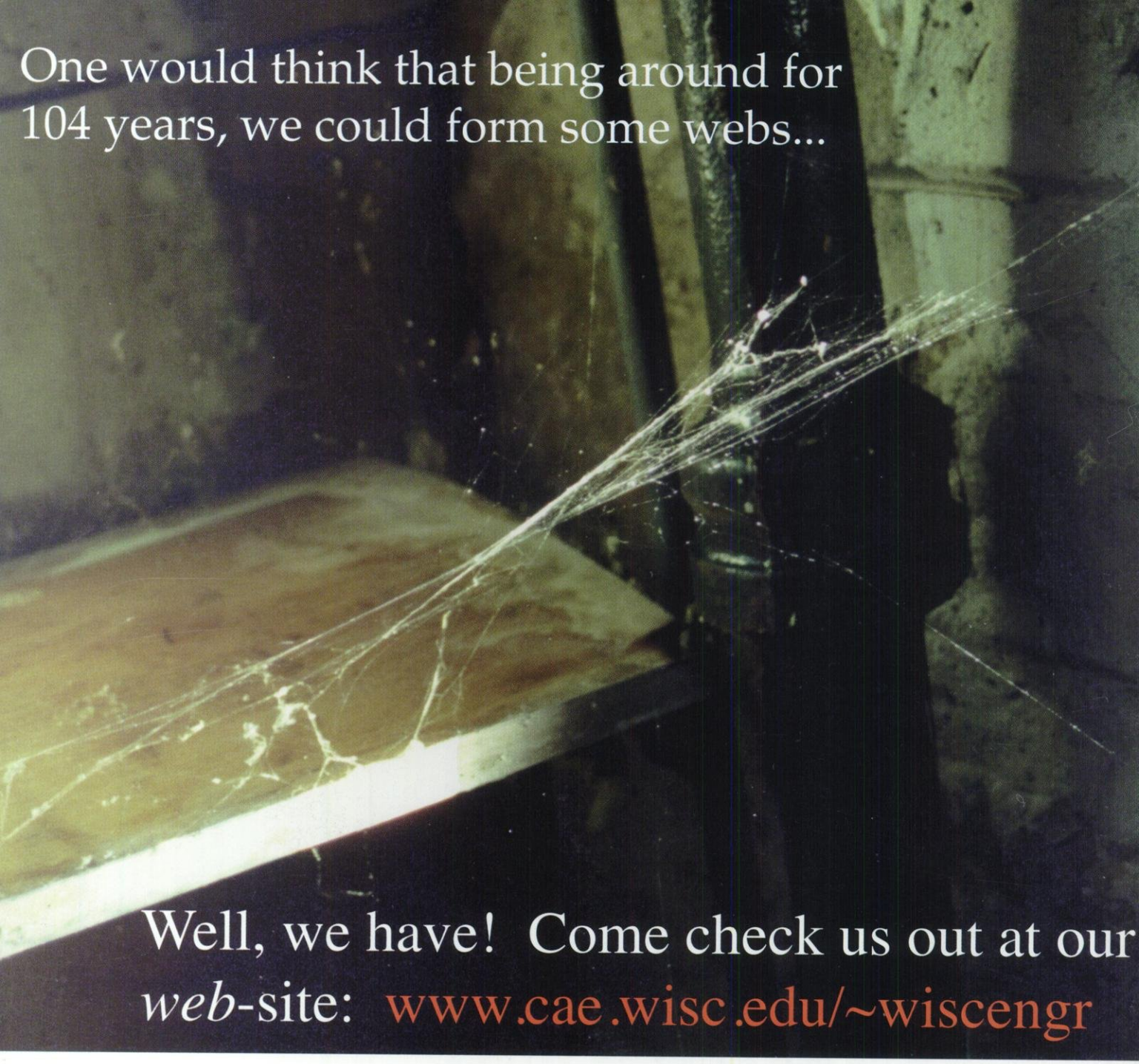
17. **Lightweight.**
Lighter than rugged.

18. **Years of development.**
One finally worked.

19. **Energy saving.**
Achieved when the power switch is off.

20. **Low maintenance.**
Impossible to fix if broken.

...JOIN US AS WE CONTINUE THE LEGACY INTO THE FUTURE.



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