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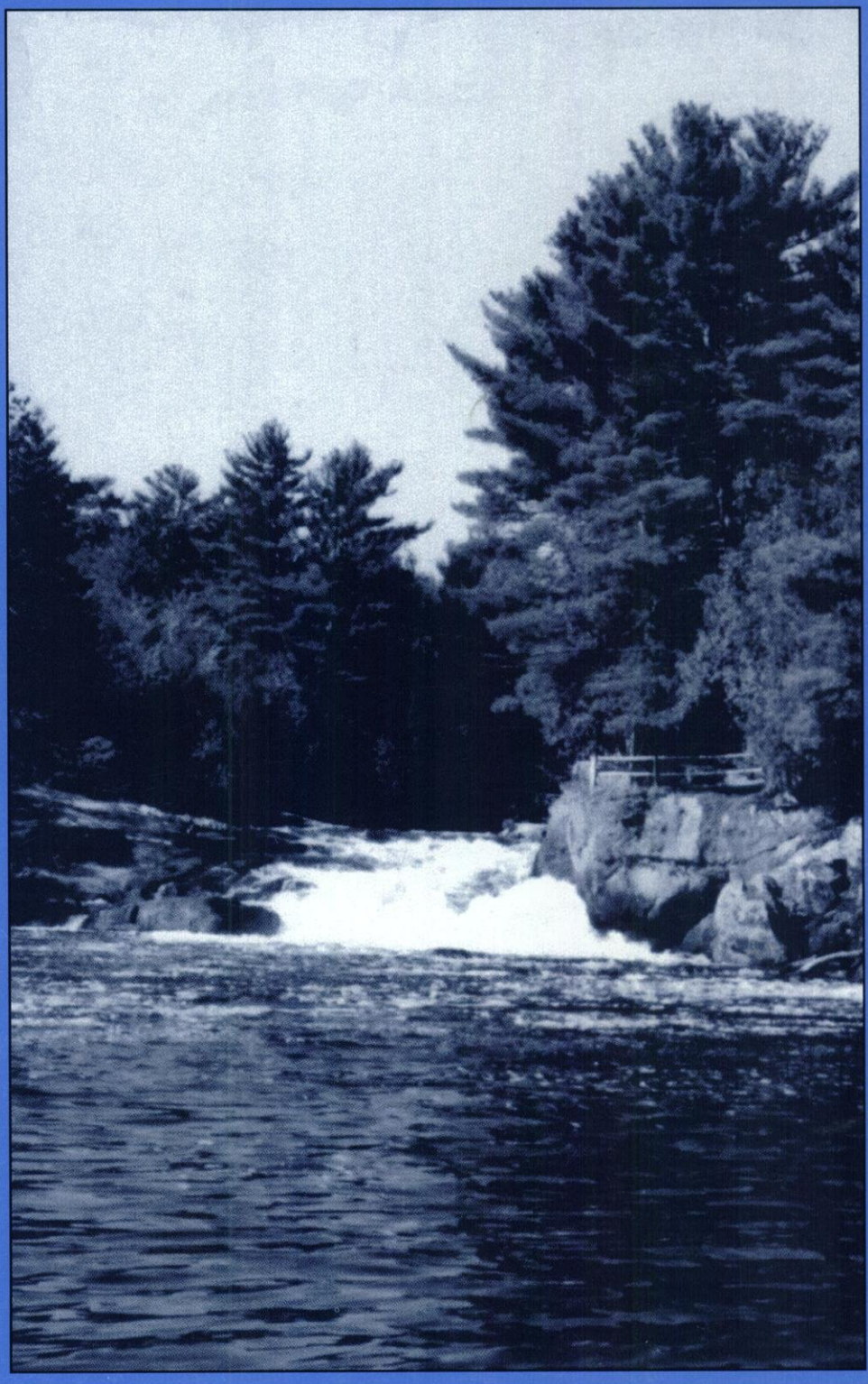
APRIL 1997
VOLUME 101, NUMBER 3

WISCONSIN ENGINEER



On The Cover:
The Sulfide Mining Controversy In Crandon, WI

- Special EXPO Section

ENGINEERING EXPO 97 — DREAMS BY DESIGN
THE UNIVERSITY OF WISCONSIN-MADISON APRIL 18-20

- The Science Behind Quicksand

WISCONSIN ENGINEER

Published by the Students of the University of Wisconsin-Madison

VOLUME 101, NUMBER 3

APRIL 1997

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The *Wisconsin Engineer* magazine, a charter member of the Engineering College Magazines Associated, is published by and for engineering students at UW-Madison. Philosophies and opinions expressed in this magazine do not necessarily reflect those of the College of Engineering and its management. All interested students have an equal opportunity to contribute to this publication.
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EXPO Through the Eyes of a Non-Engineer

By Michelle Truscott

I am not an engineer. The thought of being an engineer has never crossed my mind. As an undergraduate headed towards a career in industrial/organizational psychology, I am in a field related to industrial engineering, but technically, I am not an engineer.

The last four years, however, have brought me closer to the engineering discipline at UW-Madison than most liberal arts students get. One of my past roommates and closest friends started the ball rolling when she suggested (okay, maybe demanded is a better word) that I bring engineering to my attention by attending EXPO '95. I had no idea what EXPO was, but I dutifully fulfilled my obligation as a freind by attending this event she found so important and exciting.

At this point, I have to confess that I am a math phobic. I have been terrified of math since seventh grade and I don't really ever foresee myself getting over this fear. For the most part, I had always thought of engineering as math mixed with chemistry and physics (which I considered nearly as bad as math). Add to this the fact that I was almost completely computer illiterate, and the result was that when I thought about engineering at all (which was only when I walked across the engineering campus to get to football games), I thought about it as some remote dimension of the universe that would never involve me.

As I made my way through the exhibits at EXPO '95, I found myself rethinking engineering. I mean, how can you not be impressed by a canoe made out of concrete that actually floats or a group of students who can build a car — a real car that actually moves? Maybe to the average engineering student these are not amazing feats, but as a sophomore majoring in English and psychology, I was awestruck.

For the most part, I do not think the same way an engineering student thinks. For example, when a computer disk is no longer usable, I throw it away instead of taking it apart to see how it works, as my industrial engineering roommate did. I don't stop to think about how appliances or computers work until suddenly for whatever reason they don't work. Even then, my first impulse is to get someone else to fix the broken object, and not to try to figure out why it's broken. However, as I walked around the engineering campus that afternoon during EXPO '95, I started to ask the kind of questions students interested in science and technology ask. "Why does the concrete canoe float and how do you go about building an electrical engine?" I was thinking like an engineer.

One semester later, that same friend who urged me to go to EXPO '95 convinced me to join the staff of the *Wisconsin Engineer*. The first day of class, I walked to the engineering campus, pulled out my map from freshman year to look for a building that I hadn't even known existed — General Engineering — and sat down in a room full of engineering students. When it came time to decide what we wanted to do, I knew I wanted to write, but I couldn't come up with a scientific topic for the life of me. That first semester with the *Wisconsin Engineer* was quite an adventure. I was constantly turning to my friend and asking questions like, "What is Polygon? What is an ECE? Who is Dean Bollinger?"

Working on the magazine has proven to be a wonderful experience. I've become friends with a lot of people I probably never would have met otherwise (because they are engineers). I've learned a lot about not only writing, but about how to work with other people on a large project. Plus, I've learned a lot about science, technology and engineering.

Source: *Wisconsin Engineer*

Michelle Truscott- Editor

Even though I still do not think like an engineer most of the time, I've learned the value of being able to do so. It's nice to be able to change gears by coming to the engineering campus and looking at things with a different perspective. I still have no desire to be an engineer, but I have developed a great respect for people who do.

As seldom as I may admit it, I am grateful to my industrial engineering friend for dragging me to EXPO '95 with her. I think she opened a door for me. A door which led to a curiosity I hadn't previously had, the same curiosity which makes engineers build and design and create things to make life better.

EXPO '97 is fast approaching, and I'm sure that it will spark ideas, excitement and inspiration as it has in the past, not only for engineering students, but for anybody who can be persuaded to attend. So, no matter how much your non-engineering friends think they hate math, science and technology, convince them to come with you. They might be surprised by what they find. I was.

Author Bio: Michelle Truscott is graduating this May. She will miss UW-Madison, the engineering campus and the *Wisconsin Engineer*.

Turning On With an Off-timetable Culture

By John G. Bollinger

When you came to the UW-Madison campus, you embarked on an adventure to find and cultivate the foundation of a career in engineering. I am always amazed when I visit alumni and learn about their careers. If you follow their footsteps, many of you will become bankers, lawyers, doctors and real estate developers. Even when our graduates are no longer practicing engineering, they say they would not have traded their engineering education for anything. The thought processes, involvement and discipline they learned in engineering are what made it possible for them to have the edge in reaching the positions they are in today.

Alumni who appear to be the most successful share some common values and experiences in addition to their engineering education. They are involved in many activities and are excited about everything they do. They are liked and admired by other people. Many talk about being busy even through retirement. They like working on projects with others. They are innovative and often adventuresome. These people are living in what I call an off-timetable culture. This is a culture characterized by doing much more than is required, seeking opportunity at every corner, becoming involved with groups of people who share common goals or interests and going an extra mile when it is needed. It is a culture of continuously broadening one's education.

The off-timetable culture adds valuable experience to your life but does not give you academic credit. In our College of Engineering it is all around you, in many forms, creating some incredible opportunities. Professional societies and honorary organizations exist for every engineering discipline and for several special interest groups. Other opportunities include Polygon, the *Wisconsin Engineer* and EXPO. It is not sufficient to just join organizations to embrace the off-timetable culture. You must participate and get involved with committees, become an officer or manage an event.

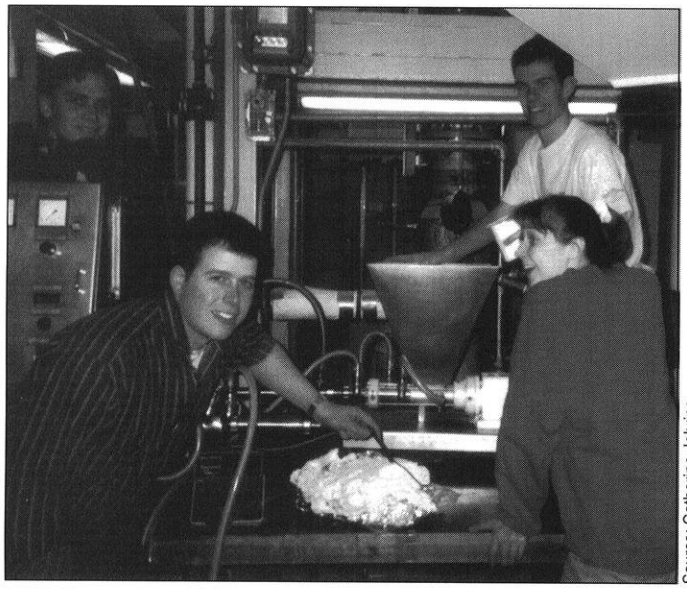
The world honors innovation and creativity, so participation in the Schoof's or Aschenbrenner competitions or on a car, bridge or canoe team can give you valuable experience and an entry pass to the off-timetable culture. Here, the hands-on experience of carrying an idea to physical reality brings the practice of engineering a little closer. Solving textbook problems helps to solidify principles and gives practice in applying theory, but it does not exercise your abililty to synthesize solutions to real situations. Creating something in the laboratory or shop brings engineering to life.

Try it, you will like it, this is where team work is practised, leadership skills are honed and real futures are born.

Source: Engineering Publications

Dean John G. Bollinger stands outside of the center of the Engineering campus, Engineering Hall.

Student Exhibits at EXPO '97



Source: Catherine Jehring

AIChE members Al Deutschendorf, Eric Iverson, Shari Franjevic and Scott Myers work on getting their Marshmallow Madness machine up and running. Make sure to check this EXPO exhibit out!

Student and student organization exhibits make up an important part of EXPO. Students get the chance to show others the projects they have been working on and share information and ideas. Not to mention the fact that students are competing for seven thousand dollars in prize money!

Graduate Student Exhibits

Biofilms for Groundwater Remediation
Lee Clapp

Campus Mapping Project
Joanna Marsolek

Computer Mediated Art
Doreen Maloney

Land Records Modernization
Dan Rodman

PowerSim
Guy Babbitt

Semi-Automated Asphalt Paving System
Bob Schmitt

Vibrations Demonstration
Scott McKenzie

Wisconsin Heights GIS
Chris Benson

Individual Undergraduate Exhibits

Back Pain Prevention - The Ultrasonic Way
Andreas Ostenso

Computer Controlled Electron Microscope
Richard Boyd

Corrosion Fatigue Modeling
Kristina Hermanson

Modern Batteries
Chris Hopp

Prometheus Spa
Andrew Cavendar

Rube Goldberg Machine
Jessie Corbett

Tire Leads
Peter Parker

Urilet
Ted Van Deburg

Variable Length Intake Manifold
Brian Dondlinger

Small Group Exhibits

Applied Superconductivity
Chris Hopp

Bicycle Framebuilding
CyclePaths

Computer-Aided Milling Machine
Brian Bartaszewicz

Create Your Own Homepage
Shawn Rediske

ECHO
Shze Lee

EnginEarrings
Jim Purins

History of EXPO
Patrick Escarcega

Human-Powered Pick-up Truck
CyclePaths

Internet Video and Bandwidth Technology
David Overbo

Live Images From an Electron Microscope
CyclePaths

Materials Surface Engineering
Chris Hopp

Mechanical Design Research Projects
Richard Hage

Rube Goldberg Machine Team
Joe Bunton

SailSim
Kris Dressler

Sound-Source Position Locator
Jeffry Lucman

SSO General Purpose Computer
David Parker

Stepping Out of Line
Jeff Miller

Tandem Whitewater Kayaks
Guy Babbitt

Touch Clutch
Michael Sloan

Student Organization Exhibits

AIAA Balloon
American Institute of Aeronautics and Astronautics

AP 600 Reactor Model
American Nuclear Society

ASME Projects
American Society of Mechanical Engineers

Badger Radio
Badger Amateur Radio Society

Benefits of Food Irradiation
American Nuclear Society

Bucky Badger Bookends
American Foundrymen's Society

Bucky Badger Bookends Foundry Tour
American Foundrymen's Society

Civil and Environmental Engineering
Chi Epsilon

Concrete Canoe
American Society of Civil Engineers

Designs for the New Millenium
Human Factors & Engineering

Engineering and Toys
Society of Women Engineers

Environmental Solutions From Industry
Engineers for the Environment and Technology

Formula Car
Society of Automotive Engineers

FutureCar
Team Paradigm

Geothermal Hot Chocolate
Geological Engineering Society

GPS
American Society of Agricultural Engineers

HEV Car
Team Paradigm

Light Stream
Triangle Fraternity

ManuFACTs
Society of Manufacturing Engineers

Marshmallow Madness
American Institute of Chemical Engineers

Moving Traffic More Efficiently
UWITS

Powering Your Dreams
Tau Beta Pi

Polymer Processing Lab
Pi Tau Sigma

Radiation Public Information Exhibit
American Nuclear Society

Tearin' Up the Competition
American Society of Civil Engineers

Technology for Tomorrow
American Society of Agricultural Engineers

Tinker Toy Team Exercise
Student Quality Society

UW-Baja
Society of Automotive Engineers

UW-Madison Nuclear Reactor Tour
American Nuclear Society

Wisconsin Black Engineering Student Society
WBESS

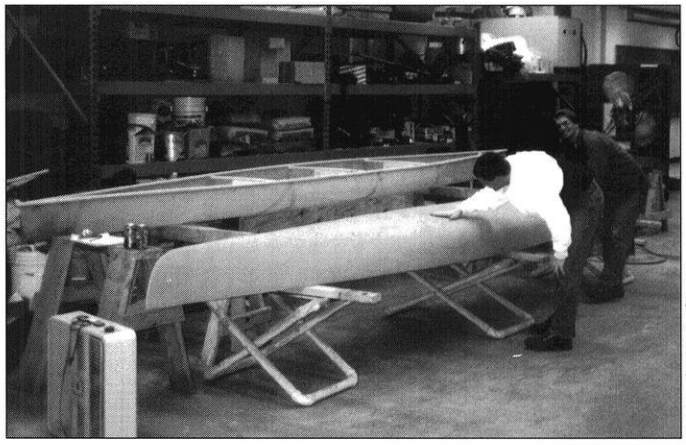
Wisconsin Engineer
Wisconsin Engineer Magazine

Laboratory Exhibits

Mechanical Dissection Display
Mechanical Engineering Department

Hydrostatic Engine Dynamometer
Guy Babbitt

Wisconsin Center for Space Automation and Robotics
WCSAR



Source: Concrete Canoe

Members of the Concrete Canoe Club check to see how smooth the underside of the lightweight concrete canoe feels.

Special Exhibits

Engineering Employment Opportunities
Engineering Career Services

EXPO '97 Student's Day Exhibits
1997 EXPO Committee

K - 12 Outreach Program
Technical Communications Certificate Program

Land Speed Racing
Mechanical Engineering Department

LEGOS™ Campus
1997 EXPO Committee

LEGOS™ Playland
1997 EXPO Committee

Maquina Project
Electrical & Computer Engineering Department

Materials Science on the Nanoscale
MRSEC

Professor Shakhashiri's Chemistry Show
Department of Chemistry

Robot Triathlon
1997 EXPO Committee

STC
Society of Technical Communicators

Technical Communications Certificate Display
TCC Program

Technical Communications Internship Display
TCC Program

The Light Fantastic
First Light Productions / PDS

UW-Stout's Manufacturing Engineering
UW-Stout Engineering

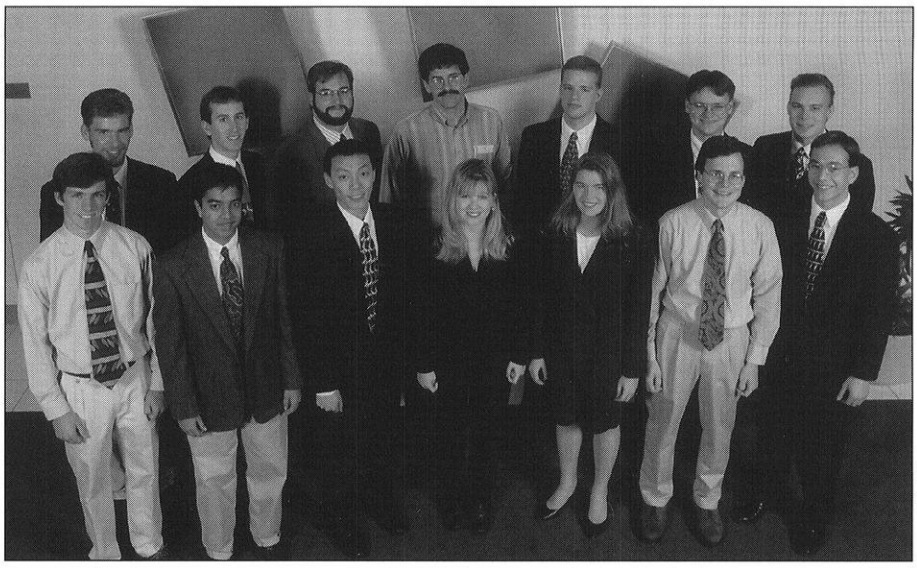
Source: Catherine Jehring

The American Foundrymen's Society will be displaying their badger bookends and giving tours of the foundry on campus.

Executive Committee for EXPO '97

It takes the talents, dedication and hard work of many individuals to plan a huge event like Engineering EXPO. EXPO's executive committee has been working for two years to make EXPO '97 a success. The committee is made up of thirteen people who are responsible for various aspects of EXPO.

Jonas Zahn **Co-chairperson**
Chuck Hwang **Co-chairperson**
Aaron Berken **Computer Support**
Andrew Bouthilet **Publicity**
Douglas Herman **Robot Triathlon**
Rachel Karisny **Logistics**
Andrew Kroll **Student Exhibits**
Scott McKenzie **Relations Industrial**
Jim Myers **School Outreach**
Shawn Rediske **School Outreach**
Vipul Soni **Administrative**
Becky Tschider **Volunteer Coordination**
Dave Waters **Advanced Promotions**



Source: Del Brown

Back Row: A. Berken, S. McKenzie, D. Herman, M. Corradini, A. Kroll, S. Rediske, J. Zahn
Front Row: A. Bouthilet, V. Soni, C. Hwang, R. Karisny, B. Tschider, D. Waters, J. Myers

Industrial Exhibits at

ENGINEERING EXPO '97 — DREAMS BY DESIGN

At EXPO '97, students and the public will be able to talk with representatives from several different companies about the technology being used in industry today, as well as what is in store for the future. The following companies will be exhibiting at EXPO:

Air Force ROTC
Case
Caterpillar
Ford
General Electric
General Mills
Guidant Corp
Marquip
Mercury Marine
Oshkosh Truck
Rockwell Defense Systems
Silicon Graphics
Wisconsin Public Service

SCHEDULE OF EVENTS

Friday, April 18th - Students' Day

Open 9am Close 6pm

Shakhashiri's Chemisrty Show at 10, 11:30am and 1pm in 1800 Engineering Hall
Lego Playland in MechanicalEngineering Building Lobby
Robot Triathlon in the Fieldhouse

Saturday, April 19th

Open 9am Close 7pm

The Light Fantastic at 3, 4, and 5pm in 1800 Engineering Hall
Lego Playland in Mechanical Engineering Building Lobby
Robot Triathlon in the Fieldhouse

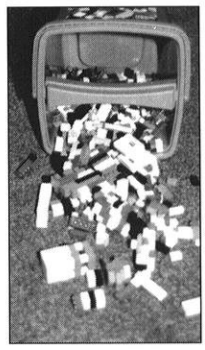
Sunday, April 20th

Open 9am Close 7pm

The Light Fantastic at 2, 3, and 4pm in 1800 Engineering Hall
Lego Playland in Mechanical Engineering Building Lobby
Robot Triathlon in the Fieldhouse

Food tents will be open during the EXPO hours and are located in Engineering Mall and next to the McLain center.

Bringing Engineering out of the Toy Chest



By Dean Nardelli

The culmination of an arduous engineering undertaking has coincided with UW-Madison's Engineering EXPO '97. Bricks, steel beams and mortar were discarded in an effort to construct a more interesting and aesthetically pleasing structure. What, then, was used for such an endeavor? Why, LEGOS, of course.

Yes, those fascinating little pieces of interlocking plastic, which have provided millions of children with years of wholesome entertainment, are the basis for one of the 1997 Expo's most amazing exhibits. Forget the traditional airport, castle, and moon rover constructed of LEGOS: a group of crafty UW-Madison students have constructed the LEGOS Engineering Campus.

The Engineering Campus model is the brainchild of engineering student Jonas Zahn. Zahn is one of a group of several students who exchanged ideas for an Expo exhibit approximately one year ago. In that time Zahn's vision became a reality, captivating dozens of students willing to demonstrate numerous engineering applications using something both intriguing and familiar to many people.

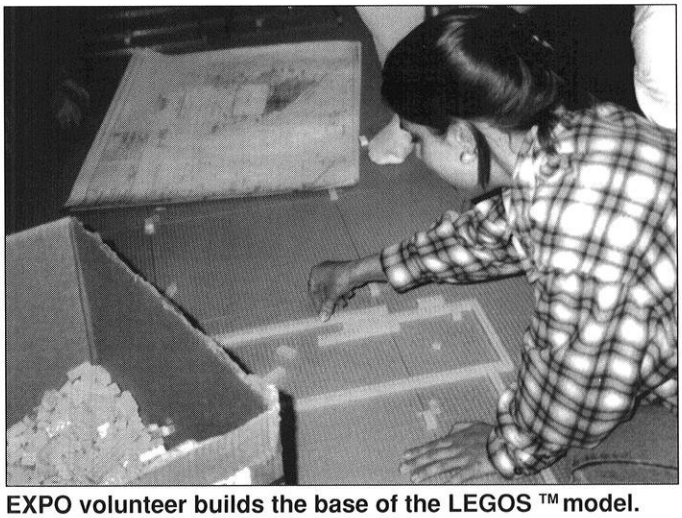
The concept appears to be extremely basic on the surface, for who hasn't at least built a simple house of LEGOS? Be assured, however, that this exhibit is anything but simple. In fact, it is nearly impossible to find a portion of the model which does not display some application of engineering. For example, the buildings could not have been constructed so precisely without some prior knowledge of statics. Essential to the project are modeling, scaling, unit conversions, and the reading of blueprints. Dynamic features slated to appear include a working model of the Descendant's Fountain and a model train running along the edge of the campus. Also planned for the exhibit is a push-button control panel which will give the viewer an oral overview of the various buildings. The most important element of engineering, teamwork, is manifested in the finished product.

This task is a complicated one, one that cannot be accomplished in time without many volunteers and a high degree of coordination. The project's co-leaders are Jessica Devenish, a sophomore pre-engineering student, and Thomas Stendel, a junior in mechanical engineering. Together they oversaw the gathering of information in the fall semester of 1996 and the actual construction of the model in the winter and spring of 1997. They divided the work among the nearly 50 diligent volunteers, the vast majority of which are freshmen and sophomore engineering students. A total of six groups were assigned to a particular area. These areas include: Engineering Hall, the Engineering Research Tower, the Mechanical Engineering building, the Computer-Aided Engineering lab and Materials Science & Engineering building, the Engineering Mall and landscape, and the soon-to-be-built Engineering Center building. Among the leadership positions in each group are a coordinator and a quality-control manager; this ensures interaction between different groups and maintains consistencies within the model.

With such a large number of engineering students working on the exhibit, it follows that this model would be fairly large. It is not merely large; it is immense. The model measures 16' long by 9' wide, and it is composed of approximately 55,000 LEGOS pieces. The model includes the entire Engineering Campus, which encompasses the area east of Breese Terrace to Randall Street and south of Johnson Street to the south end of the practice fields, parking lot, and Engineering Hall.

This project is sure to attract those who enjoyed playing (or still enjoy playing) with LEGOS, if not for the numerous engineering properties it possesses, then for pure admiration of the creativity and dedication of these students. Thomas Stendel sums it up: "Since everyone as a child loved LEGOS and carried that love into early adulthood, it would be interesting to observe the applications of engineering principles learned in college, such as modeling techniques, static and dynamic components, and teamwork, in using LEGOS as the backbone for a learning resource. It's everyone's dream to grow up and play with LEGOS, and through this project, one can, in a way, turn back the clock."

Be sure to visit the LEGOS model of the Engineering Campus at UW-Madison's Engineering Expo '97 on April 18, 19, and 20.



Source: Heather Bohrer

EXPO volunteer builds the base of the LEGOS ™ model.

Using Toys to Teach Science at EXPO '97

By Michelle Truscott

Imagine spending an afternoon walking around the UW-Madison's engineering campus and having it change your life. Actually, it's probably not that uncommon of an occurrence, especially if the afternoon you choose to walk around on is during Engineering EXPO. It's happened to at least one person, Jeanine Terry. Terry recalls, "EXPO was pretty inspirational to me, so I'd like it to be inspirational for others." Terry hopes that the Society of Women Engineers (SWE) can make EXPO '97 as inspirational for others as EXPO '95 was for her.

Jeanine Terry walked through the Materials Science building during EXPO '95. Intrigued by what she saw, she decided to change her major from chemical engineering to materials science and engineering.

For the past year, as the EXPO chairperson for SWE, Terry has helped to design a hands-on exhibit that she hopes will get kids thinking about science and engineering, and will perhaps inspire a younger generation of engineers.

Source: Heather Bohrer

SWE members Michelle Schuppener, Barb Kaiser, Maura Jenkins and Jeanine Terry work on the displays that can been seen at this year's EXPO.

SWE's exhibit is titled, "Engineering and Toys," and it will consist of four stations which aim to give participants hands-on experience in basic design, chemistry and physics.

The first station is a design contest. Participants will design a toy boat using common household items such as tin foil and straws. All the boats will be competing to see which can hold the most marbles. Prizes and gift certificates will be awarded to the winners.

The second station involves a chemisty experiment. Participants will use latex paint and acetic acid to make rubber. The rubber can then be rolled into rubber bouncing balls.

At the third station, participants will have the opportunity to learn some basic physics principles by playing a game called, "Shoot the Moon." A metal ball is placed on two parallel rods. One end of each rod is fixed, and the other end can be moved. The object of the game is to see how far one can get the ball to roll without letting it fall through the rods and hit the table below.

The fourth station teaches lessons in material structures. Participants will be given two balls made of different materials. These balls are called "Happy-Sad Balls," in an attempt to relate science to an analogy that children can understand. Because of the materials which make up the balls, one of them (the "Happy" ball) bounces, while the other (the "Sad" ball) does not.

The exhibit will be open to children of all ages as well as adults. Not only does SWE hope to introduce participants to the sciences, but also to show them how much fun science and engineering can be. With this exhibit, Jeanine Terry may very well help make this year's EXPO the inspirational force it was for her in the past.

Source: Catherine Jehring

Maura Jenkins and Jeanine Terry practice the "Shoot the Moon" game which will be featured at SWE's EXPO exhibit.

McBurney Disability Resource Center:

Turning disabilities into variations, not limitations

By Claire Coleman

Imagine not being able to walk, drive or bike to class. Imagine taking difficult engineering classes while contending with a serious disease like AIDS. How would you get there? How would you keep up physically and mentally? For many disabled students at UW-Madison, the McBurney Disability Resource Center is the answer to these questions, and many more.

Disability is a word that has different meanings for different people. Some students think about disabilities only when they notice a parking spot designated for the handicapped and wish they could park there. Other students at UW-Madison have a better understanding of how a disability can affect one's life. In their quest to obtain a college education, students with disabilities must contend with difficulties in walking, communicating, seeing, hearing or breathing.

The goal of the McBurney Disability Resource Center is to help students turn their disabilities into "...variations, not limitations." Their mission statement says, "Our mission is to create an accessible university community where students with disabilities can realize their full potential. We work with students, faculty, and staff to promote students' independence and to ensure assessment of their abilities, not disabilities." To carry out this mission, the McBurney Disability Resource Center provides academic support, programming access and information and referral services for student clients. These services are often so vital that without them, attending college at UW-Madison would be nearly impossible.

The McBurney Disability Resource Center is a program of the Dean of Students. The program was established in 1977 and dedicated to Floyd "Mike" McBurney, a wheelchair user who graduated Phi Beta Kappa from UW-Madison Law School. Mike McBurney, along with James Graaskamp and others, was a driving force behind early efforts to improve accessibility at UW-Madison. The McBurney Disability Resource Center is funded by gifts, grants and general purpose revenue from the State of Wisconsin and the Department of Vocational Rehabilitation. Trey Duffy, the Director of the McBurney Disability Resource Center, said that before the center existed, UW-Madison was, "...an each person for themselves environment. Although the campus has a long history of disability acceptance, [disabled] people were on their own, and there were a lot less of them [on campus]."

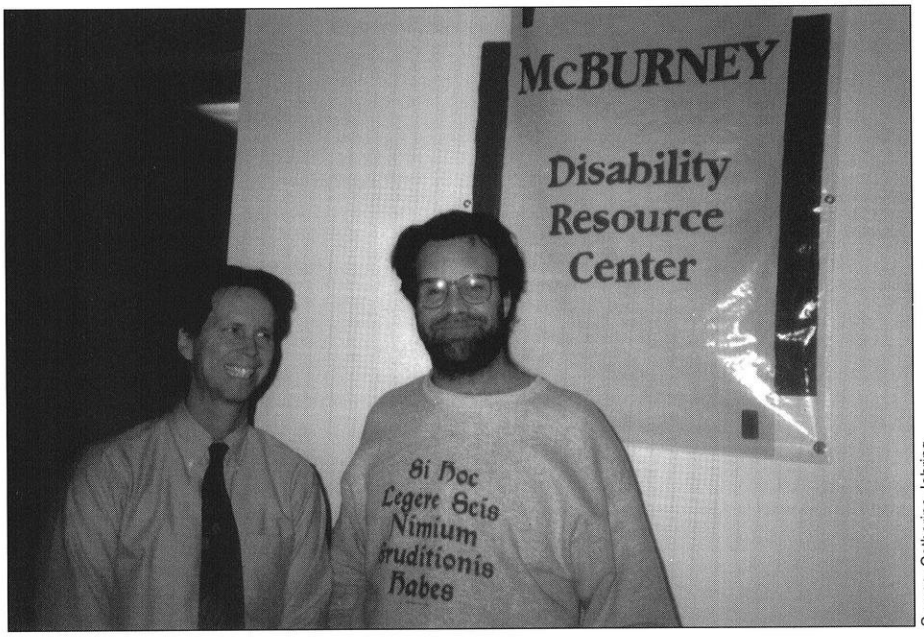
"We work with students, faculty, and staff...to ensure assessment of their abilities, not disabilities"

Now, at any given time, about 700 students use the center. Throughout the entire year, about 1,400 students use or contact the McBurney Disability Resource Center about its services. These numbers lead to incredible variation in the disabilities and needs of the students.

According to Duffy, "There is often a misconception that disability means deaf, blind, or in a wheelchair. Having a disability means you have some kind of impairment that causes you to do things differently."

People who have impairments invisible to the observer make up 75 to 80 percent of the McBurney Disability Resource Center's client list. Examples of such disabilities include: depression, learning disabilities, diabetes, arthritis, HIV / AIDS and respiratory diseases. Some disabilities, like a broken leg, are temporary, while others,

See McBurney on page 11



Source: Catherine Jehring

Trey Duffy, Director of the McBurney Disability Resource Center, and Micheal Howe, an employee of the center, are always willing to lend a hand to those in need.

What Puts the "Quick" in Quicksand?

By Susan Last

Why does quicksand provoke such curiosity in us? And why is it so frightening and mysterious? Perhaps it is the subconscious effect of the old *Lawrence of Arabia* movies, in which people are sucked into quicksand pools right in the middle of the desert. However, a more likely answer is that it is a phenomenon that challenges our concept of the soil under us. Quicksand, instead of being solid and dependable like the earth "should be," is a betrayal of our belief in the firmness of the ground beneath our feet. How is quicksand like the rest of the world's soil, and why is it "quick?"

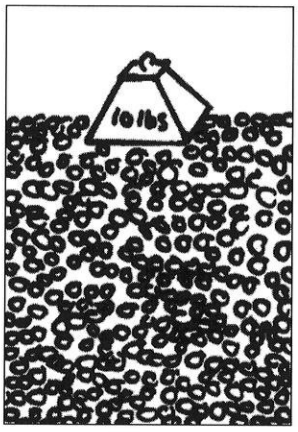


Figure 1. No water flow--regular sand.

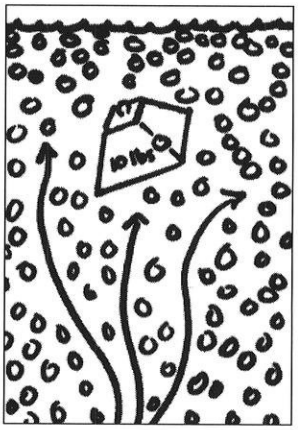


Figure 2. With water streaming through the sand, quicksand forms.

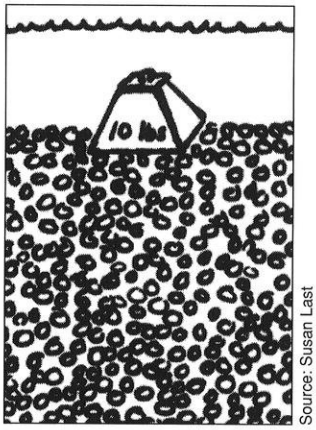


Figure 3. If the water stops moving, the quicksand settles and becomes regular sand again.

Source: Susan Last

What are the characteristics of "normal" sand that make it NOT like quicksand?
Before explaining quicksand, the characteristics of sand that is not "quick" must be described. For dry sand, or sand that is not too wet, the frictional forces between the particles are large enough to cause the sand to be relatively solid. The force of the sand grains pushing up on a mass equals the weight of the mass pushing down. You can stand on the surface of the sand, but you don't become engulfed in it because the sand particles can support your weight.

A small amount of water will actually strengthen the sand's structure because it produces a capillary force that pulls the grains together. Proof of this is the sand balls one can make out of beach sand. However, if too much water is mixed with the sand, the grains are forced apart by the water molecules. What structure there was in the sand is completely destroyed and the sand balls turn to mush.

What makes quicksand "quick" ?
Quicksand is sand that is so saturated with water that the mixture forms a suspension. When the sand and water suspension is subjected to an upward flow, it goes into motion and becomes "quick". The intergranular pressure between sand grains decreases, causing the frictional forces between them to also decrease. A cushion of water keeps each sand grain from bumping into its neighbors. The result is the sand has little strength available to bear the weight of anything resting on its surface.

Although soil scientists at one time believed quicksand to be a separate classification of soil, it is now thought to be ordinary sand, "...buoyed up by a hydrostatic pressure from below,"[1] such as water from underground springs. The sand grains can be large or small, angular or smooth in shape. Quicksand particles don't necessarily have to be rounded like tiny ball bearings as was previously thought.
The primary characteristic of quicksand that sets it apart from ordinary sand is that the water pressure beneath the sand is equal to, or is slightly greater than the weight of the sand particles. When the water pressure is high enough, the sand grains have little or no friction between them. The water flowing between the grains forms a kind of lubricant. As a result, they will no longer be able to bear a load, and the load will sink. Therefore, it is important to note that it is the *flow* of water *through* the sand which forms the quicksand.

Two other interesting characteristics of quicksand, deriving from the relatively high amount of water in quicksand, are its high specific gravity and its ability to form a partial vacuum. A body will tend to float in quicksand because it has a specific gravity of 1.156. (This is more dense than water which has a specific gravity of 1.00). However, since most people and animals are apt to panic after falling into quicksand, they thrash around and dig deeper into the sand. Taking advantage of the high specific gravity by relaxing and floating on one's back until help arrives would be a more rational thing to do.

There is also the potential of creating a partial vacuum when pulling an object out of quicksand. The vacuum is caused by the inability of air to replace the object when it is removed. It is not the sinister quicksand "sucking" one in.

Where is quicksand likely to be found?
Quicksand is likely to be found in three

different environments. The soils which are most susceptible to form quicksand are along rivers, streams, and lake shorelines. However, quicksand can be formed in hilly areas with loose soil and shallow ground water or in areas with a high probability of earthquakes. There would be little chance of finding quicksand in the desert as in the movie *Lawrence of Arabia*. The desert is just too dry.

There is nothing mysterious about quicksand. It is an interesting quirk of nature that actually fits into the soil classification scheme. Quicksand is formed by underground springs running through a bed of ordinary sand. With the proper amount of hydrostatic pressure, the sand grains become a sand/water suspension. This is the primary characteristic of quicksand that sets it apart from ordinary sand.

If anybody knows of a location of quicksand in the state of Wisconsin, please e-mail me at smlast@students.wisc.edu.

Fun things you can do at home to deonstrate the characteristics of quicksand:
Quicksand in a cup:
1. Add water to sand until it tops the sand's surface
2. Stir vigorously.

The mixture LOOKS solid, but sticking a finger in it reveals that it is not.
Note: The experiment would be more realistic if one could somehow hook up a flow of water into the bottom of the cup. There is a more complicated experiment that does this. The instructions are in the article by Leslie Ware given in the References at the end of the article.

Author Bio: Susan Last is a fifth year student majoring in Biological Systems Engineering. She is terrified of quicksand.

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McBurney Disability Resource Center

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like blindness, are permanent. All students must document their disabilities before they are considered for any of the center's programs.

With so many kinds of disabilities, one student's services may be very different from those of the next student. For example, one learning disabled student may need tape-recordings of exams to compensate for slow reading speed, another may need extra time to compensate for reduced visual perception, and a third may need a quiet, distraction-free room to compensate for attention deficits.

The McBurney Disability Resource Center's services address the four components that make an environment accessible. Physical accessibility might take the form of making a classroom wheelchair-friendly or providing accessible parking. Programming accessibility concentrates on such aspects as sign language, Braille, note -taking services, large print or policy modifications including priority registration and alternative testing. Attitudinal accessibility is concerned with creating open-mindedness and sensitivity to the issues. Electronic access deals with how various people use computers. These services ensure that a student's disability does not interfere with his or her ability to compete on the same level as other students.

Electronic accessibility is important in today's high-tech world. According to Duffy, "The McBurney Center's role is to get the campus to install adaptive systems in the libraries and computer labs." Initial efforts have been focused on making large, central locations accessible. Computer labs at Memorial Library, Helen C. White Library, and the Division of Information Technology Center (DoIT) contain accessible equipment. According to Duffy, "The Memorial Library Infolab designated four computers that have been adapted to meet the needs of just about anybody with a disability."

To meet these needs, the computers have been modified so they can handle alternative input or output. For input, track balls may be easier than using a mouse or keyboard. Other people need the computer to recognize their voices. Alternative output can take the form of a screen-enlarger program to generate large print or a speech synthesizer to talk to those who cannot see the screen. In addition, ergonomic chairs and adjustable-height tables ensure that the special equipment is in an accessible environment.

Of UW-Madison, Duffy said, "My overall opinion is that it is very open to issues of disability. If any place on the planet is open to new ideas, it would be a university. I'd probably give the campus an overall A-." The McBurney Disability Resource Center's support and reinforcement of that atmosphere ensures that a disabled student's education equals that of any other student.

For more information, contact the McBurney Disability Resource Center,905 University Avenue, Madison, WI 53715, phone (608) 263-2741 /V and (608) 263-6393 /TTY.

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In compliance with applicable federal and state law and with University policy, UW-Madison does not discriminate on the basis of age, race, color, religion, sex, national origin or ancestry, sexual orientation, arrest or conviction record, marital status, disability, political affiliation, or veteran's status with regard to treatment of employees and students in the educational programs or activities which it operates. Inquiries concerning this policy may be directed to appropriate campus admitting or employing units or to the Office of Affirmative Action and Compliance, 175 Bascom Hall, 262-2378.

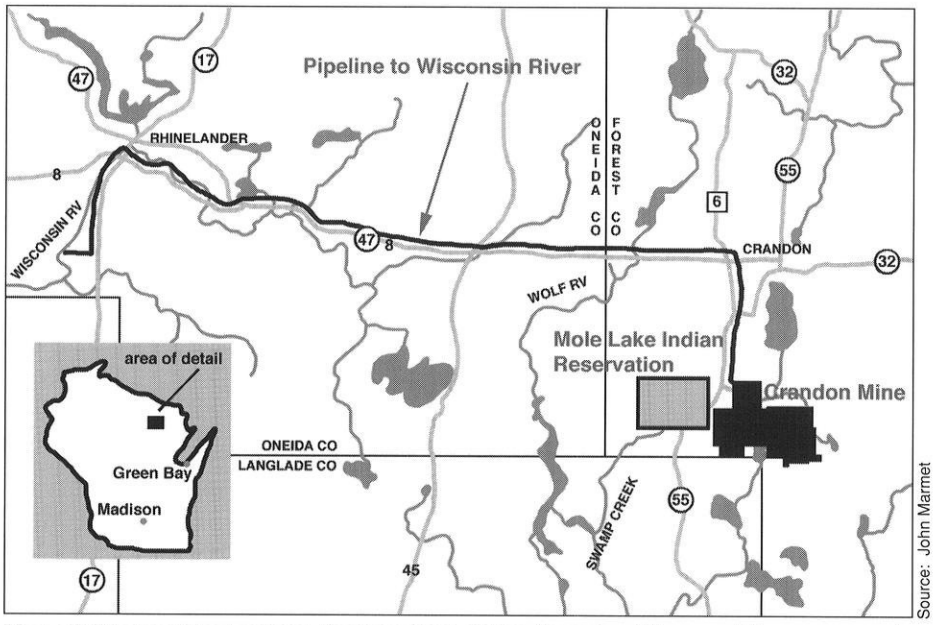
Author Bio: Claire Coleman is a recent addition to the *Wisconsin Engineer's* writing staff.

The Controversy Behind Sulfide Mining

By Jennifer Schultz

Water is one of the basic necessities of life. Sulfide mining is the center of a controversial debate in Crandon, Wisconsin. How do these things relate? Ask the people who tour the Flambeau Mining Company's open pit copper mine near Ladysmith, Wisconsin. After the tour, they take a drink of treated water that before had been sloshing around the bottom of the mining pit.

The controversy over sulfide mining is a complicated issue. Advocates for sulfide mining look at the economic aspect. Society demands the copper, zinc and lead that the mine provides. Supporters of mining also state that mines help boost the economy and create jobs. Opposition to sulfide mining centers around the environmental degradation to the surrounding area of the mine. As the Department of Natural Resources (DNR) noted, "There are no ideal metallic mineral mining sites which can be pointed to as the model approach in preventing acidic drainage industry-wide." Basically, this means that there have been no sulfide mines where all contaminates were contained.



Source: John Marmet

Map of Wisconsin showing the location of the Crandon Mine and the proposed pipeline for the disposal of waste to the Wisconsin River.

What is sulfide mining?

Mining is the process of extracting materials from the earth to obtain valuable metal ores such as copper, zinc, and lead, which are called target minerals in mining terms. Metal ores such as copper, zinc and lead are minute quantities compared to the total composition of the earth. Copper makes up only 0.0058% of the earth's crust by weight. Since these minerals are rare in a geological sense, sites for mining must have relatively high concentrations of the mineral.

In 1975, Exxon found a site near Crandon, WI, where the ore contains 8.4% zinc and 0.7% lead. In the August 11, 1996, issue of the Wisconsin State Journal, Ron Seely wrote, "...it is Crandon's good fortune - or misfortune, depending on your point of view - to be sitting almost on top of one of the richest mineral deposits to be discovered in the Upper Midwest since W.W.II."

"Thus the decision to allow mining is not a question of whether to permit environmental damage. It is a determination of the nature and extent of the damage and uncertainty that is 'acceptable' as a matter of public policy"

The minerals that contain the precious metal ores are in the sulfide minerals group. Thus, the main byproduct of separating these minerals is sulfur. Sulfur, when exposed to water and air, will react to form sulfuric acid. This toxic acid can leak into the groundwater which can contaminate wells and lakes and streams.

The Process of Sulfide Mining

The process of sulfide mining is broken down into five steps: exploration, development, mining, smelting and refining and reclamation.

Exploration consists mostly of testing the site to determine if the source of the minerals is high enough to make mining the site worthwhile. Extensive core drilling and metallurgical bulk sampling are the main tests that a company will do during exploration. The company will also determine whether the mine will be an underground mine or an open pit mine. This

decision is based on the depth and size of the ore body.

Development consists of all the activities which must take place before mining can occur. These include constructing surface structures, access roads, power lines and rail lines. If the mine is to be an underground mine, construction of access and ventilation shafts will occur during development. For an open pit mine, development is the process of removing the rocks and soil covering the orebody.

"...it is Crandon's good fortune - or misfortune, depending on your point of view - to be sitting almost on top of one of the richest mineral deposits to be discovered in the Upper Midwest since W.W. II."

Mining is the process of extracting the ore. This is done through a cycle of drilling and blasting the ore. The material that results from extraction is called solid waste. This solid waste is washed with water and the sulfur dissolves out. Then the rock is loaded onto trucks to be transported to a refinery to be processed. The material left after the target minerals have been separated is called tailings. The tailings are taken back to the mining site where they are used to fill the spaces in the mine to increase support of the shafts.

Mining affects the groundwater table level. The mine acts like a giant well by pulling in water from the surrounding area. To keep the mine in operation, the water has to be continuously pumped out of the mine. This process is called dewatering. Dewatering creates a cone of depression in the groundwater of the surrounding area which may lower water levels in nearby wells

Smelting and refining consists of three steps: roasting, smelting and converting. Roasting is used when the solid waste has high concentrations of sulfur. Iron in the concentrate is oxidized and removed. Smelting bonds most of the remaining impurities into a melt by combining the ore with a silica substance and heating the solid waste to a high temperature. Converting drives off the sulfur from metallic sulfides, oxidizes any remaining iron and removes it, leaving the target mineral. These 3 steps can result in a metal that is up to 99% pure.

Reclamation is the rehabilitation of the mining site after the mine has been closed. The goal is to restore the site to its original condition. Hazardous waste disposal is an issue throughout the mine's operation, but it is especially important after operation has ceased since proper disposal is essential for clean groundwater.

Why is there concern over sulfide mining?

Tailings, the leftover ore after target minerals have been removed, are in large quantities compared to the amount of ore extracted. Each ton of copper ore only yields 8 to 10 lbs of copper leaving 1,990 lbs tailings. Tailings contain heavy metals, chemicals and acid generating sulfide compounds. Tailings are often stored and contained in pits that are lined with generally impermeable materials, such as clay or synthetic liners. Heavy rains can cause tailings management areas to overflow or even fail, washing toxic tailings into nearby waterways.

The main result of sulfide mining is sulfuric acid. Sulfur is known by its characteristic "rotten egg" odor. Mining raises the sulfur to the surface and crushes it, thereby exposing much more surface area to the effects of water and oxygen forming sulfuric acid. This acid can leak into the groundwater and can be highly toxic to freshwater ecosystems.

Sulfide Mining in Wisconsin

There are two specific sulfide mining sites in Wisconsin, namely the Crandon mine in Crandon, Wisconsin, and the Flambeau mine near Ladysmith, Wisconsin.

The proposed Crandon mine has been a project of Exxon and Rio Algom 's since 1975. Controversy surrounding the mine has prevented actual mining up to this point. Even if all the permit processing goes smoothly, it will still be another two years before operation will begin.

The proposed Crandon mine site is located on Swamp Creek, adjacent to the Mole Lake Indian Reservation. The Menominee tribe who lives next to the mining site has raised the most opposition to the mine. Growing wild rice and fishing are major components of the Menominee culture and traditions. The Menominee tribe has stated that the chemicals used in the exploration stage, over the last year, have already caused a decrease in rice production.

Exxon has two plans for dealing with the contamination the mine will produce. The first plan is to build a 38 mile long underground pipeline from the mine to Rhinelander, Wisconsin. The waste from the mine will be treated and then transported along this pipe, eventually to be dumped into the Wisconsin River. The second plan is to construct 45 feet deep pits lined with clay and synthetic liners where the contamination will be stored. The DNR and the Crandon Mining Company both admit that some material will leak, resulting in the addition of sulfuric acid to the groundwater.

Exxon cites the economic benefits as the main support for the mine. The Crandon Mining Company will create 1,000 construction jobs and 400 to 500 mining jobs for the area over the mine's 25 years of operation.

A sulfide mine currently in operation is the Flambeau open pit copper mine near Ladysmith, Wisconsin. Bornite is the mineral being mined. The chemical formula of bornite is $CuFeS_4$. Copper is the ore being used, while the iron and sulfur are left as waste.

Opposition to the Flambeau mine before it went into operation was centered around the location. State regulation calls for a mine to be a least 300 feet away from a water source. The Flambeau mine was built only 140 feet, which is less than half the length of a football field, from the Flambeau River. Concern was expressed over the level of copper contamination in the Flambeau River; however, the water treatment process the company adopted has been quite successful. The state standard for copper levels in water is 42 parts per billion. The treated water from the mine has a copper level of only 5.82 parts per billion.

Sulfide mining is the extraction of metal ores that are associated with minerals containing sulfur. Through the processes of mining, the sulfur is left as a waste product that can combine with the air and water to form sulfuric acid, which is extremely toxic. This sulfuric acid leaks into the groundwater supply, lakes and streams in the surrounding area. Though mining

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Sulfide Mining in Wisconsin

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companies use treatment processes, they are not fool-proof and contamination does occur. However, the demands of society require that mining must continue. This issue may seem straight forward in that there are two sides one can chose from. Engineers look at the technology and the practical uses for these metal ores, but we also have to look at the environment. It's hard to make a decision, which is evident in that Exxon has not gained approval to mine at Crandon for 22 years. Doesn't it seem logical that a compromise must be found. This compromise is stated in, "The Effects of Sulfide Mining on Ecosystems," with this quote:

"Thus, the decision to allow mining is not a question of whether to permit environmental damage. It is a determination of the nature and extent of the damage and uncertainty that is 'acceptable' as a matter of public policy."

Author Bio: Jennifer Schultz is a sophomore in geological engineering. She keeps busy as editor of the Wisconsin Engineer, but somehow finds time to write articles about topics that interest her.

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Frank Lloyd Wright: A Madison Success Story

By Rob Nelson

Architecture is the triumph of the Human Imagination over materials, methods, and men, to put man into possession of his own Earth. It is at least the geometric pattern of things, of life, of the human and social world. It is at best that magic framework of reality that we sometimes touch upon when we use the word 'order'.
— Frank Lloyd Wright, 1930, 1937

Frank Lloyd Wright was an extraordinary designer. Wright studied civil engineering at UW-Madison. Much later, the people of Madison wanted him to design a convention center and in 1938, he did. The building was to be named Monona Terrace, located on Lake Monona. Unfortunately, plans for the building lay unused until the early 1990's, when a group of citizens decided it was time to take action. The final project will be completed on July 1, 1997, just in time for the Fourth of July celebration.

Wright led an intriguing life as an architect. Wright started his career in Chicago, in 1887, as a draftsman for the firm of Adler and Sullivan. Through hard work, he was eventually appointed Head of Residential Designs. However, after working at the firm for about twelve years, it was discovered that he was designing houses of his own, and he was fired.

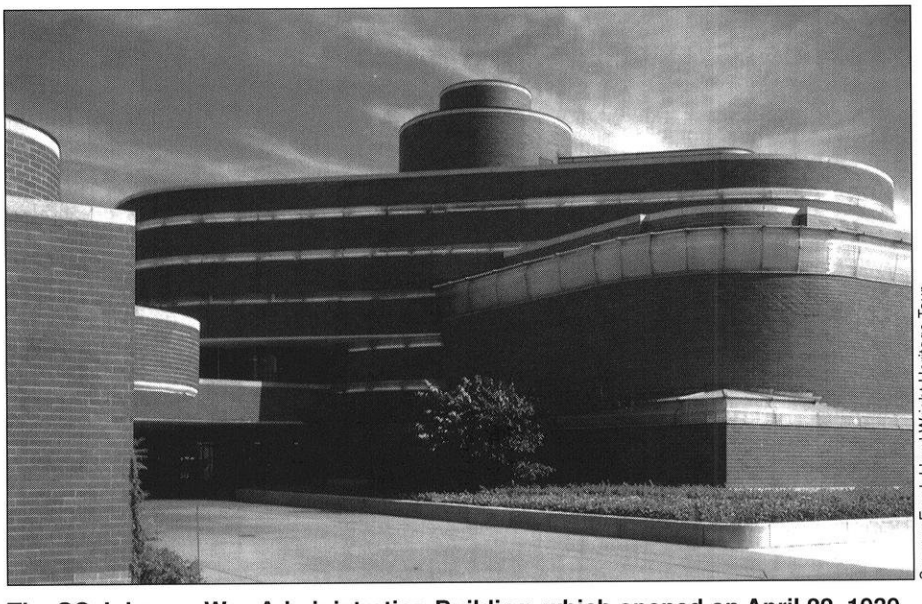
Turning his failure into success, Wright opened his own firm in 1893. Forty-nine buildings were designed and built in a span of eight years. The designs, similar to the designs he created at Adler and Sullivan, culminated in a style that became known as "Prairie House" designs, a derivation of the term "Prairie School House." These houses had the distinctive flavor of low, sheltering roof lines and a prominent central fireplace.

Wright's career took many emotional blows after the successes at his firm. He fathered five children, and in 1909, his wife suddenly left, taking their children with her to Germany. This caused Wright much pain and sorrow. He eventually took a lover, the wife of a former client, for two years (1912-1914). After which, Wright married two more times.

With his firm in hand and his reputation as a good architect growing, Wright took to designing many larger projects, including the Imperial Hotel in Tokyo. In 1932, Wright aquired thirty apprentices, who helped him become more organized and prolific in his designs.

Source: The Frank Lloyd Wright Foundation

Frank Lloyd Wright studied civil engineering at UW-Madison.



Source: Frank Lloyd Wright Heritage Tour

The SC Johnson Wax Administration Building, which opened on April 22, 1939.

During World War II, Wright designed fewer buildings. However, after the war, the GI Bill allowed more students to go to school, which allowed him to take on more apprentices. After the war, and until the end of his life, Wright received 270 house commissions. He also designed and built the Price Tower Skyscraper in Oklahoma, the Guggenheim Museum in New York and the Marin County Civic Center in California. Wright worked until his death in 1959, when he was 92 years old.

Perhaps the most well known of Wright's buildings is the "Falling Water" house in Bear Run, Pennsylvania. The house is surrounded by a dense forest, large rocks and

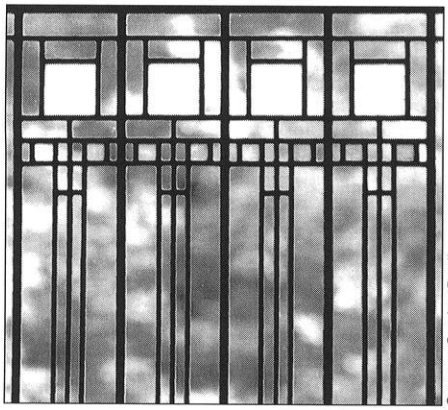
See Wright on page 16

Frank Lloyd Wright

continued from page 9

Source: Andrew D. Lautman

The Robert Llewellyn Wright House (1953), Bethesda, Maryland. This is the home that Wright designed for his youngest son and daughter-in-law.



Source: Gordon Beall

A detail of the playroom windows in The FLW Home and Studio (1889-98), Oak Park, Illinois.

a stream. What makes the house special is the way it blends in with the forest and water around it. The house is integrated with a waterfall, and strong horizontal, sheltering roof lines accentuate the broad rocks below. Inside the house, a large fireplace gives a friendly appearance, and windows offer a beautiful view of the foliage surrounding the building. Overall, the house generates a feeling of being in touch with nature.

This structure is hoped to enhance the beauty of Madison, while being a world-class mecca for meetings and cultural events.

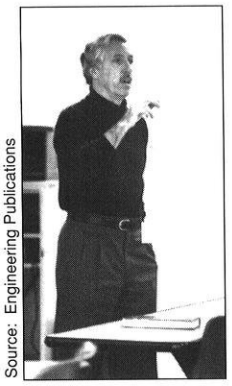
Another of Wright's great buildings is the S.C. Johnson Wax building in Milwaukee, Wisconsin. The inside and outside of this building seem to contrast each other. The outside of the building is formed by long concrete horizontal surfaces with windows mixed throughout. The exterior creates a feeling of blending with nature.

However, once one steps inside the S.C. Johnson Wax building, things begin to look odd. The roof beams are round. They seem to be very small at the bottom and to get wider until they explode into giant circles at the ceiling. Lighting for the room appears to be haphazardly placed in the open spaces between the beams. The design gives the impression that the beams cannot support the ceiling. In contrast to the simplistic exterior, the interior of the building is overwhelming.

Unlike the previously mentioned designs, Wright will never see the completion of Monona Terrace. The building will have a gentle, bow-like appearance. The convention center will be on the shore of Lake Monona with the Capital building in the background. Once it is completed, the facility will have five floors and 250 thousand square feet of space. A 100 thousand square foot garden on the roof will accommodate family picnics and outdoor events such as concerts. In addition, a 560 space parking facility will be built. The total cost will be 67 million dollars. This structure is hoped to enhance the beauty of Madison, while being a world-class mecca for meetings and cultural events.

Wright's designs were revolutionary in his time, as they are in ours. Wright was a gifted person who spent many years, filled with strife and triumph, in giving us his view of the world. Having attended the College of Engineering at UW-Madison, Wright should be regarded as a yard-stick to measure ourselves by. Hopefully, his design of the Monona Terrace will show his true genius and will strengthen pride in our community.

Author Bio: Rob Nelson is a busy electrical engineering senior. Some day he'll open an engineering company and call it "Cyclops Engineering;" its motto will be "We've got our eye on you."



Source: Engineering Publications

Professor Michael Smith

Instructing, Advising and Ergonomics

By Sara Vail

There is no doubt in my mind that everyone in Industrial Engineering(IE) has heard of Professor Michael Smith. He is involved in many aspects of the College of Engineering at UW - Madison. Professor Smith was a student here where he earned his BA, MA, and PhD. He is now a full time professor, a researcher, one of two advisors for the Madison Chapter of the Society of Women Engineers (SWE), and a Department Chair for IE. Professor Smith sums up his confidence in UW - Madison in the following statement, "As a department chair I get to see where the department and college are headed in the next several years. I think we have many challenges, but we are up to the task of meeting them. The faculty are exceptional. The students are top quality. Our supporters are many. I see a bright future for engineering students, and in particular Industrial Engineering students."

Michael Smith has lived in Madison for most of his life. He attended Madison East High School, the UW - Madison, continued here as a teaching assistant for two years, and came back to aid the rest of us in our educational endeavors as a full time teacher. Professor Smith enjoys teaching because it gives him the "opportunity to present ideas, to debate, to excite, to build confidence, to challenge." Professor Smith is a very popular teacher. He has built a very prestigious name foir himself through his ability to create a joy for learning in students. This is a result of his attitude toward his students. He sincerely enjoys his job and that is obvious in his classrooms. He strives to treat his students as professionals; meaning he is constantly asking them to meet challenges rather than spoon feeding them ideas. This generates respect in students. They really enjoy seeing classroom studies applied to real world situations. That creates more of a desire to discover a solution and tricks students into loving to learn.

You may want to look into some of the following classes if Professor Smith's style appeals to you. He teaches several undergraduate classes in the Human Factors area involving basic human factors, safety, and job design. Professor Smith also teaches the IE introduction course because he wants "to let engineering students know how great this discipline of IE is." This coming fall he will be jointly teaching Engineering Professional Development (EPD) 160, which is designed to introduce first and second year students to engineering early in their careers. He also teaches graduate seminars that deal with ergonomics, production liability, organizational management, and quality management.

Before returning to UW - Madison (where he hopes to be for the remainder of his career), Michael Smith worked for the Department of Industry & Labor and for the government where he was in charge of a well known research labratory which studied human factors and ergonomics issues of occupational safety and health. Each of his three "real" jobs provided him "with a unique opportunity to do something interesting and new, each had intellectual challenge, and each allowed [him] to make a contribution to society. What could be better? He was also a part time instructor at three universities. His return to Madison allowed him to expand his previous work into new areas.

Right now Professor Smith is working on three important research projects. Each one is very unique. The first is a study of engineering controls and organizational management procedures with the goal of reducing carpal tunnel syndrome in computer users at a catalogue retail industry. The research for that project is funded by the National Instituite for Occupational Safety &Health(NIOSH), as well as, Steelcase Inc. and Details Inc. The second project is funded by Shering - Plough Pharmaceuticals and entails an examination of the effects of allergies on employee productivity and the benefits of prescription drugs, as well as, over the counter drugs to help employees work more efficiently when afflicted with allergy symptoms. The third research project involves using engineering principles to help inner city residents with economic opportunities such as, the development of new jobs and businesses, purchasing homes, and improving schools. There is no formal funding for this project but it has been supported by contributions and gifts from individuals, as well as, the combined efforts of several neighborhood groups in Milwaukee.

Professor Smith decided to focus on the area of human factors because his educational training was in Human Factors Psychology and his job at NIOSH allowed him to focus on aspects of Human Factors Engineering. The research and courses involving the area of human factors at the UW - Madison has been increasing over the past several years. In Professor Smith opinion, "This (UW - Madison) is a great place to be if you are interested in teaching or learning about Human Factors Engineering." Michael Smith says that the students seem to be very excited about this area because it integrates elements of engineering with psychology, sociology, and business management.

When asked what his definition of a good student was Professor Smith replied, "eager to learn, inquisitive, ready to talk and discuss concepts, hard working, good interactive skills, friendly, not afraid to be wrong." His defintion of a good engineer is "someone who knows how to analyze problems, develop good solutions, and use logic to design principles to build the solution. An engineer must hold public safety foremost in developing solutions."

When asked what his greatest and most rewarding accomplishment was he replied, "helping my wife raise two wonderful daughters who will both be graduating from the UW this spring. They are fantastic women. While students will be a legacy of knowledge, my daughters will be a legacy of family. Both are very important to me, but my family is most important."

The Wisconsin Society of Professional Engineers

By Roger Bindl

All the best ideas come from Wisconsin," surmised Mary (Mel) Mitchell, Executive Director for the Wisconsin Society of Professional Engineers (WSPE). She is talking about a program that started at WSPE before becoming national, the Annual Governor's New Product Award.

Twenty-eighth Annual Governor's New Product Award

The Annual Governor's New Product Award is a major program for WSPE. In 1969, Jack Nelmark, a member of WSPE, and a group of associates were looking for ways to award engineering disciplines, and ideas to "beef up membership." They came up with the Governor's New Product Award. Nelmark's program was adopted by the National Society of Professional Engineers (NSPE) in 1978. This resulted in both a state and a national award competition. Wisconsin wins about one out of every three national competitions. Mitchell explained, "The awards aren't just for the best ideas." To win, the products must be useful, marketable, create jobs and sell.

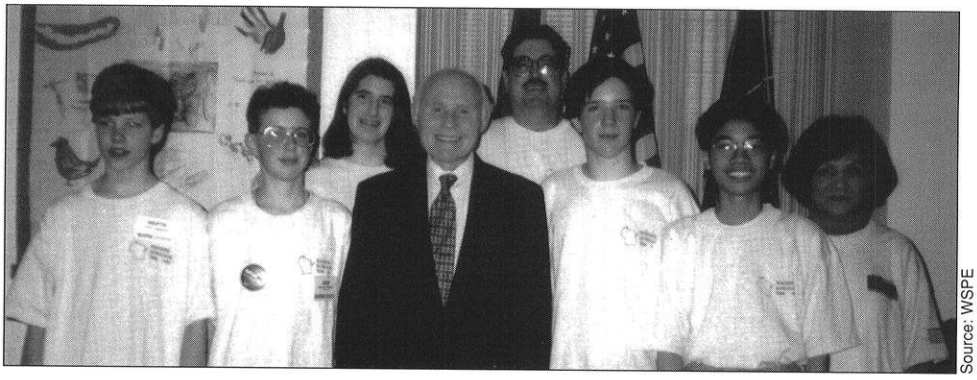
This year's awards banquet will be held in Green Bay on May 16. Between 500 and 600 people are expected to attend the banquet.

The Society

WSPE got its roots from the Engineering Society of Wisconsin, which was organized in February, 1909. WSPE was inducted into NSPE in May, 1944. Today, there are 1,500 members in nine chapters throughout the state.

The objective for WSPE and NSPE is to promote excellence in engineering through advocacy, education and networking. Both groups achieve this by maintaining a strong focus on licensing and legislative issues, providing workshops and professional development courses and offering a means for meeting other engineers.

"WSPE is member driven," explained Mitchell. One staff person coordinates the various activities, so many volunteers are needed to run programs, speak to students and provide training. Monthly meetings typically include tours of manufacturing or construction sites and guest speakers. "Engineers get a high degree of respect with having a degree and certification in engineering," Mitchell says. She views engineering as a "wonderful discipline" and believes people, "...can do so much with an engineering background... sales, engineering, management."



Source: WSPE

Senator Herb Kohl poses with Mathcount participants.

An Opportunity for Students

Students need more than just the degree. "It isn't like it use to be," explained Norm Arendt, President-Elect of the Southwest Chapter of WSPE. He believes that students need extras like professional memberships, contacts and volunteer work to land jobs.

"The Society is good for networking," Arendt added. "It gives an overall look at engineering." Membership is only one of the extras that help students get jobs. The Society also provides a platform for making professional contacts and gaining exposure through volunteer work.

Nelmark agrees with Arendt. "Companies are concerned about motivation," he said. The best way to demonstrate motivation is by being active. Nelmark also stressed electives, explaining that new employees often can't write a proper report. Students need those electives to improve themselves.

Three hundred student members are currently involved with WSPE. "For only ten dollars, the annual dues, a student receives the magazine, publications and can attend meetings," Mel Mitchell said, "It's a great opportunity to network, meet engineers and meet potential employers."

Allen Wortley sees WSPE as a valuable organization for students to participate in. Wortley is an active member in WSPE and NSPE, an active supporter of several other engineering groups and a professor at the UW-Madison College of Engineering. He feels the Society plays an important role in emphasizing professional responsibilities, ethics, education and legislative efforts in engineering.

Wisconsin Society of Professional Engineers

A state society of the National Society of Professional Engineers

Mathcounts

"Mathcounts gives recognition to math and science students in a society where so much recognition goes to athletes," Mitchell stated.

Mathcounts is a math and science competition for seventh and eighth graders. State teams and individual students from 7,500 schools compete to qualify for the national championship in Washington, D.C.

'Mathcounts gives recognition to math and science students in a society where so much recognition goes to athletes'

Competition for this year started back in February. Wisconsin has 140 middle schools competing. The nine WSPE chapters held area competitions. Four students from each school in the chapters' area advanced to the state competition. State competition was held on March 15th. The winners advance to the national competition on May 9th.

Last year, a student from Wisconsin placed third at the national competition. Po-Shen Lo, an eighth grader from Madison, scored higher than 300 thousand other competing students to earn third place.

Engineers' Foundation of Wisconsin

The Engineers' Foundation of Wisconsin (EFW) program offers scholarships to high school and college students pursuing engineering degrees. These include the College Freshman Scholarship, College Senior or Graduate Student Scholarship, Past President Scholarship, Charles H. Bennet Memorial Scholarship and Michael Odill Memorial Scholarship.

The foundation was formed in 1982. It is funded by contributions from members, businesses, individuals, endowments, trusts, bequests and other planned giving. From the time it was created, EFW has provided over 28 thousand dollars to 45 students.

Publications & Information

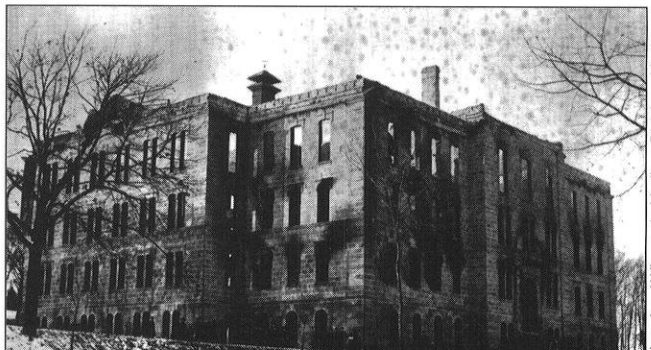
For additional information on WSPE see: www.nspe.org and www.wspe.org.

Members receive *The Wisconsin Professional Engineer* magazine, published eight times per year, and *The Wisconsin Professional Engineer Directory*.

WSPE is located at 6601 Grand Teton Plaza, Madison, WI. 53719. Voice mail: 608-833-3364 or 608-833-8864. E-mail: wspe1@aol.com

Author Bio: Roger Bindl consults, writes and pairs with his wife in politics. He has worked extensively in Telecommunications Engineering and with Computer Communications since 1975.

Science Hall: A Fossil of Steel



Source: University of Wisconsin-Madison Division of Archives

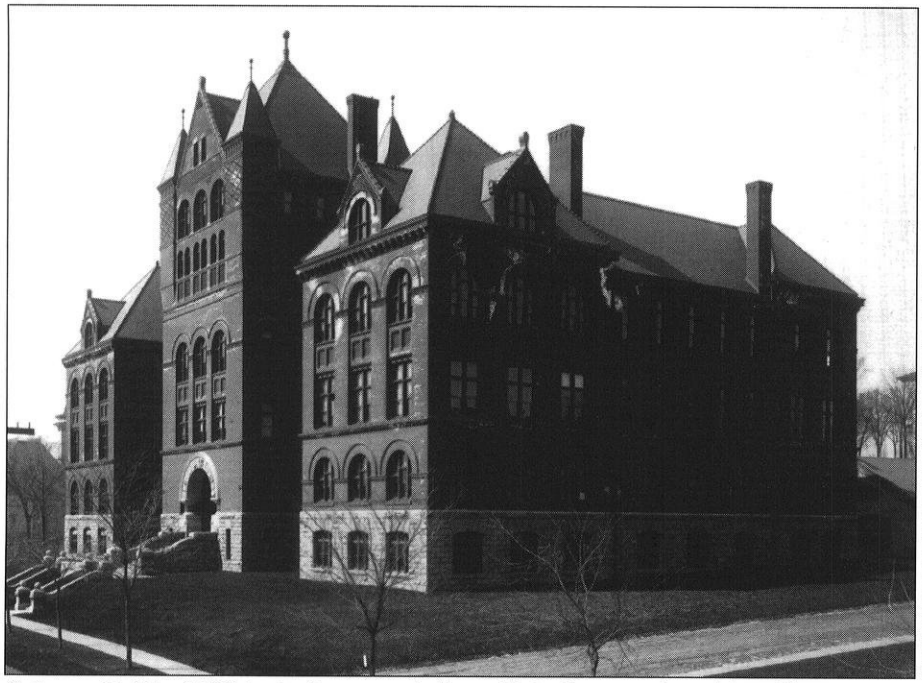
Old Science Hall after the December 1884 fire.

By Jim Feldman

A clear disregard of legislative intent and a monstrous perversion of the spirit of the law." These bitter words were the state's response to the University Regent's method of replacing the first Science Hall. That building had housed all the science and engineering departments, a museum and an art gallery. When it was destroyed by an engineering forge fire in 1884, the University replaced it with four buildings: the main Science Hall, a chemistry building, a shop building and a heating plant. Only Science Hall and the heating plant (Radio Hall) now remain. Because of the subsequent destruction of other early steel buildings, Science Hall is now the oldest building in the world to use significant amounts of steel in its frame.

The designer of Science Hall, Professor Alan Conover, modified the original plans to make the building completely fireproof. The original plans were for a style called mill construction slow burn. Conover was determined to change "slow burn" to "no burn." He changed wooden framing members to metal and wooden floors and walls to tile. Near the end of the project, Conover told a reporter, "...there isn't enough wood in this building to make a match." These modifications led to serious time and cost overruns, which led to the appointment of a legislative committee of investigation. The committee's report led to the fierce denunciation of Science Hall quoted above.

In the century that has passed since Conover changed Science Hall's frame from wood to metal, the nature of the metal has been described as steel, wrought iron and cast iron. The standard metal for building in 1885 was either cast iron or wrought iron. Some sources referred to Science Hall's metal as steel, but this was often discounted as confusion because steel, at that time, was a new construction material.



Source: University of Wisconsin-Madison Division of Archives

Science Hall in 1890 just after completion. Note the wooden sidewalks across the unpaved Observatory Drive and Park Street. Observatory Drive is at the camera's right.

The History of Iron and Steel in Building

Iron was introduced as a building material in the late 1700s in England and in the early 1800s in America. For large buildings in the 1800s, the common configuration was masonry walls, cast iron columns and cast iron or wrought iron beams. Most writers assumed that this standard method was the configuration of Science Hall. Only in the 1850s, with the development of the Bessemer process did steel become a low cost, mass produced material. The first recorded uses of steel in construction are the Statue of Liberty (1884) and the Chicago Home Insurance Building (1885).

New Research into Science Hall

In an effort to resolve the question of what materials make up Science Hall, I obtained permission from the University Physical Plant to cut samples from the roof rafters and floor joists for metallurgical analysis. This analysis was performed in the fall of 1996, by senior metallurgical engineering student, Shawn Rediske, and his professor, Dr. Carl Loper. It shows that the steel in Science Hall's attic beams is very low in carbon (~.1-.15%) and hot rolled from the Carnegie Co. The floor joists are a slightly higher carbon content (~.4-.45) from the J. Walker foundry. (The names of the foundries were found from the financial record of the project, not from the analysis).

In an effort to determine what kind of metal was used in the vertical supports,

the physical plant workers and I drilled the building's columns to their centers. No material except brick was found. Science Hall has no metal in its vertical members.

Science Hall's Place in History

Science Hall became the oldest building in the world to use significant amounts of steel in its frame when the Chicago Home Insurance Building was demolished around 1930. (The Statue of Liberty is not considered a building.) Science Hall cannot be called the oldest steel-framed building outright because, as shown, the vertical supports of the building are not steel but solid masonry. This use of masonry instead of steel reflects the fact that there was not a space crunch for the building. Steel columns would have allowed a smaller footprint, but there was plenty of room on the site for a masonry supported building.

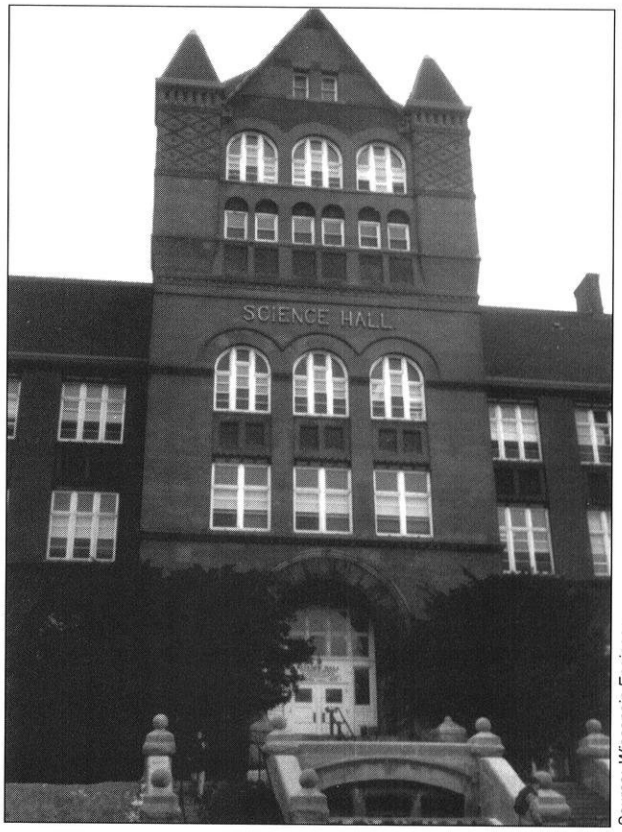
"... there isn't enough wood in this building to make a match"

The properties of steel were not clearly known in 1885, and Professor Conover was very cautious with the new material. It was well known that iron was susceptible to collapse in a fire, and good practice dictated that iron members were wrapped with tile to protect them in case of fire. Conover used this technique in Science Hall, where all the steel below the attic, which didn't really need it, is covered with a layer of hollow tile.

After the building was completed in 1888, the Regents, perhaps remembering the scathing attack by the legislature, referred to the new building as a, "...living monument to the wisdom and courage of the Regents."

Science Hall Today

An exploration of the building is an entertaining way to spend an hour on campus. Notice the steel beams visible in the central tower above the fourth floor, the generations of students' names carved and chalked on dangerously high spots on the walls, the massive polished "piston columns" that flank the front entrance and the beautiful stained glass window that surmounts it. Science Hall has been shown to have a special place, not only in the history of the UW-Madison campus but in the history of modern building. Its continuing usefulness as well as the expense of demolishing it will ensure Science Hall a place on campus for decades to come.



Source: *Wisconsin Engineer*

Science Hall is still standing tall in 1997.

Author Bio: Jim Feldman's book, *The Buildings of the University of Wisconsin*, will be published this spring. He wishes to thank Physical plant employees Mike Franke and Steve Harmon for all the help.

Urilet Brings Peace to the Bathroom

By Sheri Schneider

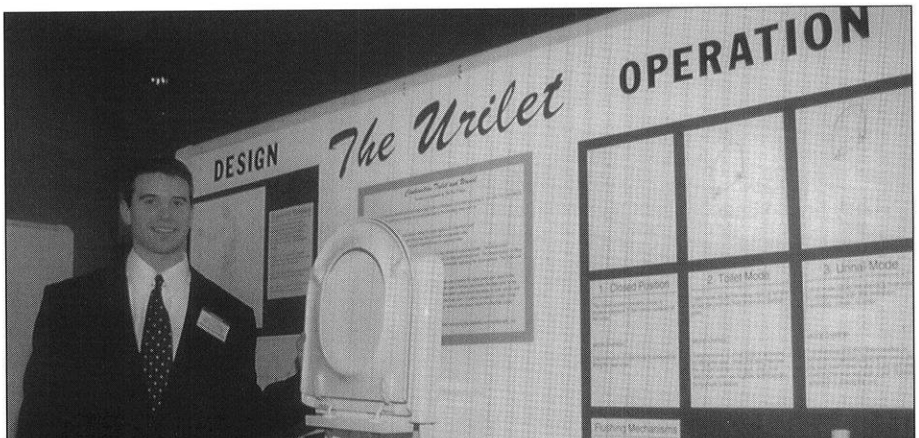
Guys, are you tired of getting in trouble for leaving the toilet seat up? Ladies, are you tired of men leaving the seat up? Does anyone like cleaning that gross place on the toilet around the seat hinges? Despair no more, because Ted Van Deburg, the winner of the 1997 Schoofs Prize for Creativity, has a solution for these age-old dilemmas, the Urilet.

Van Deburg's invention, the Urilet, is a combined toilet and urinal that looks and functions just like a toilet until the seat is lifted up. At that time, a hydraulic system lifts the cover, the seat and the front of the tank to display a urinal surface. After urinating, the man flushes the Urilet by returning the seat to it's normal position.

Van Deburg, a senior in Industrial Engineering, came up with the idea after living with four guys in a student apartment. Apparently he was the only one who ever cleaned the bathroom. "What we really needed was a urinal!" Said Van Deburg. Unfortunately, urinals are not used in homes because they take up a lot of space, are unattractive and require additional plumbing.

The Urilet solves all of these problems. It looks exactly like a toilet and has the same dimensions so it does not require additional space. It does not need special plumbing because it functions much like a toilet. Assuming that men will flush when they are finished, the seat will never be left up. Since the hinge area that gets messy on a traditional toilet is eliminated, the Urilet will be much easier to clean than a traditional toilet.

"What we really needed was a urinal!" said Van Deburg



Source: Engineering Publications

Ted VanDeburg and his award-winning invention the Urilet, a combined toilet and urinal.

The Schoofs Prize for Creativity is a contest within the College of Engineering. It is sponsored by Mr. Richard J. Schoofs (BSChE '53) and is administered by the University Technology Enterprise Cooperative, the College of Engineering's industrial entrepreneur outreach organization. The purpose of the contest is to encourage innovation and challenge students to organize and present their ideas.

To win the contest, Van Deburg scored the most points in areas such as: originality, patentability, usefulness and probability of commercial success. The contest awards cash prizes of ten thousand dollars for first place, seven thousand dollars for second place, four thousand dollars for third place and one thousand dollars for fourth place.

When Van Deburg decided to develop his idea for the Schoofs contest he was on a cooperative education assignment (co-op) at Kohler Company. He pursued Kohler's assistance in the project and the result of the collaboration was that Van Deburg did the research and design for the Urilet while Kohler provided him with the resources to make a prototype. According to Van Deburg, "Kohler provided technical information and support for the Urilet."

Van Deburg tried to keep the big picture in mind while designing the Urilet. "The first thing I looked into was how to address the problem," he said. To do so he used human factors principles, urination data and computer simulation to determine the dimensions for the combined toilet and urinal. Next he determined the actual construction and shape of the Urilet by conforming to code requirements.

After coming up with the basic Urilet design Van Deburg looked at more specific requirements. He determined the water and flushing prerequisites and related them to the necessary performance and

fixture design. Then, he determined the technical mechanisms for the seat operation. When the design was complete, a foam prototype was molded and glazed to look like an actual porcelain Urilet.

According to Van Deburg, "The Urilet would most likely be in the high-end and luxury toilet markets." It would retail for approximately 800 dollars depending on volume, distribution and design details determined by the manufacturer. At this time there is no information about the Urilet being produced by Kohler or any other plumbing manufacturer.

The Urilet adds a whole new twist to the toilet industry. Until now, the actual design of a toilet has not changed much since Mr. Thomas J. Crapper's design in the 1880s. Since then, men and women have had countless bathroom arguments. The Urilet will eliminate many of these arguments because as Ted Van Deburg puts it, "The way men urinate is not going to change. So I say, change the toilet!"

Additional information about the Schoofs Contest for Creativity can be found at www.engr.wisc.edu/students/brainstorm or by emailing brainstorm@engr.wisc.edu.

Author Bio: Sheri Schneider, a senior in industrial engineering, hates it when the seat is left up and can't wait to have a Urilet in her home.

JUST ONE MORE

So you think you have computer problems from time to time? We would be willing to bet that the average UW-Madison engineering student's problems are nothing compared to the ones below. Check out the following excerpts from a *Wall Street Journal* article by Jim Carlton.

1. Compaq is considering changing the command "Press Any Key" to "Press Return Key" because of the flood of calls asking where the "Any" key is.

2. AST technical support had a caller complaining that her mouse was hard to control with the dust cover on. The cover turned out to be the plastic bag the mouse was packaged in.

3. A Compaq technician received a call from a man complaining that the system wouldn't read word processing files from his old diskettes. After trouble- shooting for magnets and heat failed to diagnose the problem, it was found that the customer labeled the diskettes then rolled them into the typewriter to type the labels.

4. An AST customer was asked to send a copy of her defective diskettes. A few days later a letter arrived from the customer along with Xeroxed copies of the floppies.

5. A Dell technician advised his customer to put his troubled floppy back in the drive and close the door. The customer asked the technician to hold on, and was heard putting the phone down getting up and crossing the room to close the door to his room.

6. Another Dell customer called to say he couldn't get his computer to fax anything. After 40 minutes of trouble-shooting, the technician discovered the man was trying to fax a piece of paper by holding it in front of the monitor screen and hitting the "send" key.

7. A different Dell customer needed help setting up a new program, so a Dell technician suggested he go to the local Egghead. "Yeah, I got me a couple of friends," the customer replied. When told Egghead was a software store, the man said, "Oh, I thought you meant for me to find a couple of geeks."

8. Yet another Dell customer called to complain that his keyboard no longer worked. He had cleaned it by filling up his tub with soap and water and soaking the keyboard for a day, then removing all the keys and washing them individually.

9. A Dell technician received a call from a customer who was enraged because his computer had told him he was "bad and an invalid." The tech explained that the computer's, "bad command" and "invalid," responses shouldn't be taken personally.

10. An exasperated caller to Dell Computer Technical Support couldn't get her new Dell Computer to turn on. After ensuring the computer was plugged in, the technician asked her what happened when she pushed the power button. Her response, "I pushed and pushed on this foot pedal and nothing happens." The "foot pedal" turned out to be the computer's mouse.

11. Another customer called Compaq technical support to say her brand-new computer wouldn't work. She said she unpacked the unit, plugged it in, and sat there for 20 minutes waiting for something to happen. When asked what happened when she pressed the power switch, she asked, "What power switch?"

12. True story from a Novell NetWire Systems Operator:

Caller: "Hello, is this Technical Support?"
Tech: "Yes, it is. How may I help you?"
Caller: "The cup holder on my PC is broken, and I am within my warranty period. How do I go about getting that fixed?"
Tech: "I'm sorry, but did you say a cup holder?"
Caller: "Yes, it's attached to the front of my computer."
Tech: "Please excuse me if I seem a bit stumped, It's because I am. Did you receive this as part of a promotional, at a trade show? How did you get this cup holder? Does it have any trademark on it?"
Caller: "It came with my computer, I don't know anything about a promotional. It just has '4X' on it."

At this point the Technical Representative had to mute the caller, because he was laughing so hard. The caller had been using the load drawer of the CD-ROM drive as a cup holder and had snapped it off the drive!"

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