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wisconsin engineer

February 2004
VOLUME 108, NUMBER

Deep Sea Exploration:
Underwater technology helps scientists explore parts unknown

Also Inside:
Reconstructing the Pyramids of Giza
Structure of a Stadium
Industrial Espionage
Maquina

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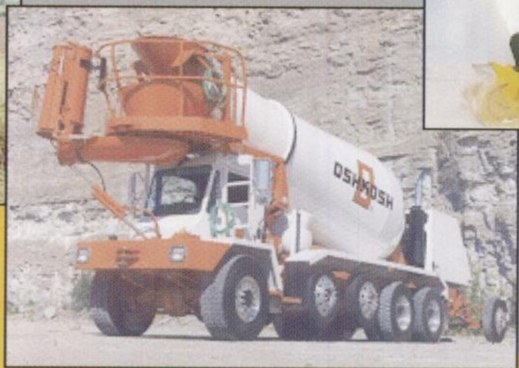

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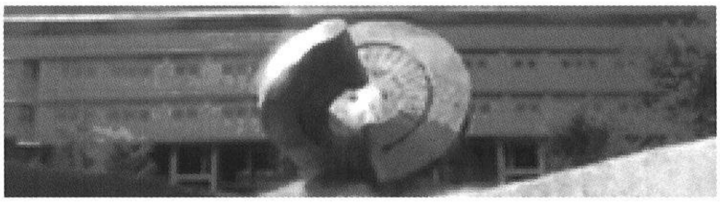
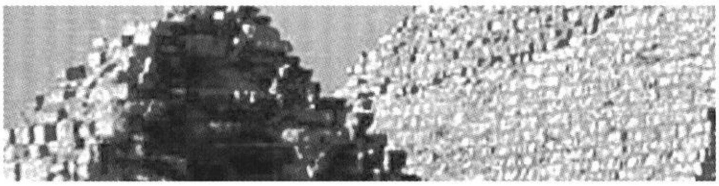
FEATURES





COVER STORY

Cover Photo by: Yana Paskova

Tired of his marine adventures this explorer decides to rest on a cucumber shaped coral.

COMMENTARY

EDITORIAL

JUST ONE MORE

Making the Case for Breadth

Kyle Oliver, Writing Editor

On Nov. 11 of last semester, a couple dozen students gathered in Engineering Hall for what they thought would be a normal honors program meeting. Instead, they found themselves working as recruiters for the College of Engineering, writing letters to high school students who have been accepted at UW-Madison and will hopefully study engineering.

The reason for this impromptu letter campaign, Assistant Dean Donald Woolston explained, was that, recently, fewer talented students have been indicating interest in engineering on the surveys that accompany standardized tests like the PSAT. Naturally, the administration fears this could decrease enrollment for the coming school year.

If the Accreditation Board for Engineering and Technology (ABET) and the nation's engineering schools do not make major changes to the way engineering is taught in this country, it seems all too likely that this interest in engineering could continue to wane. The truth is that secondary education is about more than just professional training, and engineering curricula should reflect that more than they do now.

Samuel Florman, a civil engineer and author of The Introspective Engineer, stresses the importance of non-technical courses.

"The liberal arts are what fill out a person's education, helping turn narrowly focused professionals into discerning citizens, intelligent communicators, and potential leaders," he writes.

The point here is that many of the bright, well-rounded students that engineering schools want to recruit do not agree with Rockwell International CEO Kent Black when he says, "Not so important are some of the social studies, philosophy, English literature, and even history and art. These are personal interests and engineers, who by their very nature are curious, will pursue those subjects that interest them-after graduation."

On the contrary, I believe that rather than waiting until after graduation to pursue these interests or trying to double major, many students who want to be able to take more than 15 or 16 credits worth of liberal arts classes will simply decide on a different major that allows them to do so. Too common is the liberal arts student who would like to have been an engineer but transferred out not because the curriculum was too hard but because it was too narrow.

I realize that solutions to this problem do not readily present themselves. I would certainly be the last person to advocate forcing more credits on any engineering major, especially nuclear or chemical. I also understand that engineering curricula are regimented for a reason. Obviously, these are challenging disciplines, and students need a lot of coursework to be professionally prepared for them.

However, ABET needs to consider granting schools more flexibility in how they cater curricula to students with a broad range of interests. If they do not, they risks loosing these students and all that they have to offer.

And in a world of increasing interdisciplinary cooperation, they offer a lot.

Kyle Oliver

THE UNIVERSITY of WISCONSIN MADISON

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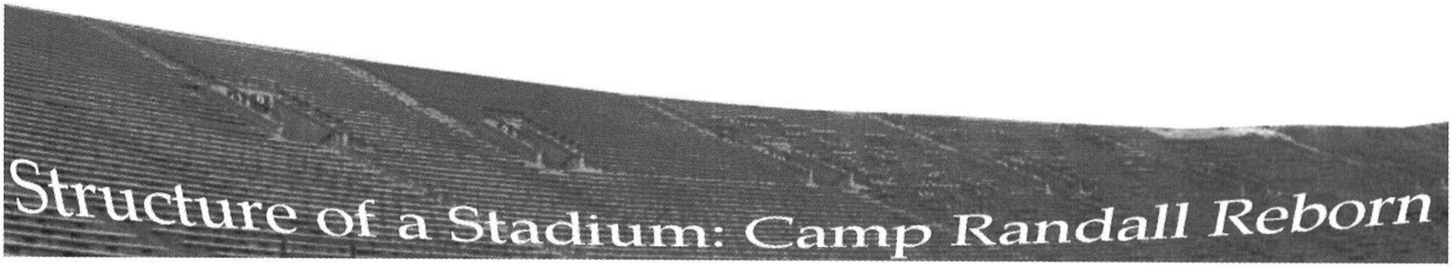


Structure of a Stadium: Camp Randall Reborn

By Peter Kohlhepp

Bucky's house is getting bigger. Just to the south of Engineering Hall a superstructure is rising, and rising quickly. Directly above the faithful inhabitants of Section O and P, Camp Randall is being transformed into a full-service stadium complete with elevators, sweeping concourses and state of the art luxury boxes.

Since the early 1990s, the Badger football program has been increasingly successful. Becoming a nationally ranked football force has revitalized the Wisconsin football fan base and turned game day tickets into a hot commodity. With 40 games over the last 10 years sold out to at least 97% capacity, the UW athletic department decided to address Camp Randall's deficiencies.

Photo By: Katie Braun

The steel skeleton of the new section in the south endzone at Camp Randall.

Wandering the narrow bunker-like tunnels that pass for concourses, even the most casual gameday fan notices the stadium's shortcomings extend beyond seating limitations. Lines spilling from overcrowded bathrooms merge seamlessly into pushy mobs surrounding the concession stands, creating an atmosphere resembling the post-third quarter student section. With these concerns as well as fan demand for luxury club seats and increased handicapped seating in mind, the athletic department came up with a two stage, $99.7 million construction and renovation plan. The historic 73-year-old stadium is the product of nine separate renovation and addition projects, so why not one more?

Photo By: Katie Braun

A crane moves 42,950 pound concrete panels.

This ambitious plan includes 72 new luxury suites, a huge video replay scoreboard, permanent night lighting, new turf, 3,746 new seats (246 handicapped-accessible), a 134% increase in women's restroom capacity, and seven new elevators.

Stage one, the focus of current construction, consists of building the west side eight-level superstructure and the ticket gate structure over the southwest entrance next to the field house and installing new turf on the field.

Stage two, scheduled to begin September 2004, will focus on remodeling the west side offices and widening the concourses to facilitate concession sales and enhance concourse traffic flow.

The historic 73-year-old stadium is the product of nine separate renovation and addition projects, so why not one more?

Occupying the prime position in the towering 116-foot superstructure is Coach Barry

Photo By: Katie Braun

The construction continues near the old field house.

Alvarez's 8th floor office. Characterized by its cantilevered balcony, the office offers an unparalleled view of the field and the surrounding city. Athletic offices will occupy the remaining 8th floor space, leaving it inaccessible to fans.

The 6th and 7th floors, however, will offer fully furnished luxury seating with adjustable windows allowing patrons to fine-tune the gameday atmosphere. Such a suite can be purchased seasonally for a mere $50,000. The 5th floor will be open to the stadium, consisting of a wide concourse and handicapped seating along the interior perimeter.

An addition of this magnitude presented significant challenges to the Arnold and O'Sheridan Firm, the company responsible for all structural and civil engineering for the project. "The Camp Randall project was one of the very first projects in Wisconsin whose design was completed based on the International Building Code," says Steve Roloff, the lead structural engineer for the Camp Randall project.

According to Roloff, a UW-Milwaukee Civil Engineering graduate, the biggest challenge came not from the new building code, which, unlike Wisconsin code, requires seismic (earthquake) considerations. Just 36 feet wide at its narrowest point, the alley between the adjacent McClain Center and the stadium had to accommodate the superstructure. With the alley barely wide enough to fit a crane, the addition had to be built "segmentally" rather than from bottom to top. The crane moves down the alley as each section is built, much like the construction of a bridge.

The first task of renovation engineers from Arnold and O'Sheridan was to pick materials. Steel and concrete, according to Roloff, are the reliable standards used almost universally on large building projects due to their strength and cost. As the Camp Randall addition undoubtedly qualifies as "large," the choice was restricted to the staples.

Poured concrete construction was the method of choice for the west side stands and upper deck. However, Roloff chose steel frame construction for the narrow 8 floor structure because it allowed faster and more efficient construction in the constricted area. The strength of modern steel made this a viable option. Steel used in Camp Randall has a strength of 50,000 lbs per square inch (psi), compared with the 36,000 psi strength common to structural steel only 5 years ago.

Two unique systems were devised to adapt steel frame design to the restraints of the narrow construction alley.

First, 5 huge steel I-beams were dropped through the roof of the McClain center to provide support for one side. These were strategically placed so as not to interfere with the center's existing functions and encased in concrete tubes to enhance aesthetics.

Second, Roloff designed vertical trusses, rather than columns, to support the stadium side of the superstructure. The trusses were attached to concrete in-ground piers and carry the lateral (horizontal) as well as vertical loads of floors 6, 7, and 8. These vertical trusses are pin-connected to unique tubular horizontal trusses left exposed to the ground alley and the third level concourse.

The second challenge was to devise a method of connecting the large addition to the existing 73-year-old stadium structure. Roloff, true to the engineering mantra "simple is best," elected simply to not connect the two. The new superstructure is completely independent of the existing stadium, meaning you could remove the whole west side

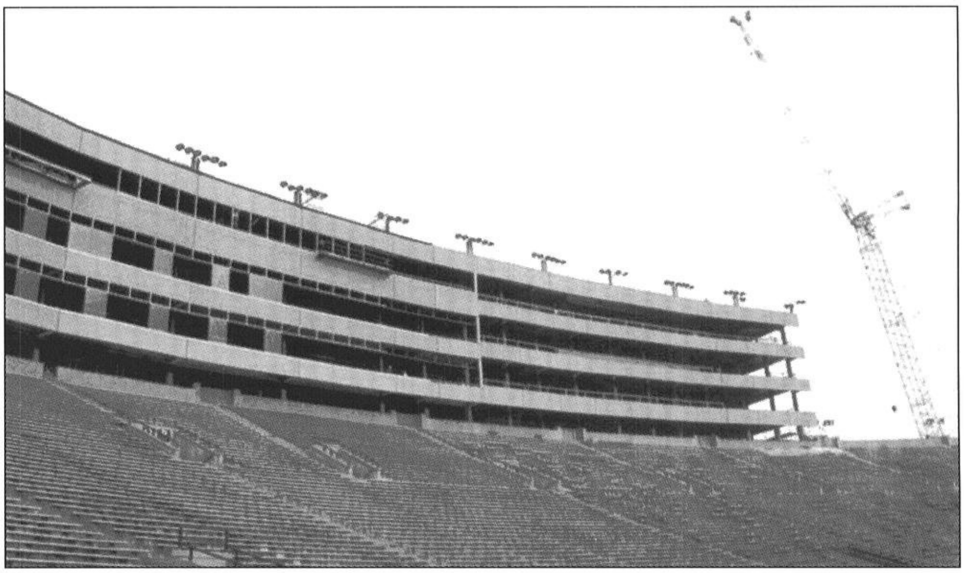


Photo By: Katie Braun

The half-finished luxury suites are still with anticipation for next football season.

of the stadium and all 8 floors of the superstructure would remain unaffected.

Vibrations were also a primary consideration in light of the recent concern over the "Jump Around" tradition. Roloff explains that the controversy actually began in 1980 with people dancing to the Budweiser polka song. Roloff's firm conducted a study which confirmed the integrity of the west side upper-deck. In addition, they discovered the phenomenon behind the pronounced bounce of the deck.

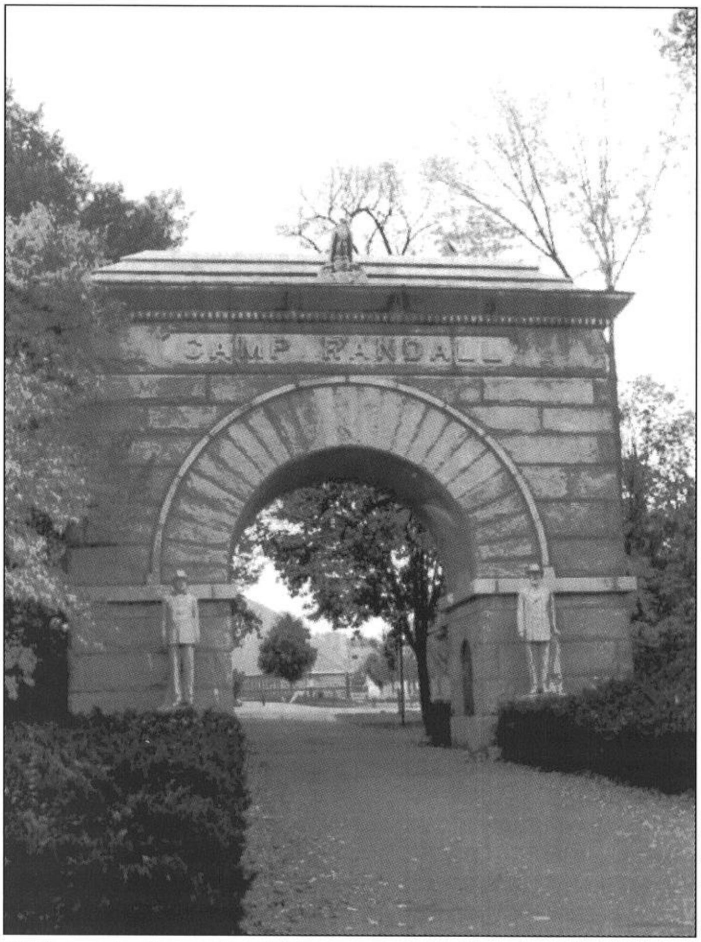


Photo By: Katie Braun

Welcome to Camp Randall, your new stadium is waiting.

The frequency of the people doing the polka was 2 hertz, equivalent to about 100 steps per minute, the same frequency of someone walking down a hall, and coincidentally, the natural frequency of the eastern upper deck. When the student section hears the beginning chord of House of Pain's "Jump Around," they also jump at about 2 Hertz. Roloff was determined to avoid this pesky number 2 in the new addition.

Construction will continue through the winter, and by August 2004 the addition to Bucky's house should be complete.

He discovered that he could raise the natural frequency to a comfortably distant 5 Hertz with a simple design alteration. Instead of connecting concrete planks with L-shaped cross-sections to form the step-like structure of stadium seating, he will use h-shaped cross-sections. The drop leg in each section proved sufficient to raise the natural frequency.

It is one thing to build in theory; it is another to build in reality. Throughout his design process, Roloff had efficiency of construction in mind. According to Ryan Shaw, recent UW graduate and site engineer for the construction contractor Cullen-Smith, "Extensive pre-project planning has allowed the University to operate Camp Randall at full capacity in the midst of ongoing construction."

For the east side superstructure, Roloff and Cullen-Smith chose a method of fabrication utilizing almost exclusively pre-cast concrete panels in an effort to minimize the time-consuming concrete pouring process. Concrete planks are placed on the steel frame and mortared together to create the floor. Huge 32-by-12 foot concrete wall panels weighing 46,950 pounds each are set in place with a crane and bolted together to create the exterior walls.

Construction hit a brief snag when workers attempted to connect the first set of vertical and horizontal trusses. The pins were machined to have such a precise fit that workers could not pound them through. A creative worker with bridge-building experience suggested that they put the pins in dry ice prior to installing, as well as heat the receiving holes on the trusses. This method effectively shrunk the pins and expanded the holes enough to simply slide the pins through. Then, as the pins expanded and the holes shrunk, the trusses were securely locked together.

"There is still much work to be done," says Shaw. "Construction activity on the site will increase in the coming months as we begin work in the south end zone following the 2003 football season."

Construction will continue through the winter, and by August 2004 the addition to Bucky's house should be complete. Big Ten rivals can't help but dread that date at Camp Randall next fall, for the Badger faithful will now number 79,500 rabid, but more comfortable, fans. WE

Author Bio: Peter Kohlhepp is a junior majoring Engineering Mechanics and Astronautics and Political Science.

On a side note:

You may be thinking "This new field looks great, but where is the red?" Well, it turns out that the Bucky's brand of red is rather unique. The Scottish company that dyes the turf fibers had only one standard shade, and after a test installation it was deemed too orange. So, the fibers are back in Scotland, awaiting a custom dye job in "Bucky Red." Look for the return of red to the field next season!

DEEP Sea Exploration:

Underwater Technology Helps Scientists Explore Parts Unknown

By Yana Paskova

They are creatures of both beauty and peril. Deemed creators and destroyers, our seas' and oceans' contradictory qualities beckon the valor of those willing to enter their realm. Infinitely mysterious, they lure human beings with the promises of a Pandora's Box. As some of Earth's most profound repositories of undiscovered secrets, their depths appeal to intrepid scientists' desire to explore.

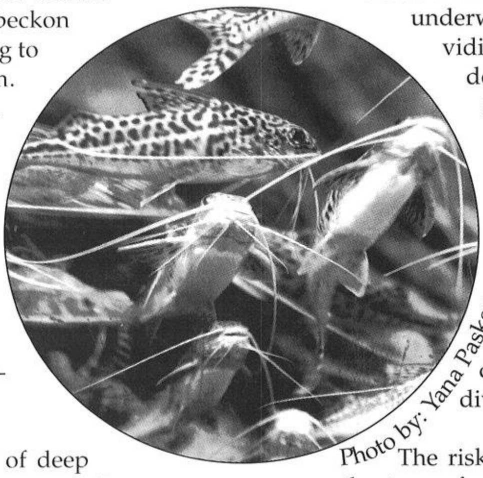


Photo by: Yana Paskova

The dangerous appeal of deep sea exploration, perhaps, comes from the challenge of overcoming human limitations. Our fragile bodies react to deepwater submersion much like they would to being thrown into outer space: they would be destroyed.

The underwater abyss denies humans oxygen and light. Although sea level air pressure is 14.7 psi (pounds per square inch), as depth increases, so does the pressure. Another obstacle faced when delving into ocean depths is the extreme variance of temperature. Water's temperature generally decreases dramatically with depth, but under certain circumstances it can reach boiling temperatures-such as around volcanic vents on the ocean floor. The technologies developed to circumvent these hindrances are a reminder of humans' vulnerability, even in places that are relatively easy to reach.

"We have gone tremendously far into the oceans considering where we were not long ago," says Fred Gorell, Public Affairs Officer and Spokesman for the Office of Ocean Exploration of the National Oceanic and Atmospheric Administration. "The technology developed over the last several decades has allowed [individuals and] vessels to go to ocean depths unimagined only 50 years ago." Exactly what kind of technology would allow a human to swim unharmed beneath the depths?

Scuba diving gear grants divers underwater access by providing them with cylinders of compressed air and thermal insulating suits. However, the detrimental health effects a human body experiences at extended submersion time and depth restrict a diver's abilities.

The risks depend partly on the type of gas mixture inhaled. For instance, a diver can experience nitrogen narcosis, which resembles alcoholic intoxication. On the other hand, oxygen toxicity can trigger a series of epileptic-like seizures that put the diver in danger of drowning.

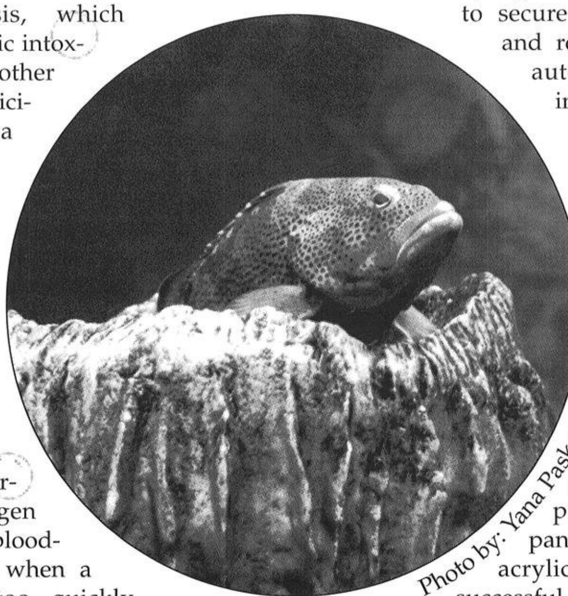


Photo by: Yana Paskova

Decompression sickness, a potentially deadly condition caused by the formation of nitrogen bubbles in the bloodstream, happens when a diver ascends too quickly from subterranean depths. Finally, hypothermia can threaten divers breathing in highly conductive gases.

To overcome the limitations of scuba gear, engineers have developed submersible technology capable of more effectively shielding passengers from the hostile nautical environments. Woods Hole Oceanographic Institution's (WHOI) Allyn Vine envisioned the first untethered manned deep-sea submersible vehicle in the 1930's. Later, a team of scientists carried out his vision, designing the Alvin, affectionately named from the initial parts of Allyn Vine's first and last names.

The Alvin took its first underwater plunge in 1964. The titanium-hulled sub was built for a maximum submersion time of 10 hours and a depth of 14,764 ft. It can endure pressure up to 6,000 psi-more than 400 times that of sea level.

But Engineers need to do more than just get researchers into Earth's oceans, they need to provide means of interacting with the environment. Newer manned submersibles, such as Harbor Branch Oceanographic Institution's (HBOI) Johnson-Sea-Link (JSL), employ a vacuum suction tube to gulp samples like invertebrate sponges, a claw and scoop to secure small creatures and rock samples and automatically closing jars that trap gelatinous creatures.

The only barrier between scientists sheltered inside the JSL and the ocean is a five-inch thick, clear acrylic sphere. Besides providing a panoramic view, the acrylic is also such a successful insulator against the frigid ocean temperatures that the front compartment requires air conditioning.

Another way scientists explore the underwater world is through using unmanned submersibles, also known as remotely operated vehicles (ROVs). ROVs are linked to a ship by cables that carry electrical messages between a stationary operator and the vehicle. Some are equipped with video cameras and lights; others use sound to pan the ocean floor, because certain animals cannot are disturbed by the unnatural presence of light.

Scientists have argued manned and unmanned vehicles both have advantages and disadvantages. One benefit of manned vehicles is the possibility of collecting delicate specimens. Explorers can exercise more caution than machinery. In addition, a manned vehicle provides better perspective and peripheral vision, since explorers inside make their observations on a real-time basis.

Shelly Dawicki, Director of Public Relations and Communications at Woods Hole Oceanographic Institution, agrees. She says that a human perspective is critical to any ocean exploration because people inside a control room cannot make the same three-dimensional observations as those inside a submersible.

"It's much like being at a baseball game as opposed to watching it on TV," Dawicki says. "At the stadium, you take in the big picture and the atmosphere yourself."

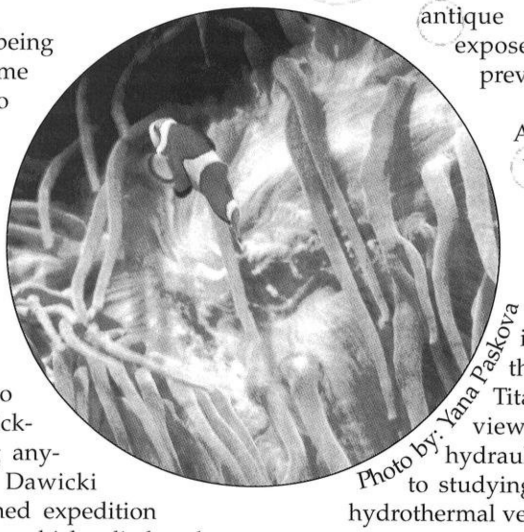
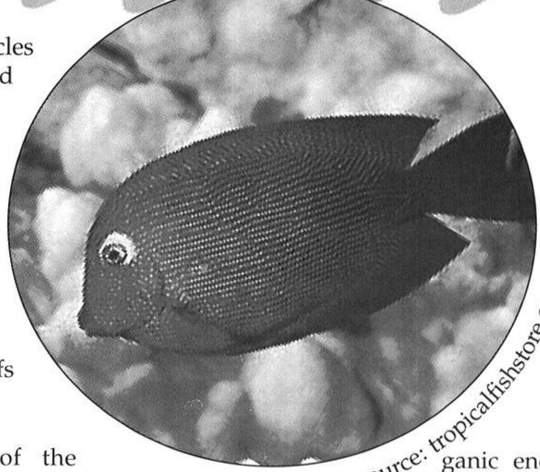


Photo by: Yana Paskova

Humans can also change plans quickly upon noticing anything unusual. Dawicki recalls one manned expedition in the early 1970s, which relied on human eyes rather than on an unmanned submersible's camera view. A vehicle accidentally entered a narrow opening upon descending to ocean's rocky bottom. The scientists were able to direct the sub back to its original location by recalling specific landmark objects around the marine terrain.

However, in case of technical problems, manned vehicles can put human lives at risk. Humans' diving capabilities are also limited because of the physiological concerns raised by being enclosed in a small space for a long time.

Another benefit of unmanned vehicles is that human weight can be replaced with equipment to increase the vessel's power and efficiency.



source: tropicalfishstore.com

Regardless of the vehicles' distinct characteristics, they have all contributed to uncovering the oceans' secrets. Missions have lead curious voyagers in search of lost steamships, hydrothermal vents, Gulf of Mexico's coral reefs and undiscovered medicines.

Dr. Robert Ballard, President of the Institute for Exploration based in Mystic, Conn. and Scientist Emeritus at Woods Hole Oceanographic Institution, participated in one such journey in 2003. Ballard utilized a new ROV, the Hercules, which was especially designed to conduct underwater archaeological surveys. They explored the Black Sea's unique cold, anoxic water, which lacks of bottom currents. This creates ideal conditions for preserving antique wooden shipwrecks exposed during Ballard's previous missions.

Additionally, the Alvin was used to locate a hydrogen bomb accidentally dropped in the Mediterranean Sea in 1966. Alvin's diving power also led its metal halide eyes to the rustic remains of the Titanic, and its viewing portholes and hydraulic arms were crucial to studying life thriving around hydrothermal vents.

Many aquatic scientists hypothesize that communities of life carefully hidden within hydrothermal vents are key to understanding life processes on Earth. Scientists believed that life everywhere was based on energy from light through photosynthesis. However, photosynthesis ceases to occur at deep ocean depths due to lack of light.

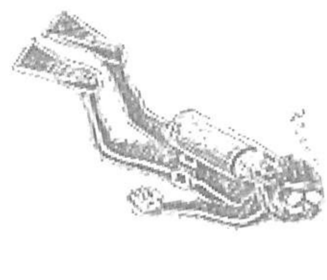
In 1977, scientists on a manned mission were surprised to discover tube worms and other microbial life within the high pressure, unlit environment of the vents. They discovered sulfur emanating from ocean floor fractures, which provides the inorganic energy needed for life. Hence, explorers found a second form of life support, chemosynthesis, existing far beyond the sun's reach. This is an example, Gorell says, of how deep ocean exploration missions can generate new scientific knowledge. Despite this progress, 95% of Earth's seas and oceans remain unexplored.

"Most of our aquatic knowledge so far has come by chance," says Lt. Joseph Ertel of the Department of Naval Science at UW-Madison. "The ocean floor remains a big unexplored jungle limited by our abilities to study it closely."

But that's not stopping Gorell. He maintains that avid deep sea exploring is our duty to human generations to come. Discoveries concealed within the ocean depths have the potential to change lives for the present and future generations.

Furthermore, we live in an ocean world. Gorell says that with oceans comprising more than 70 percent of our planet, it might have been more appropriate to name it "Ocean" rather than "Earth." WE

Author's Biography: This article has fueled Yana's desire to become a neophyte scuba diver!



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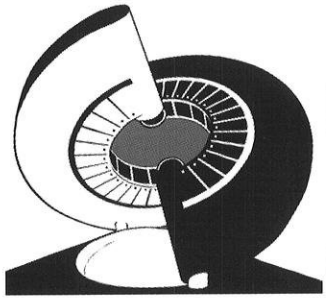


A symbol of UW Madison College of Engineering.

By Caeli Rice

The Statue of Liberty, Bucky Badger and the Maquina Fountain all have one thing in common. They are all icons. They continually remind you of what they stand for. Take Bucky, for instance. Ask any alumni, student, or child growing up in Wisconsin and he or she will know what Bucky represents.

Maquina is a repetitive symbol represented throughout the UW-Madison College of Engineering. Visit any of the computer labs throughout the Engineering campus and not only will the background have a picture of Maquina, it will also likely be featured on the mouse pad. Maquina is a symbol of the College of Engineering linking alumni, current and future students.

The redesign of the Engineering campus began as the dream of one man, Former Dean John G. Bollinger. "There were several major goals, including providing an aesthetic campus connected to the rest of the university through the (Henry) mall, providing Engineering Hall with an appropriate front door, placing a cornerstone building at the end of Engineering Drive (the Engineering Centers Building) and adding a major parking facility," Bollinger says.

A single fountain represents many visions for the engineering campus.

The Maquina Fountain idea came about during the course of the redesign when Bollinger met William Conrad Severson. Severson wanted to create an artistic work to recognize his family in Madison. His father began the Madison television station WKOW. Bollinger also happened to room in his house during his student years. "We started to share a vision of the engineering mall, the fountain and the ponds. We worked together for two years developing the concepts, while I raised the money for the construction. Many people contributed, but the largest donor was David Grainger," Bollinger says.

Other than for its pleasing aesthetics, the fountain was also built to provide UW-Madison students with an opportunity for hands-on learning. Giddings and Lewis donated a programmable logic controller that coordinates the spraying mechanisms in the fountain. Students are responsible for programming this mechanism.

That's just one task for Enlight, the student group that oversees the fountain's operation. They are also working to create a web interface so anyone can help control the fountain. Through this site, remote users will be able to manipulate the fountain and watch it live over the Internet. The Maquina fountain is on camera at http://fountaincam.engr.wisc.edu.

Enlight is working towards implementing Bollinger's original goals for the fountain. "I hope the students develop a way to propagate the vision of a facility that attracts engineers, artists, musicians, performers and others to work together to use technology to advance aesthetic appreciation," Bollinger says.

The redesign has greatly enhanced the look of the Engineering campus. It provides an enjoyable pedestrian mall year round. With large grass areas and benches surrounding the fountain, students can study, relax and enjoy events hosted there, such as the "Battle of the Bands."

Bollinger's main goals for the fountain are "to provide a special student experience as well as serve as an icon for the College of Engineering. The latter is demonstrated every year now by the fact that almost all graduates get their picture taken with family and friends in front of the fountain." WE

Author Bio: Caeli Rice is a junior majoring in Computer Engineering. She hopes to use that degree towards applications in Biomedical Engineering. She also enjoys competing in triathlons and playing tennis.

Photo By: Megan Cox

The Descendant's Fountain, also known as Maquina, is the trademake of the College of Engineering.

Reconstructing the Pyramids of Giza

By Ryan Hansen

In 1889, construction of the Eiffel Tower was completed, making it the tallest building in the world. The building it surpassed was the Great Pyramid that King Khufu, an Egyptian Pharaoh, had built in his honor around 2575 BC. The mystery of how the Great Pyramid, composed of over five million tons of stone, was constructed has led some to believe aliens built it. But new research demonstrates just how the Egyptians accomplished this incredible feat.

A bird's eye view of the pyramids of of Khufu, Khafre, and Menkaure, from left to right.

source: NASA

British researchers in the 19th century were the first to examine and research ancient Egypt in a scientific manner. Until that point, the only information known about the pyramids came from the writing of ancient historians, including Herodotus. He wrote about the pyramid construction 2000 years after they were built, making him an unreliable source. Modern research has disproved many of his theories.

Herodotus claimed that 100,000 laborers spent three months of every year for 20 years building the Great Pyramid. Professor Barry Powell of the UW-Madison Classics Department thinks otherwise. "Workmen's villages were recently discovered and evidence shows that they were occupied year round," he says. Because they worked year round, fewer workers would be needed than if work was only done for three months. Also, these workmen's villages were too small to support 100,000 workers. Consequently, experts estimate that the worker population was as low as 4,000.

The pop-culture theory of extra-terrestrials building the pyramids is being put to rest.

Determining the number of workers available helps researchers resolve how the stones were moved to the construction site. The majority of the stone used to construct the pyramids was limestone, a soft stone easily shaped by the copper tools of the time. It was found in quarries around Giza and transported by land and river. Experts estimate that teams of 20 men could drag a 2.5 ton block of limestone from the quarry to the construction site in half an hour.

The inner chamber of The Great Pyramid was constructed of granite, a much harder stone. Granite was difficult to obtain, as there was no source close to Giza. The stone often had to be sent down the Nile River from over 400 miles away. It was also much more difficult to cut and shape; copper tools are less effective on granite. "The problem with copper is it dulls quickly," Powell says. Hence, lots of tools and manpower were needed to cut just one granite block.

Researchers know where the stones came from and how they were transported, but they have differing opinions on how the pyramids were constructed once the stones got to the construction site. There are three different theories on how the pyramids were constructed, one involving a crane mechanism and the others using ramps.

Herodotus claimed that a crane was used to lift the stones up to different levels of the pyramid. Researchers tend to discount this theory as there is no physical evidence of such cranes existing. Furthermore, attempts to reconstruct a crane using materials available to the Egyptians have been unsuccessful.

The first "ramp theory" involves only one

Pyramid *continued on page 11*

INDUSTRIAL ESPIONAGE

By Nick O'Brien

A man in an unmarked van clenches a scrambled telephone and listens intently. He waits for the man on the other end to answer. He waits to hear how the man on the other end answers.

[Phone rings.]
"Hello?"
"Hello is this Daniel Grams? I'm Edward Hawthorne, I work security here at the factory, and I was wondering if I could buy your time for a moment? We have had some personnel problems recently. I guess some people haven't been signing out properly, so we are going down the personnel list to confirm identities, and make sure you have been were where you were supposed to be. Do you have a moment? This won't take long."
"I guess I can manage."
"Can you please spell your complete name?"
"D-A-N-I-E-L then, G-R-A-M-S."
"What floor do you work on?"
"The third floor in the west terminal."
"Well, can you tell me the last 2 digits of your code card?"
"06."
"Can you tell me the name of your specific project?"
"Big Papa."
"Can you go into more detail?"

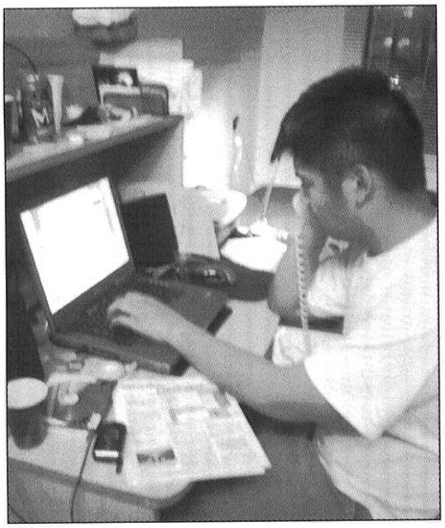


Photo By: Christine Morris

Even an innocent phone conversation could lead to information leaks.

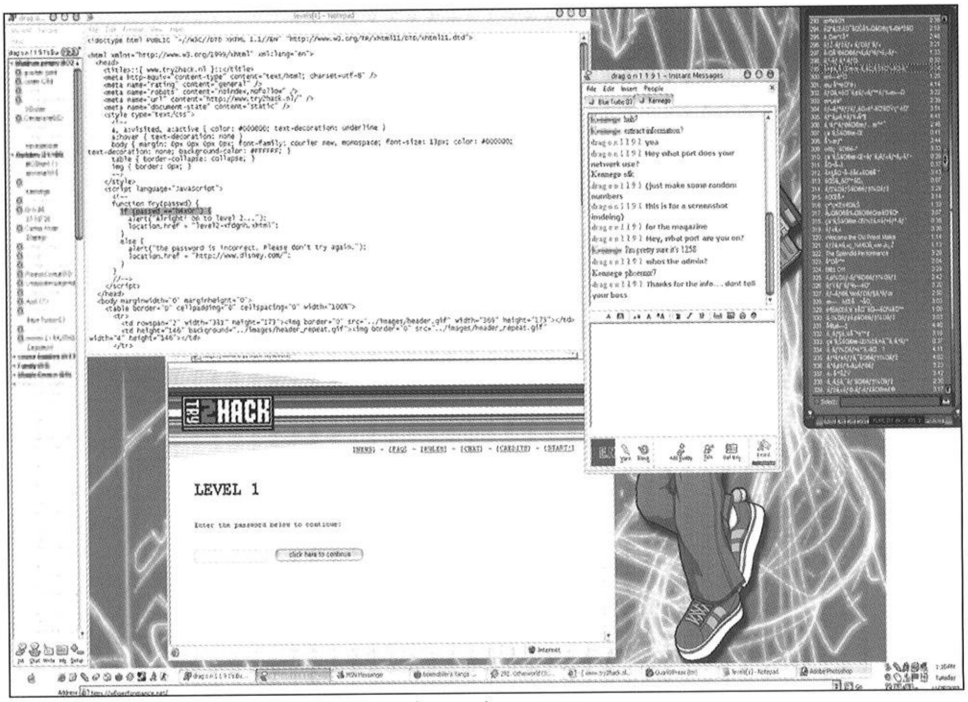


Photo By: Erik Sua

Yet another instance of low security betraying secrets.

"What?"
"Can you go into more detail?"
"Who is this!"
[Click]

The man on the phone does not work for security. In fact, he is the reason for security. He is known as a corporate spy, and he, like many others, is itching to learn more about "Big Papa."

Welcome to the world of industrial espionage, a world just as thrilling as any James Bond movie. There is lying, disguises, gadgets galore. And everyone's after the secret information. "Big Papa" is not a nuclear device; it is a new deodorant. This is big business, with big bucks on the line, and corporations that will stop at nothing to steal, or at least peek, at their competitor's hand.

Proctor and Gamble is a multinational corporation that spends hundreds of millions of dollars a year on buying and selling innovations. They are responsible for manufacturing and distributing products such as Crest toothpaste and Herbal Essences shampoo. They deal with industrial espionage on a regular basis. Ed Casey, Proctor and Gamble's head of security, says, "Industrial espionage is a huge problem. Trying to safeguard information from not only competitors, but from foreign governments is extremely difficult."

"General information gatherers...will dress up like employees and try to get into meetings, fly over factories in unmarked planes, call employees under false pretenses."
- Ed Casey

When trying to beat a competitor to the marketplace with a new innovation, keeping information secret is crucial. Also, when a corporation looks to buy another company, it is also imperative to keep the price range secret. If the selling company or foreign government knows the maximum

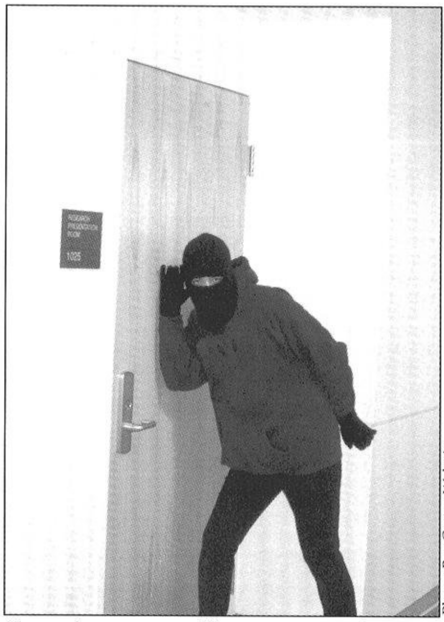


Photo By: Casey Weltzin

Even innocent office conversations can result in information leaks.

price a corporation is willing to pay, then bargaining is forgone because they will sell for nothing less.

Industrial espionage occurs everywhere. No idea is safe, not even when it has been patented.

Industrial 007s stop at nothing to get their information. Casey says, "In order to obtain information, competitors and general information gatherers...will dress up like employees and try to get into meetings, fly over factories in unmarked planes, call employees under false pretenses, and other extremes."

Some use gimmicks, like saying they were referred by another employee to get information for a school report. Spies are also likely to stake out factory sites. They use planes to take pictures from overhead in order to determine when a new factory will be operational. Industrial 007s also like to know the configurations of new buildings and factories to determine what kind of production possibilities they have.

With regards to corporate security and the measures taken to protect internal information, Casey says, "All employees must sign a CDA (contract of non-disclosure), and take classes on prevention of disclosing internal information. New products are talked about in codes, and information is disclosed on a need-to-know basis."

Even with these preventative measures, leaks still occur. With so many people involved in a project, there's no way to completely control greed and temptation. "We work with thousands of people. Some are exclusively ours, but others are extended business partners, and some are even outside contractors who work directly with our competition."

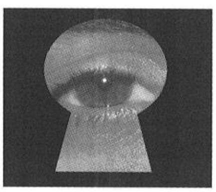
A situation in which a competitor comes out with a similar innovation around the same time could indicate that a leak occurred. Corporations have internal systems that try to pinpoint the source of such leaks. If discovered, the issue is brought to the corporate legal team to see what kind of recourse is possible.

On September 25, 1989, Proctor and Gamble used their legal might in a case dubbed "The Cookie War and How it Crumbled." by U.S. News and World Report. Nabisco, Keebler and Frito-Lay settled out of court with Proctor and Gamble. They paid an estimated $125 million for infringement of Proctor and Gamble's soft cookie patent. At the time, it was the biggest disclosed patent settlement in history.

Industrial espionage occurs everywhere. No idea is safe, not even when it has been patented. Just ask Lizzie J. Maggie, the true inventor of Monopoly. According to Time Magazine, Charles Darrow, who is credited for being the inventor of Monopoly, acquired the idea when he was shown the game by a distant friend of Lizzie J. Maggie. Then Parker Brothers bought it for $1 million from Mr. Darrow, and soon thereafter purchased the rights to all previous versions.

With ideas, there is nothing to steal but the intangible, the product of the inventor's imagination. Furthermore, ideas are not up for grabs, nor are they commodities without owners, says Casey. "Some may say that stealing is [inventors'] little dirty secret...but I say stealing is stealing." WE

Author Bio: Nick O'Brien is a freshman from Apple Valley, Minn. He likes hockey and football and is famous for bear costumes and stealing bratwursts.



***Pyramid** (from page 9)*

ramp. It claims the base of the pyramid was constructed and then each subsequent level built on the previous one. A ramp of earth was then constructed and modified as the pyramid grew. It was widened and lengthened during the construction to prevent it from collapsing and to keep the angle manageable. The problem with this theory is that the massive amount of earth required is not plausible, and no evidence of these ramps remains.

The leading theory is that the pyramid was initially built as a step pyramid, with ramps incorporated into the structure so that stones could be moved up the pyramid in a spiral pattern. "The spiral model seems most logical," says Powell. The base of the pyramid was built first, with a ramp along one of the outer walls. Builders then dragged stones up the ramp and constructed a second level and another adjacent ramp perpendicular to the initial base ramp. The construction continued in this fashion until the desired height was reached, leaving a spiral of ramps leading up to the tip of the pyramid.

Now that there is a plausible alternative, the pop-culture theory of extra-terrestrials building the pyramids is being put to rest. Researchers, then, are helping people discover that although it's fascinating to imagine aliens building the pyramids, it's even more fascinating to know that Egyptians did. WE

Author Bio:Ryan Hansen is a senior studying English and technical communication.

Just One More

the finest in eclectic humor

Top 8 Things You Do and Don't Want to Hear in an Engineering Interview

By Skye McAllister

Do want to hear...

8. Since you are the only person we are interviewing...

7. Everyone will be receiving a signing bonus.

6. Unfortunately we are no longer hiring, so here's $100.

5. Are you always this witty/intelligent sounding?

4. You are exactly the person we are looking for.

3. How was the limo ride here?

2. Welcome to the interview, son/daughter.

1. You're hired.

Don't want to hear...

8. Is THIS your resume?

7. We like your attitude, but I'm afraid you're just not good looking enough.

6. You will be starting at minimum wage.

5. Go home and put on something that matches.

4. What's your favorite color?...sorry wrong answer.

3. After taking this personality test our nurse will conduct a thorough cavity search.

2. You're hired as long as you can answer these three riddles...

1. So, just exactly how far are you willing to go to get this job?

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