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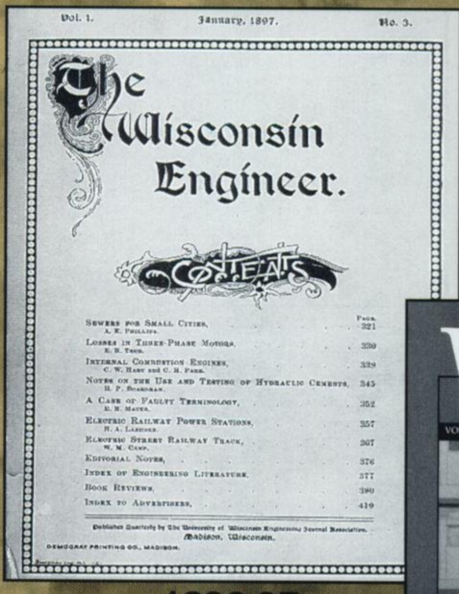
100th Anniversary

WISCONSIN ENGINEER

VOLUME 100, NUMBER 1 DECEMBER, 1995



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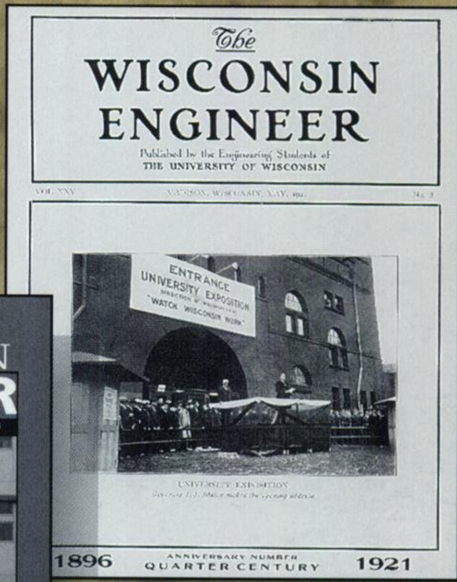

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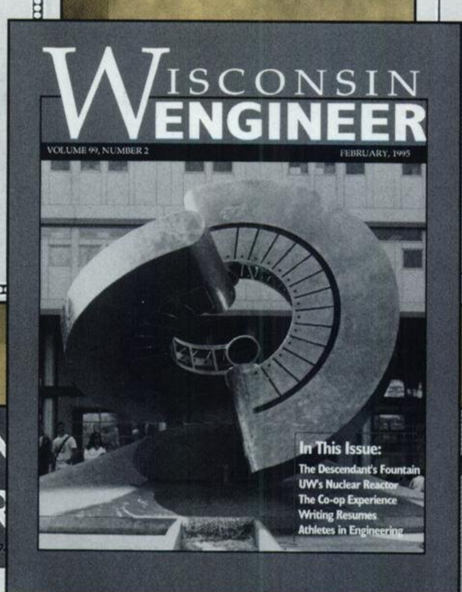

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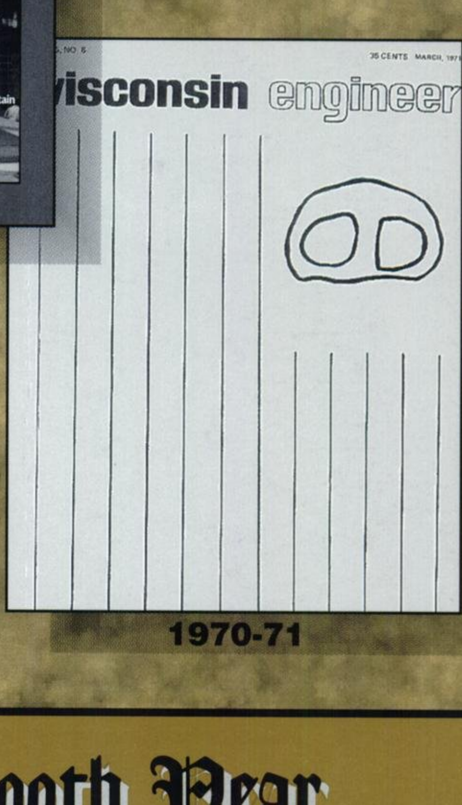

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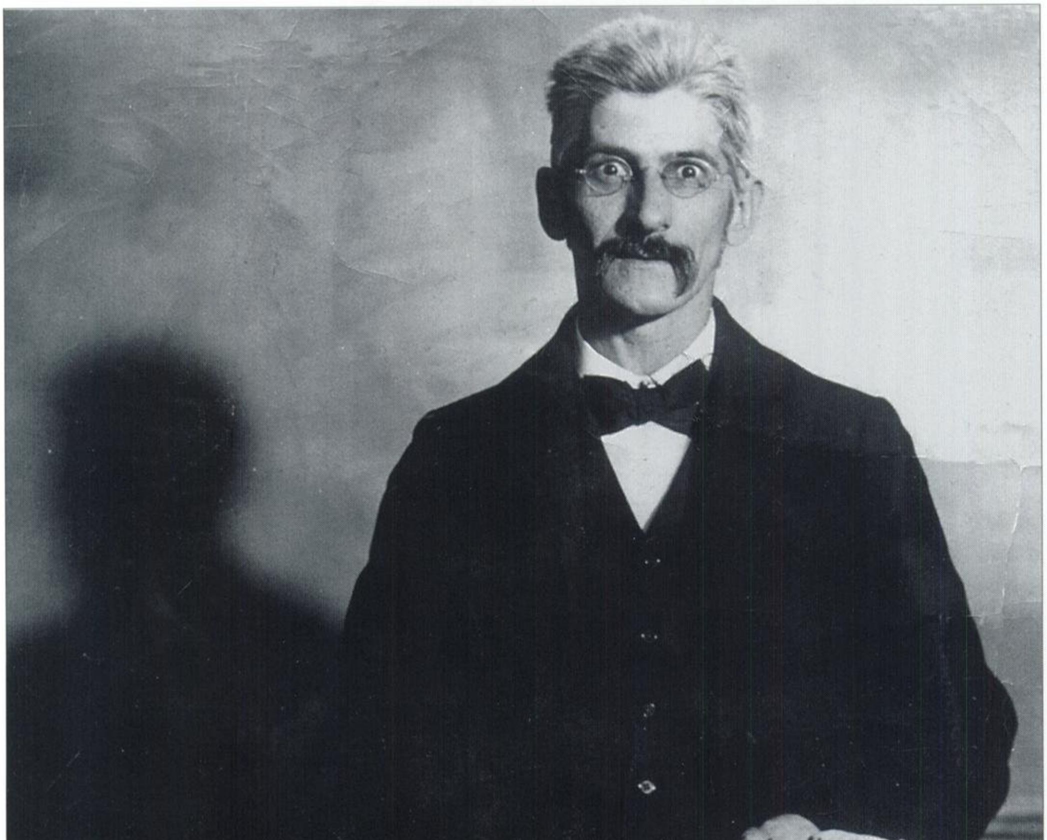
Celebrating Our 100th Year



WISCONSIN ENGINEER

Published by the Students of the University of Wisconsin-Madison

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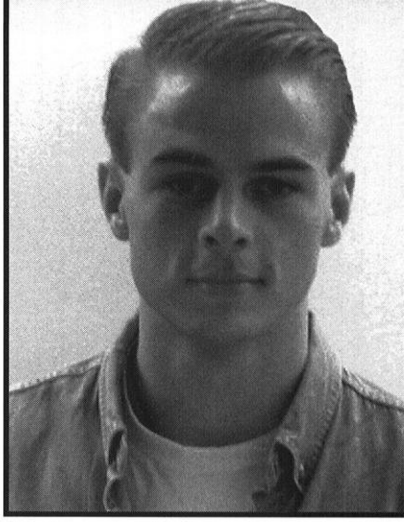
Welcome

From the Editor's Desk:

Welcome to the 100th year of the Wisconsin Engineer magazine. First published in 1896 by the students of the University of Wisconsin-Madison, the magazine strives to give the students and faculty a chance to share in the progress made in the School of Engineering. From news on the latest technologies and discoveries in the field of engineering to helping students understand the resources and opportunities available on campus , the Wisconsin Engineer magazine has as strong tradition in passing along insightful knowledge to the students, professors and staff of this world class university.

Editorial

The Importance of Student Organizations



Source: Vincent Rose

Jon Furniss, Editor

For 100 years the Wisconsin Engineer magazine has graced the campus of the University of Wisconsin-Madison. It has provided information on all disciplines of engineering and has constantly strived to be an informative, thought provoking literary source. It has given many parties a forum with which to express their ideas, but more importantly, it has always been one of many vital student organizations.

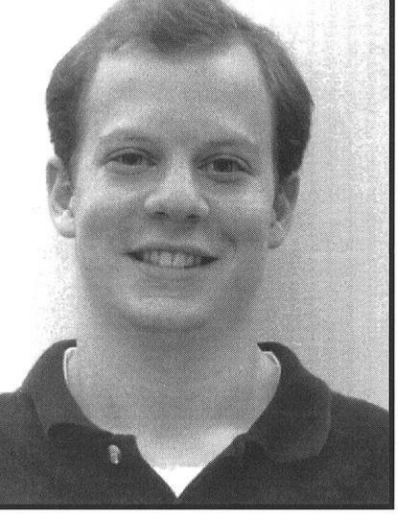
Student organizations, especially those found in the College of Engineering, play a tremendously important role in the development of any inspiring engineer. They offer opportunities that are not available elsewhere and they can help further an individuals education in ways normal classes can't.

All student organizations allow students to get involved. This may seem minor, but on a campus the size of Madison's, being part a group can be very important. These groups give students the chance to meet others with similar interests and perhaps make long-lasting friendships. Even if this doesn't happen, it is still a great opportunity to make many contacts that can either help you further along in your college career or in the "real world."

Student organizations can supply great experience. This can be seen in many forms from simply being part of a team and working on a project to being an officer and taking charge. Also, many organizations can help individuals develop skills they feel they are lacking or want to improve. The Wisconsin Engineer magazine, for example, is a terrific illustration of this. Any interested party can join and there are many choices available to them. They can develop better writing skills, learn how to prepare an intriguing lay-out or work on the business side of things. As with many of the organizations, it is exactly like running a small business complete with all the headaches and rewards. This not only offers experience that is not readily obtainable in the classroom, it looks great on a resume and can really give one an edge when it comes time to find a job.

Leadership skills are also something that can be acquired from many, if not all, student organizations. In general, there are many officer spots available within each organization. These spots require an extra effort to do a proper job, but they can teach an individual about the importance of a job well done. The student learns what it feels like to accomplish difficult goals and they often become more confident with themselves and their abilities. This carries through into other aspects of their lives and will usually have a positive effect.

Unfortunately, there are way too many organizations for me to list them here and I fear that if I were to try I would, without a doubt, forget many. Luckily, it's not necessary. If you want more information simply look around and take a moment to read the postings, or talk to a dean or professor. There's always something going on and remember, it's never too late to get involved.



Source: Vincent Rose

Jeremy Marwil, Editor

An Informed Decision

The first issue of Wisconsin Engineer magazine, published in 1896, stated its purpose as the dissemination of engineering knowledge and experience to the students and faculty of the University of Wisconsin-Madison.

One hundred years later, serious threats have been made by a radical individual, calling himself the Unabomber, against the scientific community and technological progress in general. The Unabomber does not feel mankind's progress in science and technology has lead to a better world and wants society to revolt against the entire industrial and technological system. In particular, this individual has the wildly romantic notion of returning to a simpler time when society does not have be afraid of a technologically advanced world. Of course, he fails to realize that there is no going back to a previous time since technology is always forcing us to change our views and lifestyles. For better or for worse, advances in science and engineering in the last 100 years have changed our outlook on the world. But the Unabombers random and gruesome acts of violence against scientific academia raise an important questions to students of scientific disciplines.

What can we, as engineers and the harbingers of technology, do to allay the fears of a society where scientific progress brings unforeseen changes?

At the the Wisconsin Engineer magazine, we try to inform this campus as well as high schools in the state about some of the new technologies and innovations in the field of engineering. We give society a chance to weigh both the benefits and drawbacks of technology and let them make an informed decision for themselves.

It has been the goal of this magazine, for the past 100 years, to give the students and faculty of this university a chance to read about advances made in the engineering field at the UW and how they have touched real people's lives.

Ironically, we live in the Information Age which allows access to worldwide information on the computer. Yet, a large percentage of adults do not understand computers or know how to use them. As a perk of this university, students and faculty have free access to computers where our thoughts and ideas can be sent anywhere in the world in a matter of seconds. But not everyone has the chance to listen. The Unabomber said no one listened to him, and as a consequence he said that, "in order to get the message before the public with some chance of making a lasting impression, we've had to kill people."

Have we done such a poor job of disseminating information to the public that the Unabomber is the backlash of society's fears against technology?

I don't think so. However, it does mean that the information we give to the public cannot just be placed on display, but that society must somehow identify and be able to incorporate the information into their everyday lives.

At the Wisconsin Engineer magazine, the topics relate to the field of engineering, but any student of this University may contribute to the magazine. This allows the impact of engineering to be felt by others outside of the engineering campus. A tradition mentioned in the very first issue of this magazine.

The Unabomber believes, " science marches on blindly, without regard to the real welfare of people." We at the Wisconsin Engineer magazine beg to differ and have 100 years of experience to back it up.

Engineering Progress of the Nineteenth Century

By: J.L. Van Ornum, B.S. 1888, C.E. 1891

• This article first appeared in the December 1901 edition of *The Wisconsin Engineer* .

The progress made in engineering during the nineteenth century, on the one hand, furnishes itself a reminder of its ultimate dependence upon mathematics and the sciences, and, on the other hand, it attests the fact that its great and growing inspiration has been the welfare of all the civilized world. A hundred years ago but little of engineering worth or prominence was in existence; so little, comparatively, that a glance at contrasting conditions then and now will reveal striking differences.

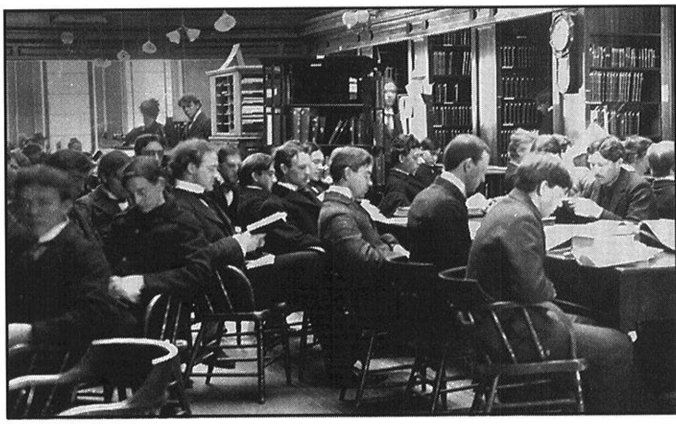
A century ago traveling in its highest development was limited on land to the horse and coach, covering perhaps a wearisome fifty miles in a day; now a day's travel is eight hundred miles. Then, a trip from New York City to Philadelphia consumed as much time and occasioned more fatigue than one from New York to St. Louis now; or a journey then from New York to St. Louis consumed the greater part of a month at best and was considered a greater hardship that a journey to India or China now. Then a wind furnished the sole motive power for the hips of the ocean, and a voyage took as many weeks as now it does days. A hundred years ago the great canals were not built (one making the route to India as short as was formerly the distance to the half-way point–the Cape of Good Hope); nor monolithic light houses erected along the coasts for the safety of ocean voyagers. Then a building three stories in height was unusual; now a sixteen-story building is not uncommon. The century has seen the chaise give place to the horse-car and this to the cable, and finally the electric car with its speedy service brings the office within easy reach of the suburban residence.

The mine engineer has developed methods and perfected details, until the total yield of mineral wealth now each year exceeds a thousand millions of dollars, while a hundred years ago it was but a modicum. Copper has been needed for electric purposes and the arts, and he has driven adits and shafts, drifts and tunnels, until some regions are honeycombed in the search for the metal to depths exceeding a mile. The same watchful enterprise characterizes the search for other metals. But by far the most important products of the mine are coal, devoting over seven hundred million tons a year to the countless uses of commercial and industrial life, and more than seventy million tons per annum of iron and steel, whose services in the century's development are preeminent.

> Then, a building three stories in height was unusual; now a sixteen-story building is not uncommon

The electrical engineer, within the latter portion of the century, has developed a field felt in all phases of practical progress, ranging from the inauguration of the telegraph of the mid-century and the sub-marine cable of about forty years ago to the enormous electric stations, furnishing power for our expanding industries, turning night into day in our cities and making practicable the great development in electric traffic in urban districts, electric elevators in our stores and electric apparatus of infinite variety everywhere to minister to our needs and comforts. Through the electric transmission of power has a vast field of industry been opened. Through all the ages had great water power been useless because of its remoteness, until the development of electric machinery, suited to the purpose, made practicable the transmission of power, twenty, thirty, forty miles, with much greater distances in prospect. As indications of the inevitable result, witness the busy life in the new cotton mills of the Piedmont regions of the Southern States or the quickened industries of the Pacific coast.

The mechanical engineer had invented the steam engine before the beginning of the century just closed, but its development was crude, as shown by the winding and pumping engines, the sun and planet, and beam engines placed in South Kensington Museum to illustrate the practice of that day, engines which were then considered unusual if they developed one twohundredth part of the power of engines of today; while the total for the world is now not far from seventy million horse-power, which is greater than the average physical power of the total population of the world, even were it possible to exert this power without cessation. And the engine is only one instance of the unparalleled advance; we should also mention such inventions and developments as the cotton-gin and cotton-baling machinery, the gas and oil engines, the harvester, the sewing machine, the hydraulic press and other labor-saving, epoch-marking machines of wide import and far-reaching significance, like the printing press, capable now of printing, folding and counting 1600 eight-page newspapers per minute, where the hand-press a century ago could make not more than four or five impressions in the same length of time.



Source: Wisconsin Engineer

Just your casual Sunday afternoon of studying (circa. 1900)

The metallurgical engineer has added his full share to the increased productive capacity of the world. A hundred years ago only a pitiful modicum of iron and steel was produced, and this with great expense and almost infinite pains. The blast furnaces then were about one-half their present diameter and one-third the height, producing perhaps five thousand tons per annum, where furnaces now will produce thirty to forty times that amount. Wrought iron was produced by the Bloomery, Catalan or other crude direct processes, or by the direct open-hearth fineries of Sweden or Wales; and steel by Catalan, cementation or crucible steel processes, likewise very expensive and slow. At the present day we have, for the production of pig iron, blast furnaces a hundred feet high, costing seven hundred thousand dollars each; and for the finished product we have the puddling furnace (first introduced by Cort close to the end of the eighteenth century) producing malleable iron, the Siemens open-hearth and the Bessemer processes (developments of the last half-century) for the production of steel. These last two inventions mark the greatest advance ever made in metallurgical processes, and have made possible the wide range in construction in steel in all various branches of engineering. Figures are wanting to give the quantity of steel produced a century ago. It could not have exceeded a hundred thousand tons, for fifty years ago Sheffield, then the great steel-producing city of the world, manufactured about fifty thousand tons per year; and the cost of crucible steel, made from Swedish iron, worth seventy dollars, was two hundred and fifty dollars per ton. Now steel is produced at less than thirty dollars; single steel firms produce millions of tons each year, and the annual product of the world is nearly thirty tons. To show the great growth of this interest, Sir Henry Bessemer illustrated the total production of Bessemer steel of the world by saying that of the product of a single month were made into a solid shafe of one hundred feet in diameter it would reach 557 feet high. This illustration of the world's production eight years ago is now equally applicable to the United States alone, nor does it include the production of open-hearth steel, or wrought or pig-iron, the total for the world approaching eighty million tons annually. There is hardly any personal, municipal or corporate life, or hardly

see PROGRESS, page 14

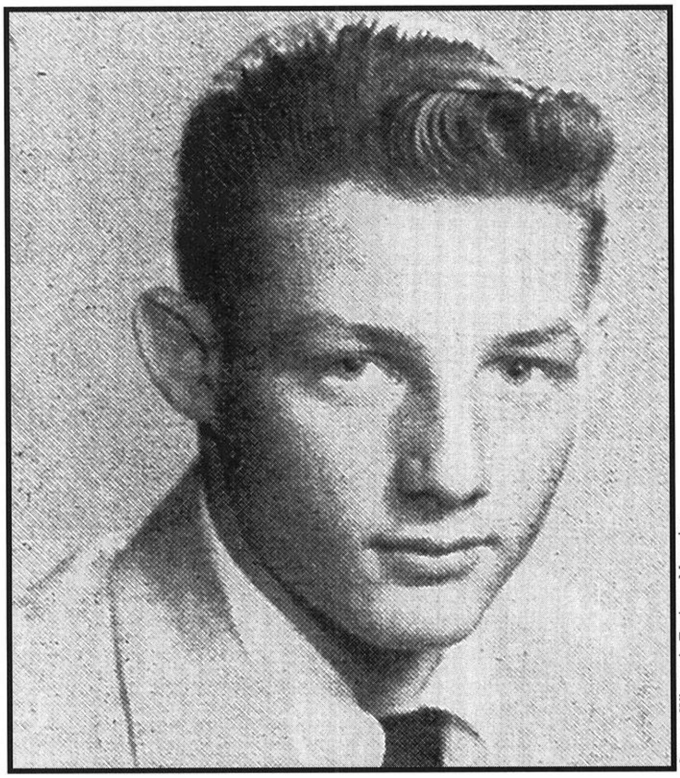
The Road to the Dean's Seat

"There is no sense of place, nothing distinctive about the engineering campus that says , 'This is where engineers work and thrive.' "

This was the campus through John Bollinger's eyes during his collegiate career. As a student, he was a part of many organizations such as Polygon, Sailing Club, Expo 1955, and yes, the Wisconsin Engineer magazine.
John Bollinger believed extra-curricular activities were an integral part of life.

Yet, being just a small part of an organization was not for Bollinger since his goal was something larger—to become a leader. He was the president of Polygon and in 1957, the Associate Editor of the Wisconsin Engineer magazine, to name a few of the positions occupied by the current Dean of Engineering.

He was never one to sit by and let things go undone.
For instance, during the early 50's, the site where the Engineering Research Building now stands was a pile of coal for the Physical Plant. Before summer vacation, Bollinger and some other students put together petitions to have the pile removed. He took these petitions to the dean and the coal was removed. This marked the first time John Bollinger realized that students could make a difference.



Source: Wisconsin Engineer Magazine

An active Dean Bollinger during his collegiate years.

After graduating from Cornell University with a Ph.D. in Mechanical Engineering, Bollinger's future pointed toward corporate America. At this time, Bollinger did not see himself staying in academia. Ironically, through the persuasion of a professor, Bollinger found himself teaching in Germany and England.

Through all of his traveling, his path never led him far away from the UW. He returned to teach in the M.E. department and eventually became the chairperson, even though his heart was still in industry.

In 1981, the UW Chancellor, Irving Shain, informed Bollinger that he had made the short list of prospective candidates for Dean of Engineering. Shortly thereafter, Bollinger was asked to take the position.

After accepting the position as the Dean of Engineering, he still longed for industry. During his early years as dean, Bollinger had his own consulting company. Time demanded that he relinquish the firm. He still did not leave industry altogether. He was asked to reside on the board of directors of several firms. It was through these endeavors that he was able to bring corporate America to the college. Ideas such as Strategic Planning and Total Quality Management were filtered down from industry, to the college of Engineering and finally

see DEAN, page 22

A History of the Engineering Campus

The first issue of the Wisconsin Engineer magazine in 1896 made a plea for an engineering building. It stated, "The engineering department of the University of Wisconsin is one of the best in the United States and yet is without an engineering building. Her facilities are good, her courses are well developed and some of them more advanced than any other American university, yet all three of the engineering departments are so crowded for room that an engineering building is an absolute and immediate necessity."

The plea was answered with a new engineering building completed in November 1900. Built for about $100,000, the new engineering building was located on Bascom Hill just below North Hall. Today, it houses the School of Education.

Built for about $100,000, the new engineering building was located on Bascom Hill just below North Hall. Today, it houses the School of Education.

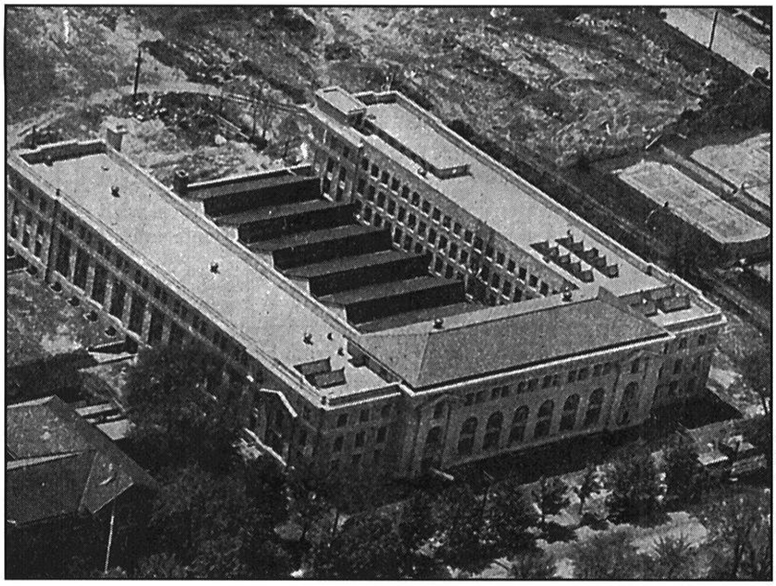
By 1905, the College of Engineering was expanding. Facilities were no longer sufficient for the needs of the students. Thus, the engineering campus was moved between Lakeshore and the main campus around 1909. However, the building on Bascom Hill remained an engineering building.

In October 1910, the Wisconsin Engineer magazine featured an article titled "New Buildings." The article mentioned improvements being made to the old heating plant to remodel it into a laboratory for mining engineers. Also, a wing was added to the engineering building as well as three large drafting rooms.

Funding for new buildings on the engineering campus was not available until 1928. The first major project was the construction of the new mechanical engineering building, which is still present today. The building, completed in June 1931, is located near Camp Randall. This marked the beginning of the relocation of the Engineering College to its current home.

Source: Wisconsin Engineer

The original Engineering Building on Bascom Hill is currently the home of the School of Education.



Surce: Wisconsin Engineer

Completed in 1931, the Mechanical Engineering building and its surroundings have seen many changes.

Controversy over the new mechanical engineering building almost prevented its construction in 1929. Governor Kohler withheld his signature from the approval of the building. With the plans already made, the funding approved, and construction ready to begin, the governor killed the project. Ultimately, the project was approved and the mechanical engineering building was completed in 1931.

Controversy over the new mechanical engineering building almost prevented its construction in 1929

The College of Engineering was moved to its present location as a result of WWI. Engineering had been located between the College of Medicine and the College Letters and Sciences. With the outcome of WWI, the College of Medicine expanded considerably, and engineering was relocated.

The ground plans for the College of Engineering consisted of nine buildings with the main engineering building facing Randall Avenue. Other buildings for mechanical, mining and electrical engineering were placed on University Avenue. Adjacent to these were buildings for transportation, civil, hydraulic and chemical engineering, as well as a materials testing laboratory. This plan was abandoned in favor of a few large buildings covering a smaller ground area.

The plans made for the nine buildings were consolidated into a plan for one building, the present engineering hall. It wasn't until 1948 that the reality of a new engineering building on the Camp Randall site would could true. The engineering building was completed by April 1951.

In the 70's and 80's, the engineering campus expanded with the additions of the Engineering Research Building, Wendt Library and Computer Aided Engineering.

More recently, the engineering building

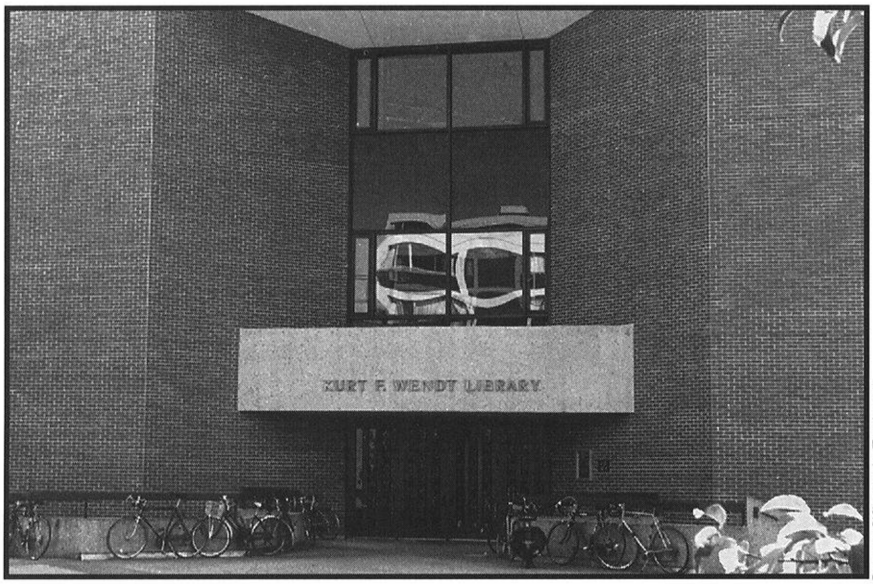
see HISTORY, page 24

The Electronic Library

The Electronic Library at the University of Wisconsin-Madison offers computerized access for the entire library system. The system contains an on-line library catalog known as MadCat, as well as journal databases, worldwide library catalogues and other gophers. Other campus information, such as library hours and proposed journal cancellations, are also included.

Since 1976, MadCat has contained information about the holdings of more than 25 UW-Madison campus libraries. Included are periodicals (by title only), audiovisual items, maps, musical scores, microforms and materials held by off-campus libraries. The system is updated monthly.

The "Journal and Information Databases" provide listings for a variety of subjects. Users can search for journals located on campus by either subject or title. This listing also includes books in medical physics, the Health Education video and audio library, music resources and photos from the State Historical Society of Wisconsin. Another useful resource is UNCOVER, which lists citations for periodicals. Topics in UNCOVER are science, technology, medicine, social science and humanities citations. Using these listings, articles can be located on these particular subjects.



Source: Wisconsin Engineer

The Electronic Library: now at a computer lab or library near you.

The next Electronic Library heading is "Worldwide Library Catalogues." From this heading, users can access information contained at libraries around the world via the Wisconsin library catalogues, the CIC, Washington and Lee University and Yaleinfo. The Wisconsin library catalogues collect the information from most of the Universities located in Wisconsin. The CIC is a shared resource among the Big Ten schools, the University of Chicago and the University of Illinois at Chicago. The most important benefit of the CIC system is that it allows interlibrary loans. The Washington and Lee University, as well as the Yaleinfo

Users can access information contained at libraries around the world via the Wisconsin library catalogues, the CIC, from Washington and Lee University and Yaleinfo

listing, collect information from library catalogues worldwide. The Washington and Lee listing uses a search by location with help files, while the Yaleinfo allows for a search by keyword.

Ken Rouse, Head of the Chemistry Library, stated that additions are being made to the Electronic Library system that might benefit Chemistry and Engineering students. According to Rouse, "the Beilstein/Crossfire system has just been added which makes chemical structure searching available to academics at an affordable price." The Beilstein database contains information such as structures, preparation data, reactivity, chemical and physical properties. It also provides access to references to chemical literature published since 1779 for over 6 million organic substances. The Crossfire software allows a user to search the Beilstein database by structure, sub-structures and combinations of over 300 numeric and text strings. Rouse explains "structure searching is a very powerful search technique that enables chemists to find information that is nearly impossible to find any other way." Now, the General Library System pays an annual lease fee that allows students and faculty to access the system via an IBM RISC 6000 computer located at DOIT.

Special thanks to Ken Rouse for his help in obtaining information for this article.

Yet another Electronic Library section provides access to other Gophers by geographical location. The Gophers allow users to access college campus databases for library catalogues, student or faculty information and general campus information. Locations included are Asia, Canada, Europe, the Pacific, South and Central America, and the U.S. A Gopher of note is the Peripatetic, Eclectic Gopher. It provides improved access to network information for both beginning and experienced users and is updated on a regular basis.

The UW campus library section provides information about the hours of each of the campus libraries as well as events, such as workshops and tours with their respective dates and times. A topic that has its own heading, but lists information by library location, is the proposed journal cancellations. This section allows the user to find out which journals or periodicals will no longer be received at a specific campus library. Some of the libraries, Wendt in particular, are making cancellations due to increased journal pricing. Planned cancellations, in most cases, are for journals with higher cost per use values. At Wendt Library, journals with a cost per use of $45 or more are being targeted. Also available is an alternate means of accessing journal articles via Document Delivery Service to help those who rely on cancelled journal subscriptions.

By no means is this a definitive listing of all the information contained within the Electronic Library System. In order to learn more about the contents of the system, go to your nearest computer terminal or library. Access the system via WiscINFO at CAE or the DOIT labs.

Author Bio: Mike Harmeyer is a senior in Chemical Engineering and wants to be a hockey player when he grows up.

Engineering: Past, Present and Future

The future of engineering at UW-Madison and how it relates to our society are important topics to anybody interested in the field of engineering. The field encompasses a wide range of ideas, products and services. Everyone's life is somehow affected by what engineers do.

On this topic, I questioned UW-Madison professor of electrical engineering Dr. Paul Milenkovic, who came to UW-Madison in January 1982 as an engineer specializing in speech acoustics. Paul says, "I think the engineering campus along with everybody else will have to deal with the long term changes in society. Demographics, changes in the size of enrollment, the economy, and in terms of what people's economic, material and social needs." Milenkovic adds, "Until now the direction of this campus has been one of growth, a growing student population, a growing demand for engineers, a growing demand in society for the products, services and ideas that engineers generate.It is most clear we won't have the same kind of growth and there is a great deal of uncertainty whether there is a leveling off or even a decline in some aspects."

Tying his ideas in with World War II, the cold war and the decline of defense expenditures, Paul says, "since World War II, until the present day, growth in engineering and engineering education was determined by some important factors out in the world at large. Physicists lay a claim to this, the microwave radar and the nuclear bomb essentially established the need for engineering in the defense of our country. After World War II we had the cold war. We have uncertainty and so I think there is uncertainty in the role of engineers. That is, is there going to be this tremendous demand for engineering in our national defense or is national defense going to be a lower priority because we are living in a fortunately much safer world." In other words, engineering growth in this country was both initiated and sustained by our national defense. Uncertainty, in fact, dominates the agenda of engineering and our future as engineers in today's society.

> We may no longer be in this wartime posture of chronic need for the kind of engineering breakthroughs to serve our military. There may be less demand for engineers

After World War II, the Apollo space program and the Vietnam war provided the engines of growth for the engineering profession. More recently, "the defense buildup of the 1980's involved unprecedented expenditures in high technologies such as the stealth bomber." With this increased emphasis on defense came an increase in the need for engineers. "Things move in cycles. You might get some period of layoffs along with new expenditures. It looks fortunate that we won the cold war. We may no longer be in this chronic wartime posture of chronic need for the kind of engineering breakthroughs to serve our military. There may be less demand for engineers," Paul says. But the military still remains a significantly large employer of the nation's professional engineers.

On a related topic, MIT is surely regarded as being the #1 ranked engineering school in the nation, especially in the discipline of electrical engineering. This is important to the University of Wisconsin engineering system in that it gives us something to benchmark the quality of our education on. Paul comments, "There is much discussion in our college meetings and department faculty meetings about what the ranking of Wisconsin is, which varies...and is not number one and whether we should try to be number one...What is often missing from those discussions is MIT is number one in part because of some historical and global forces which are well out of control of any visionary here in this department." Paul says that the ranking of MIT was due in part, "to the crash program to develop microwave radar in World War II" and they have since remained the preeminent engineering school. In the political climate of cutbacks for funding the U.W. ECE department, Madison has little hope to be number one anyway. However, with World War II as modern engineering education's stepping stone and because of the subsequent military need of a reliable microwave radar system, MIT was left as the number one engineering school by default.

Focusing on UW-Madison, there was a large expansion of the engineering campus following World War II. A large number of professors were hired in this time frame. Because of this expansion, "we [Madison] have been hiring a great deal of replacements and since then it has kind of tapered off." As this generation of engineers retires, a new generation of engineers must replace them. This factor in hiring is probably the single largest reason to support engineering education. It is unclear when the next large demand for engineers will be.

Along with the new generation of professors, there are questions about changing the engineering curriculum. A largely diversified faculty, which reflects the new emphasis on specialization, gives a wide spectrum of radical and conservative ideas. With this new diverse curriculum, "it is perhaps holding students here much longer that four years. Diverse interests, thus wanting to be represented, have created a curriculum that in fact simply contains too many credit hours for the average student to handle in four years. Only under the best possible circumstances could a student graduate in four years." Paul goes on to say, "I personally believe the number of credit hours is still too large...[to get through in four years] students would have to maintain an eighteen credit load, semester after semester, not taking into account financial needs and jobs and other responsibilities." However, the job market is continually getting more competitive, and employers expect from an education.

Does the educational system need to change to reflect the new world? On this topic Paul suggests that, "the engineering school should give a general education so that the student is prepared to work in a number of companies or industries given the possibilities of layoffs or restructuring of defense or consumer needs." This is exactly the uncertainty that engineers face. Specifically, what better way to prepare engineering students then to give them the general tools that will give them the flexibility to survive in a constantly changing work place. In this way, engineers might not need to be tied to the non-generalized and specialization of a focus that may or may not make them employable when they graduate. In contrast, the needs of industry along with downsizing and consolidatrequire that a student just entering the job market to possess an ability to work on any given project from day one. These are important issues for engineering and engineering's future.

On another topic, computers in engineering have had a large effect on "take[ing] the drudgery out of engineering work. Junior engineers are going to be replaced by the software package...I don't think the computer packages will radically change the curriculum." Is this good or bad for engineering in general? Paul says, "I think it's good, because the individual engineer will be more productive and doing more of the theory that they've been trained for and less of the drudge work and calculations." The creative aspects of engineering are becoming more important and empowering through the use of computers.

In conclusion, engineering has evolved from its roots in World War II through

Source: Engineering Publications

UW-Professor of Electrical Engineering Dr. Paul Milenkovic.

see ENGINEERING, page 19

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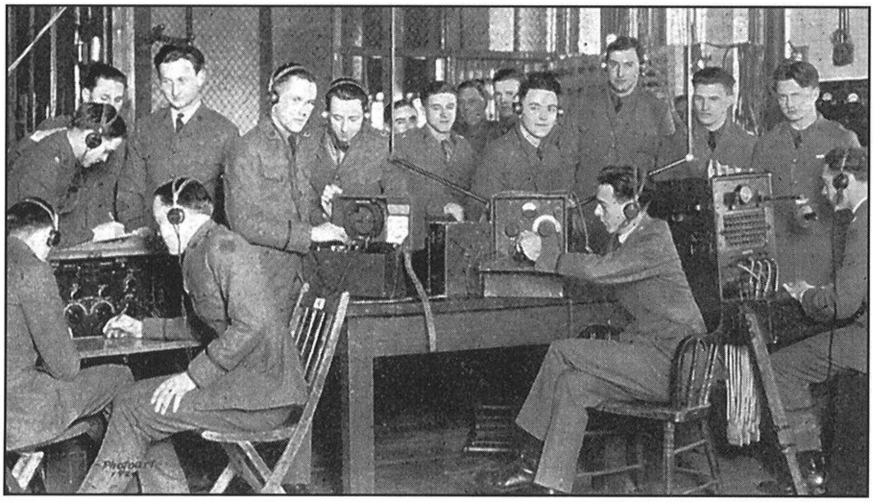
PROGRESS from page 6

an enterprise of war or peace, that has not more or less closely connected with its development the use of this remarkable engineering material.

In the domain of the civil engineer progress is none the less marked. Within a score of years there has been developed the tall office and other buildings of the steel skeleton type, where the engineer has had to design the steel frame that it will support sixteen, eighteen or twenty stories, crowded with busy life and industry, as well as to bear the weight of the walls and the great wind pressures that such high buildings sometimes must sustain; and not only this, but he has so considered and controlled methods and materials in the design and in protecting this all-important steel skeleton from fire that the occupants are safer in them than in the older style of building. Steel bridges have had a longer reign, though less than forty years ago it was considered a very remarkable feat to build an iron bridge whose length of span was 320 feet. Thirty years ago the magnificent steel-arch bridge of our

> ...the crowning glory of the measure of achievement thus far reached is that its inspiration is the welfare of the race

own city, consisting of three spans, with the central one 520 feet in length, was erected by Captain Eads. Twenty years ago the Brooklyn suspension bridge, of 1600 feet length of span, was being constructed. Ten years ago the great cantilever bridge across Frith of Froth was built, containing two spans of 1710 feet each. And now there are plans, perfectly practicable, for a suspension span of 3200 feet, to carry eight railway tracks across New York harbor and to weigh between sixty and seventy thousand tons. In railway affairs the



R. O. T. C. Signal Corps Work

engineer has perfected the problems of transportation as we have seen, until the total mileage of the century is great enough to girdle the world fourteen times. In questions of water supply and sewage all our cities provide systems as a necessity, where a hundred years ago they were luxuries of the very few, and woefully inadequate at that; and the engineer and the biologist have been colaborers in developing successful methods of preventing danger of contagion from these public utilities. Harbors and docks have been constructed and improved consonant to the spirit of the age. Foundations for great bridges and towering buildings are carried to depths requiring methods and inventions of particular resourcefulness, including the famous pneumatic processes. The development of hydraulic principles has made possible a varied series of achievements of far-reaching significance. Irrigation enterprise, which had been dead for centuries in its ancient home and was dormant even in India, has spread over the arid regions of the globe and is making oases of the waste places of the earth. In only two-thirds of the year one of the small canals of the century transports merchandise of a greater value than have the imports of China, for which the great world powers are so strenuously alert. The construction of the proposed canal from ocean to ocean across Central America will be a stupendous undertaking; humanity has never ceased to marvel because of the great pyramids, and they have always been considered one of the wonders of the world; but, reckoned at the present cost of casonry, a dozen such pyramids could be built for the expense involved in the Nicaragua Canal. And when it shall be built the engineer may well improve the great waterways of the interior and build fleets of steel barges that can withstand the sea, so that our products can be sent without transshipment from our inland cities to the western coasts of the Americas. Another product of the century of significant import is Portland cement. With the aid of the chemist this material has been improved and made accessible that now the artificial stone made from it is most widely used and is superior to most natural ones. Furthermore there is the unequivocal indication that, in combination with the all-important steel, many classes of structures of superior characteristics will be designed. Already there have been built many steel and concrete bridges which are a hundred feet in span and more, and for the Memorial Bridge at Washington, maximum spans of this construction are planned at 192 feet each in length; while the engineer who designed it considered perfectly practicable an alternative plan of similar arches 238 feet in length. Arches of such majestic span are among the imminent constructions of the engineer.

A half-century ago Maculae said, "Those projects which abridge distance have done most for the civilization and happiness of our species." And yet, since then, transportation facilities have increased many-fold, the first ocean cable had not been laid, nor was the telephone in use, nor other distance-annihilating inventions made. The attainment of results both definite and valuable has been in constantly accelerating ratios through all the broad field of endeavor which marks the domain of the engineer, viz., the 'direction of the great sources of power' and the development of the boundless resources of materials in nature to the use and convenience of mankind. The effect and value of this art pervade all lines of human interest and of contact, whether following Macaulay's idea of potentially bringing peoples nearer together or in the way (largely developed since his day) of rendering if possible to make life more thorough and intense by the concentration of power and of effort in great centers of activity, which is made possible by engineering structures and developments such as towering office and industrial buildings of the last score of years; the tremendous concentrated power in steam and electric machinery of the present; the penetrating circulation of life-bringing, waste-removing water, ministering to our cities as does the blood to the body; and other examples of almost infinite variety which would cause amazement were they not so common now.

The glory and the power of civilization of today result from the concentration of forces, both human and material, commanding the resourcefulness of mankind, applying the principles and discoveries of pure sciences, and developing the resources of nature for this purpose; and such is the degree of successful adaptation already achieved, that the span of life of man potentially surpasses the millennial existences of legendary times. "Better fifty years of Europe than a cycle of Cathay." And the crowning glory of the measure of achievement thus far reached is that its inspiration is the welfare of the race.

Congratulations

Three students of the University of Wisconsin-Madison College of Engineering were awarded $1000 scholarships for their outstanding performance while employed at Kohler Company.

Peter Cooper, Steven Vasatko, and Mark Mastalski are each recipients of the Co-op/Intern Scholarship for their work in the College Co-op Engineering Program at Kohler Company.

Nice Job!

Engineering In Spain: A Different Kind of Learning

"La ganga se forma en el escorial que sale del horno alto", declared the professor standing at the head of the room.

Jed and I looked at each other in fright. We looked around. Every single head was staring straight into their papers, every pen writing faster than we could process what we heard. Again we exchanged bewildered looks, as the professor rattled on.

"El escorial tiene elementos de....."

"Do you understand what he's saying?" I whispered to Jed.

"About every fourth word", he sighed.

We shrugged our shoulders, looked down at our own blank sheets of paper, picked up our pens and tried to scribble something intelligible.

The adventure was just beginning. For the next five months I would attend engineering classes at La Escuela Superior de Ingenieros Industriales. It is the main branch of the Polytecnical University of Madrid, Spain, known as La Polytecnica. Jed and I were the only American students among several thousand Spaniards.

Three semesters before that in February of 1995, I sat at a general information meeting of the COE International Engineering Program. A girl spoke of her experience studying in Germany. Another spoke of working in Scandinavia for a summer. As I sat listening to them, waves of excitement rushed through my mind. "Is this possible?" I wondered.

No semester at home can come close to teaching what one semester abroad can

Source: Liz Zilist

UW students Liz Zilist (far right) and Jed Vonhiemburg (center) stand with their ME class during one of the class field trips to a power plant in Northern Spain.

The idea began to bloom at the start of my junior year, with a desire to do something different, to look beyond the usual path of engineering education. Chance led me to notice the International Engineering Information sessions flyers posted around campus. A conversation with a friend who had spent a year in Spain enforced the seed of an idea. Soon I found myself at the informational meeting.

I never thought studying abroad as an engineering student was possible. I figured Engineering is hard enough in English. Studying it in another language would be impossible. Then I heard the stories at that information session. It began to seem more realistic. Gradually the idea grew and the 'something different' began to take shape. Next thing I knew, I was sitting at the International Engineering office saying to Professor Thomas Chapman, head of the International Engineering Program, "Yes, I would like to study Mechanical Engineering in Spain!"

The wheels began to turn. Professor Chapman found several contacts in Spain who could accept me into their engineering programs. We looked a various school curriculums and narrowed the search down to Madrid. The next year was full of cross continental communication, faxes, planning and hoping. While I worked with the International Engineering office making all of the arrangements, the semester abroad still seemed like a distant idea. As time passed and more details fell into place, the reality of what I was about to step into drew closer.

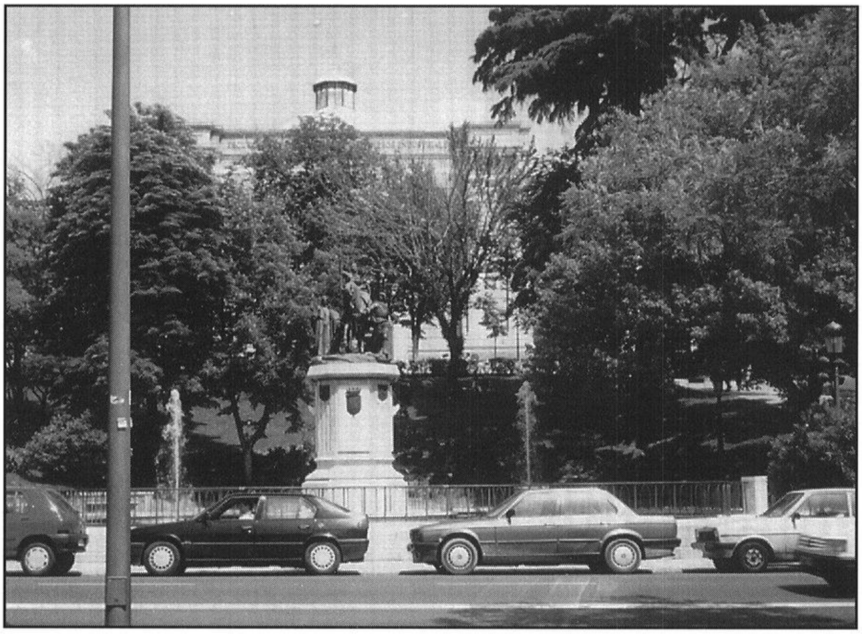
After three semesters of planning, I said farewell to my family and stepped on to a Delta flight bound for Madrid, Spain. On the plane I met Jed Vonheimburg, another ME student from Madison who had make the same seemingly crazy decision that I had.

It was neither the cars nor the Spanish food that I found innately different from America. It was the attitude, the philosophy of life that struck me

"What will it be like?"
"I have no idea."

The plane flew over the Atlantic. Twelve hours later we landed in Madrid. A short time we were to wind up half way across the world.

A world of Spanish bombarded us as we took our first steps off the plane. The taxi ride brought us to the wrong side of the city; a perfect opportunity to try out our Spanish in a desperate attempt to find our new homes.



Source: Liz Zilist

From behind the trees lining La Castellana, a central street in Madrid, peeks the Escuela Superior de Ingenieros Industriales.

We learned the hundreds of streets of Madrid by wandering, with only Jed's compass and a map in hand. Every corner offered a new sight — rows of balconies, bars and cafes at every step, waves of well dressed people on the move. As typical newcomers, we compared everything to home.

"The cars are smaller."

"The streets have huge sidewalks."

"People seems to walk everywhere."

"More cafes on the streets."

"More bars."

"More ice cream stands."

"The stores close from 2:00 p.m. to 5:00 p.m. for siesta." No, siesta is not just a myth from Speedy Gonzales cartoons.

The observations were endless. Quickly we learned the obvious differences in everyday life, as well as in engineering school. The Escuela Superior de Ingenieros Industriales is a massive building that stands on La Castellana, one of the main streets in Madrid. Within the walls of this beautiful structure Chemical, Mechanical, Electrical, and Construction Engineers work for years to earn their degrees. Engineering school lasts six years. Most students finish in eight. After officially graduating, students have to do a year long project within their field of engineering.

The first three years of school cover the general courses, which range from basic calculus to thermodynamics. In the fourth year students choose their specific engineering fields. With a field a graduating class stays together from the fourth year until graduation. They have class in the same room with the same classmates all day, all year, while professors come to them to give lectures. Classes are not chosen. They

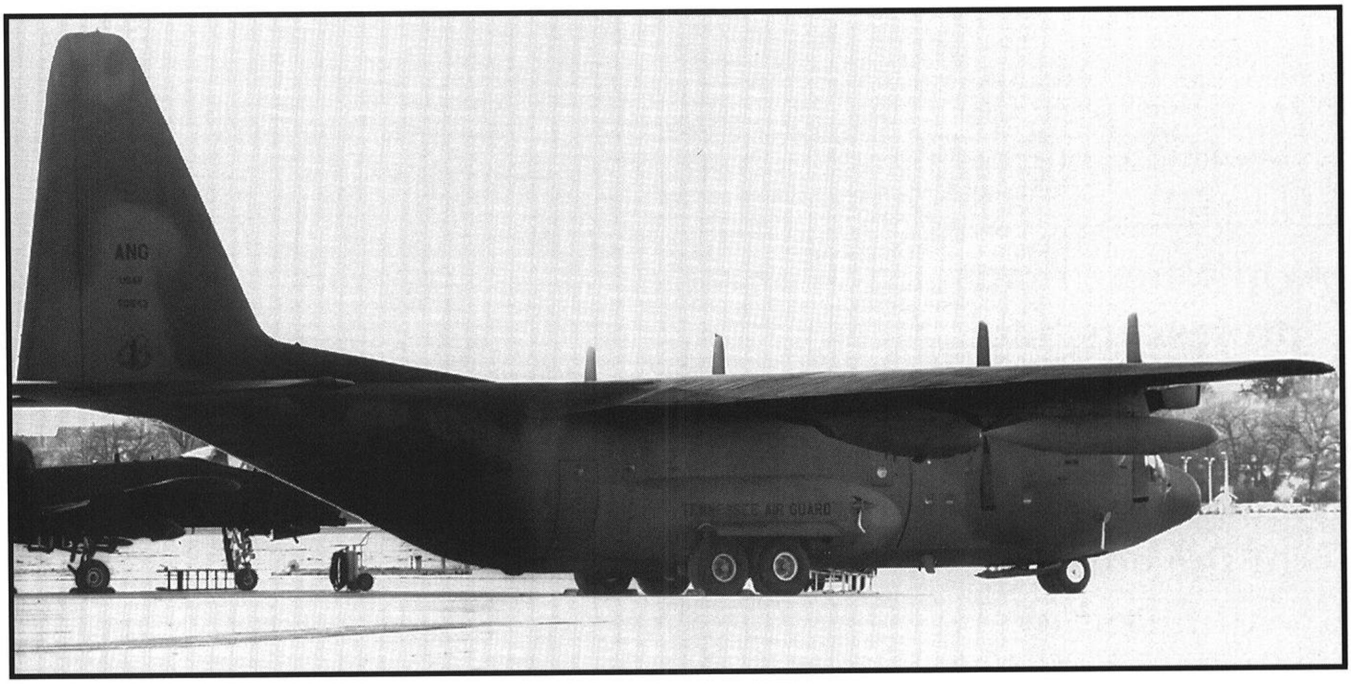
see ABROAD, page 20

ENGINEERING from page 13

the Apollo space program, the Vietnam war and finally the cold war. The curriculum of engineering, along with the new slew of professors, has changed little because of the far reaching diversity of new opinions being lobbied for and the subsequent lack of enough credits to fill them with. In addition, the introduction of computers as a tool has empowered the engineer to do fewer drudge calculations and focus more on the meaningful, creative side of engineering. If one thing can be said, it is that the future of engineering and our evolving society's needs for engineers is quite uncertain but is sure to be exciting.

> The engineering school should give a general education, so that the student is prepared to work in a number of companies or industries given the possibilities of layoffs or restructuring of defense or consumer needs

Author Bio:
Rob Nelson is an ECE junior who transferred this semester from UW-Green Bay. Green Bay is the proud home of the Weidner center, the UWGB Phoenix and the Green Bay Packers.



Source: Wisconsin Engineer

The military has always had a high demand for engineers.

ABROAD from page 18

are mandated. Electives do not exist. Neither do discussions. Few textbooks are used. Homework is unheard of; midterms are rare. Most classes last all year, with the entire grade riding on a final at the end of each semester. Their daily learning process consists of very careful note taking.

Our first week of school was shocking time.

" American professors don't speak that fast," we insisted to each other as we scrambled to understand fragments of the lectures. "I suppose at home we just don't notice".

Gradually, we became more accustomed to hearing the language and began to pick up the local expressions. Though Jed and I had studied Spanish for about five years, complete immersion in a world of native speakers bore not even the slightest resemblance to Spanish class!

While here many professors base their classes on a bell shaped curve, in Spain the idea of the curve is unheard of

The first three months of the semester did not involve much engineering work. We went to class and borrowed notes from newly made Spanish friends to fill in the large gaps in our understanding. Our focus was on understanding as much of the lectures as possible. And I had thought that understanding lectures in Madison was tough!

After about six weeks we reached that glorious day when we could manage to take an entire lecture of notes on our own. They were not as complete as those of our Spanish friends, but it was definite progress.

As the semester moved on we got into the Spanish university routine. By 8:00 a.m. every morning we were in class. By 2:30 p.m. we were out. As foreign students, our loads were lighter than those of our Spanish classmates. All foreign students in the school receive free lunch in the cafeteria. In Spain lunch is the biggest meal of the day; it is almost an event. Though the cafeteria food did not do justice to Spanish Cuisine, lunch was a good time to kick back and enjoy the company of other foreign students. We found we were the only Americans in the company of Italians, British, French and German exchange students. After lunch the tradition is to move to the bar for a strong coffee and conversation. Naturally, accepting this lifestyle was rather agreeable for Jed and myself.

Source: Liz Zilist

Jed and Liz take a break from their studies on the streets on Madrid.

Soon May approached, and with the end of May came that time dreaded by every Spanish student — exams. At Polytecnica, exams did not last a mere week, but rather an entire month! Classes end in mid May. Exams start in June. For weeks students spend each day at the library, systematically learning and memorizing the past semester. The university education in Spain involves a much larger amount of theory than ours, and much less practical application.

The first set of exams occurs during the first half of June. On the average, students fail about half of their exams. The end of June brings a second chance. Any failed exam can be retaken without penalty. And if this is not enough, September brings exam time, 'take three'. Students who failed their exams in June Are sentenced to study over the summer in order to give it one last go in September. The multitude of students failing exams in no way reflects the capacity of the students. Rather it is a measure of a very different philosophy. While here many professors base their classes on a bell shaped curve, in Spain the idea of the curve is unheard of. A large percentage of students in every class is expected to fail. Otherwise the class is considered too easy. Coming from our American system, we developed much respect for the students who go through that type of system without getting discouraged or quitting. But the Politecnica prides itself in graduating only the best and the toughest engineers that Spain has to offer.

While the school system surprised us in one respect, the people surprised us in another. Being the first Americans to have ever studied at the Politecnica, we found ourselves in a sink or swim situation. No precedents had been set for us, no guidelines given. Initially we were lost in a sea of people who knew what they were doing, but the Spanish character did not let that last long. By the third day of class we had met classmates who offered us their class notes in lecture, and invited us to join them out on the weekends. They were full of questions about our world and explanations about theirs. No one ever minded taking the time to explain things, to rephrase chunks of conversations that we could not grasp or to simplify their speech to our level. The people we met worked hard, yet really put a great importance on enjoying life. This attitude was seen in the lifestyles of the young and old alike. Most every Spaniard could be regularly found in an outdoor cafe chatting over an espresso with a friend, or taking walks along the store lined streets of the city. On weekends it was common to see couples and families if cafes at midnight. Youth, ourselves included, were found in the bars and discotecs until the rising of the sun, and later. A typical way to end a weekend night was over a breakfast of 'churros', a Spanish type of fritter, and a rich, thick hot chocolate.

The openness of the Spanish people amazed me. As I struggled to hurdle the language barriers and adapt to their world, they held their arms open and guided the way.
They welcomed us into their social groups and made us feel like long time friends.

At first, the basic elements of life in Madrid seemed fairly similar to home. Certainly the cars were smaller, the streets were more crowded, the food and people had a distinct style. But in a large city like Madrid, everyone appeared to follow a routine much like ours. The Spaniards went to work in large office buildings, attended school in large universities, drove to the stores, dressed well and went to the same McDonald's and Pizza Huts that we go to. Yet something felt different.

Only after several months did the underlying differences in our societies become clearer to me. It was neither the cars nor the Spanish food that I found innately different from America. It was the attitude, the philosophy of life that struck me. As we rush through our days filled with endless tasks and insufficient time, the Spanish live out theirs with an inherent love of life. They work as we do, study hard as we do, and fulfill the daily responsibilities of life. Yet in their days they find the time to take longer lunches, to meet friends in cafes, to end off the evening with family strolls. The days in Spain hold the same 24 hours, yet they are used quite differently by many. The race they run is a calmer one. It holds less competition and more camaraderie. It shows in their warm smiles, their close friendships, and their general openness towards others. Indeed there are economic differences that result directly from this way of life. Less material wealth abounds in Spain. Life styles do indeed have trade-offs. The question becomes which trade-offs are worthwhile.

To have lived a completely different lifestyle gives the person we are afterwards an immense edge over the person we were before

I have learned many things in that incredible land of which I was a guest for six months. I met a people very new to me, a culture whose riches are measured not in stocks or cars, but in people, laughter, friendship and pride. As I try to incorporate those lessons into my life here at home, one thing stands clearest to me. Of all the risks that I have taken in college, of all the challenges that I have accepted, from choosing engineering as a major to internships and leadership positions, none have had such an impact as this one. Learning that there are other ways of doing things and of living life is something that no class can teach. There are no textbooks that can challenge our ingrained ideas of how life should be. Only living in a different society can do that. It does not shatter ideals or negate our ways. Rather, it gives us the knowledge to be better at living, whichever society we may end up in.

No semester at home can come close to teaching what one semester abroad can. As engineers at the UW-Madison, we have a very unique opportunity to reap the most out of being abroad. The International Engineering Program places individuals on their own in foreign schools, giving us the chance to become completely immersed in the culture and the people of a different country. In comparison to a regular study abroad program that sends large groups of Americans to study and live together, International Engineering provides a much more demanding and rewarding experience. The gain is tremendous on the personal and even the professional level. To have experienced another culture is always valued in today's society. To have seen engineering in another language and society gives a graduating student a very special edge over his or her peers. But most of all, to have lived a completely different life style gives the person we are afterwards an immense edge over the person we were before.

AUTHOR BIO:
After the illustrious days of editing the Wisconsin Engineer, Liz Zilist took off for Spain. Now, as she jumps backs into the reality of engineering life in Madison, siestas and flamenco music still ring in her head, bringing happy memories and a desire to return.

DEAN from page 7

down from industry, to the college of Engineering and finally to the whole university.

Since 1981, Bollinger has attempted to give engineers and their campus a "sense of place." The Campus of Engineering (COE) is constantly improving and has a good reputation as a national competitor, especially in research.

He was not one to sit by and let things go undone

Bollinger has instituted many ideas about excellence in teaching, research and technology transfer. He changed Johnson Drive to Engineering Drive, and due to their alignment, Engineering Mall provides a connection to the rest of the campus via Henry Mall.

Engineering Mall is just the start of the future for engineers here at the UW, under the guidance of Dean Bollinger. It is a visual aid to show that engineers are an integral part of this campus. Engineers are now certainly on the 'campus map,' and do "work, create and thrive" on this campus.

Author Bio:
Ryan Mathus is a junior in Electrical Engineering praying that he will graduate in this lifetime.

Faculty Profile - Nick Hitchon

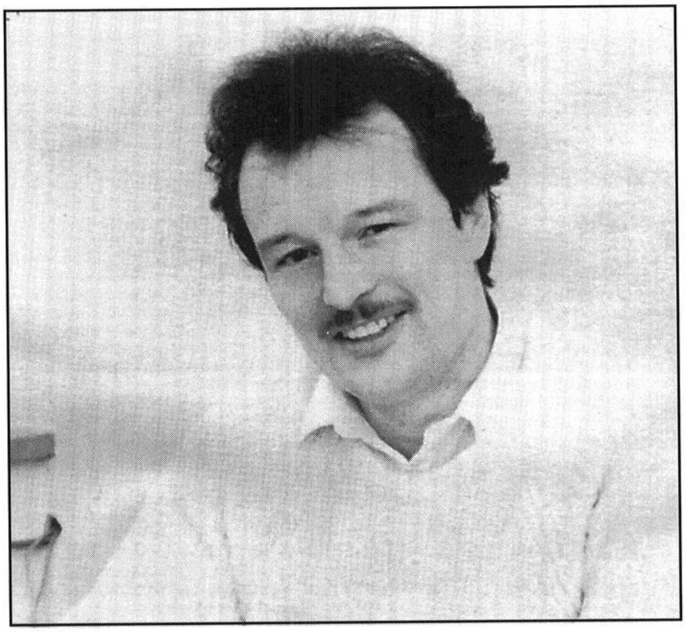
Electrical Engineering Professor Nick Hitchon began teaching at the UW-Madison 13 years ago. Hitchon, who currently teaches ECE 320 (Electrodynamics), is the graduate chair of the ECE department and is the head of computer modeling research at the Engineering Research Center for Plasma-Aided Manufacturing.

Born and raised in Yorkshire, England, Professor Hitchon received a degree in physics and got his Doctorate in Philosophy in engineering science from Oxford. After graduation, he worked in a government research lab in England doing plasma theory in support of a large plasma experiment. At the same time, he waited for his green card to come through.

Professor Leon Shohet, a future chair of the ECE department, convinced Professor Hitchon to come to Madison after meeting him at Oxford. Hitchon praised the ECE department here at Madison for having,"a very professional staff that takes the time to make sure the students understand what they are teaching. Everyone in the department tries to go the extra mile."

Professor Hitchon gears his research to the needs of industry, but tries to do significant theoretical work as well. According to Hitchon, "With the limited number of government grants available today, research has to be important and related to the needs of industry. Today, research must produce results immediately if it is to remain funded."

Professor Hitchon warned undergraduates to find an area of engineering that is going to stand the test of time. "Don't let yourself become obsolete," says Hitchon. He added that," engineers have to be able to solve problems today and twenty years from now."



Aside from spending time on his interest in rockets, Professor Hitchon is the graduate chair of the ECE Department.

Professor Hitchon also stressed the importance of computer literacy among engineers. "Our students are able to solve new types of problems because they have the ability to use sophisticated computer programs. Computers allow us to kill a lot of birds with one stone. Our computer programs have to be useful in research, in the classroom and to companies who are our customers."

Professor Hitchon is one of the stars of a documentary that follows the lives of fourteen children from all walks of life. The documentary started when he was seven years old and is shot every seven years. Professor Hitchon explained the purpose of the documentary was to examine whether people change from the time that they are children until the time they are adults. The producers thought that the fourteen children would essentially not change their entire lives. Hitchon went on to say, "One time I told the producers that I was interested in rockets. This should have alerted them that I was not likely to remain on the farm, but I guess in a way I helped prove their theory. I haven't changed much, I'm still interested in rockets."

Author Bio: Jamie Jankowski is a junior majoring in Electrical and Computer Engineering and has just completed an internship with Kurz Electric Service in Appleton, Wisconsin.

HISTORY from page 9

was remodeled into Engineering Hall. The construction was completed in 1993. Engineering Mall, the area in front of Engineering Hall, and the Descendant's Fountain were dedicated to the College of Engineering October 21, 1994.

Throughout the past one hundred years, the Wisconsin Engineer magazine has documented the changing engineering campus. While many of the buildings, such as Mechanical Engineering have not changed, the engineering campus has expanded. Although engineering has been a constant part of the UW, it is contrasted with the ever changing and evolving world of engineering and technology.

Jennifer Schultz is a freshman who hopes to study chemical engineering. All her teachers told her to go into communications, but she chose engineering.

Just One More

Top 20 Engineering Terminologies

1. **A Number of Different Approaches are Being Tried** – We are still peeing in the wind.
2. **An Extensive Report is Being Prepared on a Fresh Approach to the Problem** – We just hired three kids fresh out of college.
3. **Close Project Coordination** – We know who to blame.
4. **Major Technological Breakthrough** – It works okay, but it looks very hitech.
5. **Customer Satisfaction When Delivered Assured** – We are so far behind schedule that the customer is happy to get it delivered.
6. **Preliminary Operational Tests Were Inconclusive** – The darn thing blew up when we threw the switch.
7. **Test Results Were Extremely Gratifying** – We are so surprised that the darn thing works.
8. **The Entire Concept Will Have to be Abandoned** – The only person who understood the thing quit.
9. **It is in the Process** – It is so wrapped up in red tape that the situation is about hopeless.
10. **We Will Look Into It** – Forget it! We have enough problems for now.
11. **Please Note and Initial** – Let's spread the responsibility for the screw up.
12. **Give Us the Benefit of Your Thinking** – We'll listen to what you have to say as long as it doesn't interfere with what we've already done.
13. **Give Us Your Interpretation** – I can't wait to hear this bull!
14. **See Me or Let's Discuss** – Come into my office. I'm lonely.
15. **All New** – Parts not interchangeable with the previous design.
16. **Rugged** – Too heavy to lift!
17. **Lightweight** – Lighter than **Rugged**.
18. **Years of Development** – One finally worked.
19. **Energy Saving** – Achieved when the power switch is off.
20. **Low Maintenance** – Impossible to fix if broken.

– Author Unknown

Source: Wisconsin Engineer

Compiled by Matthew Vokoun

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