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WISCONSIN ENGINEER

Racers, start your engines:

SAE team burns rubber on the race track.

WISCONSIN ENGINEER

Published by the Students of the University of Wisconsin-Madison VOLUME 105, NUMBER 1 November 2000

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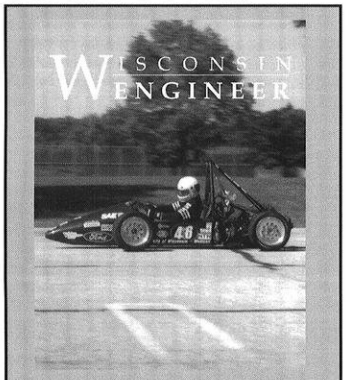

SAE Race Car:
Cruising to new heigts in the Society of Automotive Engineer's Formula Racer.

Photo by Karen Croysdale
Layout by Matt Nelson

DEPARTMENTS

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A Degree in Laughter

I'm at the point in my life when I have to decide whether I want to go to graduate school or whether I want to find a job. After much thought on each option, I am seriously considering a third option: Clown College. I can learn so much there, like how to fall without getting hurt. (I figure since I have already mastered the art of falling and getting hurt, I have a good head start.) I can also learn how to make balloon animals, a skill you absolutely NEED to have if you ever want to create a balloon animal zoo, and how to stuff dozens of people in a little car, a skill that comes in handy more often than you would think. Most importantly, I would learn how to make people laugh.

Some people might say that I am already an expert at making people laugh. I might be, but I really want to shift the focus to laughing WITH me, rather than laughing AT me. Whatever the case, laughing is a great experience. Not only does it burn calories, it brings people closer together. You know what they say, people who laugh together, laugh together. But seriously folks. Sometimes just the slight curve of a gentle smile is all that is needed to make a tense situation more comfortable. There's nothing like a jolly chuckle to help strangers become friends. Afterwards, remembering the laughter and the reasons for it are the reasons people stay friends.

Having a sense of humor can help you deal with stressful situations. I remember some late nights when a little hysterical laughter really helped release the tension that was building up in my neck while bent over a textbook. A little giggle every now and then also helps break the monotony of page after page, problem after problem of some engineering principle. The chuckles can clear your head and give your hard-working brain a little rest.

Sometimes, however, I feel like a little good-natured humor is frowned upon. Often times, I've found that my attempts at humor are met with blank stares and headshakes. Just so I feel like someone has enjoyed my joke, I always say to myself "Soma, you crack me up!" Sometimes, I am taken seriously when joking around, which usually doesn't end in a happy situation. Every once in a while, people will actually laugh along with the joke. It's quite an exhilarating feeling, similar to falling and unexpectedly landing on a feather pillow.

Sadly, there's been a shortage of feather pillows. Maybe you've seen me limping around campus. If someone ever tells you that falling repeatedly on a hard wooden floor will result in injuries, believe it. Still, I am going to continue trying to make people laugh. You should try it too! Stop taking yourself so seriously and lighten up. Tell a joke and do something funny. If no one else laughs, at least you will. And if I happen to see you, maybe I'll laugh too.

Soma Ghorai

The College of Engineering University of Wisconsin-Madison

ECMA

ASM

UNIVERSITY OF WISCONSIN MADISON

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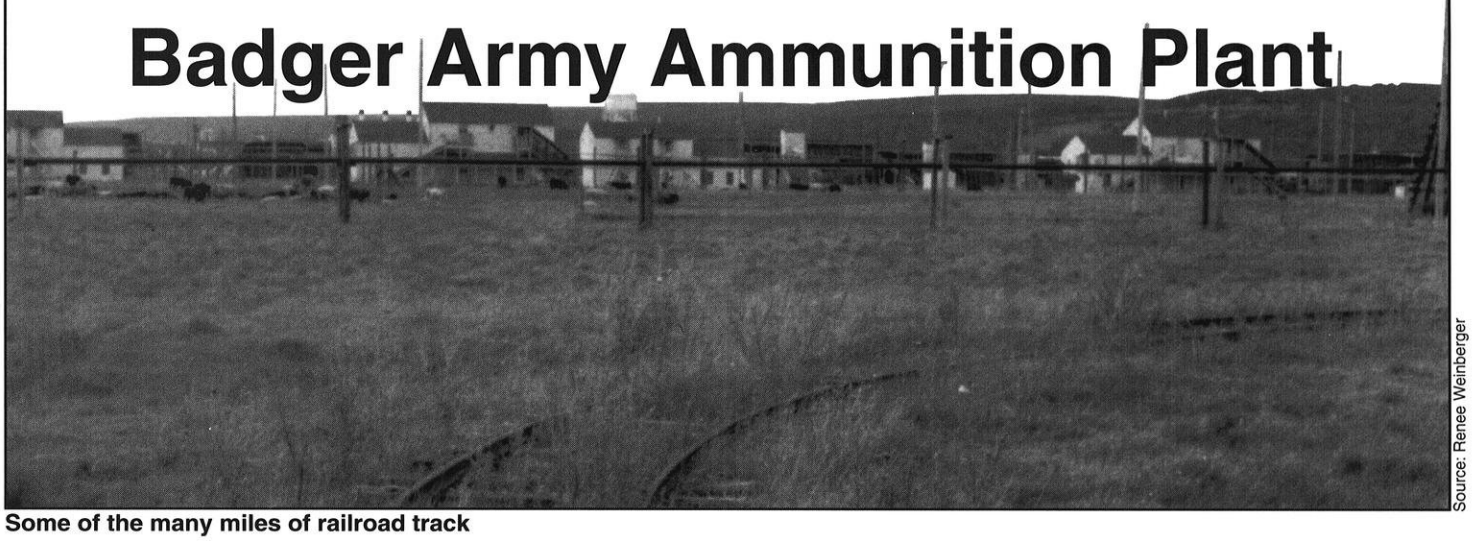
The Future of:
Badger Army Ammunition Plant



Source: Renee Weinberger

Some of the many miles of railroad track

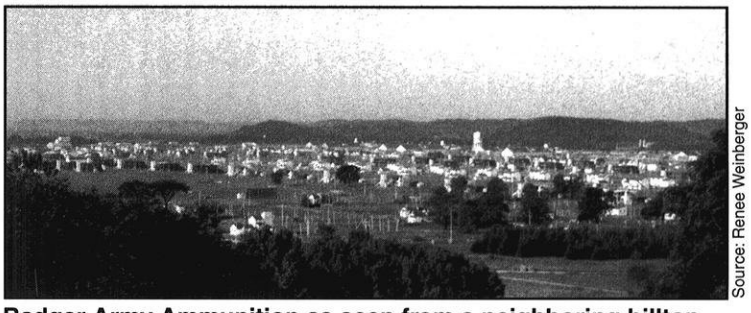
By Lynn A. Weinberger & Renee J. Weinberger

During WWII, Badger Army Ammunition Plant (BAAP) went into action through three wars including Korea and Vietnam. Although called an ammunition plant, it never produced full ammunition, only propellant, an explosive that gives energy to a bullet. During the three wars, BAAP produced over a million tons of propellant, which was shipped via rail to other plants where it was made into ammunition.

The plant must be closed because, "the Army will never again get into a [shooting] conflict... for more than 60 days," according to Dave Fordham, Plant Operations Manager at BAAP. During that time, the Army will use a stockpile of ammunition. Now the 7,354 acres of land that the BAAP presides on must be sold and reused. This land-use issue is the biggest controversy surrounding this prairie-like land in Sauk County, Wisconsin

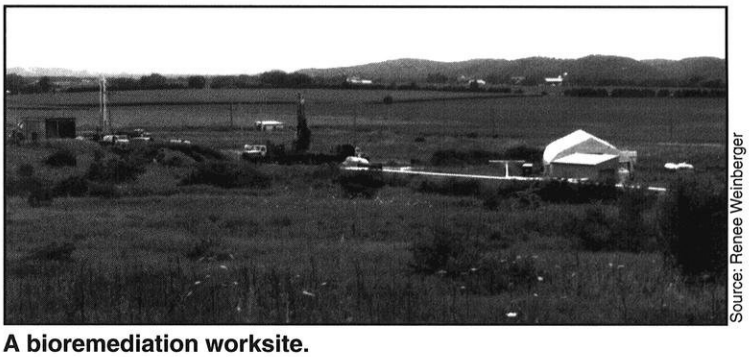
Before selling the land, the Army must make sure the land is not environmentally contaminated so that whoever inherits it "will be inheriting something usable," said Fordham. Prior to environmental regulations, wastes were often dumped into pits and burned. These wastes included fuel oil, lubricant and excess propellant. To clean the contaminated areas, the Army is using a process called bioremediation. Naturally occurring bacterial populations are stimulated until they consume all the contaminant in a particular area.

Since propellant is an explosive, many of the buildings involved in the chemical manufacturing process have the potential to be explosive. The Army, therefore, must tear down any structures that have been in contact with or contaminated by the ammunition process. Once the equipment is pulled out from the buildings through holes punched in the roof, the building can them be dismantled.



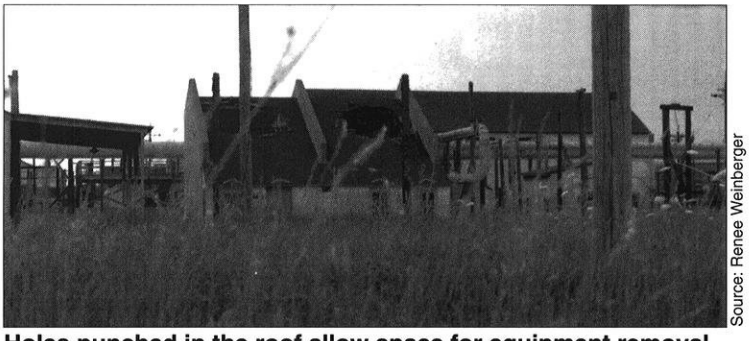
Source: Renee Weinberger

Badger Army Ammunition as seen from a neighboring hilltop.



Source: Renee Weinberger

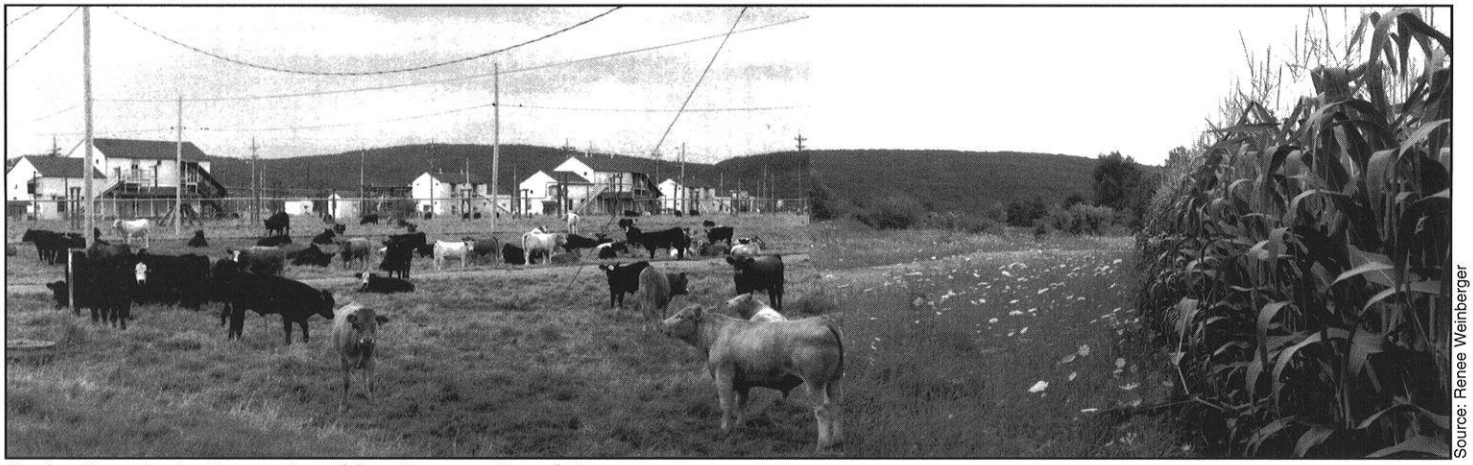
A bioremediation worksite.



Source: Renee Weinberger

Holes punched in the roof allow space for equipment removal.

Once the land at BAAP is cleaned up, it can be reused. If other government agencies, such as the U.S. Department of Agriculture (USDA), want the land, it will be transferred to them. The USDA wants 1,700 acres of land so that the 1,300 acres they are currently using for agricultural research projects such as Dairy Forage, can be made into one contiguous block.



Source: Renee Weinberger

Agriculture, industry, and prairie all currently exist.

The Bureau of Indian Affairs (BIA), another government agency, wants 1,500 acres of land for the Ho-Chunk Nation. The Ho Chunk want to use the land for recreation, prairie restoration and bison grazing. Bison are actually better for prairie restoration than the cattle currently grazing at BAAP because they cut and tear the soil.

After the land is transferred to the USDA and the BIA, the rest of the 3,854 acres of land will be auctioned off. A 200-to-300 acre industrial park is the most controversial potential use because environmentalists want the entirety of the land devoted to prairie restoration and sustainable agriculture. However, industry would make use of an existing transportation grid containing thousands of miles of railroad tracks and roads. To renovate the existing infrastructure would be more cost effective than laying new roads and train tracks for an industrial park elsewhere in the state. An industrial park at BAAP would also provide enough profit motivation for the railroad companies to continue servicing Sauk County and all of its existing industries.

Source: Renee Weinberger

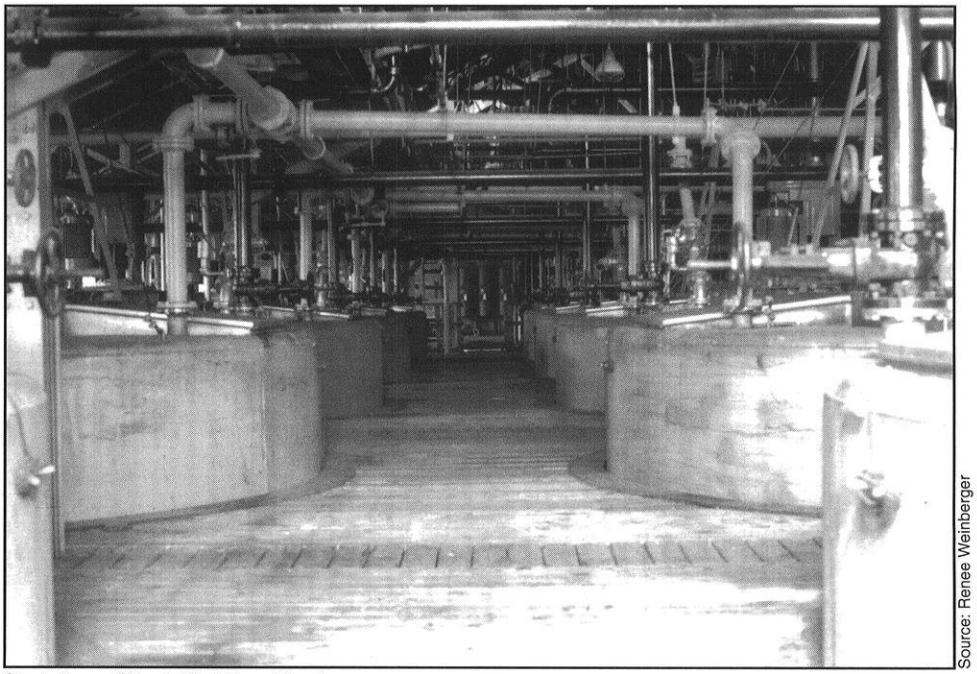
Gala Design's Office

One existing industry at BAAP is Gala Design, a company currently leasing land to produce a pharmaceutical protein from biologically engineered cows. This type of production can be done in an environmentally sound way while still providing employment and a valuable product. Gala uses a former nitrocellulose laboratory and some grazing land.

Cenex, a farmer-owned co-op currently leases stainless steel tanks to store urea ammonium nitrate, liquid fertilizer. The fertilizer is shipped to BAAP via rail, and in planting season it is shipped to farms by truck. This keeps about 300 trucks off the road per year and reduces the cost of fertilizer to farmers.

Continental Nitrogen, another fertilizer company, also wants to use some of the other stainless steel holding tanks as a temporary storage facility and a transfer point.

One of the biggest opponents to industry at BAAP is the Community Conservation Coalition for Sauk Prairie (CCCSP). They work with different organizations to restore the prairie. The land at BAAP is unique in that it has not been farmed in 55 to 60 years, during which native prairie plants have resurfaced. One such plant is the purple milk-



Source: Renee Weinberger

Stainless Steel Holding Tanks

weed, an endangered plant in Wisconsin. CCCSP's long-term plan precludes any industry or residential development as they fear such uses interfere with their vision of complete prairie restoration, recreation, sustainable agriculture and public education. CCCSP would like to see all 7,000 acres of the ammunition plant become public land when the Army leaves.

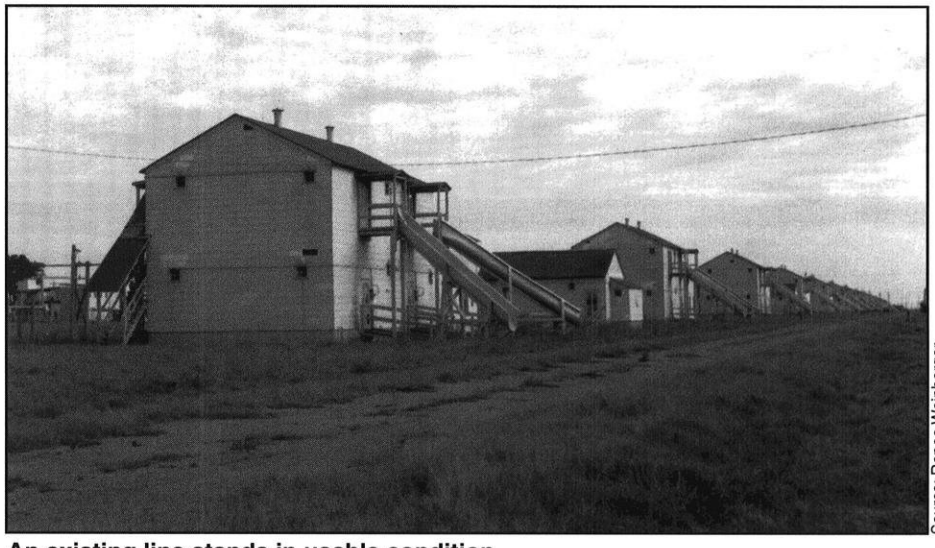
Unlike the CCCSP, Fordham believes that prairie restoration can be done alongside other land uses. For the last 20 years, Fordham has been working with various groups to restore the prairie. For the last three years, he's worked with the DNR to plant and raise prairie grasses. In response to criticisms by environmental groups, he says, "I'm not doing it as some public-relations gimmick. I'm doing it because I believe in it."

Ultimately, however, the Army and citizen groups do not make the decision about land use at BAAP. The General Services Administration (GSA), another federal agency, will auction off the land to the highest bidder. The citizen groups and county will advise the GSA, but the decision is theirs to make. Currently, it looks like the USDA and BIA will get 3,500 acres and various industries will get about 300 acres. The 3,554 remaining acres could either remain prairie, depending on who bought it, or sold to area farmers.

Author Bio: Lynn Weinberger collaborated with Renee Weinberger, photography editor and sister, to write this story. They would like to see this land issue resolved with some land left over for prairie lands.

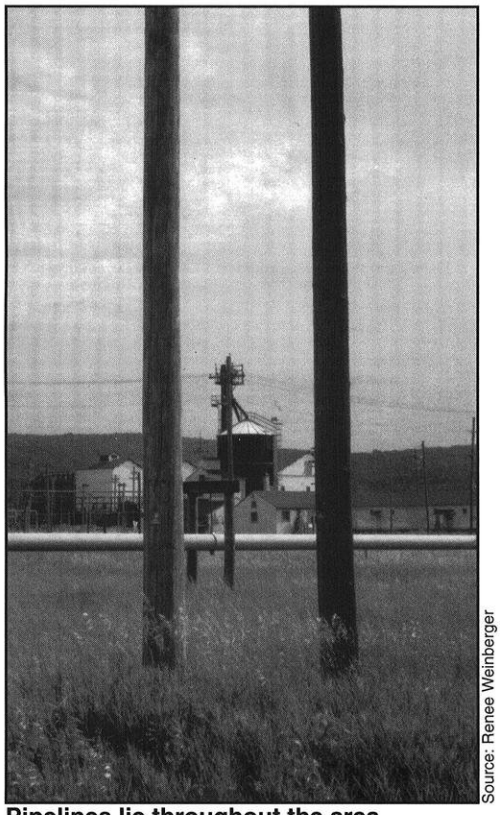
Source: Renee Weinberger

The purple milkweed, Asclepias purpurascens, a native prairie plant of the region, still grows on the land.



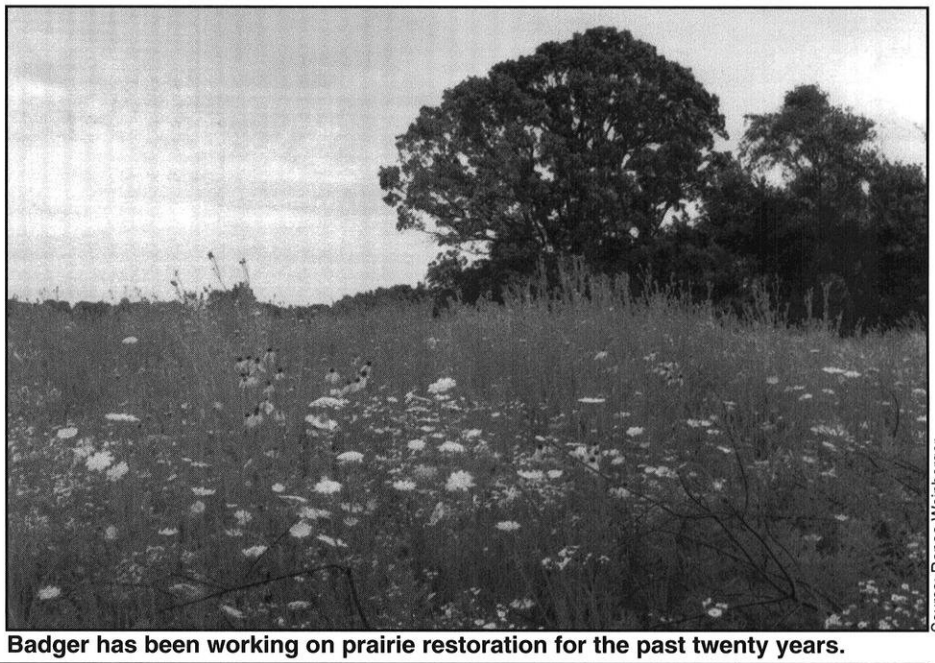
Source: Renee Weinberger

An existing line stands in usable condition.



Source: Renee Weinberger

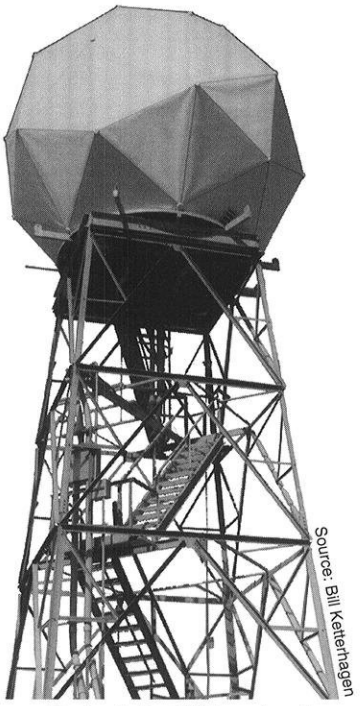
Pipelines lie throughout the area.



Source: Renee Weinberger

Badger has been working on prairie restoration for the past twenty years.

Reaching the Eyes in the Skies


Source: Bill Ketterhagen

The recently installed X-band antenna on the Space Science and Engineering Center allows researchers to gather and analyze climatic data such as precipitation, atmospheric dust, and cloud cover.

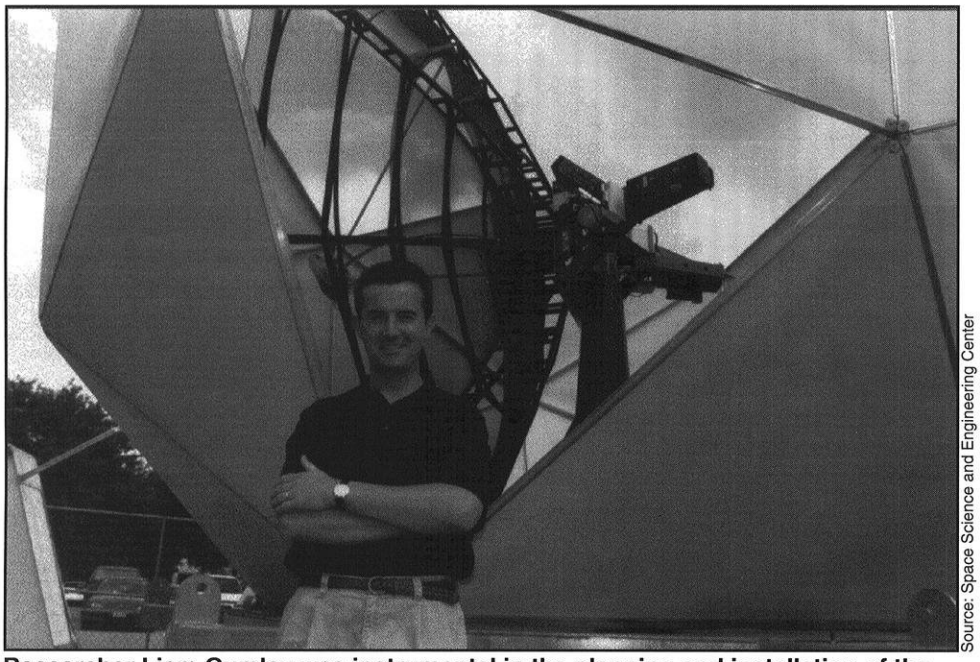
By Nicholas P. Mueller

After a fruitful summer of work at the University of Wisconsin-Madison Space Science and Engineering Center (SSEC), a new school year has arrived. This year is special for it marks the first with an X-band radio receiver. It is the newest orbital-communications radio link on campus, and also a very important one, for it allows the SSEC to communicate to a NASA satellite named Terra. Terra, the newest satellite in the system, is part of the Earth Observing System (EOS) satellite network. It contains novel instrumentation, some of which was developed in cooperation with UW-Madison.

SSEC worked mostly on Moderate-Resolution Imaging Spectroradiometer (MODIS), a sensor system which captures a complete picture of the surface and atmosphere of the world every two days as the satellite rotates about the Earth. It captures discrete portions of the spectrum of light. These separate wavelengths can be combined in a variety of ways to obtain information about the atmosphere. For instance, some wavelengths of light are the best for seeing snow; others are best for seeing rain.

When certain wavelengths are combined or separated, they can provide even more information. A specific combination of wavelengths can tell the difference between snow on the ground and snow in clouds. All of this raw data is sent down to Earth as the satellite crosses the sky. The X-band radio receiver on the SSEC building tracks the satellite as it crosses the sky, receiving the data and recording it for scientists to study. Many sites in the United States receive MODIS data, as well as other data from the satellite's various instruments.

The Terra satellite covers the Earth in what is known as a polar orbit. The polar orbital track takes the satellite across the earth's surface in a circle that crosses the North and South poles. Because the world is turning at the same time the satellite crosses its surface, the satellite covers the entire globe. Picking up data from the entire planet, instead of just one region, with the sensor suite is one of the distinct advantages of the polar orbit. In other words, the single Terra satellite can take the place of a network of geo-stationary satellites, cutting down on costs for NASA. Of course Terra is not alone; a variety of other satellites and satellite networks are part of the EOS system. However, Terra is the flagship vessel and carries out more than its share of duties.


Source: Space Science and Engineering Center

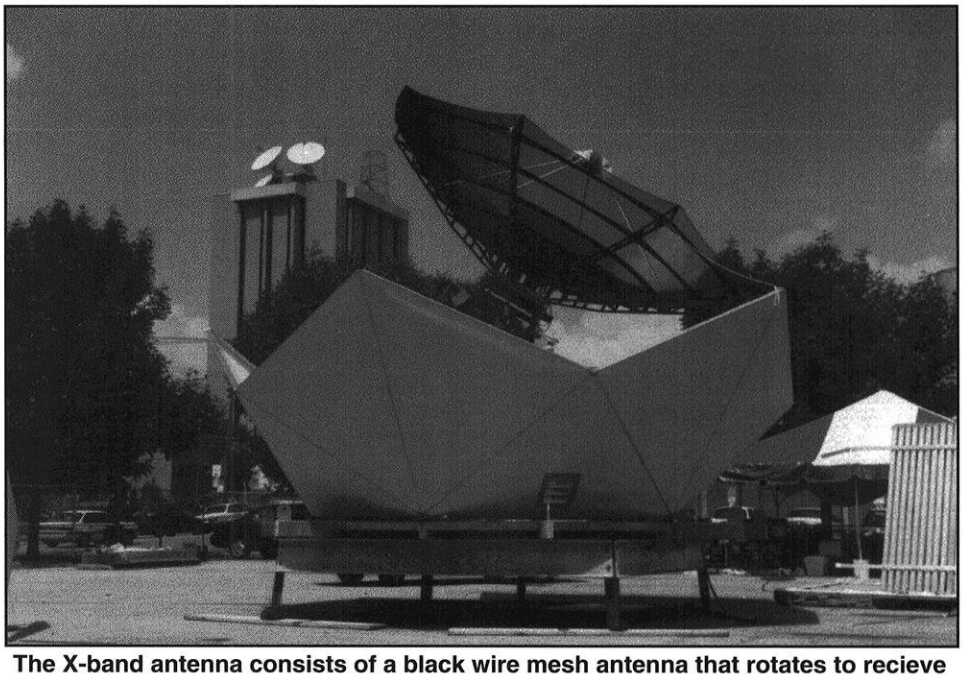
Researcher Liam Gumley was instrumental in the planning and installation of the new X-band antenna.

Due to the polar orbit of the Terra satellite, which is at a height of 705km, the MODIS package can image a 2,330 km-wide band of the world's surface in each pass in real-time.

The MODIS instrument package aboard the Terra satellite was developed with research carried out at the UW-Madison and built by Santa Barbara Remote Sensing. The MODIS package provides high sensitivity in 36 spectral bands, which range from 0.4 to 14.4 microns in wavelength. Due to the polar orbit of the Terra satellite, which is at a height of 705 km, the MODIS package can image a

2,330 km-wide band of the world's surface in each pass in real-time. The data include measurements of the percent of the Earth's surface covered in clouds, the monitoring of large-scale bioactivity in Earth's oceans and on its landmasses, and measurement of coverage of snow and ice. All of these measurements, combined with those from MODIS and Terra satellite's other sensors, provide the best pictures and data of the Earth's climate.

The SSEC and its scientists are very happy with the new data coming into the building and await the eventual launch of Aqua, Terra's sister satellite, in 2001. Earth scientists are already finding the new information useful in studies of the Earth's carbon cycle, atmospheric water vapor and aerosol distribution. All of this information helps them to link isolated events in the climate into a more complete "system" picture of the climate, and will allow them to predict global climate change and its effects on us more accurately than ever.

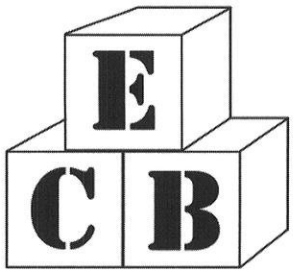


Source: Space Science and Engineering Center

The X-band antenna consists of a black wire mesh antenna that rotates to recieve signals from a satellite. The antenna is housed in a white fiberglass radome shown mid-construction.

Author Bio: Nicholas P. Mueller is a sophomore studying Materials Science and Engineering. Despite this, he enjoys writing and learning about new things in a variety of fields, which is why he joined the magazine staff.

Engineering Centers Building: The Cornerstone of the Future



By Kari Cox

Be careful walking to University Health Services for awhile. You may stumble into a treacherous hole on the corner of Breese Terrace and University Avenue. You'd have to jump over a few barricades and climb a fence but, hey, it could happen. In a few years, though, this field of construction will be replaced with the new gem of the engineering campus and the University of Wisconsin-Madison—Engineering Centers Building (ECB).

Who, What, Where, How

With a gross area of over 200,000 square feet and paid for mostly by alumni and private donations, ECB will be an amazing sight on the west side of campus. Because UW-Madison is a state school, ECB will be a state-owned building affiliated with the university. Architects outside the university designed the building with guidance from professors, staff, students and technical personnel from the university.

Connie Brachman, assistant to the dean, is the coordinator of this project for the college. She acts as a liaison between the state representatives, university representatives and the college. In fact, she represents the "end-user's view." With information coming from professors, students, campus officials, etc., she anticipates issues or problems having to do with the college and gets this information to the right people on the other side. In other words, she must organize all the details from both sides of the project, a very complicated job.

A Brief Historical Background

Before getting into all these details, though, a little reflection of historical background is appropriate. Before this project began, military surplus buildings from WWII served as temporary buildings on the engineering campus in the very spot of the new ECB. With no room to put the departments housed there, UW-Madison officials were forced to keep these unsightly, drab buildings. Kurt Wendt, engineering dean from 1953-'71, had a vision for the future of the engineering campus. Though it did not specifically include the ECB, his vision of a modern, technologically advanced engineering campus carried on.

[Brachman] anticipates that 'things will filter from one floor to the other' and get undergraduates involved in all the activities and research

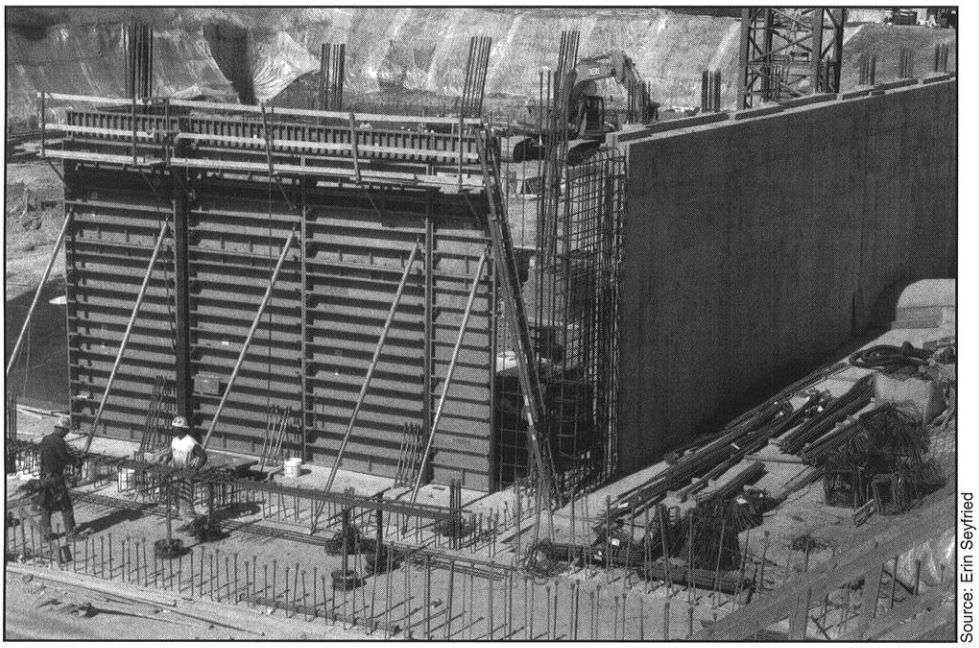
Brachman explained that it was former dean John Bollinger that set the planning for ECB into motion. In 1999, the long-awaited destruction of the temporary buildings arrived. Then on Tuesday, June 20th, the digging for ECB began.

The Inside Details (Floor by Floor)

Now excitement is starting to build as details of the interior are divulged. This is not going to be just another academic-classroom-lecture-hall building; it will be a social, full-of-activity, research-driven environment. In Brachman's words, ECB is where "off-timetable learning" will take place, where students can collaborate on projects and get involved in new and upcoming technological research.

In the plan, student-oriented activity dominates the most space in ECB. Starting in the basement is the Discovery Center and the Innovation Center, where all the great projects will initiate. The Innovation Center contains all the machinery used to build and design pieces for an engineering project. Then, these pieces can be put together in the Discovery Center, which is certainly large enough to build your end product. Currently, students in competitions such as FutureCar, FutureTruck, Concrete Canoe and Formula SAE must find their own space, but in the new ECB, this space will be readily available to them.

Then on the first floor and mezzanine, you will find the autolabs and the students. The



Source: Erin Seyfried

Workers continue construction of the Engineering Centers Building, which, after being started in June, is due for completion in the summer of 2002 with a grand opening at the beginning of 2003.

autolabs will house a full garage as well as freight elevators that connect to the basement, for easy transportation of the automotive projects from the Discovery Center. Also, the first floor is where you will find most of the students. Groups such as the Student Leadership Center and Polygon will designate space for the student organizations. These spaces will have a depth of about five feet and can contain a filing cabinet, computer and some storage. A student leadership auditorium will also be available for the student organizations to hold recruitment meetings, listen to a speaker or watch presentations on the wall space designated for that use. Some departments also moving to these floors are Career Services and recruiter space, the Technical Communication Center and the Student Leadership Center.

The upper floors are more the academic, researching places. Large clean rooms for nanotechnology, the new Biomedical Engineering Department and the Trace Center will occupy these floors. The Trace R&D Center is working on ways to make standard information technologies and telecommunication systems more accessible and usable by people with disabilities and who are aging.

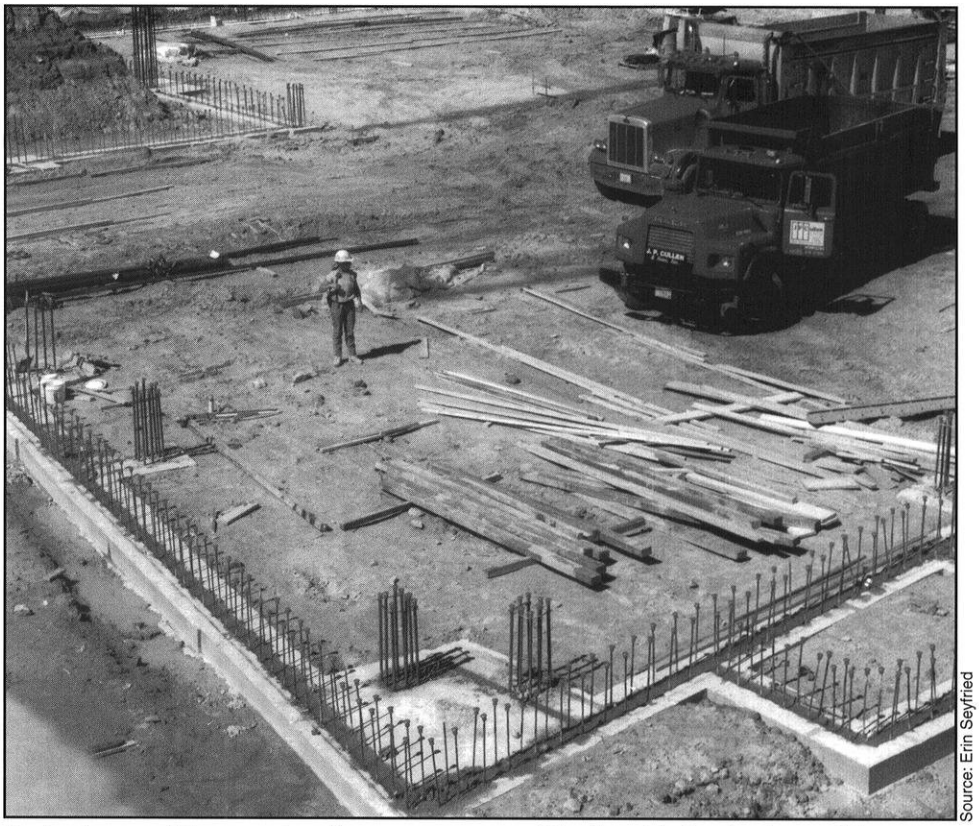
Brachman understands that the floors of this building are very diverse, but she anticipates that "things will filter from one floor to the other" and get undergraduates involved in all the activities and research.

And, of course, this new building will contain another Computer-Aided Engineering (CAE) computer lab, for those who don't want to wait until 2 a.m. to get a computer in the current CAE lab during finals. Right now, though, you can check out a picture of the future ECB on CAE's new mousepads!

ECB represents the future of the field of engineering and the future of our engineering campus

Excitement in the Future

Those of us graduating this year, or even next year, will not get a chance to take advantage of this incredible new building. The completion of this building is not expected until the summer of 2002. Starting that next fall, occupancy of the building will occur, but the grand opening is not expected until the end of 2002, beginning of 2003. A long wait from now, but Brachman exclaims, "There is a light at the end of the tunnel."



Source: Erin Seyfried

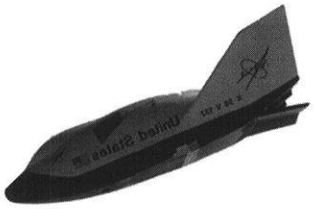
Early stages of the construction process reveal the humble beginnings of the Engineering Centers Building.

ECB will certainly be a place the engineering students can call their own. Brachman calls it the "cornerstone of the campus." This is what everyone entering campus from the west will first see as they enter town instead of those old temporary buildings. It will give newcomers to Madison and incoming students a look at the future of UW-Madison and especially the College of Engineering.

Brachman believes that the focal point of the engineering campus will remain the infamous Descendant's Fountain, but ECB certainly will be visually competitive. Both will work together to bring the old and the new together for engineers. Teamwork. That's what education is all about, and that is definitely what is emphasized for ECB. Not just another addition to the UW-Madison's engineering students' arsenal of acronyms, ECB represents the future of the field of engineering and the future of our engineering campus.

Author Bio: Kari Cox is a senior majoring in English and Technical Communications. She wishes that she could be here for the opening of this awesome facility, but instead she will be kicked out into the real world before its completion.

Building a Space Ship – NASA's X-38 Project



By Molly Mitten

Are you getting a little bored with the coming and going of the space shuttles? Are you anxious to see a new space vehicle landing on earth? It's not a flying saucer, but NASA is currently building a new space vehicle for the International Space Station. This vehicle is called the X-38 and it will be in space as early as 2002. The X-38 is a prototype crew return vehicle for the International Space Station. The project is developing the technology necessary to build a small fleet of operational Crew Return Vehicles.

When there is a permanent crew at the Space Station, there will not always be a shuttle docked to the station. If one member of the crew becomes seriously ill, if there is an emergency where the station needs to be evacuated or if the shuttle fleet is grounded, the crew needs a reliable way to return to earth. The vehicle is designed to fly with little or no input from the crew, so in an emergency the pilot could remain on the station or the entire crew could return to earth even if the pilot is incapacitated.

The X-38 project is unique because this is the first time that a space vehicle has been engineered, designed and manufactured at the Johnson Space Center in Houston, Texas. Engineers at NASA's Dryden Flight Research Center in Edwards, California, have also participated in the testing of the various prototypes, and engineers at the Marshall Space Flight Center in Huntsville, Alabama, are responsible for the design and delivery of the de-orbit propulsion module (DPS). Assignments of this type have generally been given to contractors, but the purpose of the in-house development of this spacecraft is to give NASA's engineers an opportunity to better understand the problems contractors face in the development of new technology.

Source: Karl Pohl

NASA engineer Mike Dub with the X-38 getting ready for a B-52 drop test.

Mark Dub is a young subsystem engineer at JSC, working on the pyrotechnic systems that deploy the parachutes and the landing gear on the X-38. He is excited about the challenge. "We've never done this before." Dub says, "Quite a few cutting-edge technologies – not just the LFU [Laser Firing Unit] – are being developed by the X-38 program. That is actually one of the cool things about working on this project. But the downside, or challenge that it poses is that you see a lot of things for the first time. So there are a lot of lessons which come along with our conquests."

If one member of the crew becomes seriously ill, if there is an emergency where the station needs to be evacuated or if the shuttle fleet is grounded, the crew needs a reliable way to return to earth

The concept of the basic vehicle design is the same lifting-body design created for the Air Force's X-24 in the mid-1960s. The idea is that an airplane doesn't need wings if the body itself can provide lift. The X-38 has no wings, only small fins that help stabilize the aircraft in flight.

The body may be something different, but much of the technology on the aircraft was borrowed from other applications to reduce costs. As much as 80% of the spacecraft's design is based on previous research and development. The flight computer is similar to those currently used in aircraft, and the operating system is already in use for many commercial applications. The electromechanical actuators were developed in a previous NASA/Air Force/Navy project. The video equipment has been used on the space shuttles, and the GPS navigational system is the same used in military aircraft.

The idea is that an airplane doesn't need wings if the body itself can provide lift. The X-38 has no wings, only small fins that help stabilize the aircraft in flight

No matter how reliable the borrowed technology is, a large amount of testing is always necessary to ensure proper performance. The development of an operational crew return vehicle began with four atmospheric test vehicles. Three of these vehicles are made from fiberglass and are used for atmospheric testing. They are strapped to the wing of a B-52 bomber and dropped from a height of about 37,000 feet. The parachutes are deployed, the vehicle lands and every instrument reading is recorded along the way. The results are analyzed and bugs are fixed before the next flight.

Of the test vehicles, Vehicle 131 has flown two times, 132 has flown three times and 131R is scheduled to fly four times within the next year or two. The last vehicle to be tested is Vehicle 201, the space flight test vehicle, which will be dropped from the Space Shuttle in 2002. The unmanned vehicle will return to earth to verify that all systems are ready for the construction of the Crew Return Vehicles (CRVs).

When Vehicle 201 is tested, it will fly in the same way as the CRV. The DPS is designed to overcome the Space Station's orbital velocity and propel the vehicle from an altitude of between 600,000 and 800,000 feet into the earth's atmosphere. After the DPS is spent, it is cut away to burn up on reentry. The remaining lifting body will glide through the air on the approach to the landing site, much like the landing of the space shuttles. The lifting body will allow the aircraft to fly from 400,000 to 30,000 feet, while the altitude is controlled with nitrogen gas. Once the vehicle reaches approximately 30,000 feet, the vehicle will be slowed down by a giant parafoil.

The parafoil is 7,500 square feet and is the largest ever successfully deployed. The chute is so large it must be gradually let out in five sections so the wind doesn't tear it apart. The parafoil looks like a much larger version of a skydiver's chute in the respect that it can be steered to control the point of landing. The vehicle touches down softly on skids rather than wheels. It comes to a stop after skidding only one vehicle length.

The vehicle will land in pre-selected landing sites, which are open fields or dry lakebeds. The trip to earth should take as little as ninety minutes, but the CRV will be equipped with enough life support and batteries for nine hours of flight. In the case that a preferred landing site is having bad weather, the crew would be able to circle the earth until the weather clears. You may think that problems as simple as storms and windy conditions shouldn't be holding back NASA, but even though space flight has been occurring on a regular basis for years, it is still incredibly complicated. Flight controllers do everything they can to ensure that the crew, vehicles and equipment are safe at all times.

Once the station is at its capacity of seven (sometime around 2005), there will be two CRVs on the station at all times. Each of the vehicles will have seats for all seven astronauts. After NASA has completed the research needed to develop the technology, an aerospace contractor will build the actual CRVs.

When work is complete, the CRV will be just one of many parts that make up the greatest international space effort ever attempted. We are on our way to creating the largest space structure ever built, which will lead us to even more technological advancements and will promise a future even brighter than the stars in the sky.

Author Bio: Molly Mitten is a junior in Mechanical Engineering who had the awesome opportunity to co-op at NASA's JSC on the X-38 project.

Want a job on a project like this? Here is what a few of the JSC engineers are doing:

Mark Dub, Michigan graduate, 1999

"I am a subsystem engineer working on the development and testing of the Laser Firing Unit, or LFU for V-201. We use pyros on the X-38 for numerous events, such as separating from the de-orbit propulsion stage, deploying the parachutes and lowering the landing gear ... I've been able to...travel with the X-38 team out to Edwards Air Force Base, in the California Mojave Desert. There, I provided ops support for the X-38 flight test."

Jeremy Hart, Wisconsin graduate, 2000

"The primary role of my department is to design and evaluate the flight control systems for the X-38 flight test vehicles ... I am serving as an X-38 design engineer ... I am currently working on simulating the behavior of the vehicle using the current control system to ensure that it will meet our performance requirements."

Edgar Medina, Texas graduate, 1999

"I work in the Guidance Navigation and Control (GN&C) Design and Analysis Branch ...we're working on the algorithms (and the code) that will tell the spacecraft how to move its control surfaces (flaps and rudders) to stay on the desired trajectory. Basically we're designing an autopilot that has to control the spacecraft all the way from orbit, through atmospheric re-entry, and to the ground."

Carol Evans, Vehicle Integration and Production Manager

"My team is responsible for the physical layout and integration of the vehicle systems into the vehicle....We coordinate and control the day-to-day assembly and test of the flight vehicles....We are currently installing systems in V-201."

These Walls Won't Talk - But They'll Tell a Story

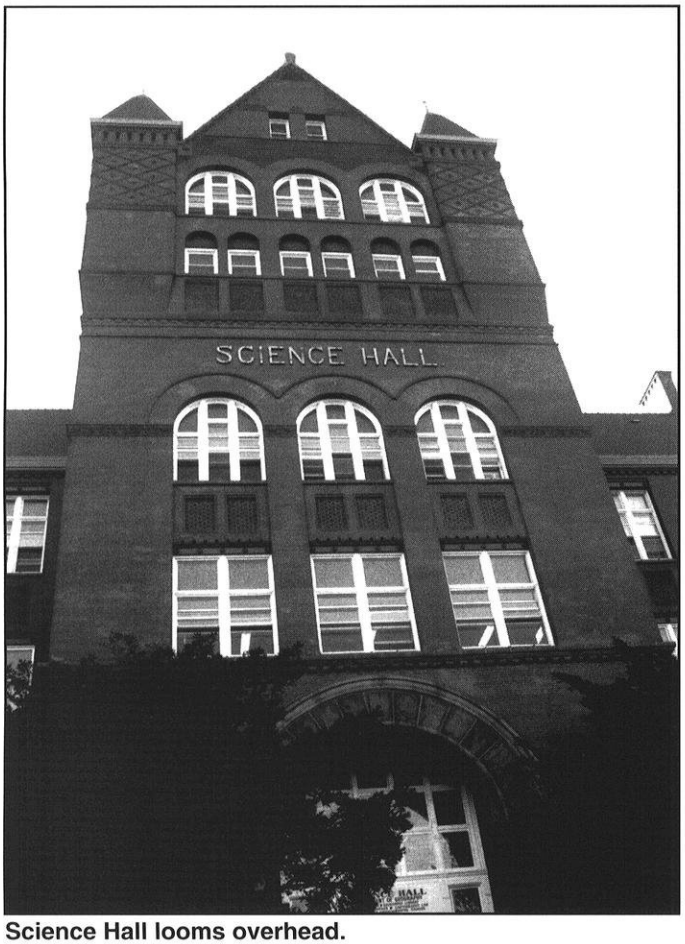
By MaryRuth Kotelnicki

With each step, I quickened my pace. It was as though every sound was amplified. I glanced back and forth, all around me. I could now not only feel, but hear the rapid beating of my heart. As I passed along the foot of the building, I observed the arched basement windows. They reminded me of an old dungeon and added to the castle-like appearance of the structure. I saw no reflection in the panes of glass, just a thick darkness within.

I rounded the corner. There it stood. During the day I had marveled at its noble presence; now though, its massiveness felt overpowering. Looking up to the peaked top, its rusty-color red bricks seemed to tower infinitely into the night sky. I climbed the steps to the huge arched doorway, looked back, then pulled open the door. I had arrived.

Science Hall. Its presence: recognized. Its purpose: known. Its history: regarded.

Legend has it that this 113-year-old building is haunted. By definition, it very well may be. After being destroyed by an engineering forge fire on December 1, 1884, Science Hall, as we know it today, finished reconstruction in December 1887. This enormous structure is designed to be fireproof. The 1888 UW-Catalog stated that: "No wood is used except for the floors, doors and window frames. The floor beams are of steel, filled in with arches of hollow tile. The staircase is of iron with slate treads ...The walls are so made as to leave two air spaces between the room and the outer wall."



Source: Matt Wachter

Science Hall looms overhead.

The rebuilding of Science Hall claimed the life of one man and maimed several others. Perhaps, though, the most significant cause of the building's mysterious legacy is the former existence of the Department of Anatomy. From 1904 to 1957 the department's residency was stationed on the upper floors of the building. The labs on the fourth and fifth floors were used for the dissection of human cadavers. Over the past few decades, students have discovered the dusty remains of human body parts in the dark and forgotten corners of the attic. They have exhumed a set of leg bones and an embalmed human foot — eerie reminders of the old department's presence.

Source: Matt Wachter

What has passed through these dark hallways over the years?

Add these to the already haunting demeanor induced by the appearance of looming towers, large creaking doors and winding hallways, and you have stepped into Samuel Rogers 1944 mystery novel *Don't Look Behind You*, which is set in Science Hall. Mike Baron, a 1971 graduate of UW-Madison, used Science Hall as the setting in his 1987 comic-book story, "The Phantom of Bascom Hill."

Over the past few decades, students have discovered the dusty remains of human body parts in the dark and forgotten corners of the attic

More of Science Hall's reputation results from a morgue in the basement, bats that fly through the hallways, its link to the campus system of underground utility tunnels beneath the building and dead bodies delivered by hearse at the back door and carried up to the attic when the old medical school was there.

For over a century students and professors have climbed the steps that lead up to the

thickly arched entranceway to Science Hall. They have walked the hallways, sat in the classrooms and partaken in lectures and discussions. Since completion, the building has housed nearly every science department UW-Madison has to offer. Today, Science Hall is mainly dedicated to the Department of Geography, along with the Robinson Map Library, the Geography Library, the State Cartographer's Office and its laboratory, the foreign students office, Chicano Studies and the Institute for Environmental Studies.

Source: Matt Wachter

Grafitti, accumulating over the years, covers the upper stairwell walls.

The top floor of Science Hall exhibits a mural that dates back to the late 1800s. Carved and written on the walls are the names of generations of students who have left their mark, their message. They, too, have become a part of the history of this building.

Whether haunted or not, Science Hall has a fascinating background. Its very walls whisper hints of its past and literally tell a story with the old signatures. Pass by Science Hall after dusk sometime and look upward toward the dark windows that mark the top floor ... look ever so closely, and then, only then, will you be able to make your own judgments and discover if the legends are true.

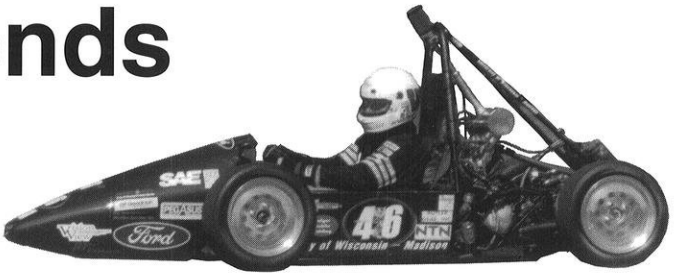
Author Bio: MaryRuth Kotelnicki is a freshman planning to major in Engineering Mechanics and Astronautics. Her dream is to work as a NASA Astronaut and step foot on Mars. She has two pet frogs, and like them, can make her tongue touch her nose.

Get involved with the EXPO! EXPO is a huge fair held biennially that allows industries, students, faculty and the community to display and learn about current advances in technology. It is an exciting time, but we need your help to pull it off.

The following committees could use some help: Industrial Relations, School Outreach, Student Exhibits, Op Robotics or Sales.

Website:
http://www.cae.wisc.edu/~expo
Email: expo@cae.wisc.edu

Gone in 3.3 Seconds



By Mike Vogel

The stoplight is red. You are sitting in front of a 75 horsepower (hp), 600 cubic centimeters (cc) engine with only 47 thousandths of an inch of aluminum keeping you 1.5 inches off the ground. The light turns yellow. Your engine roars to life, red lining at 12,000 revolutions per minute (rpm). The light turns green. A tiny smile forms on your lips as the adrenaline pumps through your veins and the powerful engine accelerates you to 60 mph in under 3.5 seconds. You are in control of the University of Wisconsin-Madison's Formula Society of Automotive Engineering (SAE) racing car.

The Formula SAE car is on the leading edge of engineering technology. The team has no stock car to work from, just an idea in their heads that they have to bring to life in a matter of months. The car is a smaller version of an Indy racecar. Its engine is not the most powerful motorcycle engine (about 1300 cc), but is not the smallest motorcycle engine either (as low as 80 cc for a small dirtbike).

The Formula SAE car uses carbon fiber, aluminum and chromoly (an alloy of steel) to create a very strong, yet extremely light frame. The engine is a 75 hp, 600 cc motorcycle engine that can accelerate the car from 0 to 60 mph in 3.3 seconds. The car is supported with racing suspension so it can take turns at high speeds and if need be, can stop on a dime with its three disc brakes. The reason that there is not four but three disc brakes is because the third disc is centrally located in the middle of the rear axle. This saves weight and allows the suspension to work more efficiently. 90% of the car is built from scratch, the rest is improved upon.

The only thing that isn't built is the motorcycle engine, which is taken completely apart and rebuilt so that it is faster and more efficient. There is not a piece of hardware that is not used on the car; everything has a purpose for being there. The team's car cannot afford the extra weight of useless materials.

This car, which won second place in the Formula SAE Intercollegiate race in May 2000, was built in 9 months. Last year's team was so successful because of the great driving and inspiring leadership of former team leader Chris Gilligan. This year's team is run by team leader, Tom Graham, co-team leader Rob Schellin and many other engineering students here at UW-Madison. The team begins the first day of school by trying to recruit as many newcomers as possible. It takes about 15,000 work hours to build a winning Formula car. The Formula team works together to reach their dream-- a running and winning car.

Graham emphasizes the "team" aspect as the most important and successful part of their program. He stresses that the group will only succeed if they work together through good communication, friendship, compromise and many other skills that are learned through the experience of building a racecar.

The team plans events to help build this atmosphere and closeness. This semester, Graham is planning a team building outing to a golfing range and go-cart racing so the newcomers can feel more familiar with the veterans of the group and have a good time. Another trip involves "silicon racing" in Chicago.

The engine is a 75 hp, 600cc motorcycle engine that can accelerate the car from 0 to 60 mph in 3.3 seconds

Silicon racing is very similar to real racing, except you are in the arcades. You sit in a version of a Formula car that is attached to hydraulics. As you race, the hydraulics move your car around as if you were in the real thing.

The intercollegiate competition occurs in May between 100 international schools. There are schools from Japan, Mexico, Canada and other U.S. teams from Cornell, Virginia Tech and Michigan State. Every car is put to the test in seven events: an endurance race, a fuel economy test, an acceleration test, a manufacturability presentation,

Source: Karen Croysdale

Seth Jaeck advises Adam Tubbs in an adjustment of the practice car.

a business presentation, a total cost of the car presentation and a skidpad test. The skidpad event tests the car's suspension by how it handles going around turns at fast speeds.

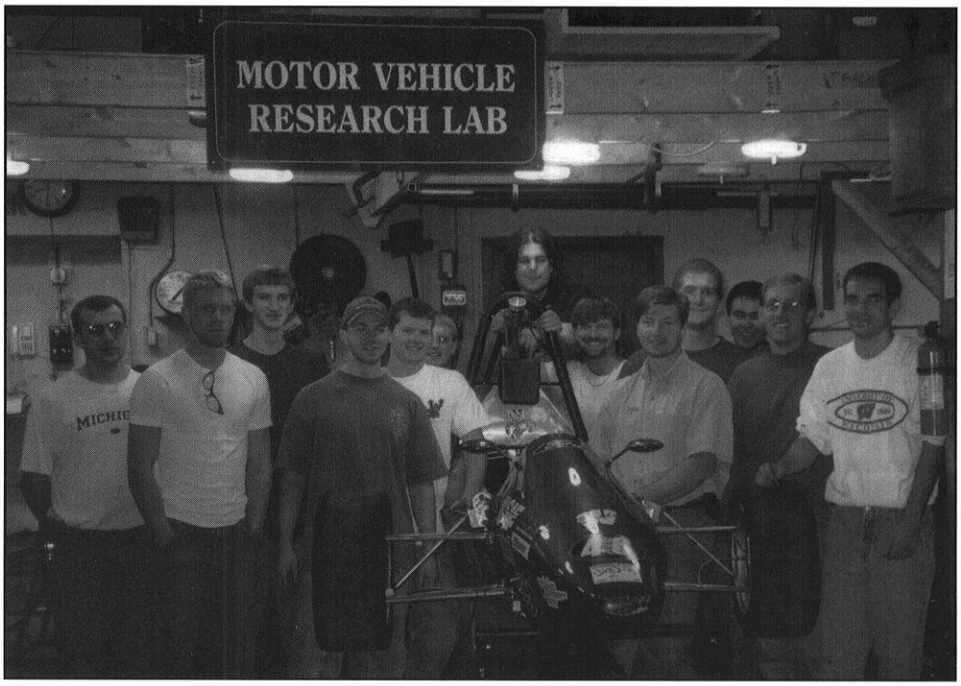
There are also strict guidelines that have to be followed just so the car can compete. The race car is not allowed to have a bigger engine than 600 cc, and its restrictor (where the air comes in) must be no bigger than 20 mm in diameter, about the size of a quarter. In effect, they have a limit on how powerful their engine can be. For example, they could pump out a lot of horsepower from a bigger engine, but it would be very inefficient since the intake is limited and it would weigh a lot more.

The team won the fuel economy test and the cost event. The fuel economy test consists of racing your car in a 20 km endurance race and measuring how much fuel you used. You are not allowed to refuel, so if the car uses fuel inefficiently, it will not finish the race. The UW team used 0.9 gallons from their two gallon tank.

In order to do well in the cost event, the team has to have accurate information on the many different costs of the car, and has to show that they used the money wisely. For this team to build a Formula racing car, it cost them about $9,000 which comes from donations supplied by Polygon, the Mechanical Engineering Department, Ford and other sponsors. It would cost the public about $30,000 to build the same car, and many more years. Through winning these events and doing well in the others, the UW team came out of the competition in second place.

The UW Formula SAE racing team is learning from their previous cars, and they continue to stay a step ahead of their competition. They plan on taking first place in the competitions in May, less than nine months away. If you are interested in the group you may email them at *sae@cae.wisc.edu* or contact the team at 608-263-6413

Author Bio: Mike (Delaware!) Vogel is a sophomore majoring in Mechanical Engineering and working toward the Technical Communications Certificate. He is involved in FutureTruck, another car project on campus, and loves to sail. He is looking forward to buying his first yellow Mustang Cobra, now that he knows a little more about cars.



Source: Karen Croysdale

Brian Anason, Peter Allex, Joe Kaiser, Adam Tubbs, Greg Aykens, Tim Isenberg, Jeremy Scheetz, Jason Drost, Tom Graham (team leader), Mark Kuwalski, Rob Schellin and Bryan Chadee proudly display their car after a hard night's work at the lab.

Rescue Robots: The Next Generation of Heroes

By Ryan Sydnor

The rain pours down outside. Through the window, you see people scurrying through the streets with newspapers over their heads; others struggle to hold their umbrellas against the biting winds. You feel sublimely safe within the thick walls of the building.

Then the world comes crashing down around you—literally. With a cataclysmic boom that shakes the earth for miles, the entire structure collapses within seconds. In an instant, you are pinned to the floor by a section of a wall. The sounds of muffled screams fade away as you slip into unconsciousness. You don't know this, but you are in a small pocket beneath several tons of rubble, and it will take at least two days for rescue workers to reach you.

You are suddenly awakened by a peculiar noise—a resonant rumbling and clanking that grows louder with each passing moment. You see movement out of the corner of your eye, and you twist your head to see a large robotic inchworm-snake thing squirm its way out of a heating vent. If this is a dream, it is by far the strangest you have ever had.

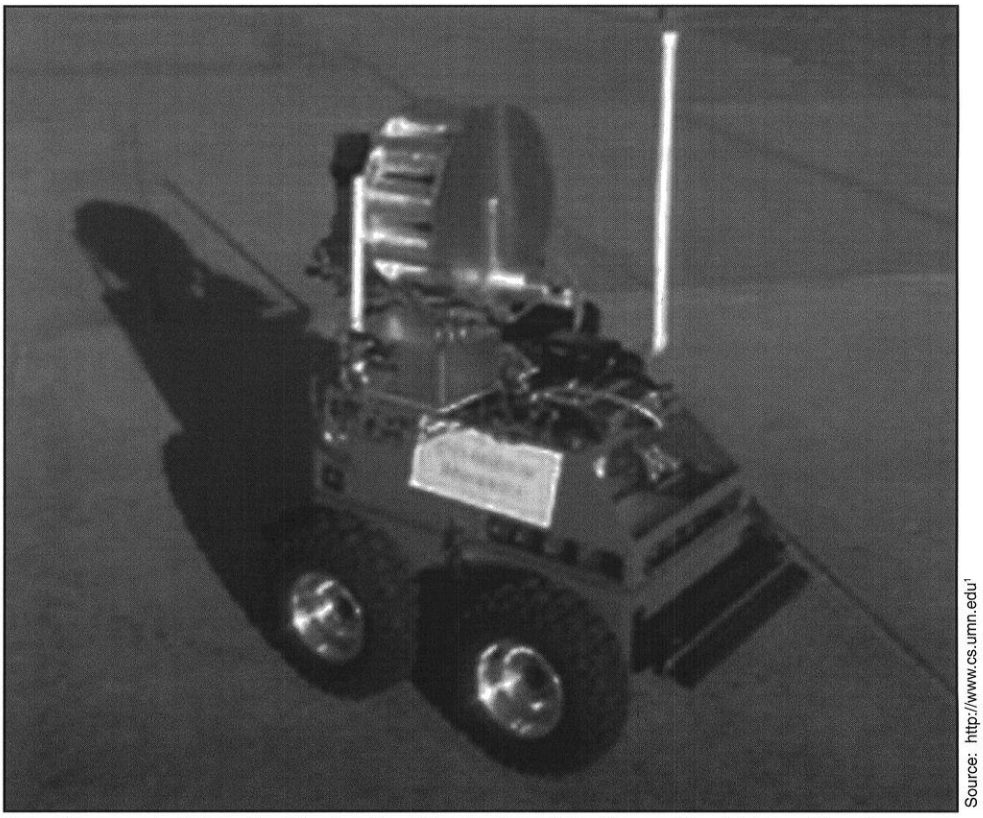
Should you ever be unfortunate enough to find yourself in such a situation, that bizarre little robo-creature could save your life. Some of the world's leading experts in robotics have devoted their expertise to the design of "rescue robots" that can locate victims in chaotic disaster sites and aid rescue workers in extracting them from the ruins—*alive*. Decades of advancement in robot mobility, sensing and intelligence have culminated in the creation of micro-rovers capable of executing such tasks.

Unfortunately, it took a tragedy the magnitude of the Chernobyl disaster, where humans had to manually inspect the facility, to spark widespread interest in the design of Urban Search and Rescue (USAR) robots. As University of Wisconsin-Madison Assistant Professor Nicola J. Ferrier says, "These engineers basically committed suicide. A video was shown at a robotics conference, which had a profound effect on many people.... Of course, Oklahoma [City] may have sparked more interest locally."

In phenomenal disasters such as the Oklahoma City bombing, rescue workers must scramble to do everything in their power within the first 48 hours, after which victim mortality rises dramatically. It is often impossible to find and extract everyone within that narrow window of time, as weather problems, further collapse, aftershocks, secondary bombs and other unforeseeable complications may delay progress. It can take hours just for structural engineers to determine the safest entry sites. Furthermore, as Major John G. Blitch of the Defense Advanced Research Projects Agency (DARPA) says, "...You can't really start extracting people until you know where everyone is. You might lift up one end of a piece of fallen concrete to save one person and consequently squish three or four other people you don't know about." Of course, another serious concern is the safety of rescue personnel, volunteers and search dogs risking their lives to save those trapped beneath the wreckage.

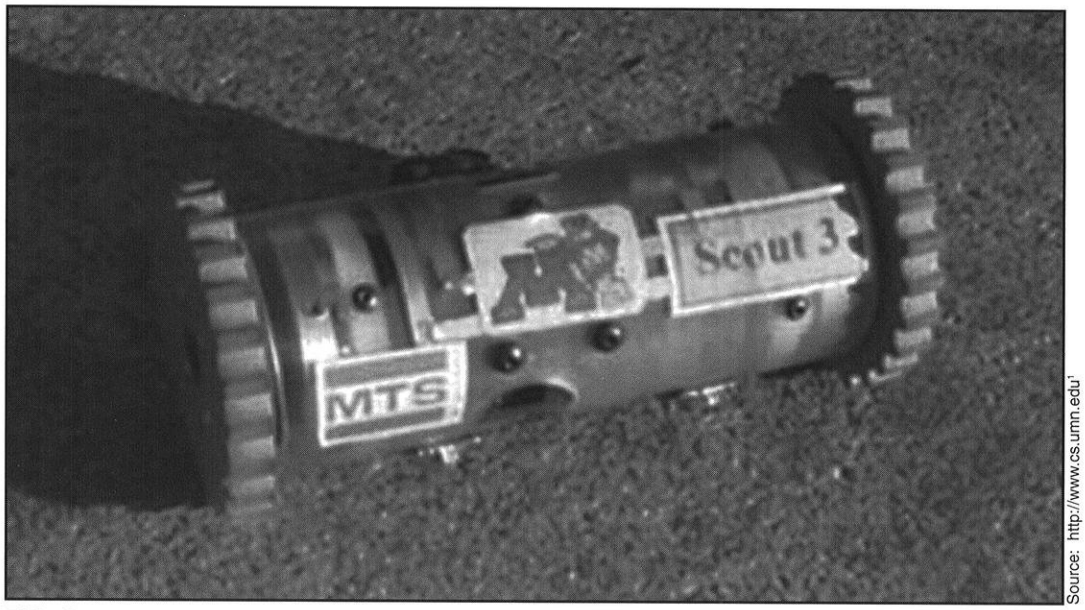
If this is a dream, it is by far the strangest you have ever had

Enter the robots. Often no larger than remote-controlled cars, USAR robots can fit



Source: http://www.cs.umn.edu/

This Ranger, built by the Center for Distributed Robotics at the University of Minnesota, is responsible for deploying scouts to achieve mission objectives.



Source: http://www.cs.umn.edu[1]

This Scout, also created at the University of Minnesota, can safely land and carry out its mission after being launched through a glass window.

into passages much smaller than any human or dog, and they are far less vulnerable to physical threats or fatigue. Using sophisticated computation and sensing systems along with diverse means of locomotion, they can navigate their own paths through the wreckage. USAR robots have been drawn into the spotlight through competitions like those held during the summer of 2000 in Austin, Tex., and Richland, Wash. These contests challenge competing teams to design autonomous robots capable of clambering through simulated disaster sites and locating victims (i.e., animatronic dummies with heating pads and fake wounds). The robots have to negotiate narrow passageways, stairs, mountains of debris, gas leaks, twisted metal bars, gaping holes, unstable floors and regions of complete darkness. They receive points not only for locating victims, but also for supplying researchers with accurate information, dropping off a package (signifying food, water, medications, etc.), allowing victims to communicate with rescue personnel and finally exiting the building.

Some of the most successful designs at these competitions have been biologically inspired—as seen in the serpentine (snake) robots whose multiple degrees of freedom allow them to wrap around protrusions and wriggle through constricted spaces. DARPA's Polybot is a versatile serpentine robot made up of many identical modules linked together. This form makes Polybot reconfigurable and relatively easy to repair, but difficult to supply with sufficient sensors and computational power.

One solution to this problem is presented by the "shape-shifting marsupials" pioneered by Robin R. Murphy, director of the Perceptual Robotics Laboratory at the University of South Florida. Murphy's system employs team tactics to locate victims and communicate information. One of Murphy's marsupial teams consists of a car-like "mother" robot called Silver Bullet and a "daughter" charmingly named Bujold. By carrying Bujold into the disaster site and deploying it (or her) through a rear gate, Silver Bullet keeps the micro-rover protected and fully charged as long as possible. The mother robot also offers off-board computation, centralized control, communications relay and surplus battery power via an umbilical cord, which allows the micro-rover to remain small and relatively simple. Bujold has impressive shape-shifting capabilities, automatically adopting one of two configurations, either flat or "sitting up," as appropriate for the terrain. By the winter of 2000, Murphy's lab hopes to produce a marsupial squad featuring an upgraded mother and three untethered daughter robots.

The scouts roll around like possessed coffee cans, using spring-loaded foot mechanisms to hop over obstacles.

Similar to Murphy's mother-daughter teams are the "ranger-scout" duos contrived by a consortium headed by the University of Minnesota. The computer-equipped ranger can deploy up to ten free-roaming, cylindrical scouts, each of which bears various sensors, like cameras and microphones, as well as transmitters and data links for communication. The scouts roll around like possessed coffee cans, using spring-loaded foot mechanisms to hop over obstacles. They are also tough enough to withstand being launched through windows by the ranger.

Other innovative designs abound, including a crab-like robot that can climb walls and numerous intelligent flying robots made to withstand 40-foot-tall flames and gushing jets of water. Researchers continually strive to improve these robots' competence and task capacity, primarily through advancements in sensing systems. As Ferrier, who has devoted a great deal of time to the development of sophisticated robotic vision technology, explains, "Sensing is what's going to make these things intelligent." According to Ferrier, one of the most daunting tasks in modern robotics is supplying micro-rovers with sufficient power; another is endowing a mobile system with the sensing power to identify its own location. This is especially challenging in a chaotic disaster zone. "You can buy a robot that will clean your floors," she explains, "but search and rescue robots are going to go into an environment that you don't have any prior information about." Of course, the need to make these brainy robots cheap enough to risk destroying further complicates things.

Despite the challenges that persist, we may see mechanical helpers roaming disaster areas in the very near future. These technological wonders may be built to administer medications, see through walls with microwave imaging and even extract victims from the rubble. For now, however, rescue robots can be of tremendous value simply by reaching those who would otherwise be unreachable, and by providing hope where there would otherwise be none.

Author Bio: A second-year Biomedical Engineering major, Ryan Sydnor once had an irrational fear of Kermit the Frog. Perhaps more interestingly, he plans to spend a year in distant Japan.

[1]http://www.cs.umn.edu/Research/airvl/distributed/hardware.html

Learn to Do What Homer Does (And Earn Credit for it)

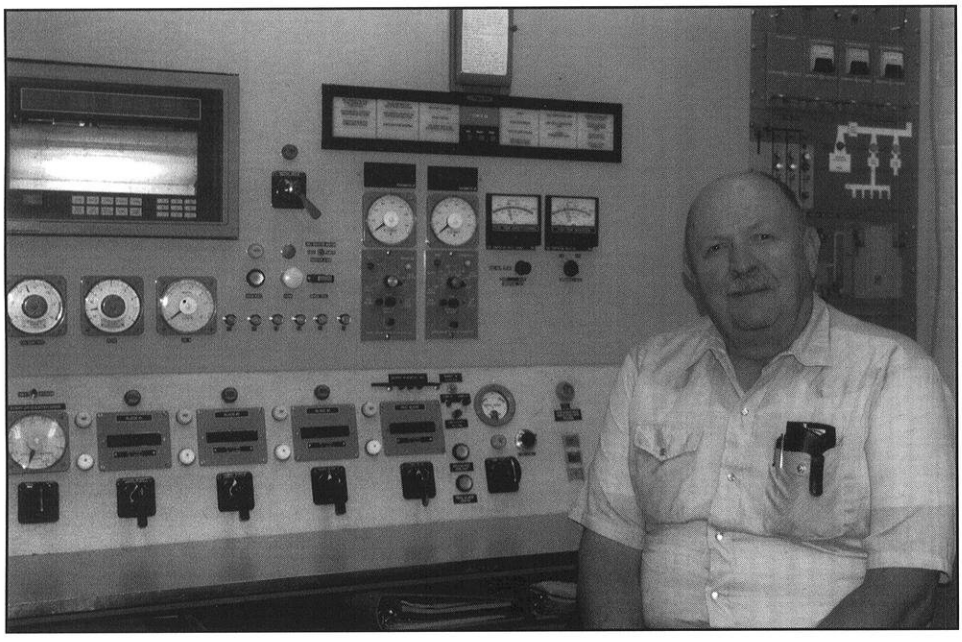
By Jeannine Washkuhn

Imagine that you are at work. Suddenly, there are sirens screaming and emergency lights blindly flashing. The fate of an entire city lies in your hands, and it can be saved with just one push of a button. There are only seconds to decide. Which button will stop the nuclear meltdown?

Many people will recognize this scenario from the "Homer Defined" *Simpsons* episode. Meet our hero, Homer Simpson, safety inspector of Sector 7G in the Springfield Nuclear Power Plant. By randomly pushing a button, with only seconds to spare, he single-handedly saves Springfield from the devastating effects of a nuclear meltdown.

Sound like a job for you? Piece of cake (or mmm ... donut) you say? Great! UW-Madison offers a great course titled NEEP (Nuclear Engineering/Engineering Physics) 234: "Principles and Practice of Nuclear Reactor Operations" that can get you started. Professor Richard Cashwell is the instructor of this unique four-credit course that will not only teach you all about operating a nuclear reactor, but will also give you hours of hands-on experience in our own nuclear reactor lab located in the Mechanical Engineering Building on campus.

Worried about meltdowns and radiation? Don't want to be stuck in the same situation that Homer was? Well, push those fears aside, it's not as bad as you think. The main difference between our nuclear reactor and the Springfield Nuclear Power Plant is that ours is used primarily for teaching and research, not to supply power, which means that our reactor operates at a much lower power level. Whew, you won't blow up the city of Madison! In fact, if the gallons of water, currently used to cool the core of our reactor and to shield harmful radiation, were to suddenly leak out, Madison would still be safe.



Source: Bill Ketterhagen

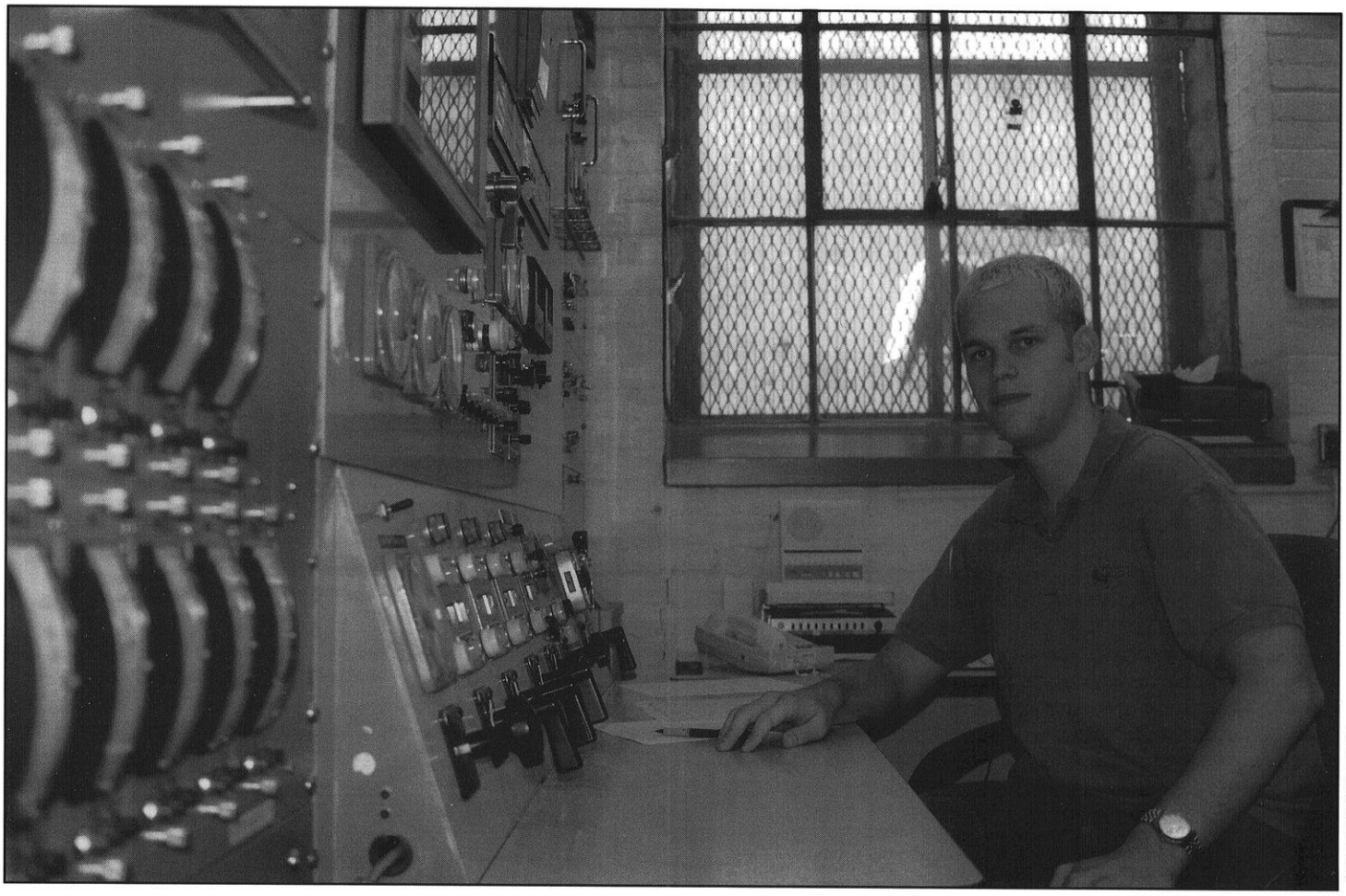
Reactor director Richard Cashwell teaches NEEP 234, Principles and Practice of Nuclear Reactor Operations.

Cashwell reassuringly states that our reactor operates at "a power level low enough that a complete loss of cool water...the heat generated within the fuel would not bring the fuel up to a high enough temperature to rupture the plant." He also adds that if we loose "all of our cool water at one time, air will keep it cool."

And the radiation levels? Any avid *Simpsons* fan can tell you that Homer's sperm count was damaged due to radiation exposure at work. How safe is it to be in our Madison reactor lab? The annual occupational radiation dose is 5,000 mg, and last year the highest dose was racked up by Cashwell himself at 155 mg. The typical student, however, will never show anything on their dosimeter, a devise used to detect radiation doses.

Even though our reactor is not nearly as dangerous as Springfield's power plant, a job as a nuclear operator is not nearly as easy and laid-back as Homer makes it appear. Cashwell prepares his students for this concept in his NEEP 234 class, covering a wide variety of important topics including nuclear physics, atomic structure, radiation types, regulations regarding radiation safety, nuclear theory and system design, basically teaching them "everything an operator needs to know."

NEEP 234 is open to all students, requires only basic algebra and meets five times a week with an additional 3 hours a week in the reactor lab itself. It will take some work, but, as Cashwell sternly states, "We just can't have any yo-yo operating them [nuclear reactors]. Homer wouldn't make it through the course ... Homer does not seem to tolerate following procedures."



Source: Bill Ketterhagen

Senior reactor operator, Andrew Smolinski sits at the the controls of the nuclear reactor in the Mechanical Engr. building.

Homer clearly demonstrates his lack of knowledge regarding emergency procedures when the emergency alarms go off a second time at the power plant. In a panic, he closes his eyes and mutters "eenie, meenie, miney, mo" and luckily pushes the correct button to save the town a second time. Thanks, in part, to Cashwell's NEEP 234 class, the residents of Madison are in much safer hands than the poor people of Springfield.

Author Bio: Jeannine Washkuhn is a 2nd-year junior (a.k.a. 1st year senior) majoring in Industrial Engineering and having fun. She hopes to earn a degree in the former sometime soon and is an expert at the latter.

IEEE
Institute of Electrical and Electronics Engineers

The Institute of Electrical and Electronics Engineers (IEEE) is a group of more than 300,000 professional and student electrical/computer engineers from more than 150 countries. It is the best source of electrotechnology publications in the world and accounts for more than 30 percent of the total publications.

At the local level, we are an organization of about 200 members. We have at least one plant tour a semester and regular meetings once a month. During the meetings, we have companies or distinguished speakers do presentations for our group. We also have social activities such as a barbecue and volleyball.

Website:
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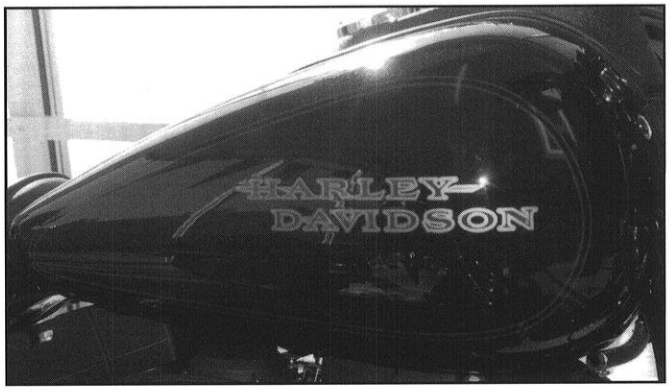
Riding on the History of a Hog



Source: Ari Nissim

By Erica Brewer

Elvis Presley had one. A true bad boy rides one. Your mom told you to stay away from them.

As of 1995, over 100,000 people ignored their moms and bought a Harley-Davidson motorcycle. For the year 2000, Harley-Davidson motorcycles hopes 198,500 more people will put aside Mom's wishes and purchase a famous "Hog." How could they do that to Mom?

The mechanical design of the bikes is one reason. The V-twin engine and trademark rumbling sound of a Harley make them the ride of choice for many. With 24 models to choose from, all with different mechanical designs, Mom just might want one for herself.

In Milwaukee, Wisconsin, four men designed the first model of a Harley-Davidson motorcycle in 1901: William Harley and Arther, Walter and William Davidson. The men redesigned the frame of a standard bicycle and constructed an engine more suitable for the new frame.

In 1903, three motorcycles were built this way, but William Harley wanted to learn more about automotive engineering. He left Milwaukee to study at the University of Wisconsin-Madison in the School of Engineering. To pay for his education, he waited on tables and did drafting for a local plant. He also continued to develop designs for Harley-Davidson motorcycles. He specialized in internal combustion engines and developed a major component for Harley-Davidson motorcycles, the bottom link fork, which became part of all the 1907 models of motorcycles and was known as the best in its day.

From there, the new business of Harley-Davidson motorcycles expanded. In less than fifteen years in the motorcycle business, the men who founded Harley-Davidson had become known as one of the world's leaders in motorcycle manufacturing. This was attributed to the V-twin engine that owners of the present day have grown to love.

Harley-Davidson wanted to increase the engine size of their motorcycle, so they decided to add an extra cylinder. Adding the extra cylinder meant a new engine design for the motorcycles. Before 1912, Harley-Davidson motorcycles used an engine with an inlet valve and a light spring, pushed by the pressure of the falling piston. It was a simple engine design, but it did not make the motorcycles go fast. With the V-Twin engines, a crankshaft and case were used to join two single engines. The new design also added a mechanical exhaust valve so engine revolutions could be increased, making the motorcycles go faster.

The V-twin engine and trademark rumbling sound of a Harley make them the ride of choice for many

Source: Renee Weinberger

A Harley-Davidson motorcycle has stood as a model of excellent mechanical design and engineering since the first one was designed in Milwaukee, Wisconsin in 1901.

Today, the V-Twin engine has evolved into the Twin-Cam 88. The engine has more torque than other Harley engines and has the traditional 45° angle overhead valve layout. It was designed with the world's best computer-aided technology. Before introducing the new engine, Harley ran 2.5 million test miles. It would not be a Harley engine without the rumble, but the Twin-Cam 88 is quieter mechanically despite the 85-ft-lb. torque the engine creates. The Environmental Protection Agency limits the amount of noise a bike can make, but Harley-Davidson found a way to make the engine more powerful and stifle the loud rumbling of the bike.

For the power within the engine, engineers used a free-flowing exhaust, but compen-

sated the mechanical noise of this system by installing quieter chain driven camshafts, stiffer crankcases and a new design of the engine covers. Harley engineers also considered emissions efficiency with the Twin-Cam 88 and reworked the exhaust and intake ports and valves.

Engines are not the only components of design within Harley-Davidson motorcycles.

Harleys have style, unmistakable sound and a strong history of mechanical design and engineering

There are four main lines of Harley-Davidson motorcycles that include six different models. The Dyna has a low riding posture and features a smooth ride. The Sportster has a narrow frame and lots of power. The Softail is a classic body design that has a lot of potential to customize it. The other line of Harley-Davidson motorcycles is the Touring, which also has a classic style, but is built for riding a long distance.

Source: Ari Nissim

A closer look at Harley-Davidson's trademark engine design.

Harley-Davidsons have become a part of world history; from being used by allied forces in World War II, to being the motorcycle Elvis Presley owned or the motorcycle that Arnold Schwarzenegger rode in Terminator II. Mom might even like them. Harleys have style, unmistakable sound and a strong history of mechanical design and engineering.

Author Bio: Erica Brewer is a junior majoring in Family and Consumer Journalism and Communication Arts. She is not an engineer; she only lives with one.

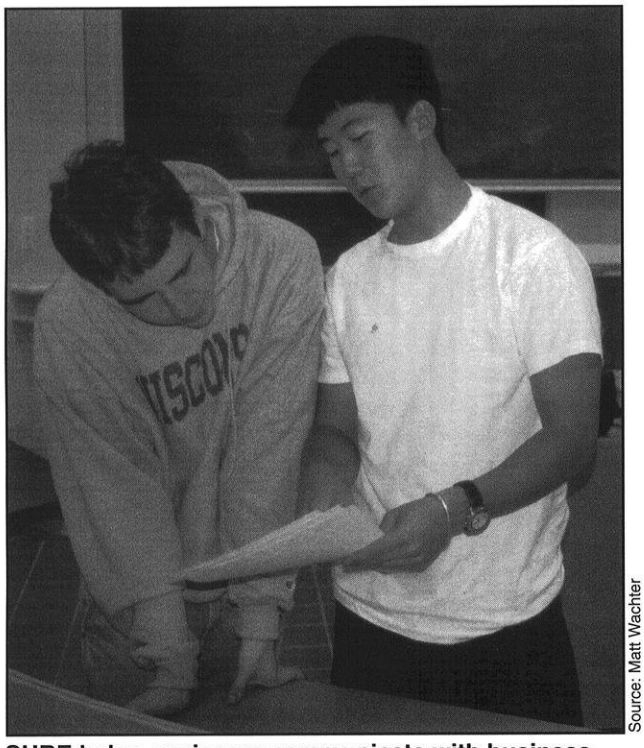
Building the Bridge Between Business and Engineering

$ $ $ $ $ $ $ $ $ S U B E 0 1 2 3 4 5 6 7 8 9

By Meena Vairavan

I have shown jokes written by engineers, intended for engineers, to friends of mine who weren't engineers. The polite ones chuckled a little bit and said, "Heh, that's pretty good," while a look of confusion still lurked in their eyes. The others turned to me, a little upset, and said, "That's not English." There is a simple reason for this-- engineers, in whichever specialized field they are in, speak in their own language. This is good, of course, since it would be tough to describe a circuit well with terms like "squiggly line" and "triangle thing." In the working world, this specialized communication can lead to difficulty.

Imagine a beehive in which the worker bees couldn't understand what the queen wanted. Or even imagine a military in which the general shrugs at his troops and says, "Go do whatever it is that you guys do, just have those enemies taken care of by tomorrow." Now, imagine a company that employs both businessmen, with their MBAs and *Wall Street Journals*, and engineers, with their years of maths and sciences. The dynamic relationship between these two is a reality for many. The frustration comes when the businessmen, trained for years in their field, attempt to convey their corporate desires to the engineers, who have been trained for years in their specialized area as well. Neither side has a full understanding of the other. Engineers, to effectively do their job, don't need to know how to run a company, and businessmen, to run a company, do not need to know how to design a circuit.



Source: Matt Wachter

SUBE helps engineers communicate with business majors.

Problems obviously pop up when businessmen need to confer with engineers to make company decisions. There is a communication gap. To help bridge this gap, one or both parties need to have at least a basic understanding of the other side.

The relationship between engineering and business is the focal point of a University of Wisconsin-Madison student organization called Students Uniting Business and Engineering (SUBE). The four founding members of this group met at UW-Madison's 1997 Leadershape Conference. Of these four students, two were mechanical engineering majors and two were business majors. They had all been on co-ops and had observed that in the working world, their fields intermingled. They figured that college, which was supposed to prepare one for this new environment, should more accurately reflect what was happening. As a result of their experiences and observations, they formed a new student organization to generate a reason for engineering and business students to meet.

Since its formation in 1997, SUBE has been exploring the relationship between the engineering world and business world through various activities. Two of their major activities are SUBE consulting, and the "Meet Your Future" event. The latter is a congregation of professionals that students can talk to to gain a clearer understanding of the current status of engineering, business and their interaction. It is held every other year, opposite to UW-Madison's Engineering Expo event.

Engineers, to effectively do their job, don't need to know how to run a company, and businessmen, to run a company, do not need to know how to design a circuit

SUBE consulting is a service that members of SUBE provide mostly to small, local businesses. Their primary customers are small businesses who lack the personnel, time, money or skill to adequately keep the technology-based business aspect of their company up to date. SUBE consulting provides a low-cost service that helps both the business and the student, and also exemplifies one of SUBE's main goals—to promote and increase the awareness of the interaction of engineering and business. Members who participate also gain valuable real-world experience.

I had the opportunity to talk to Leon Bauman, co-founder of SUBE. He currently works as an account manager at a Milwaukee-based company. He found that SUBE was helpful for him because it introduced him to business. He initially was a mechanical engineer but transitioned when he became more familiar with the business side

of things through interaction with other SUBE members. I asked him how a student could integrate business into his or her engineering degree. He responded that it would be wise for an undergraduate engineer to get a business certificate, work for a couple of years and then, if needed, return to school and pursue their MBA.

If you are interested in SUBE and want more information, visit their web site at *http://www.cae.wisc.edu/~SUBE* or contact the organization at *SUBE@cae.wisc.edu*.

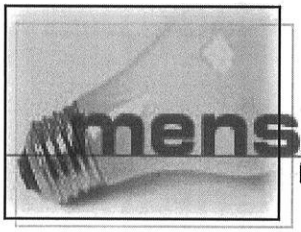
Engineering students here at UW-Madison have a couple options if they wish to expand upon their engineering degrees. One of these options is a certificate in business. A certificate in business is for students who wish to incorporate knowledge of business through a variety of courses into their preexisting degree without either double majoring or going into a MBA. For more information, go to *http://wiscinfo.doit.wisc.edu/business/certificateBus.htm*.

Another option for engineering students is a master's degree, either a Master of Business Administration (MBA) or, more specialized, a Master of Science in Business (MS) degree. The MS degree is subdivided into a number of different programs, which students can choose from to fit their desires. One of these is a half-business, half-engineering graduate program called Manufacturing and Technology Management. Information about both the MBA and the MS can be found at *http://wiscinfo.doit.wisc.edu/bschool/program/mba.htm*.

The interaction between business and engineering is important in the real world and also here at UW-Madison. Student organizations such as SUBE help students understand the current job market and what they can do to better prepare themselves for it. No matter what students wish to accomplish during college, the university has the courses, programs and organizations designed to help them reach their goals.

Author Bio: Meena Vairavan is a senior majoring in Electrical and Computer Engineering.

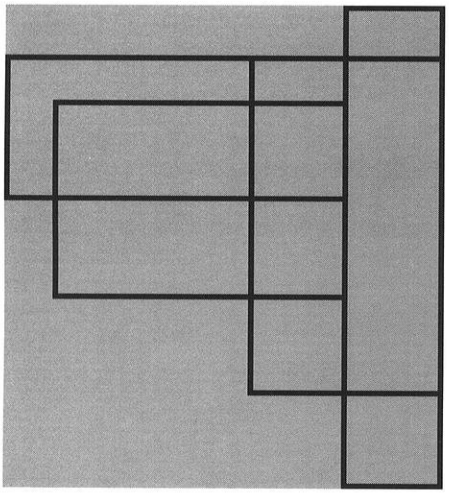
Just One More



So you think you're pretty smart, huh?

Well, when's the last time you checked out Mensa? In 1946, a couple of British guys had the idea of forming a society for "bright" people. With their idea of bright being an IQ in the top 2%, they started Mensa. Today, Mensa opens its membership to people of a wide variety of backgrounds who like to participate in varying cultural and social activities. Occasionally, these smarty pants' like to flex their mental muscles with a few brain-teasers. Below are some examples of questions found on the Mensa website for you to try out. If you successfully answer all of the questions below don't think you're one of the biggest and brightest because these are the easy ones...remember 98% of you aren't good enough for the Mensa folks.

1.) How many four sided figures are in this diagram?



a.) 10 b.) 16 c.) 25 d.) 28

2.) Which of the following proverbs is closest in meaning to the saying, "Birds of a feather flock together."?

a.) "One swallow doesn't make a summer."
b.) "A bird in the hand is worth two in the bush."
c.) "A man is known by the company he keeps."
d.) "Fine feathers make fine birds."
e.) "Don't judge a book by its cover."

3.) Following the pattern shown in the number sequence below, what is the missing number?

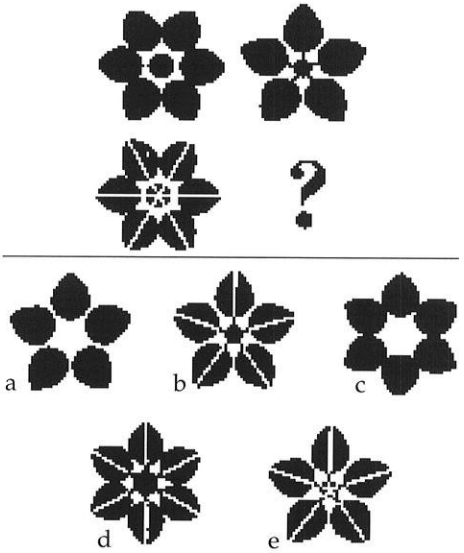
1 8 27 ? 125 216

a.) 36 b.) 45 c.) 46 d.) 64 e.) 99

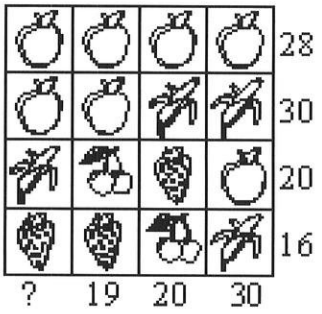
4.) Sally likes 225 but not 224; she likes 900 but not 800; she likes 144 but not 145. Which does she like?

a.) 1600 b.) 1700

5.) Which of the figures below the line best completes the series?



6.)Look at the drawing. The numbers alongside each column and row are the total of the values of the symbols within each column and row. What should replace the question mark?



a,) 23 b.) 25 c.) 28 d.)30 e.) 32

7.) Which letter comes next in the series?
B A C B D C E D F?

C D E F G

8.) The same three-letter word can be placed in front of the following words to make a new word; what is the word?

LIGHT BREAK TIME

"Is that your final answer?"

1.) 25
2.) c
3.) 64. Each number is the cube of the sequence 1, 2, 3, 4, 5, 6.
4.) 1600. Sally likes perfect squares
5.) e. The first column has six 'petals,' while the second has five. The first row is solid. The second row has lines going from 'petals' to the center.
6.) 25. Apples are worth 7, bananas are worth 8, strawberries are worth 3 and cherries are worth 2.
7.) E. Alternate letters increase by one.
8.) DAY. DAYlight, DAYbreak, DAYtime.

Source: http://www.mensa.org

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