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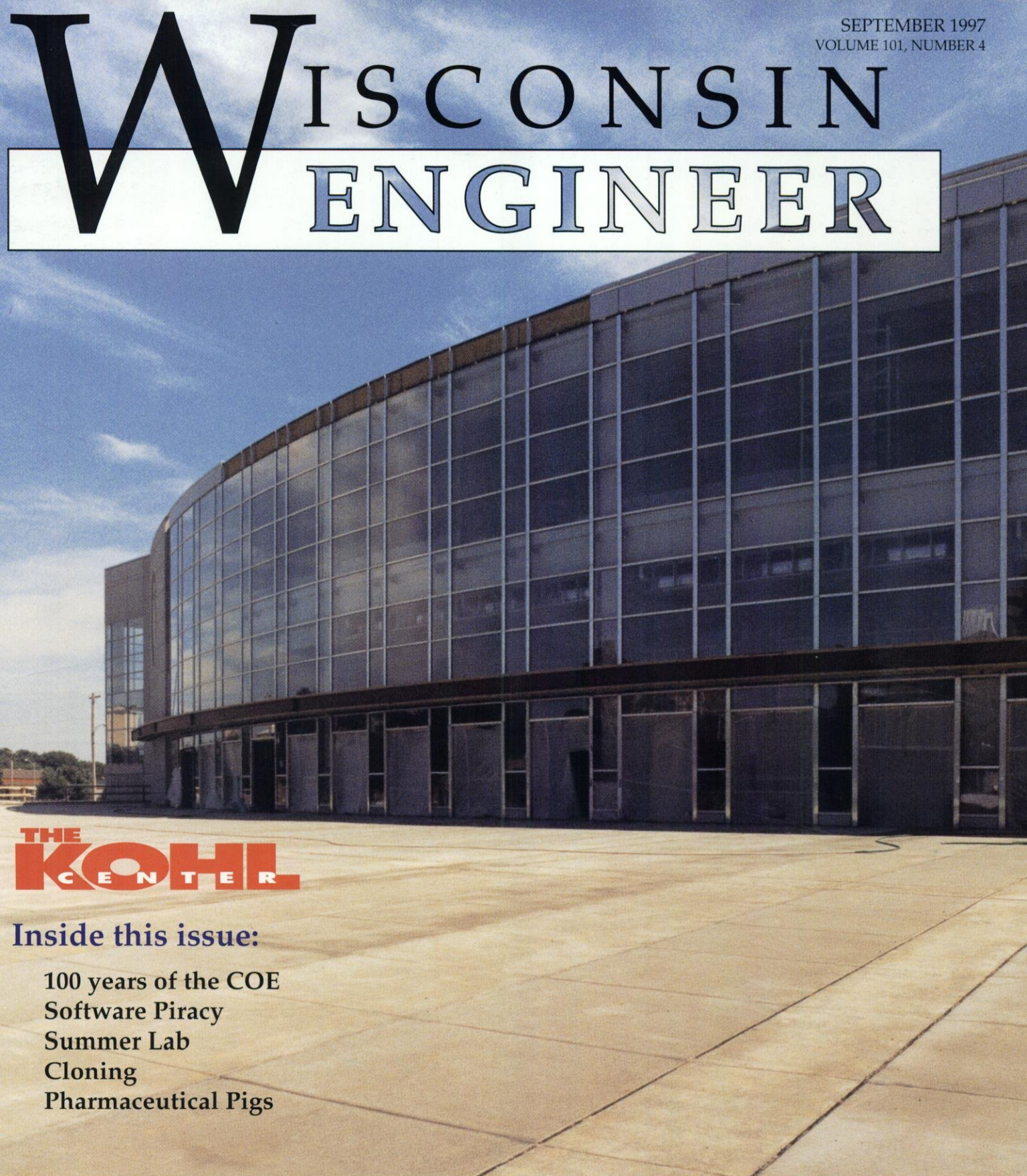
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SEPTEMBER 1997
VOLUME 101, NUMBER 4



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Summer Lab
Cloning
Pharmaceutical Pigs

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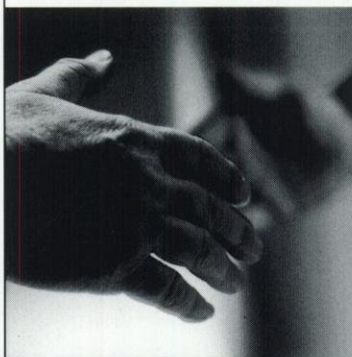
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WISCONSIN ENGINEER

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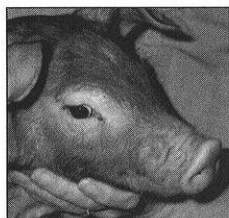


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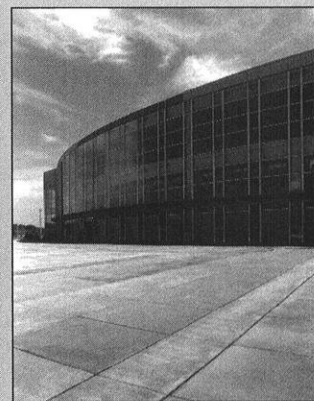
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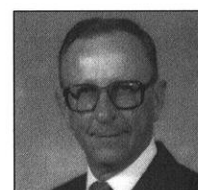
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Make Opportunity Knock

Why are we here? Why did you decide to attend the University of Wisconsin? Ultimately your goal is to get a great paying job you love. What are you doing to obtain that goal?

I spent this summer living in Arlington Heights, Illinois. I commuted each weekday to Aurora, Illinois, where I had a summer internship with Caterpillar, Inc. How I ended up at Caterpillar is an unusual story. I did not interview for my internship. I found out I had the job nine days before I started working there. I got my internship by being in the right place at the right time. I attended a meeting where I was to talk about the *Wisconsin Engineer* magazine, and I met a representative of Caterpillar who tossed out the idea of a possible internship. I followed up on the idea and had a challenging and rewarding internship this summer.

My point is that you never know when or where an opportunity will present itself. As we struggle through our classes, we all keep our long term goals in the back of our minds. Many resources that help us gain our goals are available to us at the College of Engineering. Engineering Career Services is the most prominent resource and the most logical source for obtaining an internship, co-op or permanent job. Other resources are the numerous student organizations. Being involved in these organizations introduce you to companies and workshops that help you understand what it takes to be successful.

The best resource I have found is attending conferences. Most conferences associated with engineering are similar to our Career Connections. Companies attend these conferences to speak on issues they deal with or such issues as improving your resume and interviewing skills. Take advantage of the "tutoring" conferences can offer you.

The staff of the *Wisconsin Engineer* is hosting the Engineering College Magazine Associated (ECMA) 1998 National Conference. We want representatives from companies and technical magazines to do workshops at the ECMA Conference so we can see how to improve what we do and how the skills we have relate to the business world.

In between the stresses of classes, I hope you have the chance to get involved with extra-curricular activities. Our education is not just what we learn in class.

Jennifer Schultz



The College of Engineering
University of Wisconsin-Madison

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The Way We Were: The College of Engineering

By Jim Feldman

One hundred years ago, the College of Engineering had been recently reorganized and comprised a total of 217 students. Neither the Regents nor the State took the College very seriously. The Regents had not appointed a dean, and the State had balked for years at providing decent quarters for the Engineers. This lack of support ended as a result of two events during the worst cold snap of the 1890s. The first was the arrival of Professor J. B. Johnson as the new dean of the College of Engineering. The second was the discovery by engineering Professor D. C. Jackson of a way to thaw the city's frozen water mains without the expense of digging up the streets.

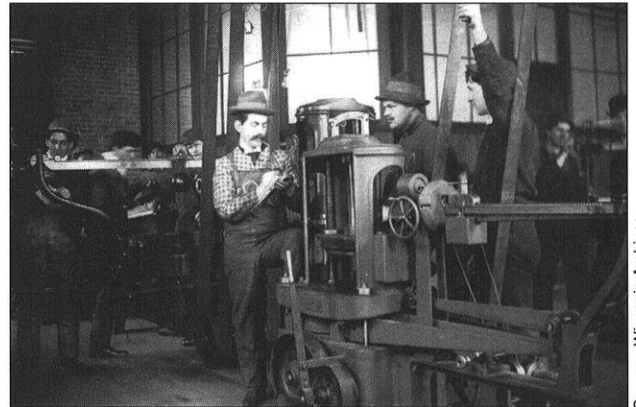
In the winter of 1899, the temperature in Madison stayed below zero for more than four weeks. By mid February, most water supply lines to Madison homes were frozen, although the more deeply buried supply mains stayed open. Professor Jackson, with the help of graduate assistant R. W. Woods, experimented with connecting a generator between a house's water meter and the street hydrant nearest the house and then routing current through the frozen pipe. Jackson's first attempt, at the Langdon Street home of a Madison alderman, produced a cleared pipe in ten minutes. Aware of the attempts of the University to convince the State legislature to take the College of Engineering seriously, Jackson began to take his generator on a round of visits to the homes of the governor and numerous legislators. He thawed

their pipes, courtesy of the College of Engineering.

The Wisconsin State Journal compared Jackson's feat with the world famous Babcock milk test which made possible the easy and accurate measurement of the butterfat content in milk. Babcock's test had greatly enhanced the prestige of the College of Agriculture in the eyes of Wisconsin's dairy industry.

Within weeks after Jackson had thawed the pipes, the legislature voted to fund a new building for the College of Engineering. Funds for this building had first been requested six years earlier. The main impetus for the appropriation was probably the result of the arrival and lobbying powers of Dean Johnson, but Jackson's demonstration certainly helped. University President C. K. Adams recognized the fact that this would be good publicity and distributed a printed circular describing Jackson's method. R. W. Woods was later a faculty member and became known as Wizard Woods.

The engineering student body of that day was noticeably different then from today's mixture of students from around the world. In 1897, the registrar's records show that of the 1,544 students enrolled during the previous four years, 7 percent were self-supporting, 22 percent were sons of farmers and dairymen, 33 percent were sons of merchants, 6 percent were sons of railroad employees and the remainder where of mixed occupations. Oddly enough, 12 percent reported that their fathers were deceased. All were Wisconsin residents. The regents interpret this information by saying, "Nothing could more clearly show the perfectly democratic nature of our institution than the



Early engineering students working in the early College of Engineering facilities.

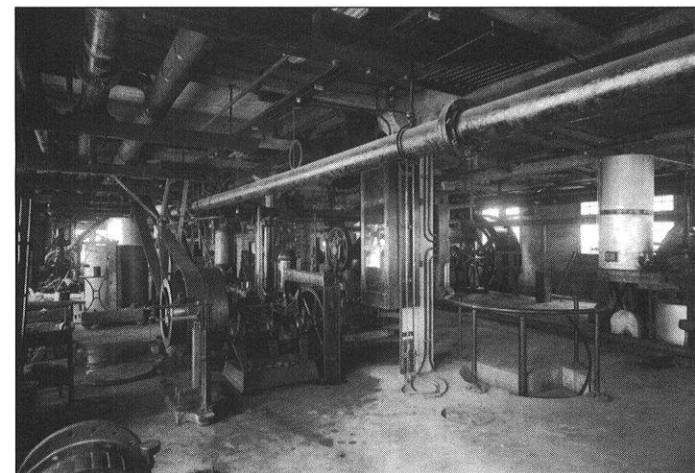
results of this investigation." The first U. S. non-Wisconsin student (from Illinois) graduated in 1900. The first foreign student was from Germany and graduated in 1906.

It was pretty democratic in that faraway day when all students came from Wisconsin immigrant stock. Since there were no restrictions against women students enrolling in the College of Engineering, it must be assumed that, because of preference or social pressure, no women wished to become engineers. There were about 600 women in the

In 1897, the entire College of Engineering was housed in Science Hall and the old Machine Shops building, located where Helen C. White Hall now stands

University as a whole in 1896, but they were almost entirely in the College of Letters and Science. The first known women engineering students enrolled around 1910. The first recorded woman to graduate with an engineering degree did so in 1914. Engineering did not see women students in quantity until WWI. The fearsome dropout rate seen in engineering applied to women as well as men. There is no record of any of the students in the Girls' Mechanics Club of 1915 ever graduating.

The common view of engineering students a century ago seems disconcertingly like the image of them now. Other students considered the engineers "grinds". They



The interior of the old Machine Shops Building.

also began to readmit students who appealed their academic expulsions. One student was readmitted with the requirement that he have nothing more to do with athletics. Over the years, beginning in the 1890s, the curriculum was brought more in line with the rest of the University. The image of engineering as a difficult field of study has survived more than a century.

Because engineering had not been professionalized at the time, the issue of how to staff the college and teach students was

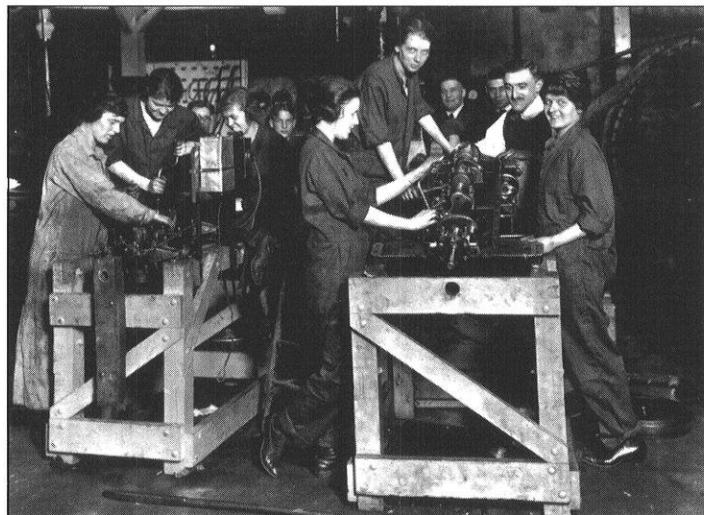
"Engineering has little in common with society"

-Dean Johnson

still an active debate in 1897. One group thought the instructors should be full time professors in the usual University sense. A second view held that the classes should be taught by visiting working specialists. The problem with using the professional system was that engineers with a degree were rare and had excellent opportunities in industry. This made them hard to hire, and once they were hired as permanent faculty, they would lose their contacts with new practices and engineering developments. Guest lecturers,

on the other hand, would be difficult to administer and would not have highly developed teaching skills. In the end, the College used a mixture of both methods, which sufficed until there was enough enrollment and support for the College to gradually eliminate the guest lecturers. In 1897, there were regular Friday afternoon lectures by visiting professionals; classes were suspended for students to attend these lectures.

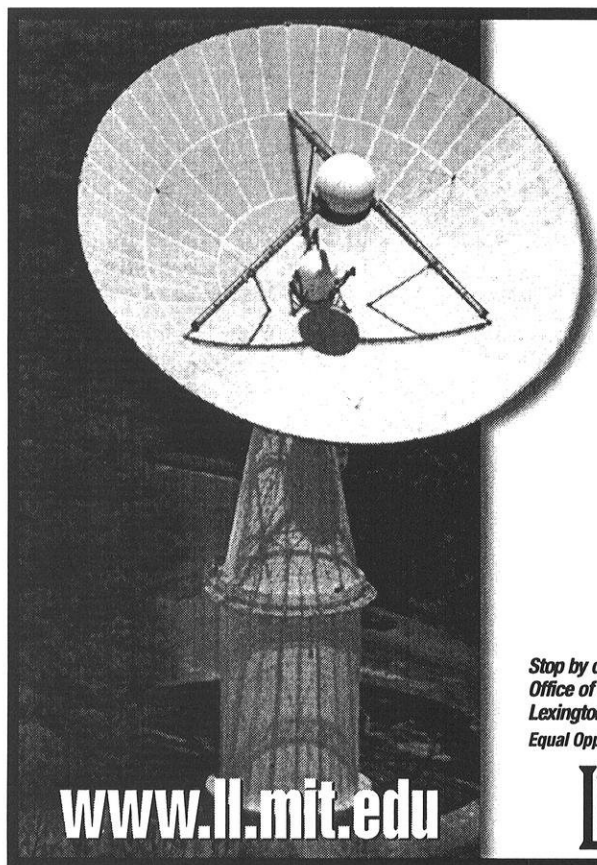
If a modern student were to be transported back one hundred years, there would be a mixture of the familiar and the unknown. One way in which the College of a hundred years ago would look very unfamiliar to the modern student is the curriculum. In 1890, the entire curriculum consisted of seven courses: civil, railway, mechanical, mining, metallurgical, electrical engineering and railroad mechanics. In years when no one enrolled in a course like metallurgical engineer-



Engineering students were very 'hands on.'

ing, the course would be dropped for that year. Gradually, the courses were subdivided as industry became more specialized. In 1892, the civil engineering course was subdivided, as was the mechanical course in 1897. Later in the 1890s, electrochemistry and hydraulics were added. Research played only a tiny part in the development of the College, and almost all instruction was aimed at preparing students to take positions in industry as soon and effectively as possible.

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Sparking Changes in Teaching Assistant Practices

By Sara Vail

Sitting in your ECE 230 class listening to your teaching assistant chatter away about the many wonders of circuitry, you recall hearing some of your friends complain about the inadequacies of some of their teaching assistants (TAs). You must be very lucky because all the electrical and computer engineering (ECE) TAs have been incredibly resourceful. But then you remember back to Physics 201 when your TA was practically afraid of his own shadow.

People often wonder, "Where do our TAs come from? Why are they TAs? What requirements does UW-Madison have for the TAs?" Well, our TAs come from all over the world. TAs are graduate students here at UW-Madison. Some of them were lured to our campus by the promise of a job as a TA; while others were pulled here by the prestige of their focused graduate program alone. TAs are human beings and have many of the same considerations that we have as undergraduates. For example, they have to consider quality of education, prestige of the college and program, location, family, job recruiting and cost of education.

Why do TAs decide to become our guides through perilous curricula? Sadly, some are in it for the money and some for the glamor-

ous title, but there is hope for us as undergraduates. Hope is found in those individuals who show us it is possible for human beings, not only super-human professors, to understand circuits, physics, statistics and calculus. These are our TAs. They have social lives and can still break this complex information into our language, which is something that professors sometimes seem unable to do.

Once chemistry is presented in the undergraduate college student ideology, "The chemistry of making beer..." suddenly, 24 lights go on in the discussion section, and our interest is captured. "Wow, this stuff really does have a practical application!" This is why the successful TAs teach. They do it to witness this sudden interest and understanding on our parts, to know that their presentation of these ideas helped make them less abstract and alien for us.

TAs can bring us a step closer to achieving our goals and dreams. Each class we do well in brings us that much closer to earning our degree. TAs teach because they want to see results and see people benefit from their hard-earned knowledge. Teaching is also beneficial for them personally. It increases communication and presentation skills. Teaching has the potential to increase confidence and shows an ability to manipulate information so that every student understands the material.

Now to answer the question that has great potential to create controversy, "What requirements does UW-Madison have for its TAs?" First of all, each department is individually responsible for monitoring the productivity of their TAs. UW-Madison has guidelines as does each college. Within the College of Engineering (COE),

each discipline has its own set of guidelines and is ultimately responsible for enforcing them.

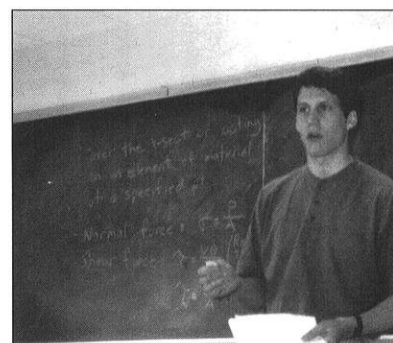
I was directed by an anonymous faculty member to the electrical engineering department as an example of a discipline that has done a great job with their TA program. The woman in charge of the upkeep and remodeling of this program is Donna Lewis. She has been working on reconstructing the way TAs are hired, trained and maintained over the past seven years and has made incredible progress.

New TAs must fill out an application, have their academic files checked, have any additional available information files checked and references are called. The department looks at undergraduate and graduate grade point averages, institutions attended and graduate school entrance exam scores. Additional test scores are evaluated for international applicants. Preference is given to ECE majors so that people who have certain specialties can be matched up with courses that focus on that area. Tutoring experience is favorable, and letters of recommendation are also accepted and reviewed.

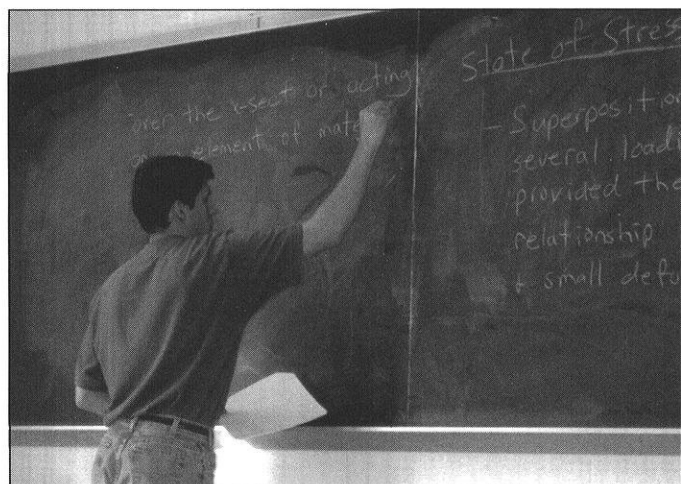
If a TA wants to continue into the following semester, he or she must re-apply. Faculty and student evaluations are examined, course load is reviewed and his or her GPA is looked at to see if it has remained constant or increased. This is to make sure that the graduate student is moving forward successfully in his or her curriculum, in addition to performing well in the job.

The faculty and student evaluation process is enforced by each department individually. The ECE department is proud to say that they have 98 to 100 percent of their evaluations filled out and returned to be used to evaluate the performance of the TAs. There is one mandatory evaluation each semester, the results of which are put on the TA's permanent record, but the TAs are encouraged to hand out additional evaluations for their eyes only. The mandatory one is the only one

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Source: Heather Bohrer



Source: Heather Bohrer

Peter Onesti is one of many teaching assistants in the UW-Madison College of Engineering.

Engineering Ethics According to Professor C. Allen Wortley

By Dean Nardelli

In a time in which the morality of individuals seems to be tested constantly, it is comforting to know there are intelligent, revered people willing to guide us in the right direction. One such person is Professor C. Allen Wortley, a civil engineer with a particular interest in construction. He began his career as a design consultant of sewers, bridges and roads. A member of the Department of Engineering Professional Development (EPD), Wortley has been a professor at the University of Wisconsin-Madison for the past 22 years. He is a valuable resource on ethics in the engineering profession. Wortley's interest in engineering ethics started almost 40 years ago, around the time he graduated from college.

All the exams were take-home exams with no proctors, and they would either be labeled open-book or closed-book

When Wortley speaks about his educational background he does so with a calm, suppressed pride. His modesty destroys the boasting and excessive enthusiasm to which he is certainly entitled. In the 1950s, he completed his undergraduate studies in engineering at Antioch, a predominately liberal arts school in Ohio. He received a scholarship as a graduate student to attend the California Institute of Technology in Pasadena. As recently as eleven years ago, Wortley finished a post-baccalaureate degree followed by a professional development degree from the University of Wisconsin in the study of soil mechanics and ice engineering.

Wortley eagerly recalls his days at Antioch. He notes that, in the 1950s, the institution had several distinguishing characteristics. Antioch was a completely co-op college, which provided students the opportunity to gain experience in the workplace while being enrolled in the school. A very liberal school, Antioch was the target of attacks by Senator Joseph McCarthy and the House Un-

American Activities Committee as a "hotbed of radical ideas."

The school was run entirely on an honors system, unlike nearly every other college in the nation. Wortley said, "Everything was on your own. You would walk through the lines, put your meal tickets in the box and no one would bother to pick them up. All the exams were take-home exams with no proctors, and they would either be labeled open-book or closed-book. There were not any dorm hours. You didn't have to be in at any certain time. You were on your own." He also notes that the students were trustworthy; therefore, the system worked. The success of this system may have sparked his interest in ethics.

Wortley has been active as a practicing engineer and as a member of the National Society of Professional Engineers. His interest is not ethics in a philosophical point-of-view; he views ethics and professional practice together. He believes in teaching a practicing engineer the importance of conforming to a set of standards or a code of ethics. Wortley states that if one believes in quality professional engineering practice, there should be an, "...interest in educating people in the area of ethics."

Wortley does believe in practicing quality engineering, so it should be no surprise that he is asked to lecture to several classes regarding ethics in the workplace. He is a guest lecturer for the Contemporary Issues in the Engineering Profession course (EPD 101) and the fresh-



Source: Engineering Publications

man-oriented Introduction to Engineering course (EPD 160). He also speaks for CEE 491 (Legal Aspects of Engineering), which is related to engineering and professional practice. Wortley is helping to develop a three-credit course on ethics geared toward, but not exclusively for, civil engineers. He is happy to note that the Accreditation Board for Engineering and Technology (ABET) has developed new criteria to ensure that students who graduate from engineering programs have some understanding of ethics.

Wortley knows that everyone has been exposed to a lecture from a parent, teacher or superior regarding doing what is morally correct. Therefore, he does not tell his stu-

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dents what to do. He often presents them with a hypothetical situation and tells them to do the right thing. Thus, the responsibility of forming ethical judgments lies with the students. He believes that there is too much teaching going on and, "...not enough causing learning to take place."

He often shows his classes films containing realistic situations in which an ethical decision must be made. Many times the scene will end before the actor makes a choice, forcing the student to assume that role and make his or her own choice. He says that improvements in learning can be made. For example, he believes creating more co-ops would expose students to real work situations and thus teach them a great deal more than merely sitting in a lecture hall.

As for the time students are in the classroom, "The best of all worlds would be to have the students in smaller groups and actually having a dialogue with a professor — arguing with a professor — and asking them, 'Why is something this way and not that way?' That would be where the most learning occurs."

However, this is not currently the format being employed by the University. What does Professor Wortley want the students to

learn from him in their short time in his class? "I use what little time I have to basically tell the students that they do have to behave in an ethical manner, either by state law or by a code of ethics of a society. They have to start thinking about it right now if they are going to have a satisfactory adult professional life."

With this philosophy, Wortley measures success with good ethical behavior. "One measure I would make is how respected you are, not only for your brilliant designs, but as a person. People that get awards and recognition typically have built a career that is exemplary. They are downright good people, and they are recognized for being helpful and honest. When they write papers, people know that their data is accurate. It's all part of an overall behavioral mix. To me, that is in part a measure of what sort of person you are, which goes back to how ethical you are," Wortley said. Wortley knows there are people who achieve success through unscrupulous means, but he believes that is not the model of success.

Professor Wortley is a popular educator at UW-Madison. His manner of presenting interesting material keeps his audience paying attention and participating. Wortley will always ask his students for their opinions,



and he listens to them all. His relaxed and conversational style does not intimidate nor does it make him an ineffective professor. He prefers to be down-to-earth and reasonable in his role as a teacher. He acknowledges that along with the immense collection of knowledge displayed by the educators of prominent institutions, come immense egos and a great sense of self-importance. He is not the type of professor who, in Wortley's view, "...is so impressive in their background that they choose to be rather unfriendly, and

continued on page 9

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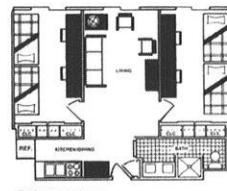
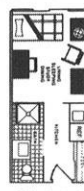
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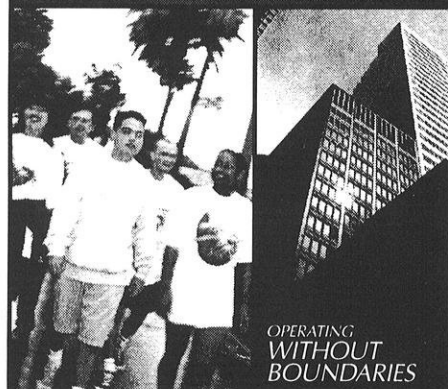
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***Wisconsin Engineer* wins “Best All-Round Magazine” at 1997 ECMA National Conference**

The 1997 Engineering College Magazine Associated National (ECMA) Conference was hosted by Virginia Tech in Blacksburg, Virginia, from April 17-19. For the staff of the *Wisconsin Engineer*, this conference turned out to be a gold mine of information and awards.

ECMA exists for the sole purpose of aiding college engineering magazines. It was established in 1920 with the intent to have a national advertiser help the magazines better maintain good advertising relationships. Since that time the organization has switched its purpose to helping college magazines communicate better and have great team relations to produce a quality publication.

The staff of the *Wisconsin Engineer* would like to thank Polygon, ASM and the College of Engineering for making it possible to attend this conference.

WE won a total of seven awards, three of which were first place awards.

Best All-Around Magazine- First Place

Best Layout-All Issues- First Place

Most Entertaining Feature- First Place

Most Improved Magazine- Second Place

Best Cover- All Issues- Third Place

Best Single Issue- Honorable Mention

Best Layout- Single Issue- Honorable Mention

Best Article for General Science Background- Honorable Mention

Wortley

when they communicate information people just sit there in awe and take it all in." When asked to describe his style, Wortley modestly says, "I don't really consider myself doing anything extraordinary."

This comment is typical of C. Allen Wortley, a modest yet valuable resource to UW-Madi-

son. A man licensed to teach people to improve the quality of their work by improving their character is a man that deserves to be held in high regard. In his work, C. Allen Wortley epitomizes outstanding moral character, truly ensuring a stream of trustworthy engineers year after year.

Author Bio: Dean Nardelli is a sophomore who is planning on majoring in civil engineering and English.

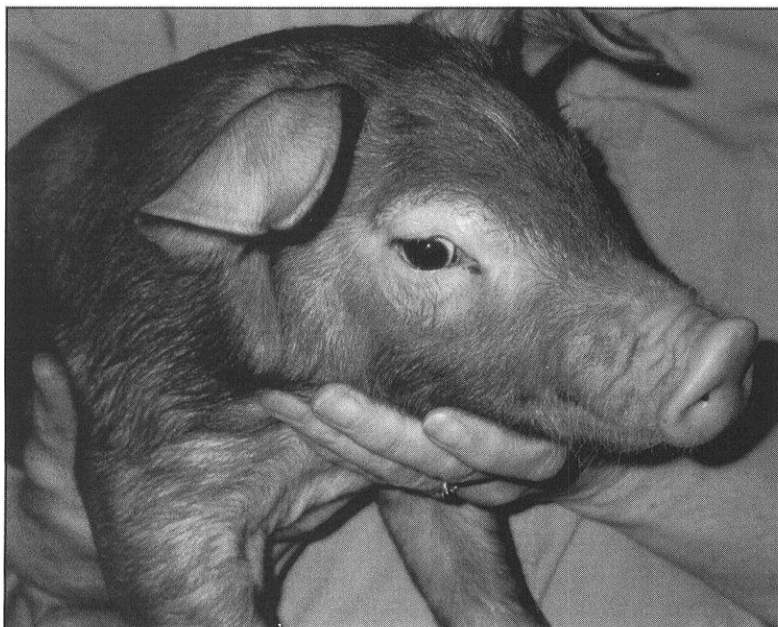
Pig Parts: The Inside Scoop

By Roger F. Bindl

Frog eggs, cow brains, hog intestines may sound like ingredients of witches brew, but they're actually sources of natural pharmaceuticals. These animal organs are used in the fight against cancer, multiple sclerosis and blood clots.

The National Pork Producers Council lists nearly 40 hog organs including pancreas, brain, ovaries, placenta, thyroid, and spleen which are used for pharmaceutical extracts. While this article focuses on pigs, there are many other plant and animal organ resources. Natural plant extracts can be found in unusual species. Taxol, a cancer treatment drug, comes from the needles of the Pacific Yew, an endangered plant. Another evergreen is now used because of the Yews' endangered status.

Patrick Shaklee, Ph.D. discussed the Pacific Yew and hogs in an interview on natural pharmaceuticals. Shaklee is a Senior Research Scientist at Scientific Protein Labs (SPL). He explained how animal parts are a rich source of natural pharmaceuticals. "We are using parts that would otherwise go to waste," noted Shaklee. SPL's primary sources of extracts are pig pancreas and mucosa, which is the lining from the small intestine of pigs. "We use all of the parts but the squeal." Nothing goes to waste.



Source: Heather Bohrer

Amazingly enough this pig is a walking drug store.

Scientific Protein Labs (SPL)

SPL was started in the early 70s by Oscar Mayer Food Corporation. They're currently owned by American Home Products, employ about 100 people and produce bulk products for pharmaceuticals. These bulk products require FDA approval. The full process can take up to ten years before a final product gets to market.

Some products they are working on include a bovine brain extract which will be used for multiple sclerosis (MS); an extract from chicken egg yolks to be used as an anti-infectant; and an extract from frog eggs for an anti-cancer treatment.

Treatment For Cystic Fibrosis (CF)

CF is a condition where the duct between the pancreas and stomach is blocked. Without enzymes, food is not digested properly. CF patients suffer from under-nourishment, thus the need for pancreatic enzymes.

Pancreatic enzymes are extracted from hog pancreas, and used in the treatment of cystic fibrosis. First, chemists like Shaklee experiment with methods to extract and purify the pancreatic enzymes. They work closely with engineers who will take over the process afterwards.

Next chemical and structural engineers, work on production methods. The process

dealing with the hog pancreas includes grinding the pancreas, removing the fat and tissues, separating the enzymes into solution, removing the solution, reclaiming the solution and finally processing the resulting bulk enzymes.

The pancreas arrive in crates and are

shipped out as bulk enzymes. The yield is about 50 percent. Finishers or formulators refine the bulk further, then produce pills for patients. The pills help people with cystic fibrosis (CF) digest food.

An interesting extension product of pancreatic enzymes is soluble pancreatin. It's a highly filtered enzyme which is used to make contact lenses cleaner. Instead of digesting food, the enzymes digest proteins on the lens.

Frog eggs, cow brains, hog intestines may sound like ingredients of witches brew, but they're actually sources of natural pharmaceuticals

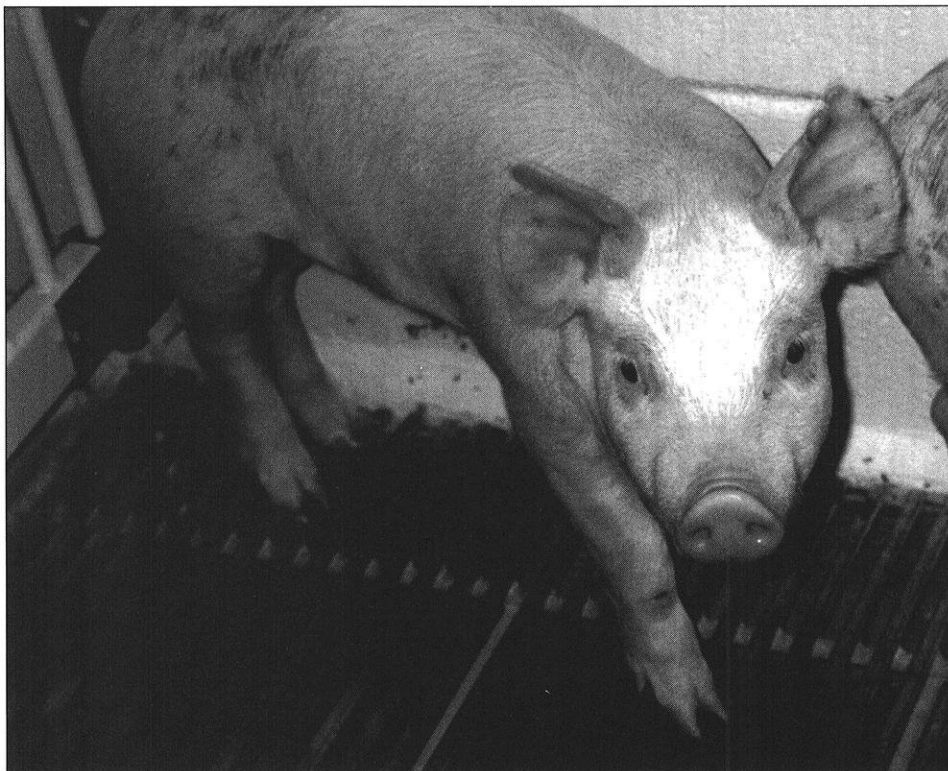
Anti-Coagulants

Anti-coagulants are agents which prevent blood clotting. One such anti-coagulant is heparin which is extracted from hog organs. It's extracted from the mucosa, or small intestine lining. Shaklee described it as, "...the pink finger-like material inside the intestine."

"Domestic hogs are highly efficient at absorbing nutrients" explained Shaklee. "Their small intestine is very long, about 20 inches." The intestines provide large amounts of mucosa. Even with these highly efficient hogs, the yield is low. Trucks arrive with 40,000 pounds of mucosa, but the yield of heparin is only five to six pounds. The main byproduct from processed mucosa is water. After processing, the water is sprayed on fields and the solids are often used to produce dog food.

Typical uses of heparin include heart bypass operations, knee and hip operations and the coating of surgical instruments. Synthetic counterparts to heparin are warfarin and coumadin. There's a contrast, however, between natural heparin and these synthetic drugs. Not only do they work in different ways but their applications are slightly different.

Heparin is administered in the hospital via injection or intravenously. It's fast-acting, has a short half-life and has an anti-dote. War-



Source: Heather Bohrer

This Madison pig could help many human ailments.

farin or coumadin are used at home in pill form. They are slower acting, have a longer half-life and don't have an anti-dote. Warfarin comes from the Wisconsin Alumni Research Foundation (WARF). It was developed at the University of Wisconsin, Madison. Check their web site www.wisc.edu/warf/ for more information about warfarin.

SPL is developing a natural alternative to Coumadin. The alternative is a low molecular weight heparin. This new heparin will have a longer half life and will be used at home via injection.

After talking with Pat Shaklee, I had a better understanding of natural drugs, but I couldn't get a song out of my head, "...greasy,

grimy gopher guts and me without a spoon." I think humorously of the song, but recognize a certain truth in it. The truth is that many people eat more bizarre ingredients than those described above. The next time you're in a health store, look at the natural vitamin ingredients list. Don't be surprised when you read raw thymus tissues or placenta as the primary ingredient.

Author Bio: Roger Bindl has an engineering background in telecommunications, a programming background with personal computers and a "taste" for vegetables.

Pig Parts

The National Pork Producers Council lists 39 drug and pharmaceutical by-products from hogs. They describe hogs as powerful medicine, and important contributors to society. Their web site is at www.nppc.org.

Here is a list of hog parts and the associated pharmaceuticals.

ADRENAL GLANDS

Corticosteroids
Cortisone
Epinephrine
Norepinephrine

BLOOD

Blood Fibrin
Fetal Pig Plasma
Plasmin

BRAIN

Cholesterol
Hypothalamus

GALL BLADDER

Chenodeoxycholic Acid

HEART

Heart Valves

INTESTINES

Enterogastrone
Heparin
Secretin

LIVER

Desiccated Liver

OVARIES

Estrogens
Progesterone
Relaxin

PANCREAS GLAND

Insulin
Glucagon
Lipase
Pancreatin
Trypsin
Chymotrypsin

SKIN

Porcine Burn Dressings
Gelatin

SPLEEN

Splenin Fluid

STOMACH

Pepsin
Mucin
Intrinsic Factor

THYROID GLAND

Thyroxin
Calcitonin
Thyroglobin

PINEAL GLAND

Melatonin

PITUITARY GLAND

ACTH-Adrenocorticotrophic
Hormone

ADH-Antidiuretic Hormone
Oxytocin
Prolactin
TSH-Thyroid Stimulating
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The *Wisconsin Engineer* was one of the founding members of ECMA and this past year we won best all-round magazine at the 1997 ECMA conference. ECMA is an organization that recognizes excellence in engineering college magazines and provides education and support for the magazine staffs. Our conference will be held on April 23 through April 26, 1998 on the University of Wisconsin-Madison campus.

The theme for the 1998 ECMA conference is

Quality and Continuity: Links to the Future.

It will provide a forum for students working on engineering magazines to learn how to produce a quality publication and how to maintain high production standards even as staff turns over from semester to semester.

The days when a student publication could be cranked out on a mimeograph machine are long gone. Readers today expect a well-written, well-designed magazine in keeping with the modern-day emphasis on quality assurance.

At the 1998 ECMA conference, we hope to offer numerous workshops to help students focus on improving all aspects of our magazines. Facilitators will lead discussions about relevant issues in writing, editing, illustration, layout and design, advertising sales and business management.

It is important to maintain the quality of the magazine once standards have been established. An important question we all must face is how to deal with continuity when the turnover among staff is so high.

These two issues-quality and continuity-are our theme for ECMA '98. They are the links to a successful future for any engineering college magazine.

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Looking Back into Time With the Hubble Telescope

By Susan Last

The Hubble telescope could be thought of as a tool for mapping out the cosmos, but it is much more. It is a tool for opening a window to the distant past. Many of us think that the Hubble is only recording beautiful pictures of the dances of the galaxies, but it is also taking pictures of what the universe looked like eons ago. We may not be able to physically go back in time, but we are able to have portions of the past come to us by using the Hubble telescope.

The Concept of Space-Time

A telescope's ability to travel through time is explained by a portion of the concept "space-time." In everyday life here on the earth, we think that light travels instantaneously from place to place. You hit a light switch, and the light travels from the lightbulb to your desk in no time at all. But this concept is valid only for short distances.

Out in the open expanse of space, light does not arrive instantaneously from one place to another. Celestial bodies out in space are so far apart that it actually takes a measurable amount of time for light to travel between them. For example, it takes eight minutes for light from the sun to get to us. Similarly, it takes four years for light to travel to us from the next closest star. Thus, this star is said to be four light-years away.

These two examples illustrate the finite velocity of light¹. On earth, we are not even aware that the speed of light is finite. The distances between objects are so short that the speed of light appears to be infinite and immeasurable. However, in space, where the distances between things are very large, the time lapse between light emitted from an object and light detected by another object is more noticeable. The speed of light was found to be approximately 186,000 miles per second. This is truly faster than a speeding bullet or anything else for that matter.

Time Traveling With the Hubble Telescope

Now that we know it takes time for light to move from point to point, we can theorize that if we were capable of seeing an incredibly large distance into space, we would be able to see back through time. And indeed we can.

With our most powerful earthbound telescopes, we can see galaxies as far as millions of light-years away. Remembering that a light-year is the distance that light travels in one year, this means that we are able to look millions of years back into time. We are now seeing those galaxies as they looked millions of years ago.

The Hubble telescope's advantage is that it is hovering 300 miles above the earth. Therefore, it doesn't have to peer through the atmospheric layer. The resolution of the Hubble is, "...ten times better than any Earth-bound telescope."² Using this clear resolution, we are now able to see the Virgo cluster of galaxies, which is about 60 million light years away.

With the Hubble, we are able to observe the nature of the cosmos at any point in the past 60 million years (or more, with its recent improvements) depending upon how far out into space the telescope is focused.

What We See Now May Not Currently Exist

We have a dilemma. We don't actually know what these galaxies look like right now. We won't know until we can physically travel to these galaxies or wait another million years for their light beams to get to us. For all we know, those galaxies may not even exist.

Next time you look up into the night sky, remember that the stars you see may be different from the stars that exist up there right now. The starlight being generated at this instant in time isn't scheduled to arrive on earth for perhaps another million years. In fact, the starlight you see right now is about a million years old.

So, if any of you eager, industrious space cadets know of a way to see the stars as they exist right now, please write to me at smlast@students.wisc.edu. I'd appreciate any help you have concerning this matter.

Author Bio: Susan Last is a fifth year senior majoring in biological systems engineering. No, she is not a Star Trek fan.

Bibliography:

Capra, Fritjof, *The Tao of Physics*, Bantam, New York, 1975.

Hubble Space Telescope website:
<http://www.stsci.edu/>

Photo Source: NASA

T. Burbee '89

The Kohl Center

by Gottlieb John Marmet

A project monumental in the making. This is not the Monona Convention center, but rather a new addition to the UW Athletic Department. Beautifully built to house basketball, hockey, and other events, the 450,000 square foot Kohl Center is engineering in practice.

Designed by H.O.K. of Kansas City and Venture Architects of Milwaukee, the Kohl Center incorporates some of the latest technology and building practices. H.O.K. is the architect of the United Center, Coors Field, and Camden Yards. The head architect was George Heinlein. Formerly with H.O.K., he is now with Heinlein Schrok Architecture. Heinlein is the designer of the Nashville Arena and the new Miami Heat facility. The general contractor, the Oscar J. Boldt company, has built the Wisconsin Timber Rattlers' Fox Cities Stadium. The Oscar J. Boldt company, with the Hammes Company, under the name of the Badger Sports Development Company will build Miller Park, in Milwaukee.

A unique end-zone seating system from Italy will be installed for the first time in the world. Called Xylox, the variable pitch risers are positioned at the far ends of the arena. The system allows for a change in seating layout between hockey and basketball. Built by the Occor firm, the system has a steep pitch or angle for hockey games, which require a larger floor space; and a shallow pitch for basketball, where the basketball floor uses less space than hockey. Running electrically, the 8' of vertical travel that Xylox will provide, can be operated by one individual. The new risers have brought the interest of many similar arenas and are likely to be installed in the new Miami Heat professional basketball arena.

The seating in the Kohl Center was given high priority. A sightline study was conducted over several months and findings were used in significant design elements. All seats are barrier free and even the railings ringing each balcony were designed so they would be less obtrusive. The railings use a flat bar as the top

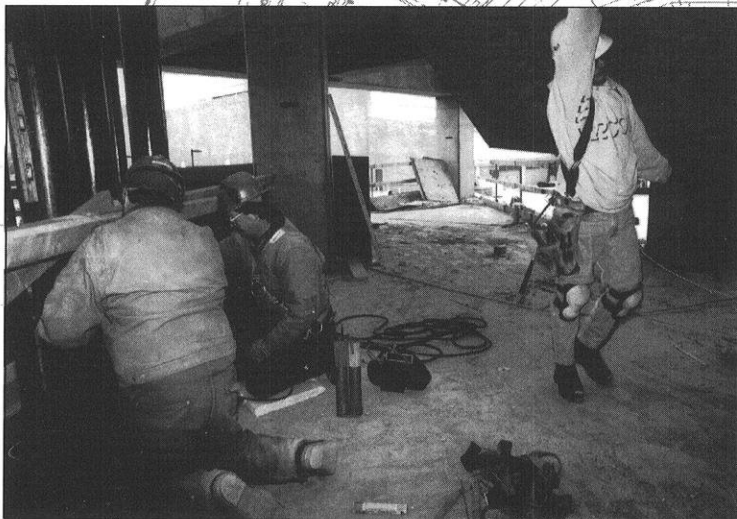
support, which is angled towards the arena floor to create a smaller obstruction in sight. The remaining bars, which fill out the railings, are small and round; again to minimize the obstructions. The Kohl Center also has exceeded the number of wheelchair accessible seating at 165, giving great views from many levels around the arena.

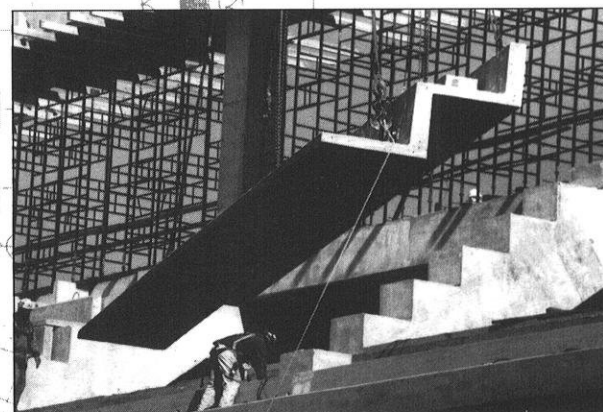
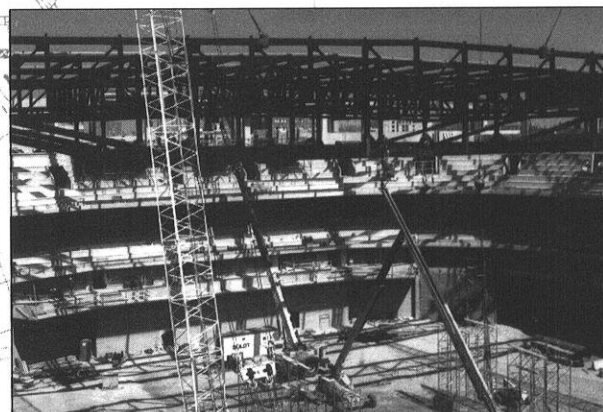
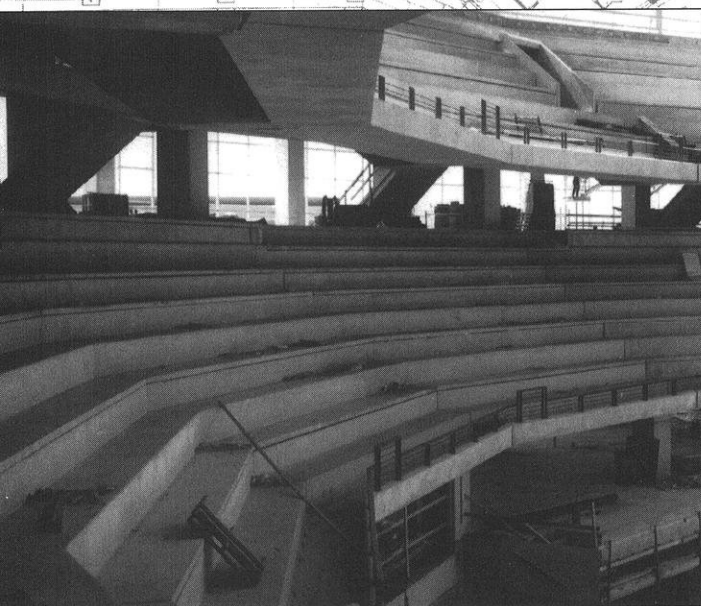
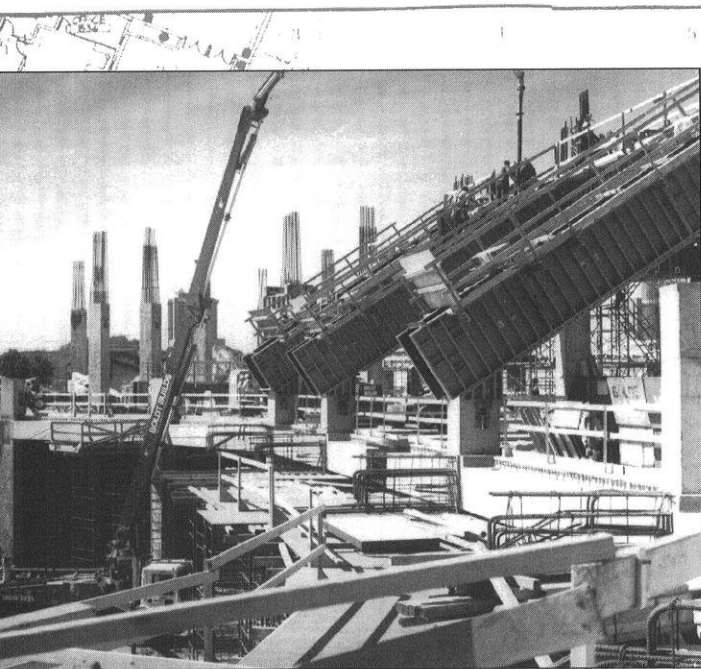
Another significant element is the overhanging second balcony. The seating sections weigh 390 tons each, hanging over 31' above the first balcony level. This was done to produce a similar environment to the old Fieldhouse. It has also placed the farthest seat from the basketball floor at 120'. The arena

will hold a total of 16,500 for basketball. The lower bowl has 7500 seats, while each balcony holds an additional 4500 seats.

Due to a modified soil analysis the Kohl Center has no piles placed in the ground. Instead the arena rests on conventional spread footings. Each footing has a 14000 psi bearing capacity. Altogether the 40,000 cubic yards of concrete in the Kohl Center could build a sidewalk from Madison to Chicago, Illinois.

The arena features a 265' wide clear span. The roof, which weighs 1200 tons, is built to support an additional 93,000 pounds, for the scoreboard. The 40,000 square feet of glass





used is enough for 166 homes. The HVAC system uses 410,000 supply fans and will run off the University Central Steam and Hot Water Plant.

The hockey floor has been installed by Cimco at a savings of 30 percent over the previous installation plan. The original plans called for the removal of the old concrete pad and installing the hockey floor at a later date. The facility will not be able to support ice in the summer since it has been designed as an eight month hockey site. It is believed that at the start of the 1998 Badger Hockey season the hockey floor will be fully utilized. The seating for hockey has not been absolutely de-

termined, but projected numbers are around 11,000.

The basketball floor was taken from the 1997 NBA All-Star game and refinished. Each floor panel is 4' by 8' and only 6 inches deep. The basketball floor will be stored underneath the lower bowl seating.

Prime benefactors of the arena include US Senator Herb Kohl, for which the building is named. Kohl's \$25 million gift is the largest private donation in University history. Former all-Big Ten basketball player Albert Nicholas and his wife Nancy Johnson Nicholas pledged \$10 million and have had the

practice gymnasium named the Nicholas-Johnson Pavilion.

The Kohl Center will open on January 17, 1998 for a Men's Basketball game versus Northwestern. When it opens, the arena will be the second largest in the Big Ten Conference.

All Photos by Greg Anderson.
Special thanks to Scott Jenkins, John Rodell, and Tony Reinder.

Author Bio: Gottlieb John Marmet is a Production Editor, Industrial Engineer student, and involved with the Engineers for Environment and Technology.

Engineering Student Organizations

Alpha Chi Sigma

<http://genchem.wisc.edu/genchem/acadres/axs/axs.html>

Alpha Chi Sigma is the professional fraternity in the chemical sciences. It is the bond between chemists, chemical engineers, life scientists, and other chemistry related fields. Members are selected from undergraduate students, graduate students and faculty members and become members for life. The Alpha Chapter at the University of Wisconsin-Madison has an active membership of about 50 men and women. Alpha Chi Sigma is strong both socially and professionally with movie nights, guest speakers, chemistry magic shows, a wine and cheese social with the faculty, parties and many other events.

Alpha Pi Mu

The official statement of purpose of Alpha Pi Mu is "to confer recognition upon the student of industrial engineering who has shown exceptional academic interests and abilities in their field." In addition, Alpha Pi Mu hopes to bring IE students together through extracurricular activities.

American Foundrymen's Society

Please consult the Materials Science and Engineering Department.

American Indian Science and Engineering Society

To provide opportunities for American Indians to pursue studies in science, engineering, business, and other academic areas. Be a catalyst for the advancement of Native Americans as they seek to become self-reliant and self-determined members of society.

American Institute of Aeronautics and Astronautics (AIAA)

<http://www.cae.wisc.edu/~aiaa>

AIAA is the nonprofit professional society serving the aerospace industry. Its members include some of the most prominent figures in aerospace today as well as in aerospace history. As a member of the UW-Madison Student Branch you will get a chance to participate in exciting activities like the model rocket competition at Engineering Expo, demonstration firings of the UW-AIAA Hybrid Rocket Engine, and the launch of Super Loki sounding rockets at the Wisconsin Rockets for Schools exhibit!

American Institute of Chemical Engineers (AIChE)

<http://www.cae.wisc.edu/~aiche>

The UW-Madison student chapter of AIChE is a student run organization that facilitates communication between ChE undergrads and both the ChE department and industry. AIChE recruits industrial representatives to speak at the meetings, organizes plant tours, and organizes social events. AIChE is open to anyone, and provides services to people considering a chemical engineering degree or just starting their schooling through the Outreach and new student Mentor Programs.

American Nuclear Society (ANS)

<http://www.ans.nep.wisc.edu/~ans>

The American Nuclear Society (ANS) is a professional society dedicated to the increased understanding of nuclear technology throughout all facets of the community, including students, elected officials, corporate executives, community leaders and all other members of the public. The UW-Madison Student Chapter of the ANS has been active in this role of public information for many years and considers it one of their primary mandates.

ASM/TMS The Materials Society http://vandum.msae.wisc.edu/msae/student_groups/asm/asm.html

American Society of Agricultural Engineers

To promote education and understanding of the Biological Systems Engineering Dept. as well as the National ASAE.

American Society for Engineering Education (ASEE)

<http://www.cae.wisc.edu/~asee>

The Mission of the University of Wisconsin - Madison Graduate Student Chapter of ASEE is to provide an organization committed to improving undergraduate engineering education and instilling the values of life-long learning. Our goals are to identify and promote effective teaching and learning strategies; to act as a catalyst for interaction among students, faculty and administration; and to better prepare students for Graduate School and/or careers in industry, government, and academia.

American Society of Civil Engineers (ASCE)

<http://www.cae.wisc.edu/~asce>

Competitors in the Concrete Canoe Competition Mission: ASCE advances professional knowledge and improves the practice of civil engineering as the lead professional organization serving civil engineers and those in related disciplines; the focal point for development and transfer of research results, and technical, policy and managerial information; and the catalyst for effective and efficient service through cooperation with other engineering and related organizations.

American Society of Mechanical Engineers (ASME)

<http://www.cae.wisc.edu/~asme>

We are a professional and social group of 150 students committed to educating the community and students about mechanical engineering. Not all of our members are mechanical engineering majors. In fact three of our officers are from the following: materials science, civil engineering, and chemical engineering.

American Society of Heating, Refrigeration and Air Conditioning Engineers

Please consult the Mechanical Engineering Department.

American Society of Quality Control

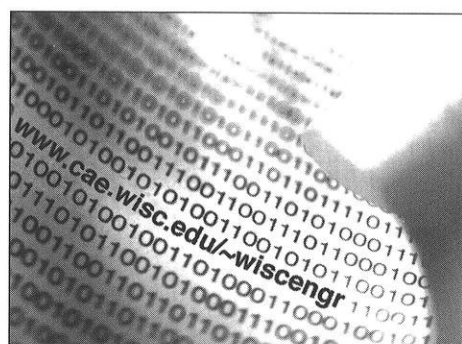
Please consult the Mechanical Engineering Department.

Badger Amateur Radio Society

Please consult the Electrical and Computer Engineering Department.

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as an ideal profession, Chi Epsilon was organized to recognize the characteristics of the individual civil engineer deemed to be fundamental to the successful pursuit of an engineering career and to aid in the development of those characteristics in the civil engineering student.

Engineering Expo
<http://www.cae.wisc.edu/~expo>
 The next Expo will occur in the spring of 1999

Geological Engineering Club (GLE Society) <http://www.cae.wisc.edu/~gleclub/clubinfo.htm>
 The UW-Madison Geological Engineering Society is a registered student organization consisting of students interested in geological engineering. We are also a student chapter of the Society of Mining, Metallurgy, and Exploration (SME). The purpose of the GLE Society is to educate students about careers in geological engineering, to serve as a social group for students with similar interests, and to provide better visibility for the major, both on campus and in industry.

Team Paradigm
 The group works on the FutureCar and Escort Hybrid Electric Vehicle.

Human Factors and Ergonomics Student Chapter (HFES) <http://www.cae.wisc.edu/~hfe>
 The richness and uniqueness of Human Factors Engineering is in the essence of its interdisciplinary nature. We have members with backgrounds in Psychology, Business, Nursing, Occupational Therapy, Industrial, Mechanical, and Electrical Engineering, Product Design, etc.

Institute of Electrical and Electronic Engineers (IEEE) <http://www.cae.wisc.edu/~ieec>
 The Institute of Electrical and Electronics Engineers is a Society of student and professional electrical/computer engineers. Join for Networking, Social, Publications, Resume Builder, and References.

Institute of Industrial Engineers (IIE)
<http://www.cae.wisc.edu/~iie>
 IIE is the only international, nonprofit, professional society dedicated to advancing the technical and managerial excellence of industrial engineers. The Institute is committed to provide the most timely information about the profession to its members, professionals who share industrial engineering concerns, businesses and industries that employ industrial engineers, and the general public.

Institute of Transportation Engineers
 This student chapter provides the following benefits: Promote transportation engineering among UW students; Talks by transportation officials and professors; Student presentations on research topics; Field Trips; Monthly Wisconsin Section of ITE professional meeting in Madison, Milwaukee, or Appleton.

Kappa Eta Kappa (KHK)
<http://www.cae.wisc.edu/~khk>
 Aims and Goals: Believing that the attainment of education as well as technical training is the aim of all true engineers, we band ourselves together to foster and promote fraternal

relationships among the Electrical Engineering students; to strive at all times for the maintenance of a complete and lasting understanding and fellowship between the faculty and students; to unceasingly cherish and develop character and ideals of service as the necessary attributes of the profession.

Phi Eta Sigma
<http://www.wisc.edu/~rho/pesigma>
 Phi Eta Sigma is an honor society which recognizes outstanding achievement by freshman students. You are eligible to join Phi Eta Sigma if you have a cumulative GPA of 3.5 at the close of any academic term during your first year in college. Transfer students are also eligible.

Pi Tau Sigma
<http://www.cae.wisc.edu/~pitau>
 Pi Tau Sigma is a Mechanical Engineering Honor Society open to the top quarter of the junior class and the top third of the senior class.

Polygon Engineering Council
<http://www.cae.wisc.edu/~polygon>
 Founded in the 1920s, POLYGON Engineering Council is the student council for the University of Wisconsin-Madison College of Engineering (COE). POLYGON provides students with opportunities to develop the communication, teamwork and leadership skills they will need when they leave the COE. POLYGON encourages all engineering students to communicate their concerns about the UW to POLYGON so that the council can develop recommendations and strategies to address these concerns.

Society of Automotive Engineers
 To inform students and give the opportunity to learn about and build cars. Build a scaled down formula race car and a mini Baja car. These cars compete in a national SAE collegiate competition.

Society of Experimental Mechanics (SEM)
 SEM has sponsored an undergraduate student paper/project contest for EMA 307 - Mechanics of Materials Laboratory, has participated in the Milwaukee Local Section research paper contests, and participated in an EXPO '93 project - which received an honorable mention! Please contact John Dreger at (608) 262-3993 for more information.

Society of Hispanic Professional Engineers (SHPE)
<http://www.cae.wisc.edu/~shpe>
 The UW-Madison SHPE Chapter is a student-based organization (affiliated to SHPE National) which has the following objectives: To increase the number of Hispanic engineering and science students enrolled at the University of Wisconsin; To promote the advancement of Hispanic engineers and scientists in employment and education; To promote academic, professional, and cultural exchanges at all levels, including with universities and other institutions of Hispanic background; To develop and participate in programs between industry and the UW which can benefit students seeking science and engineering degrees; To improve retention of Hispanic students enrolled in engineering and science, and thus address the under-representation of Hispanics within scientific and engineering professions.

Society of Manufacturing Engineers (SME)

<http://www.cae.wisc.edu/~sme>
 SME's mission - to provide information to its members and the international manufacturing community - is executed through many different vehicles, including: Expositions, Conferences, Clinics, Courses, Publications, and Professional Contacts.

Society of Plastics Engineers
 Please consult the Mechanical Engineering Department.

Society of Women Engineers (SWE)
<http://www.cae.wisc.edu/~swe>
 The Society of Women Engineers (SWE) gives support, guidance and recognition to women engineers and other engineering students. Today, SWE is a nationally recognized professional, educational, non-profit, service organization. Its student section membership includes graduate and undergraduate female and male engineers. The student section of SWE at the University of Wisconsin-Madison was chartered in 1977.

Tau Beta Pi (National Engineering Honor Society)
<http://www.cae.wisc.edu/~tbp>
 Tau Beta Pi is the largest engineering honor society in the world. It was founded in 1885 to recognize engineering students of superior scholarship and outstanding character and engineers of eminent achievement. So far, Tau Beta Pi includes around 210 collegiate chapters and has initiated more than 370,000 men and women.

Theta Tau
<http://www.cae.wisc.edu/~thetat>
 The purpose of Theta Tau Fraternity is to develop and maintain a high standard of professional interest among its members, and to unite them in a strong bond of fraternal fellowship. In addition to the desirable attributes of a general fraternity, it offers a common bond: an interest and pursuit of engineering in its various branches.

Triangle Fraternity
<http://www.cae.wisc.edu/~triangle>
 Triangle limits its membership to students majoring in engineering, architecture, and the sciences. Thus, Triangle is unique in the National Interfraternity Conference, being the only member fraternity that selects its membership from these majors. This is done to draw together outstanding men with similar course work and career goals.

Wisconsin Black Engineering Student Society (WBESS) <http://www.cae.wisc.edu/~wbess>
 The Wisconsin Black Engineering Student Society (pronounced "W-BESS") is a student-run professional organization at the University of Wisconsin-Madison. Its goals are the enrollment, retention, successful graduation, and career placement of its members. Since its first meeting on October 21, 1979, WBESS has been dedicated to serving its members.

Wisconsin Engineer Magazine
<http://www.cae.wisc.edu/~wiscengr>
 The Wisconsin Engineer magazine, a charter member of the Engineering College Magazines Associated, is published by and for engineering students at UW-Madison. Wisconsin Society of Professional Engineers. The Wisconsin Engineer is published four times yearly in September, December, February, and April by the Wisconsin Engineering Journal Association.

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Cloning, Cloning, Cloning, Cloning, Cloning

By Dan Peirpont

In February 1997, Dr. Ian Wilmut announced that he had successfully cloned a sheep in Edinburgh, Scotland. The seven-month-old clone, named Dolly, is genetically identical to her six-year-old counterpart. The cloning of a higher mammal is a landmark discovery in the scientific world. Despite great technological advances, this achievement raises many questions for the future. For example, with the ability to clone a higher mammal like a sheep, will cloning of humans follow in the future? In what ways can cloning be useful? Is human cloning ethical, or even animal cloning, for that matter? How can cloning be regulated? These questions are of vital importance and will become increasingly important as we move ahead into the future.

It took Dr. Wilmut nearly 23 years of difficult laboratory work to finally produce something only previously discussed in science fiction novels. He created a mammal genetically identical to an adult female sheep. There have been other attempts at cloning higher mammals, but none were successful until now. The technology to clone plants has been known for quite some time now, but plants are much less complicated than mammals. There have also been attempts to clone frogs. However, these experiments were only successful in cloning tadpoles, but never an adult frog [Jones and Lamke, 1997].

The process Dr. Wilmut used to create Dolly is outlined below. First, the nucleus of an adult sheep mammary cell is starved of nutrients. The nucleus, which contains the

cell's DNA, is then transplanted into an unfertilized sheep egg that had its nucleus previously removed [Friend, 1997]. Then, an electric current is used to "jump start" the egg. The cell begins to divide, and after being placed in a surrogate mother, it is on its way to becoming another organism identical to the sheep from which the original mammary cell was taken.

One of the reasons why cloning was previously thought to be impossible, involves the DNA of the cell. It was thought that the DNA did not carry all the instructions for growth in the earlier stages of the sheep's life. With the advent of cloning, it has now been proven that the DNA in an adult cell nucleus contains the information for the growth of an organism for its entire life span [Friend, 1997].

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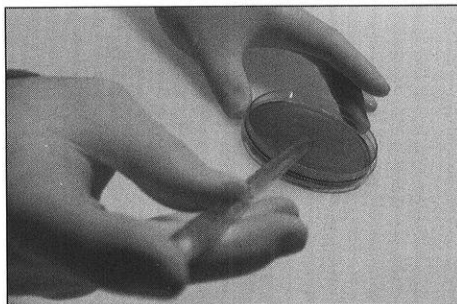


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Now that cloning of a mammal has been successfully performed, the question arises, how will cloning be useful? It turns out there are countless uses, beginning with medical technology. Cloning can provide scientists with an understanding of diseases never before realized. It can produce more information about medicinal drugs and their effects on animals. For instance, there is a protein produced in sheep's milk used to treat cystic fibrosis which could be manufactured with the help of cloning [Friend, 1997]. Another example involves producing a large number of cells for use as therapy for Parkinson's disease [Jones and Lamke, 1997]. Cloning could also aid in the creation of vaccines by producing other animals which can be used to harvest the vaccines. These are just a few of the possibilities of cloning for medical purposes.

Another area in which cloning could be useful is in the production of commercial goods. For example, it could be possible to create a "perfect" cow. A cow that produces a large amount of milk could be cloned to produce a herd of cows which make an incredible amount of milk. Along that same line of thinking, a herd of cattle that produce high quality meat could be created. In the past, farmers have created hybrid corn of excellent taste and quality; with cloning, the same could be done with all farm animals.

Another possible use for cloning is in the pet industry. Imagine if the technology existed to make a replica of your recently deceased pet. This would be a very valuable commodity for people who can't bear the thought of losing their beloved Fluffy or Fido [Friend, 1997].



Could humans, one day, simply be whipped up in a petri dish?

Some of the most important potential uses of cloning include transplants and other medical procedures. For example, if a person needs a life-saving bone marrow transplant, but there is not a suitable donor available, a clone of this person could provide genetically identical bone marrow and save his or her life.

On the other hand, this idea raises yet another question. Will the clone also develop a bone marrow problem because it is identical to the original person? Or will the person and his or her clone experience the same phenomena throughout each of their lifetimes? For instance, if a young boy lived to the age of fifteen and died from a ruptured aneurysm, would his clone live to be fifteen and die of an aneurysm too?

These questions are not easily answered, because it depends on your beliefs. Is a person a product of his or her environment or would the person be the same person regardless of the environment? In my opinion, a person is a product of their environment and therefore, a human and his or her clone would not necessarily be alike. For example, if we had cloned two Albert Einsteins, and placed them in different environments, one could have been an incredible genius and the other a drug addict [Kluger, 1997].

In the last few examples, cloning humans has been discussed, but one thing we have to keep in mind is that Dr. Wilmut has only cloned a sheep. It may not even be practical to clone a human. It took Dr. Wilmut nearly 300 tries to get a successful clone [Friend, 1997]. That means even if we had the same

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Cloning

success rate as Dr. Wilmut, we would still destroy 300 human eggs to get one clone. Thus, we would have to consider whether cloning would be practical in terms of the effort needed and the amount of human eggs used.

Assuming we had the technology, there is still a tremendous barrier before cloning could be implemented. This barrier is human ethics. Currently, it is illegal to use human eggs as test subjects in the United States. However, there are other countries in the world where it is not illegal. Just because it is illegal, does not ensure that attempts at cloning would not happen. What could stop someone from attempting to clone a human in their basement? Realistically, underground attempts at cloning would be a very hard thing to police. Even if cloning became legal, there would still be large numbers of people against it, just like any other controversial issue.

UW-Madison chemistry professor Richard Guilfoyle expressed that he could only think of a couple reasons why it might be useful to clone a human, and none of these reasons outweighed the ethical risks [Jones and Lamke, 1997]. Guilfoyle said cloning humans, "...would be a form of eugenics, trying to form the perfect race." This statement basically asks will we create a non-diverse perfect culture as a result of cloning humans. "It would be better to let nature run its course and keep the gene pool diversified," says Guilfoyle.

Guilfoyle's testimony is very important because it reminds us that cloning humans may not be a good idea. One could imagine all kinds of horrible consequences if the technology falls into the wrong hands. Imagine if a modern day dictator comparable to Hitler was given the power to clone. It would then be possible to create a destructive race rather than a perfect race.

The ability to clone adult mammals can be an extremely powerful and potentially dangerous tool, which should not be taken lightly. Toying with genetic engineering could easily get out of control and create major problems. Because of the nature of this topic many vital questions are brought forth. A lot of questions are asked, many of which don't have answers. We may very well be forced to answer these questions within the next couple of years, as the technology gets better and the demand for the technology becomes greater. President Clinton has already taken the initiative and delegated a federal commission to investigate the legal and ethical implications of the new cloning technology [Kluger, 1997].

Author Bio: Dan Pierpont is a senior in chemical engineering who wants to make three clones of himself so they can do his homework while he goes golfing.

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CATERPILLAR

One Crazy, Crazy Summer...

A Survivor's Story of the Chemical Engineering Summer Lab

by Matthew R. Vokoun

Now that another school year has begun, many students' thoughts longingly turn to memories of a blissful summer past. Most engineering students recollect on great internships and co-ops, new friends and industry contacts, exciting cities and vacations, and fun-filled weekends and afternoons. Others think back to an easy, relaxed summer class in Madison complemented by many nights and afternoons sipping a favorite beverage at the Terrace. However, if you are a chemical engineering student near the twilight of your education, your summer memories are likely darkened by long days in a lab, even longer nights in front of a computer, severe sleep deprivation, out-of-control stress levels, and academic challenges worthy of Einstein. These students are the survivors of Summer Lab, otherwise known as Chemical Engineering 424, Operations and Process Laboratory.

The Facts

The purpose of Summer Lab is for chemical

Typical Schedule During Summer Lab							
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
7:45 AM							
8:00 AM							
9:00 AM							
10:00 AM							
11:00 AM							
12:00 PM	Calculations & Report Writing	Lab	Lab	Lab	Lab	Lab	Calculations & Report Writing
1:00 PM							
2:00 PM							
3:00 PM							
4:00 PM							
4:30 PM							
5:00 PM							
6:00 PM							
7:00 PM	Calculations & Report Writing	Calculations & Report Writing	Calculations & Report Writing	Calculations & Report Writing	Calculations & Report Writing	Calculations & Report Writing	Calculations & Report Writing
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10:00 PM							
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12:00 AM							
1:00 AM							

Source: Matt Vokoun

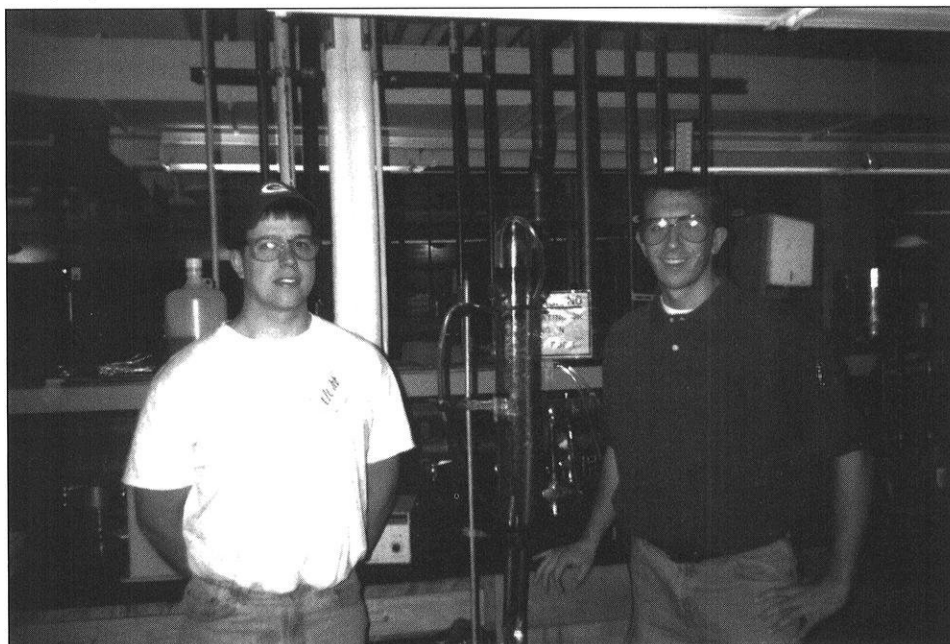
As you can see from this schedule, chemical engineering students have not a moment to spare while taking Summer Lab.

engineering undergraduate students to perform five formal experiments in unit operations and four informal experiments in a wide range of chemical engineering topics. Reports ranging from twenty to sixty pages are written for eight experiments, and a ten minute presentation is given on one experiment. The lab can only be taken during the summer and lasts for five weeks. Students have the option of taking the class at the be-

ginning or end of the summer in Madison or at the beginning of the summer in London. The class schedule requires almost nine hours per day in the lab, and most students then spend around five additional hours each weekday and around twenty hours each weekend outside of class working on calculations and reports. For five weeks, almost every waking moment of every day is spent on Summer Lab work! This lab gives students whole new definitions to the ideas of time commitment, lack of free time, and stress!

The formal experiments are designed like any other laboratory experiment. The lab manual gives the background, procedure, required calculations, and questions to answer in the report, and the equipment has been built and is in place for students to use. These formals focus on demonstrating the unit operations and equipment taught in the classroom and on challenging students with difficult and lengthy calculations, error analysis, and questions into theory. The five formals are Distillation Column, Heat Exchange, Kinetics, Pump, and Humidification.

The informal experiments have no set design, instructions, or equipment. An instructor will think of a theory, application, or piece of equipment for the students to investigate. The students must then do the background research into the experiment, determine



This bubbling extraction column was designed and built for a Summer Lab informal experiment. Acetic acid was extracted from red oil bubbles floating up through downward flowing water.

Source: Matt Vokoun

what equipment and chemicals will be needed, develop an experimental procedure, collect and assemble the equipment, and then perform the experiment. The informals challenge students to go from a research idea to concrete results and a complete engineering report in less than ten days. These ex-

Summer Lab is one of the oldest traditions in Wisconsin's famous chemical engineering department, dating back to 1915.

periments are focused on unit operations as well as fluid dynamics, reaction kinetics, reactor design, polymer technology, analytical methods, and computer-based controls and simulations.

The History

Summer Lab is one of the oldest traditions in Wisconsin's famous chemical engineering department, dating back to 1915. At that time, lack of opportunity and adequate transportation and communication limited the industry experience chemical engineering students could get. Today's ease of having on-campus recruiting, many co-op and internship opportunities, and the ability to

move to a new city for the summer was not conceivable in 1915. Therefore, the chemical engineering students requested the department to create a lab in the summer that would give them industry-like experience here in Madison. Today's students would surely have a few choice words for these Summer Lab pioneers if they were to ever meet!

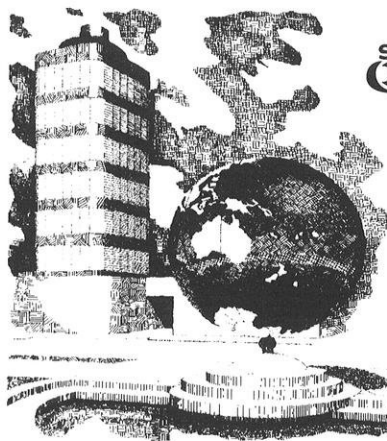
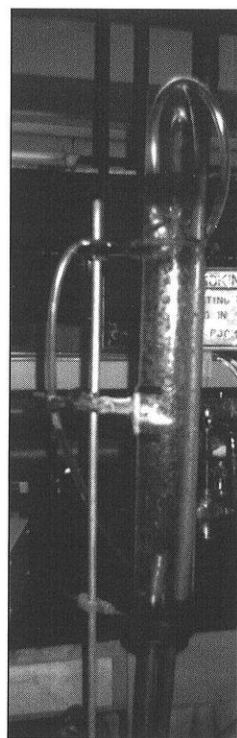
The Opinion

As one of the most recent Summer Lab survivors, this author has a fresh perspective on the lab and how it affects chemical engineering students' lives and education. From the moment we step into the chemical engineering department, we are told of the extreme academic challenges of Summer Lab and of how it will dominate our lives for five weeks. Alumni, students, professors, and advisors will say, "Summer Lab will be the hardest class you will ever take in your life! It is the hardest class at the University of Wisconsin-Madison." We are taught to fear it and dread the summer we must take it.

Well, this survivor can say that, for the most part, all the talk is true. I can truly say that I have never worked so hard or been so challenged as I was during the five weeks of Summer Lab. I had no life other than lab, computers, food, my daily run, and a few

hours of sleep. However, as with any modern folklore, Summer Lab has been made out to be much worse than it actually is. It is not a nightmare, but only a rough dream that leaves you a little shaken and tired the next morning. You do have to work very hard, but you can manage the class and succeed at it as well.

Summer Lab has a very interesting affect on chemical engineering students' lives. Becoming so completely absorbed in one thing has an unavoidable impact on the other aspects of your life. Everything else becomes minor, minor details compared to lab work, calculations, and report writing. Health, fitness, diet, and even hygiene all get pushed aside as report deadlines approach. Friend-



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ships and relationships suffer because we simply do not have any free time to spend with the significant people in our lives. The relationship break-ups suffered by several people during my session of Summer Lab is a testimony to this lack of quality free time. Reactionary behaviors for dealing with the stress such as excursions to the bar for lunch, screaming at the computer, sipping beer while writing reports (I hope this confession does not get my CAE account suspended for one day!), and excessive celebrating when the class is finished are common in every Summer Lab.

The rewards and experiences received from Summer Lab far outweigh all these negatives. The challenging experiments and reports make you draw on your past classes and work experiences and reinforce the chemical engineering theories and principles. The class brings together all the loose ends of information received in the other chemical engineering classes and binds them together into one useful, organized package of knowledge. No other class can come as close as Summer Lab does to a true industry work experience. I count this class as one of the biggest milestones and accomplishments in my chemical engineering education and in my life, and this education will lead me and every other graduate of Wisconsin's

chemical engineering department to a bright future of employment. Summer Lab develops the technical, communication, and teamwork skills that will be vital in any chemical engineering career. Completing this utmost challenge will only make us stronger and more successful in the future as harder challenges are encountered.

I am proud to say that I am now part of the long tradition of Summer Lab survivors at Wisconsin! The class taught me to think and be creative in ways I had never done before,

and then to organize these thoughts and efforts into a comprehensive, clear report or presentation. In a twisted way, I really enjoyed the class, because I was working on the topics I loved learning in the classroom. Most of the other survivors say the same thing. Don't get us wrong though, we're still very, very happy that Summer Lab is now just a past highlight on the timelines of our lives.

Author Bio: Matthew R. Vokoun is the Editor-in-Chief of the *Wisconsin Engineer*.

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Teaching Assistants

seen by the administration and is used to aid in determining whether or not that particular TA needs more help. New TAs are evaluated after the first seven weeks of class and are considered "new" until their third semester. At that point they can be evaluated at any time during the semester.

As far as dealing with the language barrier between students and international TAs, these TAs must pass a series of tests. The Test of Spoken English requires the applicant to verbally answer questions asked by a panel. If applicants pass with flying colors, they are ready to stand in front of a class and teach. Some do not pass, and they can not be a TA for at least a semester. Those that fall in between must take an English course here at UW-Madison along with the class they teach.

A variety of booklets are used to outline procedures that TAs must adhere to, but probably the most helpful booklet is written by former TAs. It gives advice on common areas where improvements are needed and good ways to go about getting help. The evaluations for TAs that are not shown to the administration are part of this booklet.

Donna Lewis has been facilitating these different options for getting help and feedback in an effort to increase the quality of education provided by the professor/teaching assistant combination in the ECE department. Her main goal can be described using one word: ATTITUDE. She wants each and every TA to be proud of their job and to understand that it is important. She wants them to know they can make a difference in a student's life, and she wants them to do just that. A TA can meet all the requirements, but if they are in it for the money or just because it looks good on a resume, they will not be

successful TAs. "There has to be a desire to help people understand, to encourage, to be patient, available and ultimately promote the learning of the students that look to them for guidance."

Lewis oversees approximately 50 TAs. She tries to be available to these people if they should need her for any reason even though she has many other responsibilities. She sets a great example for her TAs. Lewis wants to implement a high feeling of importance in ECE TAs. She can not emphasize enough how much TAs can potentially influence their students. This change in attitude is vital to a TA's success. TAs must have a feeling of accomplishment when they walk away from their classrooms. Just because someone has a degree does not mean they can teach. "Teaching takes a special type of person with a special dedication."

As soon as TAs are hired, and before they enter a classroom, they begin their job training. There are mandatory orientation sessions and at least one TA/professor gathering. This shows the TAs that the professors care too, and that increases the amount of caring on both sides. It also gives them a chance to talk about class-related topics in a casual setting. New TAs are required to attend two half-day training sessions, and returning TAs must attend one half-day session. Sessions cover different topics geared toward the two individual groups.

Sessions are overseen by three TA coordinators and two administrators, one of which is Lewis. TAs do a series of exercises, which include being given a problem to present in front of a group of their peers. They are evaluated on clarity, eye contact and voice level. These sessions give them classroom experience before they actually enter a classroom, and it also helps to point out where

they may need some work. Such sessions are mandatory, and if a TA does not attend he or she can lose the position. The ECE department does enforce this. If there is a good reason for the absence, and the department is told ahead of time, the TA is allowed to watch a videotape of the sessions. After which, the TA comes in and has a one-on-one discussion with an administrator about what he or she has learned from the session viewed.

Similar training sessions have been occurring since the fall of 1990, when Lewis was given the responsibility of monitoring TAs. Lewis gives the TA program very high priority. She believes there is always room for improvement no matter how much progress

Teaching takes a special type of person with a special dedication.

has been made in the past. "The College of Engineering, specifically ECE, believes in preparing their TAs for teaching and improving those teaching skills which will best promote the learning of their students."

Various awards are given to TAs college-wide to encourage and recognize those who excel at their jobs. ECE has nominated their TAs for awards five times, and all five times they have won at least one award. Generally, TAs submitted have been teaching for three to five semesters.

Lewis wants students to understand that they have the right to a great TA. They should go to the department as soon as they are having a problem with their TA, instead of waiting until the end of the semester because by then it is too late. The problem will

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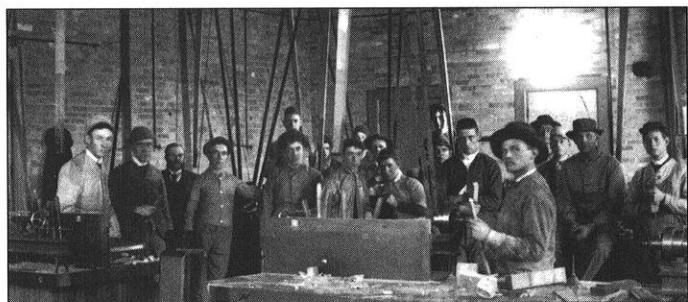
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be worked out for next semester's class but that does not help with the current semester. The earlier it is brought to the department's attention, the earlier action can be taken to remedy the problem. If the department does not hear about problems from the students, they assume that everything is running smoothly. The ECE faculty is fairly involved, so they usually notice if there is a problem. However, students should not make the assumption that the problem will be taken care of. They need to take responsibility for their own education. Students also need to understand that different people come from different cultural backgrounds. We need to be respectful of those differences and work around and with them. Those differences are what make this college such a wonderfully diverse learning environment.

Author Bio: Sara Vail is going into industrial engineering.



Source: Engineering Publications

An early class of engineering students.

College of Engineering

Another way in which the College of a century ago differs from today's, is in its facilities. In 1897, the entire College of Engineering was housed in Science Hall and the old Machine Shops Building, located where Helen C. White Hall now stands. Even after the new engineering building, now the Education Building, was erected in 1900, the College was entirely contained on Bascom Hill. Not until the 1920s, did the College begin its migration off Bascom Hill to its current site on University Avenue.

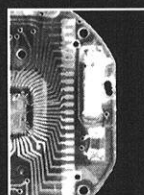
Other impressions of our time travelling student would be of the very small size of the student body and the number of legendary teachers encountered. In 1890, there were 89 engineering students. By 1899, there were 327. To demonstrate what a new and under-professionalized discipline engineering was, this tiny number was enough to make UW the third largest engineering school in the country behind MIT and Cornell. Fees were \$20 per year. An attempt to raise engineering tuition to \$40 was rescinded after protests. Instructors the time traveller would meet on a daily basis were Alan Conover, Nelson Whitney, Frederick Turneauer, John G. D. Mack and D. C. Jackson. In addition, you might be friends with students who later became very well known in their own fields. Charles Hart and Charles Parr, who were later the largest producer (Hart-Parr) of small gasoline engines in the country, began their development in the University shops by building an eight horsepower engine to drive the University water pump. Their work was first published in the *Wisconsin Engineer*. Both the College and the *Wisconsin Engineer* have flourished in the last century, and both show marked differences and similarities to the infant undertakings that they were in the 1890s.

Author Bio: Jim Feldman is a returning student working toward a TCC certification. He has published a comprehensive history of the University buildings.



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Yo-Ho-Ho A Pirate's Life For Me

By Rob Nelson

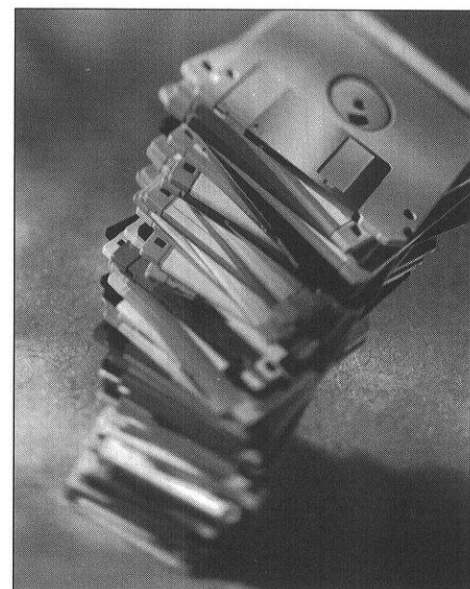
Piracy began with the world's first seafaring people, the Phoenicians. Piracy continued into the nineteenth century, when Black Beard was captured off the Carolina coast. The definition eventually broadened to include the hijacking of airplanes. However, modern-day pirates prefer to surf a different sea, the World Wide Web. Pirates now use floppy drives, modems or recordable compact disks, instead of the swords of yore as their tools.

There are many obvious benefits to copying commercial software. Despite the existence of many free software programs or free handicapped commercial programs, these are not as good as commercial products. In addition, as long as the software is used for a productive purpose, the software actually adds value to our economy and the money that would have been used to purchase the

software can be used for other productive purposes. Many modern-day hackers proclaim that, "Freedom of information is good." Thus, software piracy, which frees up this information, can only do good.

The legality of piracy, taken to its limits, often brings ludicrous results. There is a movement in the White House Infrastructure task force to make simply browsing the World Wide Web illegal. The rule in question deals with the loading of the cache on the computer with information on the Web to make browsing faster. If stiffer rules were enacted and all information on the Web was copyrighted, this act would be illegal unless the browsing was strictly authorized.

Despite these arguments, software piracy continues to be a huge problem throughout the world because of the misconception that it does not hurt anyone. Because of this, the software industry continues to make less



of a profit than it would in an honest world. Smaller profits mean that fewer people will have jobs in the software industry and fewer products will be made. In fact, it is such a large problem, that in 1994, software piracy consumed 49 percent of the market for software, or \$8.1 billion. This is the equivalent of 50,000 or more jobs lost to pirates, every bit as deadly as their seafaring ancestors.

In the United States, software was first rec-

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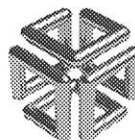


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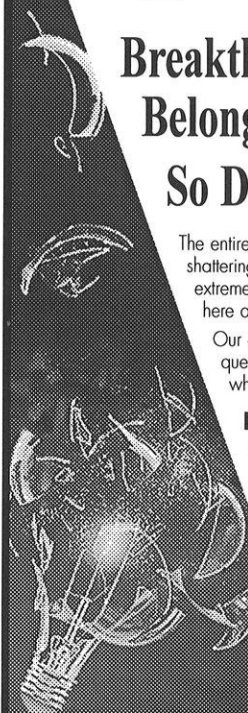
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ognized as a form of literary expression in 1964. By 1992, the penalty for software piracy in the United States included a possible felony conviction and fines of up to \$100,000 for each work infringed. The maximum penalty was a \$250,000 fine and five years imprisonment when ten or more copies with a total value of only \$2,500 were made.

A pirate can commit five basic forms of software piracy. First is counterfeiting, where

The legality of piracy, taken to its limits, often brings ludicrous results

the software and packaging are copied to pass it off as original merchandise. This is the form where money most often changes hands. The second form of piracy is softlifting, where the licensed user will allow his or her friends or co-workers to make copies of the licensed software. This form is by far the most prevalent and costly for the software industry. Third, hard-disk loading is where a computer will be loaded with copies of original software before sale to a customer. This is done to make the computer a more attractive purchase for the consumer. Another form of piracy is called bulletin-

board piracy, where copyrighted software is made freely available for users to download. This form has the potential to become a large problem, but with close monitoring of the large online services, it is kept small. Lastly, software rental is renting software which is not licensed for rental. This is why one does not find software for rent at a rental store, because many software products don't include a license for rental due to the ease of copying the product.

The rates of software piracy vary substantially around the world. In 1995, it ranged from a high of 98 percent of total software value in China to a low of 35 percent of total value in the United States. Yet, the United States has a commanding lead of software development throughout the world. These two facts may be related. In places such as China, the high software piracy rates do little long term good in creating viable software industries.

Software companies are doing many things to combat software piracy. They are forming alliances and focusing on education as a key strategy in the assault. When education does not work, often the only method left is to pursue litigation if the country provides for this. When countries have lax copyright laws or make litigation hard to pursue, negotiations between the company and the

host country are sometimes a better alternative. In any respect, the host country should see the benefits to tightening copyright security. These benefits include generating a better economic climate to foster their own software industry, giving the software company an economic incentive to give more software support to users and generating language specific versions of software for the country.

In addition to these measures, software companies are finding other creative ways to stifle piracy. For instance, Microsoft Office now comes on 1.7 MB floppy disks, which makes it impossible for pirates to copy the

Software companies are finding other creative ways to stifle piracy

Office disks using standard DOS or Windows programs. Also, SoftCop has a program that locks the entire application until the user calls in to register the software and gets a unique password. Finally, many gaming companies require one to enter information from the supporting documentation to use the program. However, this just requires

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Pirate

the would-be pirate to copy the documentation along with the software. Despite these measures, the previous solutions don't make it impossible to copy software, only that much harder. Not so surprisingly, these techniques work well to reduce the piracy rate. The price of reducing the piracy rate is the added inconvenience users experience when installing and using new software. However, public acceptance of these methods is increasing.

Software piracy has both benefits and costs. The benefits include an ability to have the finest software at one's disposal for little cost. In addition, piracy supports the idea of freedom of information. However, the costs include fines when one is caught, lost jobs in the software industry, lower quality software and support, and a small software industry for those countries pursuing the policy of software piracy. The choice is up to those that use the software. Many will choose to pay for the software they use and many will choose to copy software. The choice is up to you.

Author Bio: Rob Nelson is an ECE senior who really enjoys writing. Thanks to everyone for giving me the opportunity to write to a large audience. Check out the webpage at [//www.cae.wisc.edu/~wiscengr](http://www.cae.wisc.edu/~wiscengr).

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Geological Engineering Society: Building Friendships and Careers

By Claire Colman

With its small size and short history, the geological engineering program at UW-Madison is often overlooked in the College of Engineering. The geological engineering program has been in existence for eight years and is comprised of only 60 students. However, geological engineering majors have something that more populated and reputed engineering majors do not — a close-knit organization called the Geological Engineering (GLE) Society. Within the GLE Society, students find a warm and friendly atmosphere that nurtures them not only professionally but personally.

"I've met some of my best buddies in the GLE Society," said Eric Nelson, a senior who has been a member of the GLE Society for two years. "My favorite thing about the GLE Society is the social side, the things we do as a group, like some of the traditions we started last year."

"Tappers" is one of those traditions. "We meet on Thursday nights, at the Union or Essen Haus or the White Horse, and get together to not talk about classes," Nelson explained. "Tappers" is not just about making friends. "When we have our formal meetings, the fact that we have gotten to know and trust each other makes carrying out business easy."

According to Andrea Pittman, the GLE Society President, socialization is extremely important. "GLE is one of the smallest majors, but this is a strong point. People get to know each other and often live together," said Pittman.

This camaraderie prepares students for their careers. They are learning that they are not alone and that they can reach out and get help. Speakers at GLE meetings often reinforce this point by addressing students about the personal side of engineering. "Bob Cords from Kenosha Testing talked to us about emotions such as fear, like realizing that you

just cost someone \$10 million," said Nelson. "He talked about what will keep you awake at night and feeling like you're in over your head. He said finding a mentor, and having confidence, and knowing you're not alone can help."

Lessons about relationships are not all the GLE Society provides. The GLE Society also helps students find jobs and provides valuable leadership experience. For example, the GLE Society helps students to be their own advocates in their careers, especially because they do not have the advantages that larger majors have.

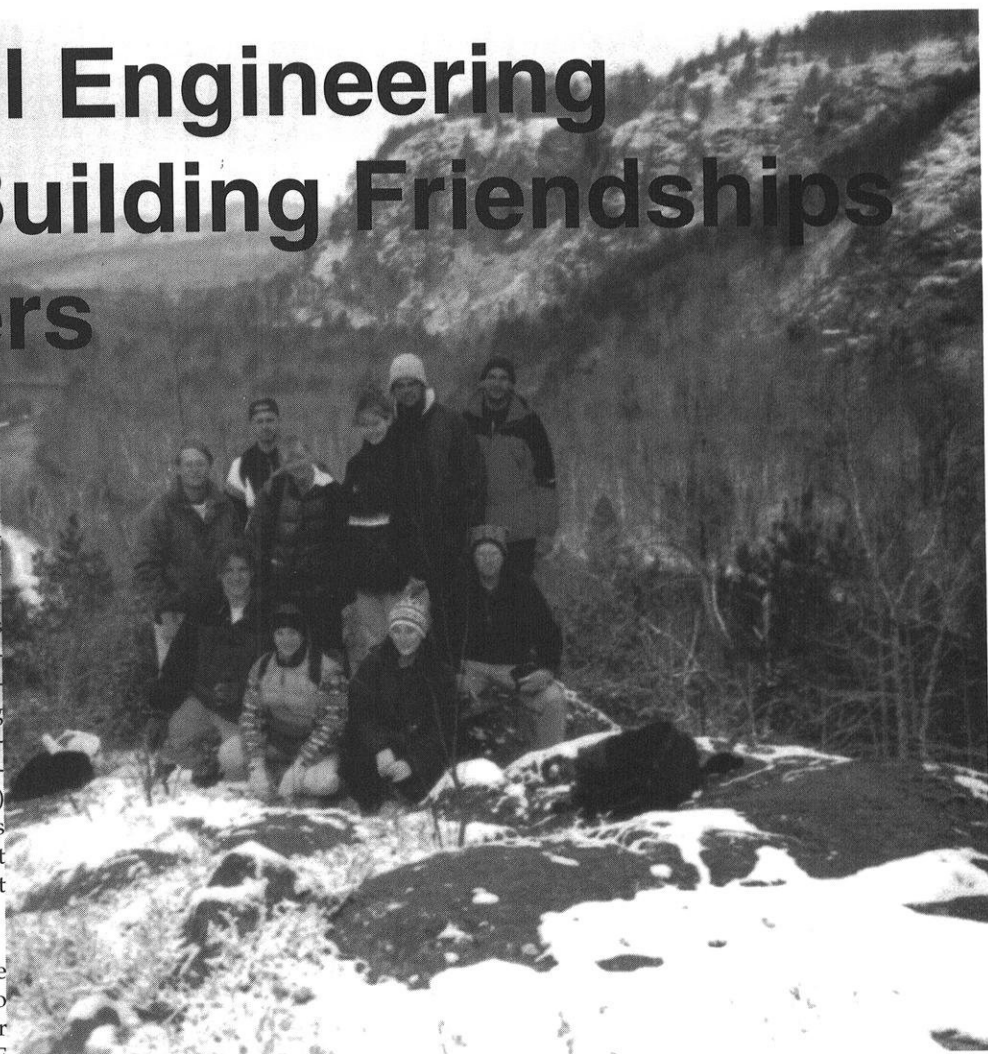
"GLE is underrepresented by Engineering Career Services (ECS). Often other majors have alumni come back and recruit, but because we are a relatively new program, we don't have that advantage," said Pittman. "So even though it is not entirely ECS's fault, it is harder for us to get a job because we can't just sign up for interviews."

This hardship led the GLE Society to begin

publishing their own resume book to send to 600 companies. In addition, Vice President Josh Hartmann created a pamphlet that accompanies the resume book, which explains to employers what GLE's do.

The GLE Society is also active on campus, participating in events such as Engineering EXPO. For EXPO 1997, GLE created an exhibit called geothermal hot chocolate. To Pittman, "Dealing with problems in the natural world in an engineering way is the best part about a career as a geological engineer." But as a GLE student, one of her best experiences is being a member of the GLE Society. "I joined when I was only a sophomore. You learn a lot of things that you wouldn't learn otherwise by talking to older people and faculty and getting leadership experience."

Author Bio: Claire Colman is an industrial engineering student.



GLE club members are surrounded by the beautiful Canadian wilderness.

Source: Geological Engineering Society

JUST ONE MORE

The following is a true story. A thermodynamics professor had written a take home exam for his graduate students. It had one question, "Is hell exothermic or endothermic? Support your answer with a proof."

Most of the students wrote proofs of their beliefs using Boyle's Law or some variant. One student, however wrote the following:

First, we postulate that if souls exist, then they must have some mass. If they do, then a mole of souls can also have a mass. So, at what rate are souls moving into hell and at what rate are souls leaving? I think that we can safely assume that once a soul gets to hell, it will not leave. Therefore, no souls are leaving.

As for souls entering hell, lets look at the different religions that exist in the world today. Some of these religions state that if you are not a member of their religion, you will go to hell. Since, there are more than one of these religions and people do not belong to more than one religion, we can project that all people and all souls go to hell.

With the birth and death rates as they are, we can expect the number of souls in hell to increase exponentially.

Now, we look at the rate of change in volume in hell. Boyle's law states that in order for the temperature and pressure in hell to stay the same, the ratio of the mass of souls and volume needs to stay constant.

So, if hell is expanding at a slower rate than the rate at which souls enter hell, then the temperature and pressure in hell will increase until all hell breaks loose.

Of course, if hell is expanding at a rate faster than the increase of souls in hell, then the temperature and pressure will drop until hell freezes over.

It was not revealed what grade the student got.

- Source Unknown

Drug dealers are usually portrayed as the dregs of society. Software developers are thought to be geniuses leading us into the future. However, as the following comparison shows, perhaps they are not so different after all.

Software developers

Refer to their clients as "users".

"Download a free trial version..."

Have important South-East Asian connections (to help debug the code).

Strange jargon: "SCSI," "RTFM," "Java," "ISDN".

Realize that there's tons of cash in the 14- to 25-year-old market.

Job is assisted by industry's producing newer, faster machines.

Often seen in the company of marketing people and venture capitalists.

DOOM. Quake. SimCity. Duke Nukem. 'Nuff said.

Damn! Damn! DAMN!!!

- Source Unknown

Drug dealers

Refer to their clients as "users".

"The first one's free!"

Have important South-East Asian connections (to help move the stuff).

Strange jargon: "Stick," "Rock," "Dime bag," "E".

Realize that there's tons of cash in the 14- to 25-year-old market.

Job is assisted by the industry's producing newer, more potent mixes.

Often seen in the company of pimps and hustlers.

Their product causes unhealthy addictions.

Do your job well, and you can sleep with sexy movie stars who depend on you.





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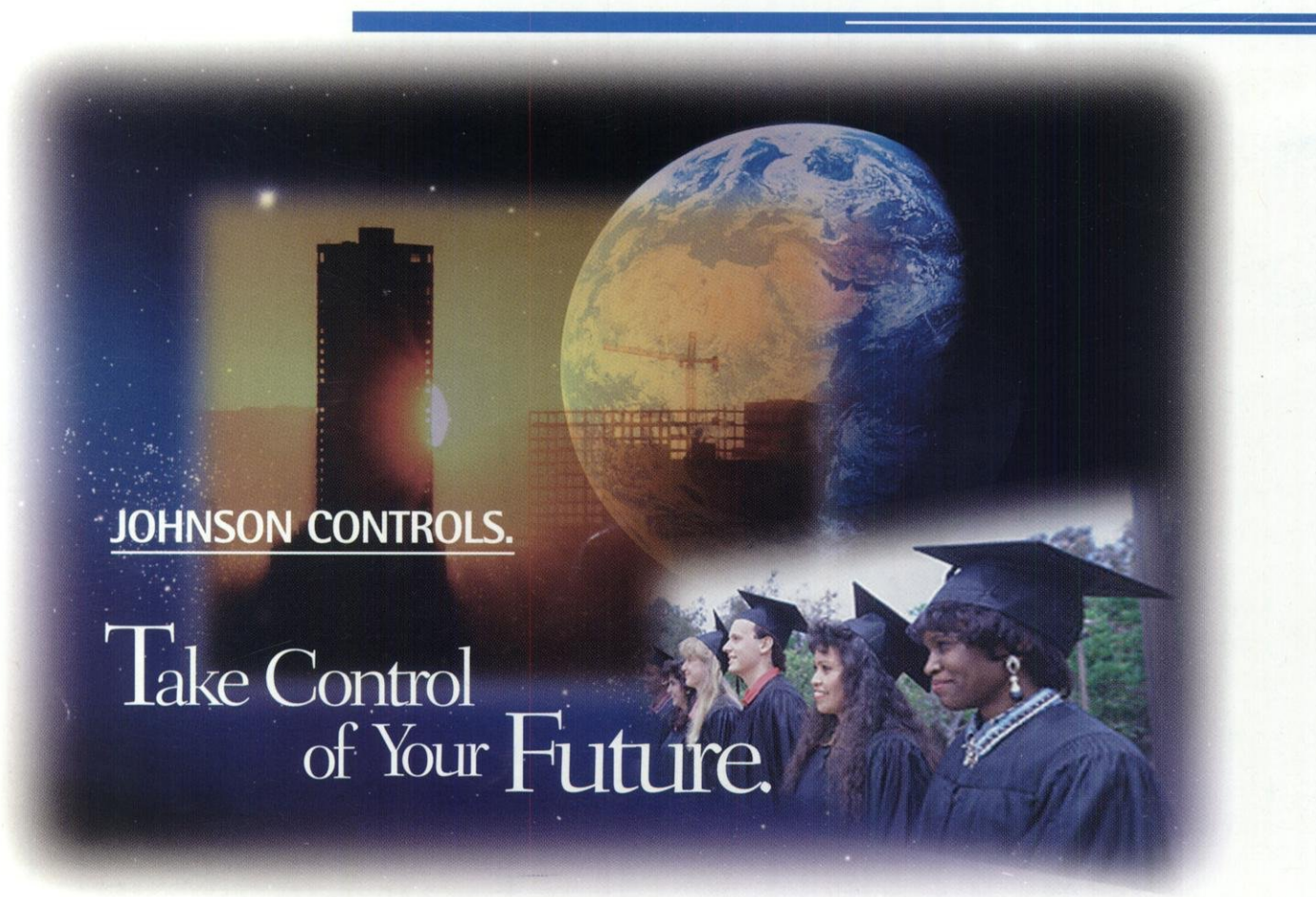
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