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wisconsin engineer

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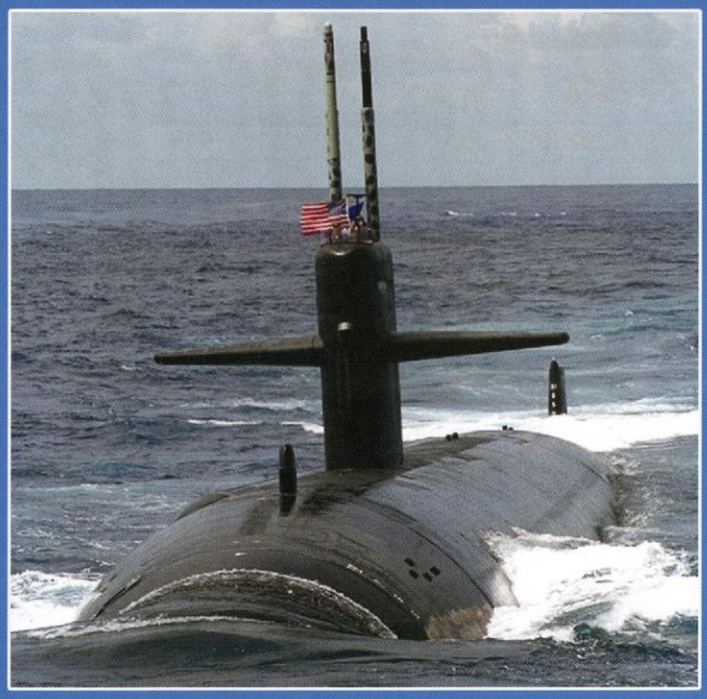

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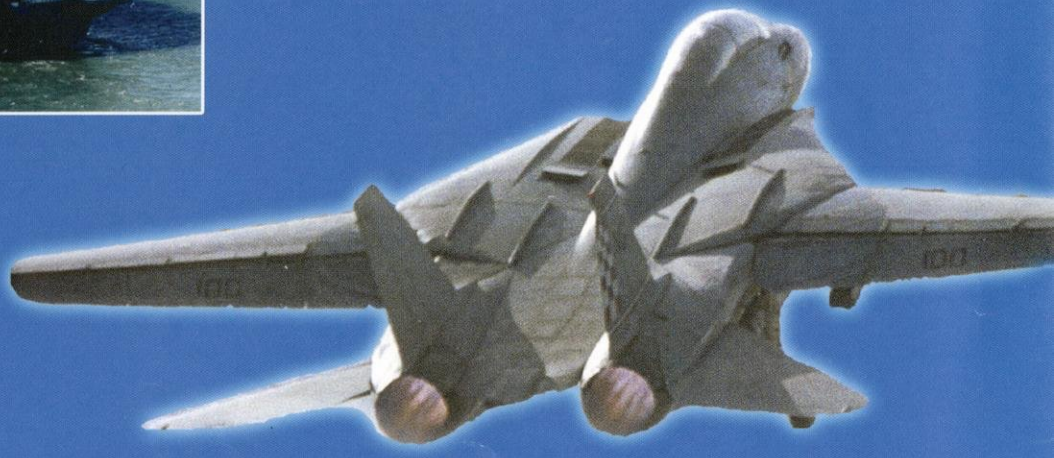

Navy Pilot

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COVER STORY

Cover photo by Jamie Tabaka

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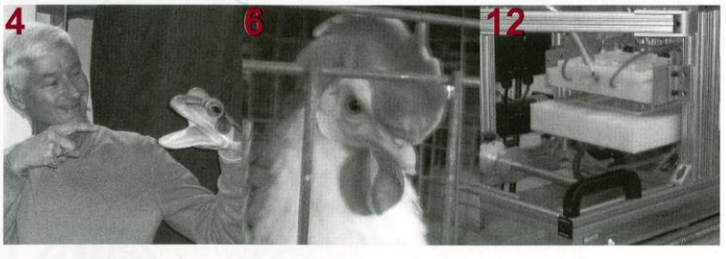

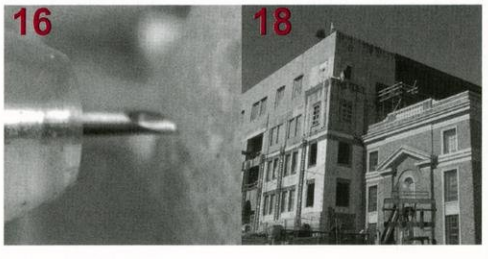

COMMENTARY

Mike Verner
Writing Editor

Fusion confusion

A couple of months ago I was watching the Super Bowl, the world's grandest arena not only for football but for advertising as well. Like most Americans, instead of running to go to the bathroom or refrigerator during the commercial breaks, I sat glued to the television, anxious for what laughs or surprises advertisers had in store. One of these ads, however, greatly disturbed me. Perhaps it was the mixture of orange and blue colors in the midst of the Big Ten basketball season. Perhaps it was the comparison of nuclear reactions to an everyday consumer product. More likely, it was the sense of déjà vu that bubbled up inside of me seconds after watching the commercial.

Years ago, *The Onion* (America's finest source of "news") published an editorial mocking the shaving industry. Gillette's Mach 3 was currently the most successful razor on the market, with three blades for your shaving enjoyment. Schick had just released the "Quattro," upping the ante to four blades. *The Onion* mocked this constant increase with the idea that Gillette would, in response to Schick, release a razor with five blades. Well ladies and gentlemen, Gillette did just that.

Gillette's "Fusion" promises users five blades that "reduce the pressure less blades put on your skin, leading to less irritation" and even an *additional* single blade on the back for shaving in "areas that require more precision." I was trying to think what kind of engineers thought up this product when something else came to mind: were engineers even involved?

In a land where Cadillacs rule the road, mansions dot the suburbs and all-you-can-eat buffets are never more than a short drive away, the bigger something is and the more we have of it, the better. It was only a matter of time before we got to five blades, and, in a short few years, more "technological breakthroughs" will allow for six. As a whole, people are very predictable, and businesses have figured this out.

Gone are the days when a product was designed because it worked. When it comes to consumer products, we're in an age (at least in this country) where marketing takes precedence over engineering. Commercials for minivans advertise how many cup holders and LCD screens are crammed in them, rather than fuel efficiency or lifetime. Shoe commercials show how cool they look, rather than how comfortable they feel.

Advertisers use this strategy because it works. Two days after the Super Bowl, I was doing some shopping at a local grocery store when I walked down the toiletry aisle and decided I had to get a look at the Fusion. The store, however, had already sold out.

Clearly, marketing has a huge impact on ensuring the success of many products, but when we neglect the engineering behind those products, we stop considering the benefit consumers might receive. Instead, they buy what's pleasing to their senses. If marketers say five blades feel better, it must be true; who cares if that's 67 percent more shaving per stroke?

This doesn't mean marketing should be abandoned. It's an integral part of business today and can actually aid engineers in the design process. Market research can steer us in the right direction, but it shouldn't be the only thing we look at. Gillette released the Fusion because they knew people would buy it. Companies need to consider the bottom line, but they should also consider the societal impacts of what they make. If the Mach 3 was still selling well, and the Fusion does the same job that the Mach 3 does, then the money put into it, along with the money spent on it, was just a waste of resources.

Marketers and engineers should be bridging the gap between each other and working together directly to ensure that engineers are designing products that are valuable to consumers and will still turn a profit for the companies that make them. Maybe then we'll never reach six blades.

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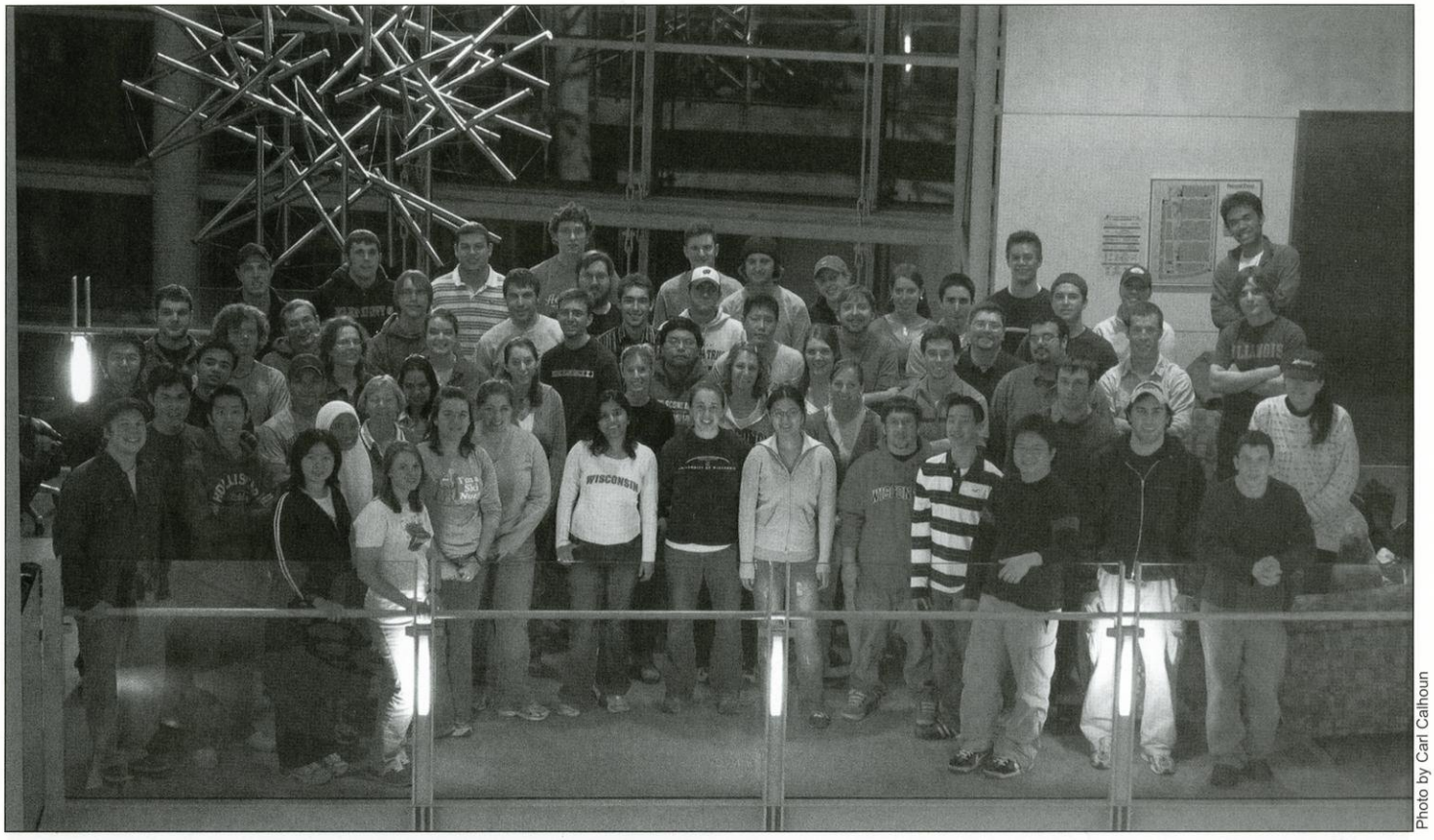

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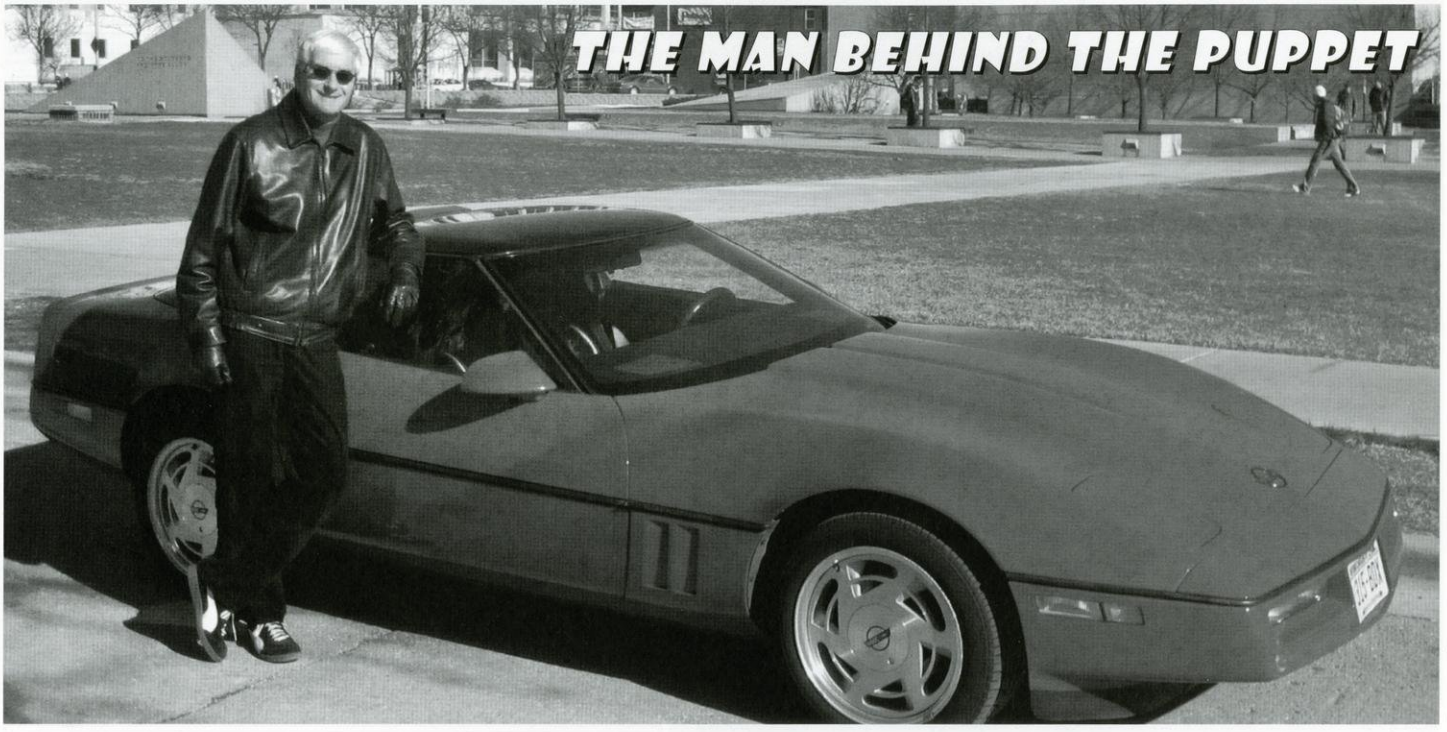


Photo by Steve Ng and Jen Kovars

By Nicole Rybeck

Growing up as an only child in Kalamazoo, Mich., Greg Moses showed signs of promise in the field of science from a young age. Moses participated in the Junior Engineering Technical Society and wrote a paper on atomic energy when he was in sixth grade. He credits his junior high science teacher, Mr. Oschger, with encouraging him in his journey into the field of science. Talented in math and science, Moses would become the first of his family to go to college. His guidance counselor suggested he consider the University of Michigan.

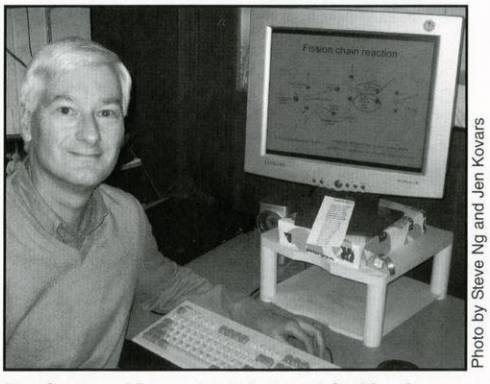


Photo by Steve Ng and Jen Kovars

Professor Moses works on his Nuclear Reactor Theory lecture notes.

Moses ultimately decided to follow his counselor's advice.

"I'm good at taking directions," he says. Moses remained at Michigan for six and a half years, earning his bachelor's, master's and doctorate degrees in nuclear engineering. He says he never really considered becoming a professor until he was in graduate school.

"Being a professor is like being a well-paid grad student," Moses says.

He became affiliated with UW-Madison through an effort to add more researchers to the faculty. He filled out an application and, in less than a year, relocated to Wisconsin to pursue his career in higher education.

Moses describes his teaching style as informal and motivational – a way to open pathways for discussion. Moses says that he tries to relate to his students and that he "tries to dress like the students dress."

Moses has taught a variety of courses, including nuclear reactor theory, transport theory and Computer Science (CS) 310: Problem Solving Using Computers. CS 310 might be the class he is best known for. Moses records his online lectures for the class in his office in front of a curtain his daughter helped him make.

"Being a professor is like being a well-paid grad student" -Greg Moses

Although his overall level of energy and enthusiasm enriches the experience of watching an online lecture, Moses also integrates a wholly unique classroom tool: a puppet. He says he bought the frog puppet – which is familiar to many engineering undergrads – at the San Diego Zoo because he thought it was cute.

Moses isn't exactly sure what made him think to use the puppet in lecture.

"It just seemed like a good idea," he says.

His innovation and excitement in his online lectures for another class recently earned him an award from the Frontiers in

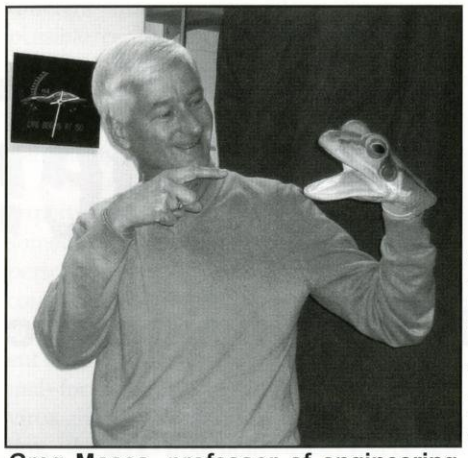


Photo by Steve Ng & Jen Kovars

Greg Moses, professor of engineering physics, and his puppet deliver a point in a Computer Science 310 online lecture.

Education group, a committee that promotes the widespread distribution of innovations in engineering and computer science education. Last October, Moses was honored for a paper he wrote detailing his method of teaching Nuclear Engineering 405: Nuclear Reactor Theory. He says he allows students to watch the recorded lectures at home so he can spend class time working through problems and administering quizzes. Moses claims that this method is especially effective because students are forced to take many more quizzes due to the increase in "discussion" time. This method helps students to gauge how well they are absorbing the material.

Beyond sharing his passion for science with his students, Moses also spends a significant amount of his time on his research. He is currently involved with the Fusion Institute, High Average Power Laser Program (HAPL) and the International Tokamak Experimental Reactor (INTER). HAPL's mission is to find a way to use high-energy laser fusion as a source of power. It will probably take 30 to 40 years for the project to come even close to completion.

"HAPL creates as many questions as we answer," Moses says.

Although his dedication and enthusiasm for his students and research is readily apparent, when asked where he sees himself in 10 years, Moses says he would like to be retired and living somewhere warm. It would be a nice place for him to practice his golf game, which he works on whenever possible, and to drive his 1989 Chevrolet Corvette Convertible.

Until then, his unique teaching style and extensive research likely will continue to impact this campus--especially its students.

Author Bio: Nicole Rybeck is a sophomore majoring in industrial and systems engineering and French. She is actively involved with Polygon Engineering Student Council and currently serves as its vice president of leadership development.

The next great plague?

Preparing for the avian flu epidemic

By Matt Stauffer

The disease was much more contagious than anyone had expected. The antigenic shift occurred only five months ago and already millions of Americans have died. We weren't even the hardest hit country. All international trade and travel was brought to a halt five days after the first cluster of the flu broke out in Istanbul. The attempt at quarantine was futile. The disease is everywhere. It's on your hands, it's in the air and it has tainted the drinking water of many cities.

The slightest tickle of the throat can escalate to deadly pneumonia in a matter of 72 hours. With 55 percent of H5N1 cases being terminal, it will likely claim a large portion of the earth's population before its reign of terror comes to an end.

The government insists that it is only a matter of time before there will be an effective vaccine. Even then, only government officials, healthcare workers and the wealthy will be able to get it.

For the first few weeks, people tried to don facemasks and continue with their daily routines. Now most major cities look like eerie ghost towns. There are huddled masses in cathedrals and synagogues looking to the heavens for answers. No such answers have come as the pandemic continues to claim thousands of lives each day.

Airplane hangers are used as mass storage facilities for the dead, since the morgues filled up long ago. They stack the bodies in layers (body-tarp-dry ice-tarp-body-tarp-dry ice) as high as the forklifts can go. There are not enough caskets or crematories to dispose of all of this death in a humane way. Worse yet, there is nowhere to hide. Public transportation and the shear overpopulation of many areas are the perfect conditions for this prolific virus to spread and multiply …

The avian influenza virus has the potential to make Hurricane Katrina and the tsunami of Southeast Asia look minor in comparison to the devastation it could cause. It has not yet mutated into a form that is communicable from one person to another. Should the virus gain this ability, the state of the world would depend on whether the outbreak could be contained to a local area. If it spreads worldwide, the epidemic would become a pandemic.

The symptoms of the avian flu differ from the seasonal flu. Both generally cause high fever and coughing. The avian flu does not usually produce the runny nose, inflamed sinuses or upper respiratory congestion typical of seasonal flu. Instead, the sickness often escalates to pneumonia, which is the most common cause of death in all flu patients.

"Unlike the normal human flu, where the virus is predominantly in the upper respiratory tract, so you get a runny nose, sore throat, the H5N1 virus seems to go directly deep into the lungs, so it goes down into the lung tissue, causes a severe pneumonia," Dr. Malik Peiris of the University of Hong Kong said in an interview with ABC News.

Peiris was the scientist who first discovered the so-called SARS virus, which killed 700 people and drew worldwide attention. Autopsies of the first recorded victims of the avian flu revealed lungs so filled with blood and fluid that the people literally drowned on their own body fluids.

The avian flu is a particular strain of the influenza virus of the type H5N1. Currently, there is an outbreak of H5N1 virus in Southeast Asia and Eastern Europe. Over 200 million birds have been euthanized in an attempt to rid the flock of the virus. This influenza virus is highly pathogenic to most domesticated birds, that is, it kills many of those that become infected. (Wild birds often carry the virus but do not die from it.) It also has infected some people, killing about half of them. H5N1 is unusually virulent and so new that people around the world have had no chance to develop immunity.

"If we had a significant worldwide epidemic of this particular avian flu, the H5N1 virus, and it hit the United States and the world – because it would be everywhere at once – I think we would see outcomes that would be virtually impossible to imagine."
-Dr. Irwin Redlener

The H5N2 virus, which is similar to the H5N1, was discovered early in December 2004 in a flock of Korean ducks and pigs. The outbreak was local, and quarantine followed by the euthanasia of nine thousand animals is thought to have destroyed this strain.

Chickens and other domestic or wild birds infected with bird influenza shed the virus in their saliva, nasal secretions and feces. All of the reported human cases have involved contact with infected birds, including butchering or plucking chickens, eating undercooked poultry or spending time in areas contaminated with the bird blood or droppings. The virus can remain stable for long periods of time, which means it can be spread by contaminated water or farm equipment. So far, the risk of transmission from an infected human to other people has been low.

There are three distinct types of the avian influenza virus: H5, H7 and H9. Each of these three viruses is paired with any one of nine

different surface proteins. Thus, there are 27 possible forms of the virus. The avian influenza virus has eight separate gene segments. The segmented genome allows the viruses from different species to mix and match gene pairs to create new strains of the virus.

Experts fear that this evolving virus will someday gain the ability to spread easily from person to person. The virus would become communicable by swapping genes with the common seasonal flu virus. If the two different strains of the flu virus infect the same animal--for example, a pig contracts the avian flu virus and the common flu virus at the same time--the genes from both viruses will be able to mix and create a new strand of virus. This process of gene sharing is called reassortment. If such a simultaneous infection occurs, reassortment could create a strain of the avian flu virus that is capable of spreading from one person to another.

This type of major reassortment in the genome structure of the flu virus is known as an antigenic shift. When an antigenic shift occurs, the resulting virus strain is one that people have never been exposed to. Therefore, we will have little or no immunity to it. If the strain also is easily transmitted between people, as is characteristic of the seasonal flu, an influenza pandemic could occur.

Public health authorities closely monitor outbreaks of human illness associated with the avian flu because of its ability to mutate into a virus that could cause widespread infection of the human population. The sign that the virus has undergone an antigenic shift will be the outbreak of cases in humans who have not had any contact with infected birds. This would most likely occur among healthcare providers. To date, reported cases of human infections have not resulted in sustained human-to-human transmission. Should such a situation occur, it would be a race against time for authorities to contain the outbreak and develop an effective vaccine.

Time is of the essence when considering the damage that a flu pandemic can inflict on the population. The1918 influenza pandemic, also known as the Spanish flu, killed an estimated 40 million people in a single year. That amounts to more deaths than occurred from the Bubonic Plague that ravaged Europe from 1347 to 1351. The 1918 influenza pandemic virus infected 28 percent of the American population and killed approximately 675,000 people, effectively lowering the average age of the population by 10 years. The flu is most deadly in elderly people, who inherently have weaker immune systems.

The state of the nation in the aftermath of World War I led the masses to be relatively calm in response to such a crisis. At this time, government officials placed strict regulations on many areas affecting people's daily routines, including travel, commerce and rationing. The population accepted these regulations in the best interest of the nation; they were used to inconveniences such as war rationing and the draft and were willing to comply with the demands of public health officials.

Photo by Lianne Streng

Many clinics around the world, such as the University Health Services at UW-Madison, might become overwhelmed with students and faculty requiring medical attention if an avian flu pandemic occurs.

Exotic Newcastle Disease

By Taneka King

An outbreak of Exotic Newcastle Disease (END) was reported on the America's West Coast in 2002. END is a strain of the influenza virus similar to the avian flu. Most waterfowl are potential carriers of END. Although it is highly pathogenic in poultry and other game birds, many infected water fowl do not show any signs of the illness. The virus travels in infected birds' saliva and feces. Like the avian flu, END is relatively stable at ambient temperature, so it has the ability to spread in contaminated water or farm equipment used around infected birds. The disease was able to spread very quickly across the West Coast, and had the potential to cripple many industries and our nation's food supply. Public authorities employed the Incident Command System, (ICS) in response to this emergency.

"ICS is intended to be a flexible and widely applicable approach to many different types of emergencies," Donald Moynihan, UW-Madison assistant professor of public affairs, says. His research and teaching interests include performance management, homeland security, citizen participation and public budgeting. "It is a chain of command involving many different organizations and professionals of multiple disciplines."

A three-phase approach was employed by ICS, which used the resources of many different federal, state and local agencies to handle the END outbreak. Phase one involved classifying the disease in order to get an idea of how fast it could travel among bird populations. An estimated 1.2 million birds in California were declared potential END carriers and were euthanized. Officials quarantined many farms, and all commercial routing of poultry was brought to a halt. Phase two began when a state of emergency was declared as END spread outside of California. The task force grew to well over 1,000 employees and six ICS command posts were set up throughout the western states. This helped officials pool knowledge and resources to effectively locate and contain infected farms. The last phase dealt with the extermination of every remaining case of END. No cases have been reported since June 2003, when the last infected bird was euthanized and the trade restrictions were lifted.

"All federal agencies are obligated to employ ICS approach in a state of national emergency," Moynihan says. ICS proved to be swift and effective in its means of handling an emergency similar to the influenza pandemic.

It isn't hard to believe that, in this day and age, people would be more resistant to yielding any such freedoms to the government, even if the cause is as important as containing the next great plague.

In the event of a mutation and subsequent outbreak, drugs like Tamiflu, used in combination with an effective quarantine, would help to slow the spread of the disease and minimize the damage until an effective vaccine was produced. The World Health Organization has an established plan of incident command in place for such a global threat.

"A set plan of action may look good on paper, sound feasible and give a sense of safety. When it comes to implementing those plans in an emergency situation, there are often pitfalls such as lack of resources, practice or shear impracticalities of the plan itself." Vicki Bier, UW-Madison professor of industrial and systems engineering, says. Bier is an analyst specializing in probabilistic risk analysis for homeland security and critical infrastructure protection.

"It tends to be that the lists of actions far outnumber the wealth of resources that are available," Bier says.

Photo by Heidi Mielke

Although millions of domesticated birds around the world have succumbed to the avian flu virus, this chicken from the UW-Madison Poultry Research Laboratory lives in relative safety since there have been no reported cases of the virus in the United States.

Such is the case when considering the possibility of an influenza pandemic. In theory, authorities should be able to contain a localized outbreak by isolating sick people and treating those who have been exposed to the virus with anti-viral drugs. If that strategy fails, the virus will spread, most likely to other countries and even worldwide, since international travel is so common in today's society. At that point, attention will shift to rapid development and distribution of a vaccine, the supplying of anti-flu medication to affected areas and implementing other broad public health measures.

The development of a vaccine only can occur after the particular strain has been identified. This could take as long as six months after the mutation occurs. The ramp-up to full scale production and the delivery to patients could take another six months. In this time, the virus already could have killed one billion people. Many universities and health organizations around the world are trying desperately to develop an effective vaccine, as well as faster methods for its production.

"If we had a significant worldwide epidemic of this particular avian flu, the H5N1 virus, and it hit the United States and the world--because it would be everywhere at once--I think we would see outcomes that would be virtually impossible to imagine," Dr. Irwin Redlener, director of the National Center for Disaster Preparedness at Columbia University's Mailman School of Public Health, told ABC News.

Tamiflu is made by the Roche pharmaceutical company in Switzerland. Roche has been selling Tamiflu for years, but only recently did scientists learn of its potential to fight against the H5N1 virus. This discovery has since created a huge demand and a critical shortage. All of the wealthiest countries in the world currently are ordering stockpiles of the drug.

"The way we are approaching the discussions with governments is that we are operating on a first-come, first-serve basis," Dr. David Reddy, head of Roche's pandemic task force, said in an interview with ABC News. There already is a list of numerous governments trying to get large orders of the drug. The U.S. is nowhere near the top of that list. Ideally, the U.S. would like to have 30 million doses of Tamiflu on hand; at this point, the stockpile only has two million.

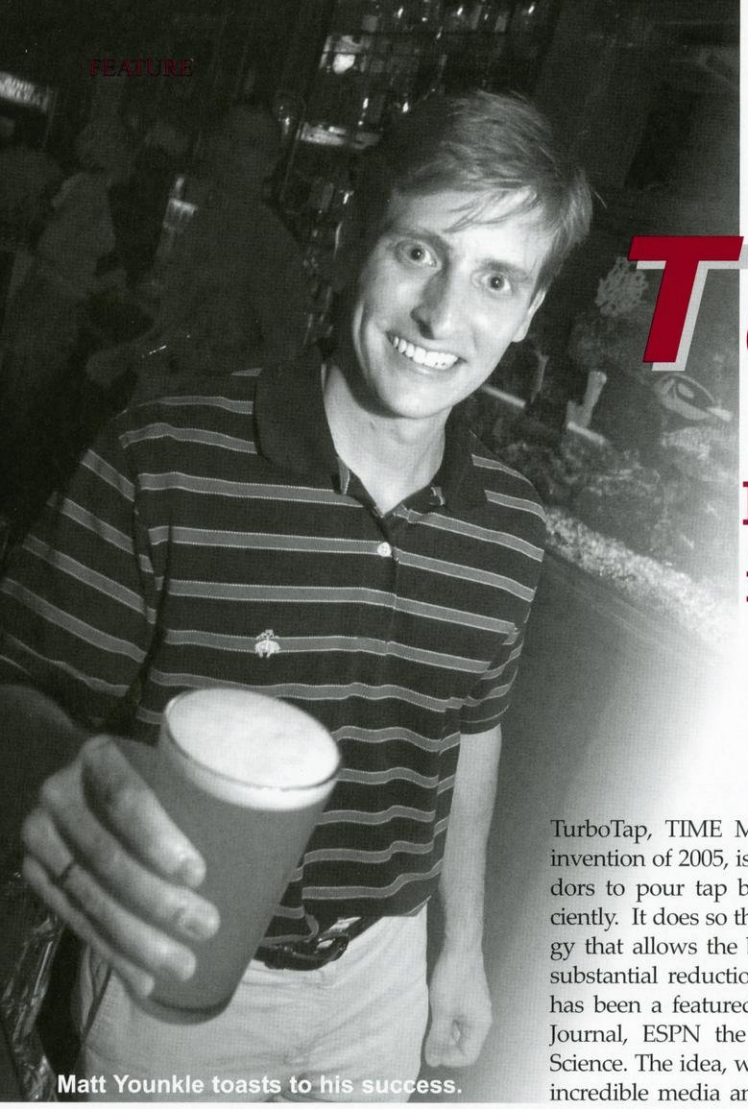
Should an outbreak occur as predicted, hospitals would be overwhelmed almost immediately. One study predicted that an estimated 100,000 people would come seeking medical attention for flu-like symptoms in Washington, D.C. alone. Of these, 20,000 would need urgent medical care. The problem is that there only are 7,800 open, staffed hospital beds in the D.C. area. Another study showed only 66 percent of healthcare workers would show up to work if it were imminent that the patients they were treating could infect them with the avian flu.

Most experts are speaking in terms of when, not if, in discussing the potential of a widespread avian flu pandemic. Officials are doing everything in their power to prepare for what could be the next great plague. Early warning, swift containment and public compliance will be key factors in minimizing damage, should the situation arise. WE

Author bios:

Matt Stauffer is a sophomore majoring in materials science and engineering. His article was inspired from reading H.G. Wells' War of the Worlds.

Taneka King is a freshman majoring in computer engineering and has an interest in becoming a pediatric nurse practitioner. This is her first semester with the magazine.



Matt Younkle toasts to his success.

TurboTap

How a Schoofs Prize-winning invention made it all the way to the big leagues

By Nick O'Brien

A warm autumn sun shines down on the large glass edifices of the Windy City. The Cubbies are in the midst of the 7th inning stretch, up by a run, with Barry Bonds leading off for the Giants in the upcoming inning. As the familiar words of "Take Me Out to The Ball Game" start to swoon one back to a more simple preadolescence, a Harry Caray size urge for a tall cool brew takes command of a bleacher bum's body like a hypnotist at his senior class party. He finds himself in a giant pickle, stuck between watching the kid most likely to catch Hank take a swing against the future hall-of-famer Maddox, and the undeniable urge for a refreshing brew. He takes a chance, sprinting like he's stealing home. He reaches the beer line and with jaw dropping astonishment is able to get his beer and back in his seat before the count of "three strikes you're out, at the old ball game." He ponders to himself, "How is this possible?" Was there a spiritual intervention by the ghost of Johnny Evers? No. It was TurboTap, an exciting new beer system that made his dreams come true.

TurboTap, TIME Magazine's most amazing invention of 2005, is a device that allows vendors to pour tap beer faster and more efficiently. It does so through patented technology that allows the beer to be poured with a substantial reduction in foaming. TurboTap has been a featured story in the Wall Street Journal, ESPN the magazine, and Popular Science. The idea, which is recently gathering incredible media and sales momentum with places like Wrigley Field (Cubs), US Cellular Field (White Sox), and Heinz Field (Steelers) leasing the product, was created by Matt Younkle 10 years ago while an engineering undergraduate at UW- Madison.

During his junior year, while standing in the beer line at the Memorial Union Terrace, Matt Younkle thought that there had to be a better way for beer to be poured. Using his engineering ingenuity along with the help of partner Robert Meyers, Matt was able to come up with Fast Tap and entered it into the 1996 Schoofs Innovation Days Competition. Fast Tap won the grand prize for best invention along with a check for $10,000. He and his partner used the money they had won to secure a U.S. patent.

Before the TurboTap was invented the problem with the way tap beer was poured was that the tap released the beer above the glass. With the standard approach, as the beer falls, it accelerates and the circumference of the beer stream shrinks which causes excessive foaming upon contact with the bottom of glass. To counter the problem TurboTap uses an elongated nozzle that has a narrowing cross sectional area with walls that stay in constant contact with the stream of beer until it reaches the cup. By doing this, TurboTap establishes a gentler impact upon the bottom of the glass which keeps the beer from foaming allowing bartenders to turn up the pressure of the kegs so that the beer is poured more quickly.

A year after the success at Schoofs Competition, and while in the midst of securing a patent, Matt graduated from UW-Madison with degrees in Electrical Engineering and Computer Science. Although Matt was very interested going through with the product, he accepted a position as vice president of a small start up company, Vosaic LLC.

During his junior year, while standing in the beer line at the Memorial Union Terrace, Matt Younkle thought that there had to be a better way for beer to be poured.

Vosaic LLC commercialized Internet video streaming products that were being developed by a small group of engineers based at the University of Illinois. The job allowed Matt to do a lot of traveling and hone his skills in programming, marketing and presentations.

"I don't think anyone can learn how to be an entrepreneur in a classroom. It takes entrepreneurial encounters and time to develop a proper skill sets," Younkle says.

Not too long after Younkle had started working with Vosaic, the company was bought out by V-Tel, Inc. In addition to learning first hand how to be an entrepreneur, the time at Vosaic was exciting for Younkle because he had the opportunity to meet many of the personalities behind the rapid growth of the Internet--important figures like Scott McKnealy and Jim Barksdale.

"When I was in college I had no way to know I'd be working in the beer business."
-Matt Younkle

"It was an interesting time with the start of the internet bubble. There was a lot of investing," Younkle says.

Younkle then moved on to his second job, again holding the title of Vice President, this time with UCLID Software, LLC back in Madison. He spent two years at UCLID, an Artificial Intelligence Mapping company, before moving back to Chicago in 2000 in an effort to turn around a struggling technology company.

For nine months Younkle tried to turn around the company, looking for anything they had patented that could be deemed as useful. He made some strides, but when the Internet bubble burst, the chance for a turn around was considered impracticable. Younkle stayed in Chicago, working as a consultant before he finally decided it was time to refocus on his prize winning invention.

"I always thought the project had promise, and I wanted to see it through, for better or worse," Younkle says. "Conversations around TurboTap never stopped. I had trouble coming up with a good excuse for why I hadn't gone through with it. I was just busy with other things."

Younkle used his established network of connections to hook up with investors who helped him set up shop under the company name Laminar LLC.

"The most interesting thing learned is the importance of having a talented network of entrepreneurs and investors around you. This network takes time to build; there are no shortcuts to the process," Younkle says.

Originally the thought was to sell the product to the big beer companies, but when that didn't work out, Younkle decided it was time to sell TurboTaps on his own. With refinements in the product through extensive R & D, ("research and drinking" - a phrase coined by Younkle), TurboTap was ready for the marketplace.

Although TurboTap was launched in 2005, the company has already been able to accumulate a strong customer base.

"We've been fortunate to have a lot of momentum, the media has been very nice to us, and we were fortunate to establish some great customers early on that have been very supportive," Younkle says.

Customers like Wrigley Field. The timeless stadium has reported that not only are beer line waiting times down, but TurboTap is helping the stadium produce 6 to 8 more cups, an increase of revenue by $30 to $40 per keg. The decrease in run off and the production of more sales is the real reason the TurboTap is so coveted.

"When I was in college I had no way to know I'd be working in the beer business," Younkle says. "I had been lucky in that my prior projects had given me the opportunity to experience many sides of running a business, from technology to sales and marketing. Ultimately, I found that I really like working with new products ... inventing."

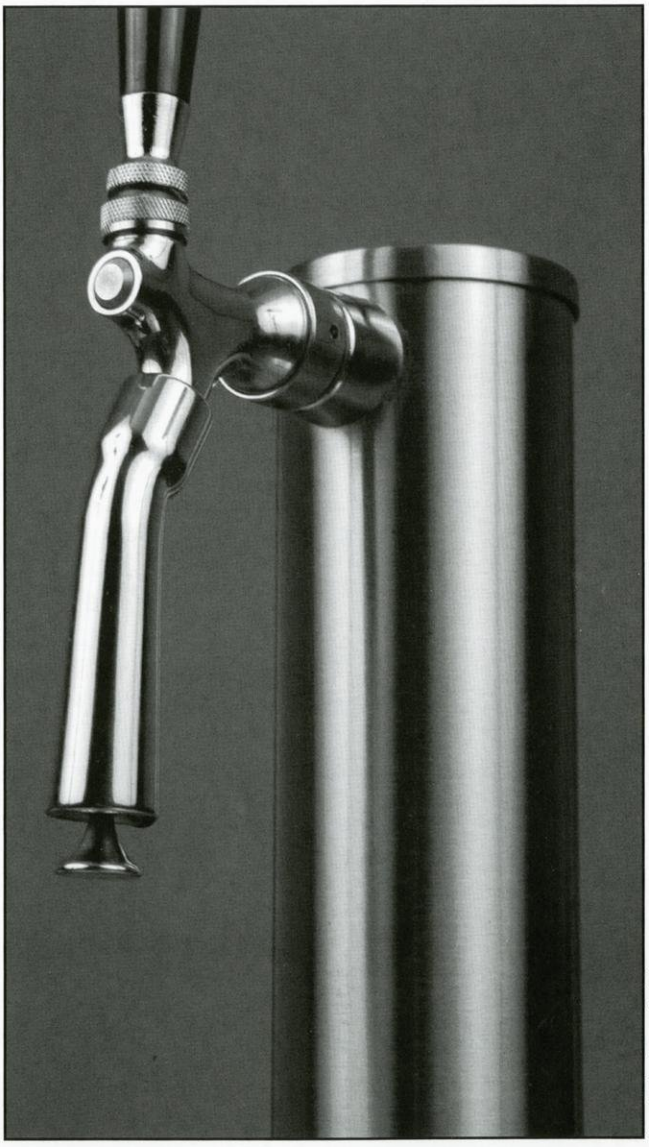
Despite all his recent success Younkle still makes an effort to stay involved with his alma mater. He enjoys returning to UW Innovation Days to help judge the Schoofs Competition. He is very passionate about helping others learn from his experience. He is very open and always willing to give advice to fellow inventors, especially students.

"Frequently people come to me and tell me they have a great idea they want hand off to me. To which I say, 'if it's a good idea don't be eager to hand it away,' " said Younkle. "No one is going to have more passion for your own idea than you. You need to take charge and see it through to success."

Younkle's passion for bringing TurboTap through to success has not gone unnoticed or unappreciated.

The crowd roars. As the Cub fan eases back into his seat with brew in hand, a serene smile forms across his face. He takes a brief moment to take in all the majesty that is Wrigley Field. The sights and sounds of the ballgame seem to make all his problems drift like popcorn in the customary Chicago wind. He is moved by the vastness of the moment, and although not a poet by nature he thinks to himself, "Although the Cubbies didn't win the N.L. pennant this year, at least I watched Maddox strike out Barry while drinking a beer." WE

Author bio: Nick O'Brien is a double major in chemical engineering and theatre and drama. He is thrilled to be in his third semester with the magazine.

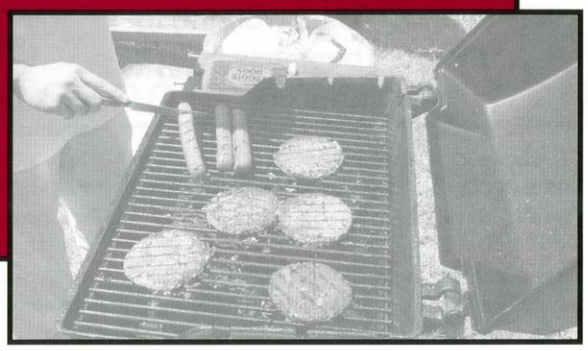


Courtesy of www.turbotap.com

The TurboTap is a 4.5 inch stainless steel nozzle.

Plasma processing:

Researchers help take microbes off the menu



By Kevin Jayne

What types of thoughts cross your mind when presented with a scrumptious meal on an empty stomach?

In all likelihood, microscopic pathogens are not one of them. However, food-borne diseases caused millions of illnesses and thousands of deaths in the past year alone. These contaminants are a problem that will continue to fester until action is taken to stop them.

New technology developed at UW-Madison may be a step in the right direction.

Frank Denes, UW-Madison professor of biological systems engineering, has created a method of using cold plasma to defeat food-borne pathogens before they reach the consumer. For now, the innovative idea remains in the developmental stages, though it appears very promising and could someday have industrial applications.

Plasma is generated by passing a gas through a high voltage electric field. The electrons this field accelerates bombard the gas molecules, converting them into a mixture of ions and free radicals. Unlike hot plasma, which can reach temperatures of thousands or millions of degrees Fahrenheit in the vacuum of outer space, cold plasmas are created with the atomic or molecular species at close to room temperature and at low or standard atmospheric pressure.

"A cold plasma exists in a gas environment that is ionized and at a low temperature. The ionization degree and temperature of the atomic species is low, but the energy of the electrons is high," Denes says.

This combination of high energy and low temperature can give cold plasmas useful disinfectant properties. But researchers must first choose which gases to use in achieving the desired end-use properties.

"We are using air, oxygen and mixtures of air with moisture for our disinfection purposes. For other applications we can use different types of gas--they will produce different surface characteristics," Denes says.

New technology developed at UW-Madison could help reduce food-borne pathogens.

Denes collaborated with Amy Wong, a UW-Madison professor of food microbiology and toxicology, to develop this technology. His innovation has helped him secure two patents through the Wisconsin Alumni Research Foundation (WARF): one for a device to treat solids and another for a device to treat liquids.

Cold plasma technology has been in existence for decades. However, Denes' machines are specially designed to work at atmospheric pressure for decontamination and disinfection purposes.

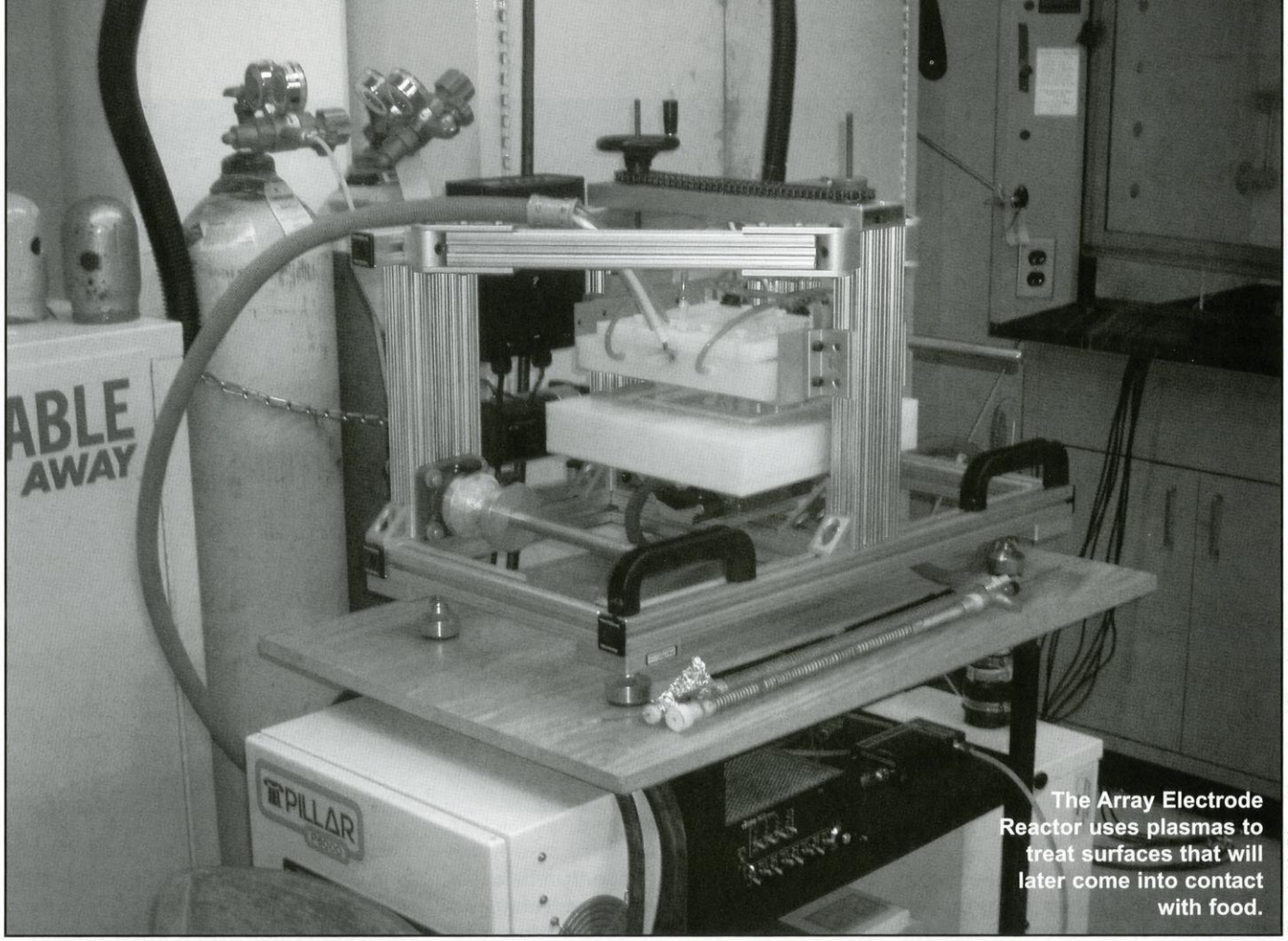
Capable of generating and releasing cold plasma species at a steady rate, Denes' first piece of equipment is the Array Electrode Reactor. This device is composed of over 200 closely spaced cylindrical wire electrode chambers. Arranged in a grid, these chambers control the distribution of plasma over the surface to be treated.

"Individual plasma reactors are working [in] parallel and generate reactive plasma species which are blown over surfaces that are contaminated. Using this technique, we found that disinfection is fairly efficient," Denes says.

With only a few minutes of cold plasma treatment, this apparatus decreases the number of bacteria by a factor of thousands. Researchers suspect plasma kills pathogens by altering the surface of their cell membranes, interfering with necessary metabolic processes.

"The plasma species are already energetic. Their energy levels are comparable to other common bonding energies found in organic compounds. By applying the plasma to the surface, the action interrupts these chemical bonds, causing them to decompose and killing the bacteria," Denes says.

Denes' second invention achieves a very similar goal, but this device treats liquids. Approximately one liter of the substance to be treated is enclosed in a container. The device



The Array Electrode Reactor uses plasmas to treat surfaces that will later come into contact with food.

Photo by Norikhwan Hamzah and Ahmad Ariff Juhari

then introduces plasma into the mixture, eliminating bacteria and decontaminating the sample.

While these devices are very efficient at removing unwanted bacteria, they will not replace current market tools for ensuring food safety.

"This is not an alternative to regular cleaning and sanitizing. This is just another safeguard in case there are some bacteria left behind," Wong says.

Though no definite plans exist for cold plasma technology to make the jump into industry, the researchers' efforts have not gone unnoticed. Denes and Wong currently are working on a project funded by the Department of Homeland Security, which anticipates their work will have useful public safety applications. In the meantime, diners can hope the technology gets picked up by the food industry, letting them satisfy their hunger without worry of any microorganisms on the menu. We

Author Bio: Kevin Jayne is a junior majoring in mechanical engineering and technical communication. This is his second semester working with the magazine.

Combine and conquer:

New phones help users multitask

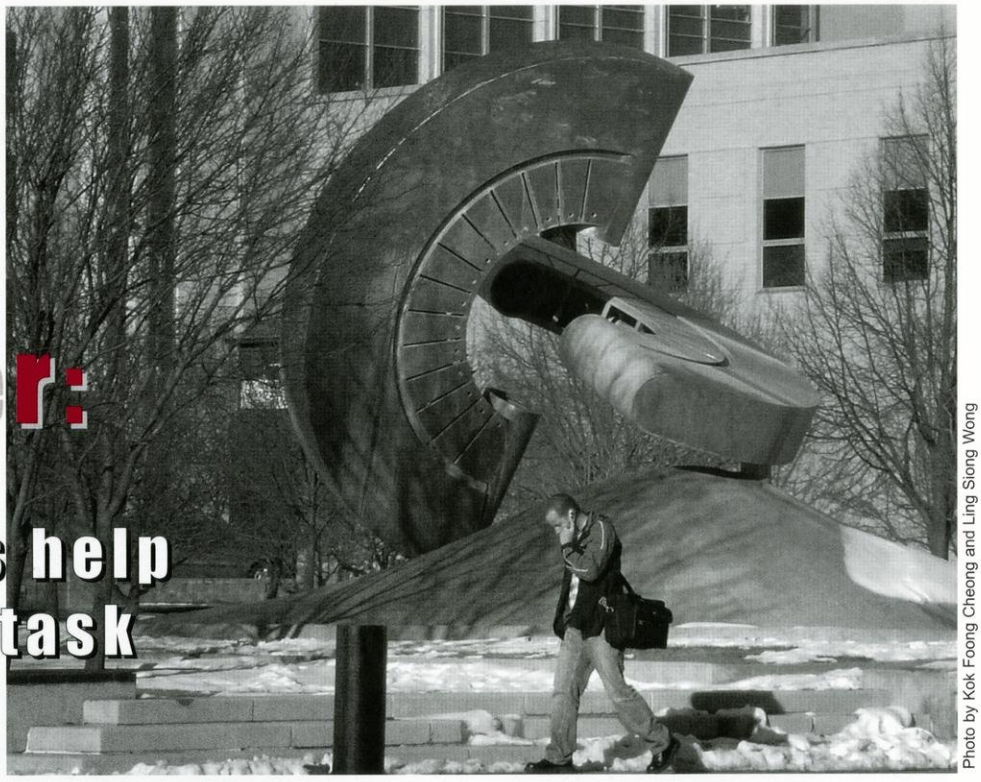


Photo by Kok Foong Cheong and Ling Siong Wong

By Carly Mulliken

With a wave of new combination cell phones on the market, the world truly is at your fingertips – it just depends on how much you are willing to pay.

Combination cell phones are a unique class of mobile phones that have the capabilities of both a handheld computer and a cell phone. Well-known brands such as BlackBerry, Palm, Audiovox and Samsung have released phones that can meet many phone and Internet needs. Besides typical cell phone features, these phones allow users to check their e-mail or even download their favorite artists' new singles.

The newest member of the BlackBerry family is the 7130, which, among other features, boasts a sleeker shape than its older siblings. Similarly, the newest Palm, the Treo 700, has been tweaked to improve upon Palm's older models. Likewise, the Audiovox PPC-6600 boasts huge advances over its predecessors. Samsung recently has entered the market with its first combination cell phone, the SCH-i730.

Common features

These phones have a few important similarities. First, all of the phones are Bluetooth capable. Bluetooth is a wireless technology that allows users to operate their phones via a headset from up to 30 feet away. Other Bluetooth capabilities include the ability to exchange contact or scheduling information with other phones or computers and to play games against other Bluetooth users. The power of Bluetooth comes with a price; compatible headsets cost anywhere from $50 to $100.

All of the phones give users the ability to check their e-mail and also to surf the Web via a wireless connection. They all have the same data transfer speed, which determines the speed of the Internet connection. Another function the phones share is "PC Sync." This function allows a user to connect the phone to a computer with a cable and share contact and scheduling information. Finally, the phones all come with a color LCD display.

The Lineup

Photo courtesy of www.smartbcmobility.com

Audiovox PPC-6600

Photo courtesy of www.pcmag.com

Blackberry 7130

Photo courtesy of www.amazon.com

Samsung SCH-i730

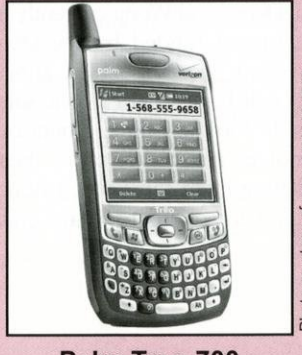


Photo courtesy of www.amazon.com

Palm Treo 700

The contestants

Of course, it is the differences between the phones that determine which one fits your personality and needs.

The Palm Treo 700, which earned top marks from popular phone review site *phonescoop.com*, tied the BlackBerry 7130 as the smallest phone. It also is the second lightest and has the longest battery life. Other notable characteristics of this Palm are its ability to play MP3s, take pictures and capture and stream video.

The BlackBerry 7130 is the smallest in the BlackBerry lineup. It is the lightest of the phones and has the second shortest battery life. Unlike the other three phones, which use Windows for Pocket PCs as their operating system, BlackBerry uses its own "Enterprise" software. This phone has the least memory available, but the ease of transferring information between a computer and the phone offsets this weakness. Important features of the BlackBerry include its ability to function as a modem between a computer and the Internet. The Blackberry contains Java 2 Micro Edition, which allows the phone to run different software specifically built for mobile devices, such as corporate applications. These last two features of the BlackBerry can make the phone a vital tool in the business world.

The Samsung SCH-i730 is the second smallest of these phones but shares the title for largest LCD screen with the Audiovox PPC-6600. It is the second heaviest of the phones and has the shortest battery life. The phone has stereo speakers which enhance its ability to play music, games and stream videos.

Unlike the other three phones, which use Windows for Pocket PCs as their operating system, BlackBerry uses its own "Enterprise" software.

The last, and largest, of the phones is the Audiovox PPC-6600. Not surprisingly, it also is the heaviest of the group. The Audiovox's battery has the second longest life of the phones. The Audiovox has a music player and a camera and can capture and stream video.

The bottom line

The bottom line will always be how much you are willing to spend on an item, no matter what amazing features it may contain. Prices vary slightly by carrier. Verizon Wireless currently lists the Palm and Samsung both at $499.99 and the Blackberry and Audiovox at a more affordable $299.99. These prices require the customer to sign up for a two-year service contract. Users must consider what type of coverage they are willing to pay for, which affects where they will get service and how fast their connection will be.

The future

The phones in this article are all relatively new, but there are always more products on the horizon. For example, the Motorola Q--which is due for release shortly but was not out as of press time--boasts similar technology to the other phones, but with a few improvements. The Motorola Q is Bluetooth-ready and has e-mail and Internet capabilities similar to the other phones. One of the key improvements is that the Q is smaller and lighter than any of the others. It also will run on a new operating system that is not yet available for any other phone. Motorola claims that the phone will be perfect for corporations wishing to improve their mobile communication capabilities. Assuredly, another company will follow with similar claims for an even fancier new product. WE

Author Bio: Carly Mulliken is in her final semester at UW-Madison and is delighted to be spending time working with the Wisconsin Engineer Magazine again. This is her fifth article.

DIRECT FROM THE SOURCE

Minimizing the negative effects of cancer treatment

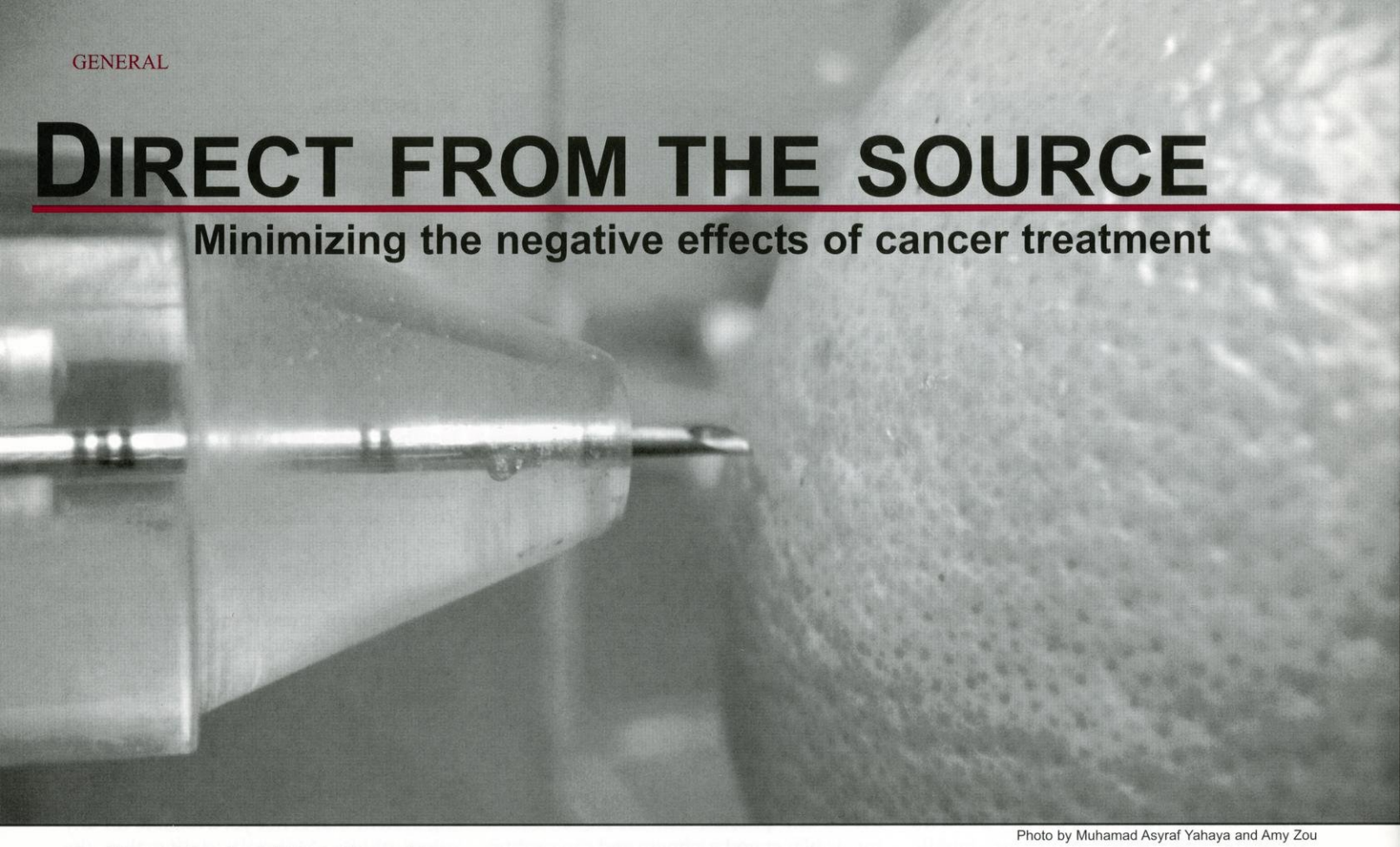


Photo by Muhamad Asyraf Yahaya and Amy Zou

By Alauna Hersch and Paul Kamenski

Albert Einstein once said, "The secret to creativity is knowing how to hide your sources." Little did he know that his thoughts on plagiarism would be the key to a newly optimized treatment for prostate cancer.

Douglass Henderson, professor of engineering physics, and Bruce Thomadsen, associate professor of medical physics, collaborated to come up with a new technique for treating prostate cancer. This treatment will more accurately and effectively radiate cancerous tissue and, in the process, minimize damage to surrounding healthy tissue. Doctors insert small radioactive sources into the prostate. These sources are shielded on specific sides to direct radiation toward cancerous regions. Their new three-component approach combines use of these sources with robotics and optimization software to decrease the deleterious effects of radiation on healthy tissue.

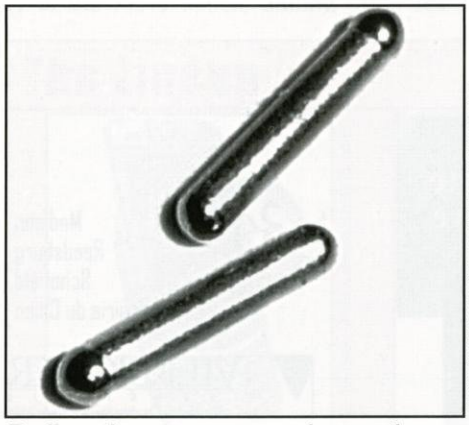


Photo by Muhamad Asyraf Yahaya & Amy Zou

Radioactive sources, no larger than a grain of rice, are injected into the prostate to treat cancerous tissue.

Prostate cancer is treated through the implantation of radioactive sources into the cancerous region of the prostate. Currently, doctors implant these radioactive sources by use of a sieve-like grid with aid from an ultrasonic view of the prostate. However, this grid limits source placement options.

"We couldn't put sources where we wanted them because there wasn't a hole there," Thomadsen says. This inaccuracy inevitably results in uneven dose distributions and the irradiation of healthy tissue.

Thomadsen began working on the robotics part of the invention in 1991, with the goal of increasing the accuracy of source placement. Robots are typically used because they are, as Thomadsen says, "very stable and precise." The robot is able to align the radioactive sources at different angles, which is not possible through the use of the grid template.

When Henderson entered the picture, he helped improve this treatment method. He came up with the idea of shielding the sources. A thin gold strip is inserted into the source in order to direct the radiation toward cancerous tissue and away from healthy tissue. This shielding significantly lowers radiation to protect sensitive areas. This allows doctors to, according to Thomadsen, "put sources in the prostate right next to the urethra or on the edge of the rectum." By strategically orienting the sources, doctors can direct the radiation toward cancerous areas. Their use of these directional sources, in addition to traditional non-shielded sources, will help increase treatment effectiveness.

Henderson also developed a new computer optimization process to further improve the precision and speed of the source placement. Before implantation, software initially maps out the calculated placement of all sources. However, due to inaccuracies in the placement procedure, sources do not always end up exactly where they are supposed to be. Older software did not adjust for this occurrence, but the new program recalculates where to put subsequent radioactive sources based on the actual location of previous sources. The speed of this program will allow patients to come for only one visit, compared

Photo by Muhamad Asyraf Yahaya and Amy Zou

Professor Bruce Thomadsen holds up radioactive sources for treating prostate cancer.

to the current two-day schedule--one for a pre-scan and one for the actual operation.

"[This procedure will] get the proper dose into the prostate very precisely while keeping the dose lower to the surrounding tissues," Thomadsen says. Using robotics in collaboration with the computer optimization program will, in turn, reduce the occurrence of complications and lead to more effective treatment.

If these inventions are employed, a typical procedure would run as follows: After an ultrasound is taken of the prostate, the physician runs the optimization software and transfers the information from the computer to the robot. The robot then implants the sources, either the regular or new shielded type. The entire procedure will take about two hours, including only a mere 20 minutes of implantation time.

This technique eventually could be used to combat cancers of other areas of the body. For example, by using shielded sources in the treatment of breast cancer, doctors can direct the radiation with more precision, delivering a lesser dose to the skin and lungs. The complexity of the head and neck make this procedure very attractive for treating cancers in those areas as well.

"The [directional] sources are good to better define where you're giving the dose and where you are not," Thomadsen says.

This faster and more precise way of treating prostate cancer may be available sooner than you think. Currently, the team is working on devising a way to anchor the directional sources so they do not rotate after implantation. Nevertheless, if things go as planned, animal tests will begin within the next year. With no other major delays, Thomadsen says, "in two years we will be ready to start some clinical trials with patients."

Thomadsen and Henderson's new three-component approach has the potential to enhance the effectiveness and accuracy of prostate cancer treatment. And – though the ideas were all their own – they have, in a sense, mastered the art of hiding their sources. WE

Author Bios:

Paul Kamenski is a sophomore majoring in materials science and engineering, in which he plans to pursue a doctorate after graduation.

Alauna Hersch is a junior majoring in biology. She plans on attending medical school after completing her undergraduate degree.

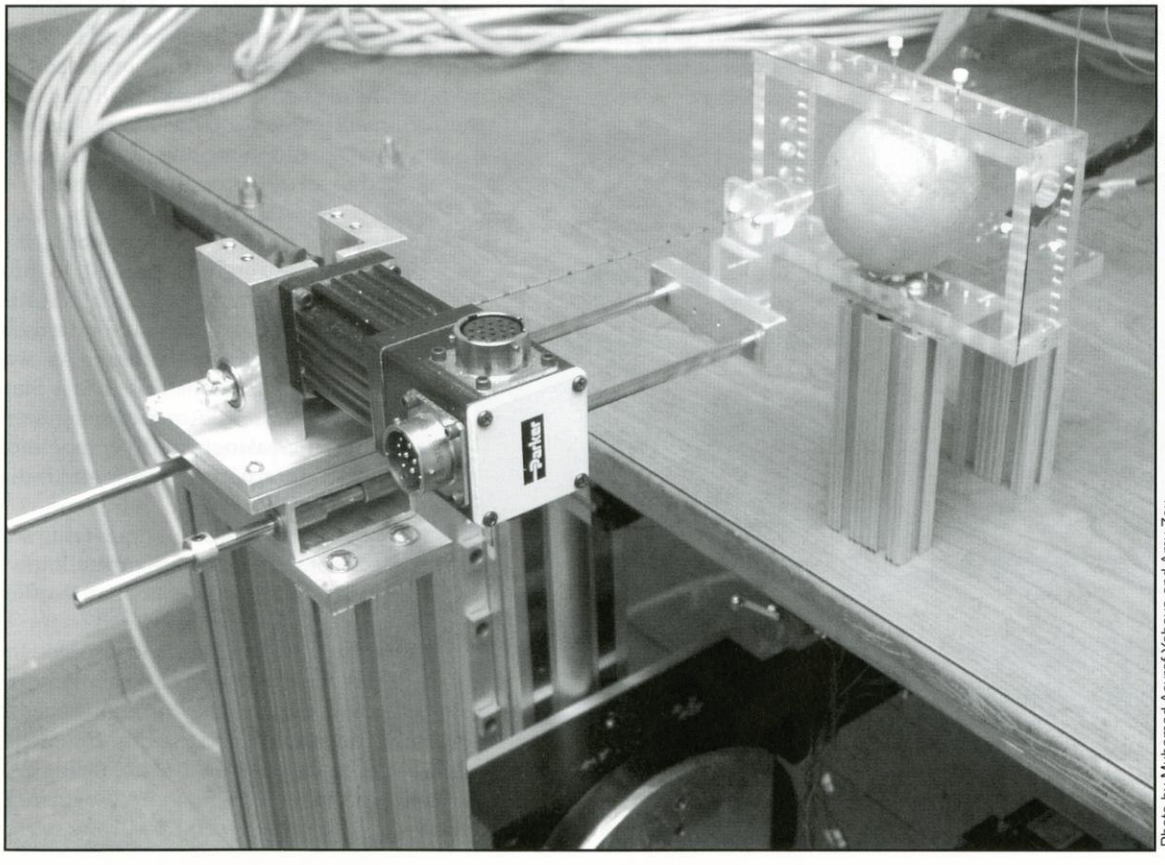


Photo by Muhamad Asyraf Yahaya and Amy Zou

With data about the cancer's coordinates in the prostate, doctors can program the robot to insert the radioactive sources precisely into the tumor.

Task Force for Change

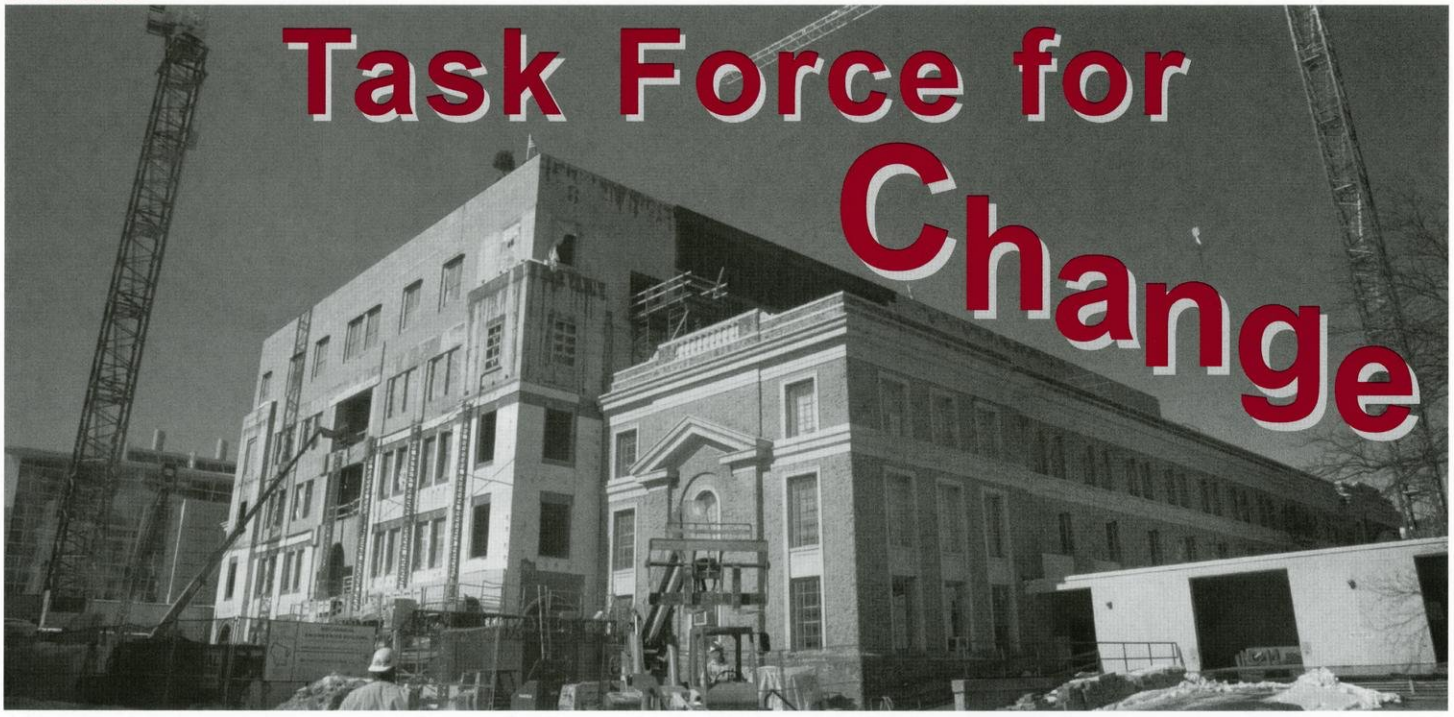


Photo by Justin Novshek

By Nate Holton

Imagine walking into an engineering class, calculator in hand, ready to solve problems with free body diagrams and theoretical equations. Just as you are about to write down all the numbers written on the chalkboard, you notice something strange.

The person at the front of the class isn't an engineering professor but, rather, a professor of sociology.

Such a scenario could exist in the future of engineering education. The College of Engineering 2010 Task Force is studying what needs to be done to fully prepare engineering students at UW-Madison for the changing landscape of the world. Since last September, a group made up of engineering professors and deans have been thinking long and hard about how to ensure the successful future of the college and all of the students enrolled in it.

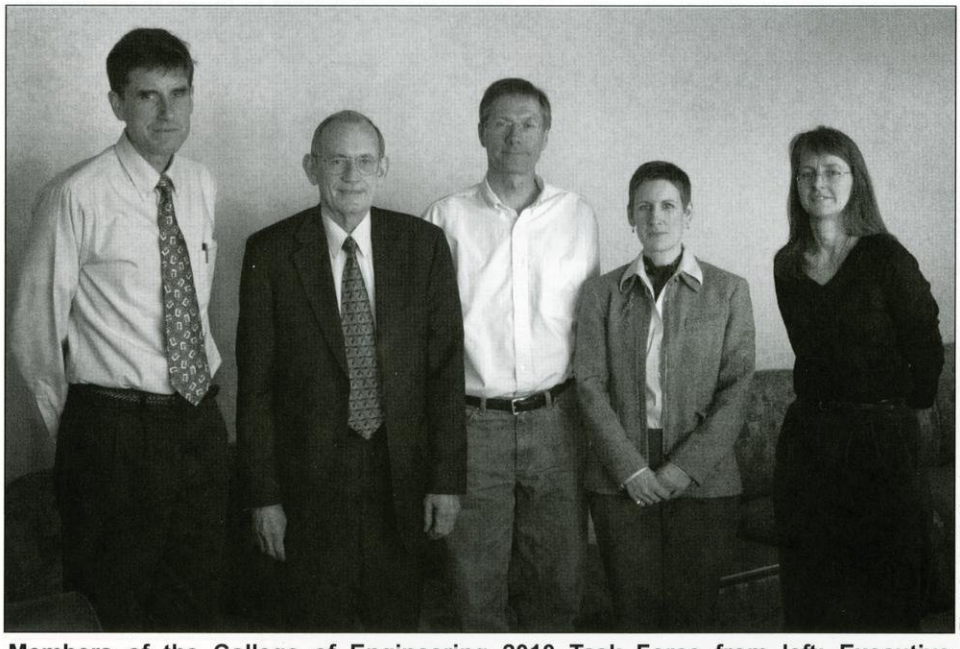


Photo by Justin Novshek

Members of the College of Engineering 2010 Task Force from left: Executive Associate Dean Pat Farrell, Dean Paul Peercy, Professor Jay Martin, Assistant Dean Sarah Pfatteicher, and Professor Amy Wendt.

Though the future certainly will not involve social science experts teaching technical material, it seems likely that there will be many interdepartmental courses that stretch the boundaries of the classic engineering curriculum.

"One of the big advantages of UW-Madison over almost any other place is that we have virtually every other discipline here," Jay Martin, professor of mechanical engineering and COE 2010 task force member, says. "That means that our students should have the chance to get exposed to all of these other activities."

In the eyes of the task force members, it is becoming increasingly important to provide engineering students with a versatile and broad education that would give them an edge over their competition. As was emphasized in President Bush's last State of the Union address, American engineers are facing increasingly stiff competition from their counterparts in China and India.

To stay ahead of the game, engineering students must take advantage of the knowledge the rest of the university has to offer.

"Students that leave here and people who work here have to have a sufficiently broad perspective so that they're really able to contribute and participate in the major decisions on the issues that are facing us," Martin says.

In order to achieve this goal, task force members believe initiatives such as the expansion of certificate programs and an increase in interdepartmental courses will be crucial. For example, a student could take a class on energy that is broken down into multiple sections. In one section, a mechanical engineering view of energy would be taught; in another, the focus would shift to chemical engineering; and a third section could have a sociologist discuss the effect of energy policy on social systems.

Broadening the reach of the engineering curriculum not only will make students better engineers, it will make engineers more marketable for other career paths.

"Engineering may not be commonly thought of as an entry degree to all sorts of other things, when in fact it should be," Martin says. "Engineers do develop ways to think that are useful in most, if not all, other disciplines."

Increasing the already strong viability of an engineering education will go a long way in ensuring that talented young people continue to look at the College of Engineering as the gateway to a fruitful and successful career.

Besides creating a more far-reaching curriculum, task force members hope to make the engineering student body more diverse.

"The principle that we would say is central to what we're doing is that the environment and culture improve as the college gets more diverse," Martin says.

Besides raising the enrollment of women and minorities, task force members feel that diversity can be achieved by internationalizing the college through an array of partnerships with other universities. Though the competition of foreign countries weighs heavily on the minds of many task force members, they also know that the rest of the world can be a valuable ally in their quest to improve the college.

"We're going to be actively seeking cooperative arrangements with universities around the world. And when I say around the world, I mean around the world," Martin says.

The College of Engineering 2010 Task Force is looking to the future to find out what can and must be done to ensure that the COE remains a world leader.

Not only can this tactic diversify the student body and help broaden the undergraduate experience, linking up with other universities also may be an important way of staying ahead of a different kind of competition. As the Internet and other communication technologies become more prominent, online universities such as the University of Phoenix are turning education into a commodity that can be supplied, without overhead, at a reduced cost.

Though such decentralized universities seemingly cannot compete with the quality of a bricks-and-mortar institution like UW-Madison, they are carving a niche in the education sector and need to be taken seriously, according to task force members.

In order for the College of Engineering to implement the innovations task force members are hoping for, it needs to keep the bottom line in mind. Task force members expect the amount of state and national funding for the college to stay at the same level or decrease in the coming years. Government money is important to the college, and the best way to lobby for additional funds seems to be through the quality of performance.

"We have to be worth the expenditure, and hopefully at some point people will recognize that expenditures here generate a rate of return that makes sense," Martin says.

At the same time, the majority of the college's finances are derived from faculty activity, and this type of income will continue to be important to the sustained success of the college. While attempting to broaden and diversify the educational experience of the student body, the engineering faculty also must continue to create the funds necessary for the stable future of the College of Engineering through activities such as research.

While this certainly will be a difficult job, the task force members also see an opportunity. Change is going to occur no matter what, but the college can put itself in position to control some of that inevitable change.

"We want to have some control of our destiny," Martin says. "That to us is really motivating. But at the same time, I would say with equal importance that this gives us an opportunity to improve the college." WE

Author Bio: Nate Holton is a senior majoring in philosphy and mechanical engineering. Upon graduation, he plans to attend law school.

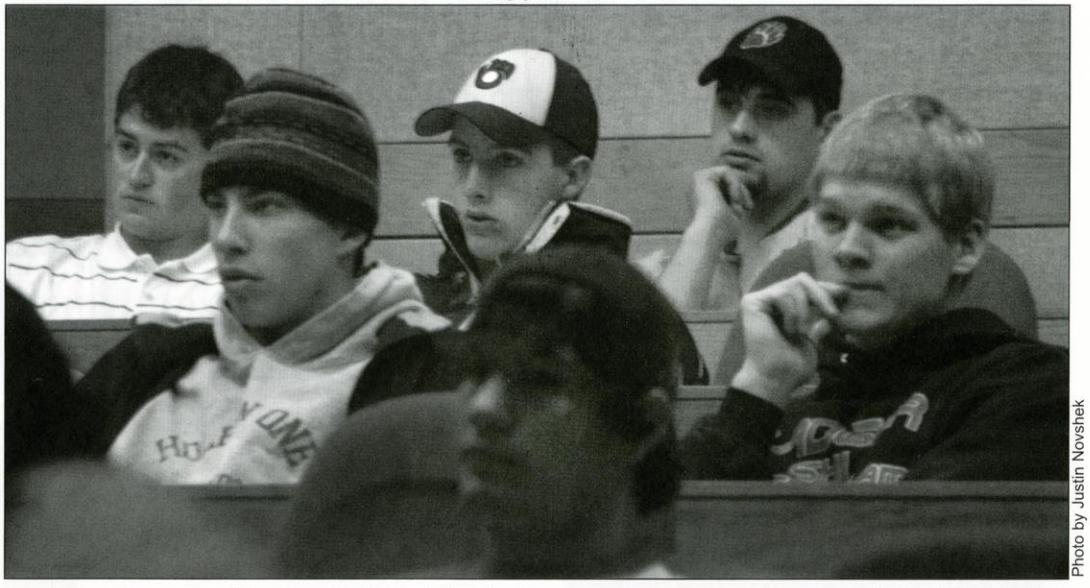


Photo by Justin Novshek

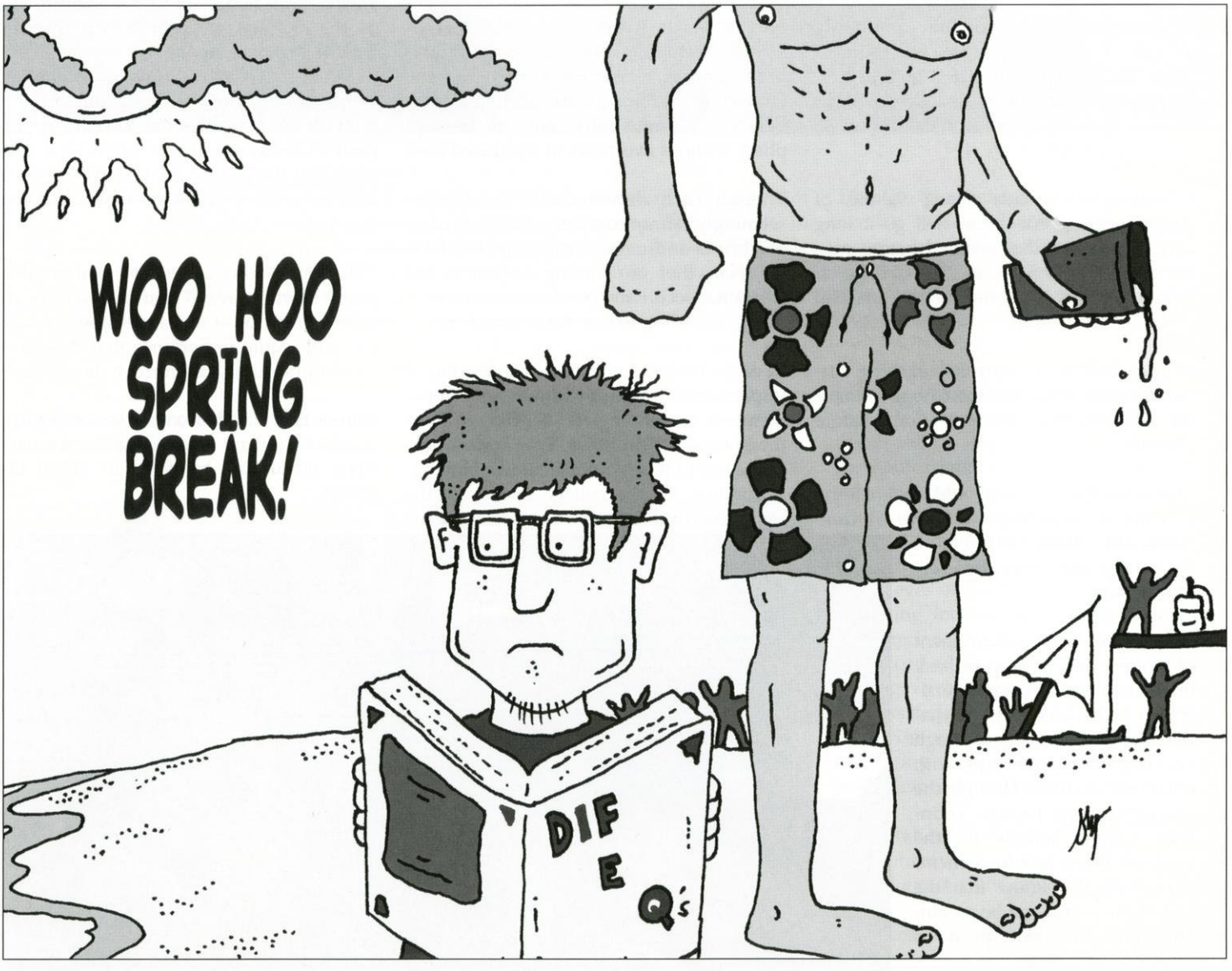
Listening to a guest lecture in their Introduction to Engineering class are students from left; Paul Swanson, Eric Wojta, Garret Larson, Andrew Prell, and Richard Ruzga. The COE Taskforce is looking to expand and diversify the engineering college experience.

Just one more

The finest in eclectic humor

By Skye McAllister

Spring break for engineers



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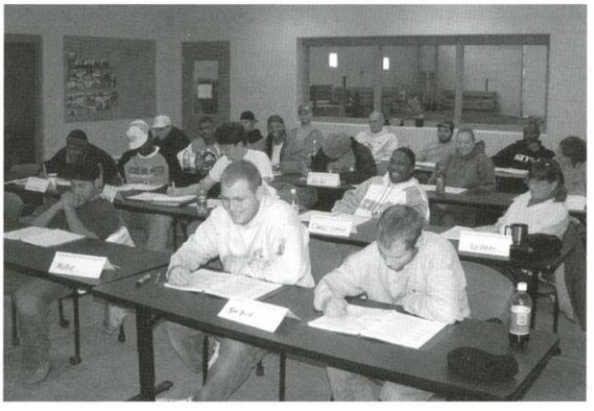

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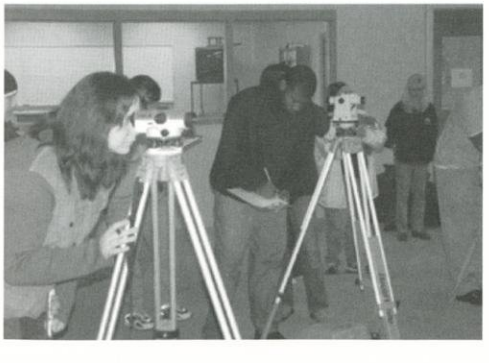

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