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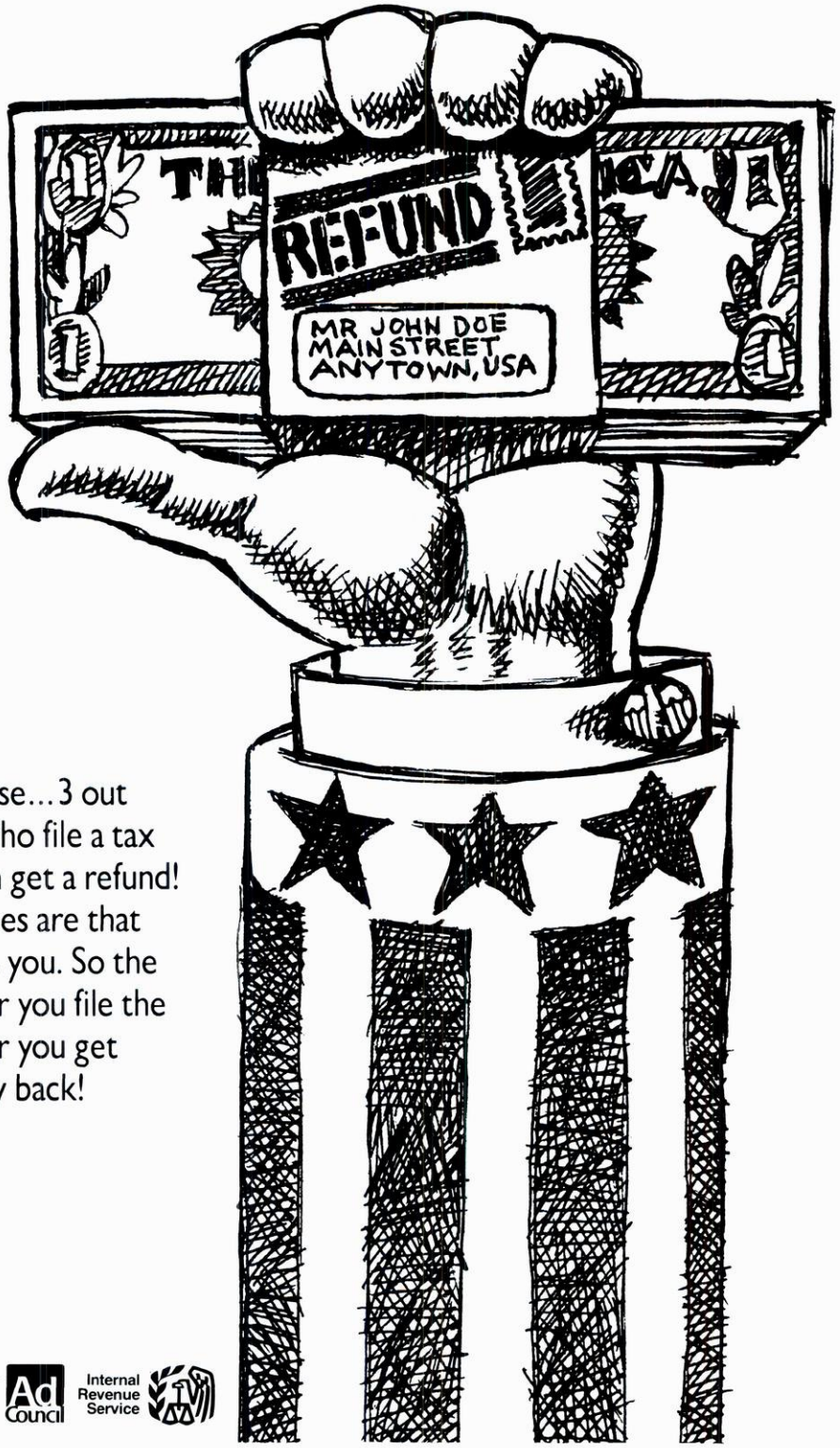

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wisconsin engineer

Published by the Students of the University of Wisconsin–Madison, March 1992

Cover
Drawn by Dawn Stanton, the cover "depicts" the rollercoaster-ish luge ride of a typical UW engineering student's life.

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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. All interested students have an equal opportunity to contribute to this publication.
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Learning Creatively

Nancy Hromadka
Wisconsin Engineer Co-editor

• **PRETEND THAT YOU** *are the sound system manager for a Madonna concert. You are in charge of setting up the microphones and positioning the loudspeakers. To secure your job in the future, you must ensure that Madonna's voice is heard above her backup singers. What can you do to achieve this specification?*

• *Now, you are a backpacker hiking across the flat, rocky mesas of the southwestern United States. You come to the edge of the plateau and see another one in the distance that you would like to explore. Unfortunately, there is a steep valley between that plateau and you. Can you get from one place to the other without descending into the valley?*

Although you may have failed to see the engineering concepts illustrated in these two examples, vivid images undoubtedly came to mind as you pondered each question. These two anecdotes were recently used to communicate technical ideas to a group of electrical engineers in a classroom setting. The diversity of each example clearly emphasizes the creative talent within some of the engineering professors at this university. Instead of just explaining a theory and writing a series of cryptic equations on the board, these professors help their students experience an application of the theory by painting a picture with their imaginations.

With their own creativity, these teachers serve as role models prompting similar creativity in their students. Why can't more professors teach with such a degree of ingenuity? Maybe they can with the right kind of assistance. In my experience as a student, I have discussed teaching techniques with both professors and teachings assistants. More than once, I have been asked for suggestions on ways to improve a class I was taking. These inquiries indicate that many of the educators in the engineering college are truly concerned with providing their students with a quality education. These faculty members are open to new ideas and are constantly searching for improvements.

In one effort to improve the skills of its teaching assistants, the College of Engineering introduced a series of workshop topics last semester which included seminars and lectures on teaching ideals. Reactions from some of the TAs who participated indicate that the lectures describing the role of an educator were beneficial for the new TAs but perhaps not necessary for those with more experience. One TA explains that most TAs understand their role as educators. They recognize the importance of their work and the responsibilities they hold. However, she notes that there is a difference between knowing what to teach and knowing the best way to teach it. Thinking back, this TA felt that the most beneficial part of the workshop was the information exchange with other TAs, learning what methods were effective and what methods fell short. If these discussion sessions are helpful for TAs, perhaps similar programs could prove helpful for professors as well.

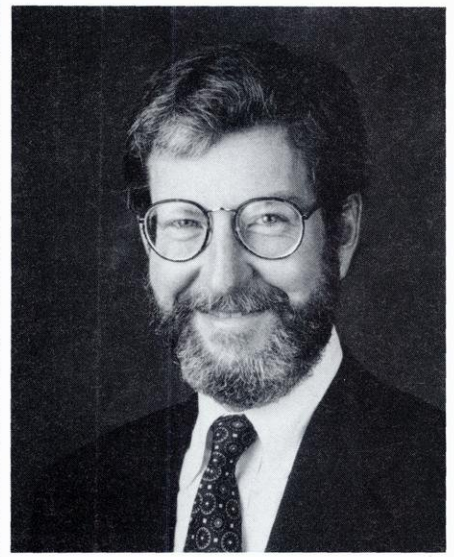
At the end of each semester, students are invited to respond to course and faculty evaluations, recording their complaints, praises and suggestions. This feedback is extremely valuable to many faculty members. With that fact in mind, perhaps there is a way to increase and diversify the kind of feedback these educators receive.

One possibility involves an additional evaluation earlier in the semester, during the fourth or fifth week of classes. This evaluation could be used by the teacher as a form of immediate feedback, offering the opportunity to adjust teaching styles to better accommodate students before the end of a semester.

Without question, the written, anonymous evaluations are effective and allow students to express their opinions honestly and concisely. However, perhaps in addition to these written evaluations, some type of department forum could be created. This panel could consist of a number of student volunteers from each level who could meet with faculty members to discuss the teaching techniques they have experienced and their reactions to them. Basically, this forum could provide additional communication between the department heads and the students in an effort on both

(Continued on page 4)

"America" Still a World Leader



Engineering Publications

Thomas W. Chapman
Associate Dean International Relations

IN RECENT MONTHS WE have heard a lot of discussion about the poor international competitiveness and productivity of U.S. industry. Indeed, the conventional wisdom adopted by many politicians and commentators today is that America has lost its ability to innovate; our workers are unproductive, and our companies cannot keep up with foreign competition. Although there are a few exceptional situations that tend to support this view, the facts show that American business is still the world's industrial leader.

Since 1986 the volume of America's manufactured exports has risen by about 90% compared with average growth in the rest of the industrialized nations, including Japan, of only 25%. Our share of these exports has risen from 14% in 1987 to 18% in 1991, ahead of Japan's 17%. Indeed, our success in international markets has been one bright spot in moderating the current recession.

Although it has become popular to bemoan America's poor productivity, the truth is that America is one of the world's lowest-cost producers with the highest level of worker productivity among the large industrialized nations. In fact, after losing ground in the '50s and '60s, America's manufacturing productivity growth in the 1980s was faster than that in Japan or Germany.

To quote a recent article in *The Economist*, "Thousands of American firms, big and small, remain among the most competitive in the world... American firms lead in a slew of technology-based industries such as computer software and hardware, microprocessor chips, aerospace, pharmaceuticals, biotechnology, new materials, energy and environmental control. Listing American companies that are world-beaters in many of these fields is easy." Many companies in the service sector, including industrial construction, are also highly efficient.

Another sphere in which America is a leader is in tertiary education. For all the faults of education in America, our universities are the envy of most of the world, in terms of both quality and accessibility. Witness the large numbers of foreign students who seek to study here.

Listing America's industrial successes and strengths is not intended to make us complacent. Rather, we must recognize realistically where we are today as we plan our strategies for the future. There is a risk that excessive pessimism will lead to counterproductive political measures. For future strength, it is important that we improve general education, raise our level of capital investment and increase our research efforts. On the other hand, for a country that gains considerable benefit from exports and access to foreign markets, moves toward isolationism and protectionism would be disastrous.

Most of the American companies that we can point to as leaders have maintained their positions by becoming global institutions. Their growth and strength have come from development of international linkages for manufacturing, marketing and transfer of technology. Many UW engineering graduates contribute to these developments in the course of their professional careers. International Engineering Programs at UW-Madison is committed to supporting our students as they prepare for their role in the "new world order." ■

Footnote: International Engineering Programs is responsible for the College's linkages with international organizations and foreign institutions. Through this office, located in 1018 Engineering Research Building, students are offered many opportunities for study or work abroad. For information contact:

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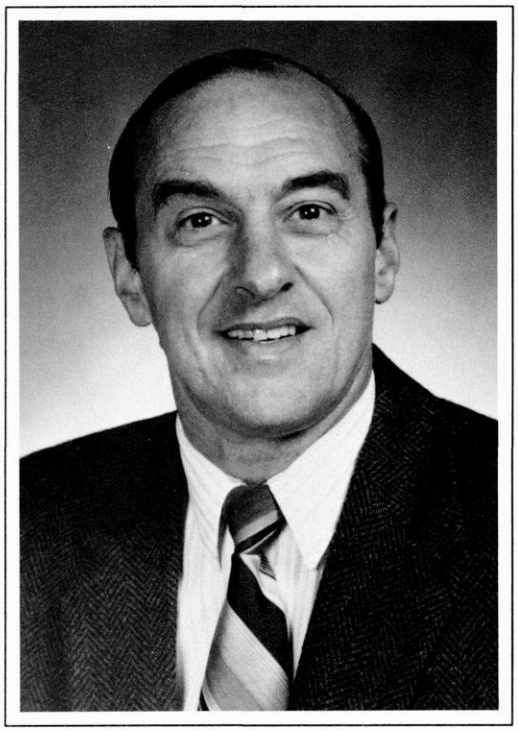
Alois "Bud" Schlack

A Teacher Out Of This World



It is evident by his crammed classes every semester that "Bud" Schlack is devoted to his teaching

IT HAS BEEN SAID, "A great teacher never strives to explain his vision - he simply invites you to stand beside him and see for yourself." These words of Reverend R. Inman capture the teaching spirit of Alois J. Schlack, who has bestowed engineering students at the University of Wisconsin-Madison with his knowledge and wisdom for 32 years.

Professor Schlack, known to most as "Bud," has chosen to put the emphasis of his career on the actual teaching process and has been recognized for his ability and devotion to this endeavor numerous times. A native of Eagle River, Wisconsin, Schlack came to the University of Wisconsin-Madison as an undergraduate with little knowledge of what engineers do. He earned a degree in Applied Mathematics and Mechanics and was hired by Ford Motor Company. There he began to notice the work of engineers around him and realized that this type of work was more appealing to him than his own. With that in mind, he took a leave of absence from Ford and returned to the University to pursue a degree in engineering.

"As far as I know I am still on leave of absence," jokes Schlack more than 30 years later. A year after coming back to school he was awarded a fellowship in the College of Engineering, and shortly after that a part-time job teaching there. Having no particular interest in teaching, he accepted the job to provide his wife and newborn child with financial security at least until his graduate studies could be completed. Though the type of teaching he did during that first year did not appeal to him, the response of the students was overwhelming.

"It's important for students to realize the impact they have on educators staying in the profession," says Schlack. For him, it turned out to be the deciding factor in choosing between returning to industry and staying on at the College of Engineering, which for the past 32 years has benefitted tremendously from his choice.

Schlack received a Ph.D. in Engineering Mechanics from the University of Wisconsin-Madison in 1961 and has since then been developing and expanding that department. He served as department chairman from 1974 to 1980. He has personally developed six courses, including Satellite Dynamics and Celestial Mechanics, both of which he presently teaches. Enrollment in these courses is always the highest in the department. He has also created a computer aided tutorial system for statics and dynamics, which allows students to get help with problems any time of the day or week. Through the efforts of his teaching and research the engineering mechanics department has created an astronautics option for undergraduates.

Schlack explains that many of the classes were already being taught at the University. However, officially providing an astronautics option makes the College of Engineering at Madison a possibility for undergraduates interested the this field who might have looked elsewhere for an aerospace degree.

Though research is well incorporated into Schlack's schedule, his main focus is teaching and educational research. He feels that the university provides a flexible environment for professors that allows them to place their emphasis where they believe it is most beneficial. In a research-oriented university, teaching, though very important, is not the first priority, Schlack explains, but both facets are rewarded. "Teaching and course development are driven by a person's own comittments," he maintains. Throughout his career recognition has been plentiful. Schlack has received Polygon's Engineering Mechanics Outstanding Teacher Award 19 times. Tau Beta Pi members presented him with their Outstanding Teacher Award in 1984. In 1987 he was honored by the College of Engineering with the Benjamin Smith Reynolds Award for Excellence in Teaching; the list goes on.

It's important for students to realize the impact they have on professors staying in the profession

Teaching is really what keeps Schlack at the University. Administration and research can be done in industry just as well, but here he has the opportunity to make an impact on the professional development of future engineers.

Realizing that the classes he teaches are difficult, Schlack challenges his students with practical problems that are likely to be found in the aerospace industry.

"I get paid to help them learn by giving challenging problems," he says, and from student feedback it appears that they enjoy learning the material on a practical level. Often, Schlack will give such problems on take home exams, which often produce high quality results coupled with student enthusiasm.

"I put a lot of effort into the courses," Schlack says, "I can expect them to put in at least as much." He hopes to help his students understand the meaning of his lectures, rather than just doing the algebra and to grasp the concepts rather than simply the mathematics.

Enthusiasm fills Schlack's voice as he stands lecturing in front of a group of students. They have chosen to be in his class because they want to learn and because they know Bud Schlack makes it his first priority to help them do just that. ■

AUTHOR

Svetlana Zilist is starting to tackle real engineering classes for the first time this semester. The more involved she gets with them, the more she admires Winnie-the-Pooh, "a bear of little brain", who lived quite happily that way.

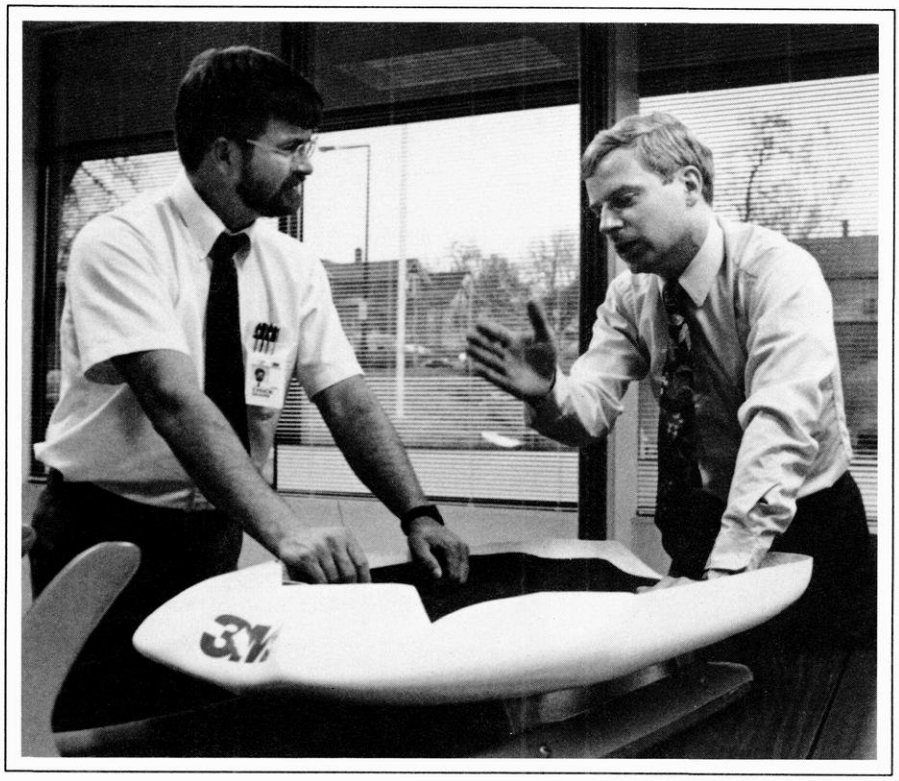
Editorial Continued from page 2

sides to improve the quality of education. This forum could offer students a chance to express general opinions, both positive and negative, about their teachers without specific names. Teaching techniques rather than personalities would be stressed.

As a follow-up to these discussions, professors themselves could offer informal seminars on a voluntary basis for fellow faculty members and TAs. Assuming the same holds among professors as it does among TAs, seminars filled with specific examples and helpful suggestions instead of theoretical how-tos could be implemented to everyone's advantage. Of course, not everyone will be teaching with Madonna and backpacking examples, but maybe the interaction and creativity will inspire new examples and teaching techniques that will improve the quality of education at Madison and increase enthusiasm. ■

Sleek New Sleds

Producing Winners and Lugers



3M

Engineers Chuck Devore and Mark Reeves review the sled design as a whole. The luge, the French word for sled, now incorporates space-age materials. Previously, sleds were handmade, never the same twice and difficult to alter to an athlete's preferences.

IMAGINE THE EXCITEMENT and thrill of gliding down an ice track in an aerodynamic sled at speeds over 80 miles per hour, the bitter cold wind in your face, the smooth track zooming underneath you. Lugers experience this exhilaration each time they race.

To a spectator, the luge race may appear basic and unchallenging, but many factors affect the luge's performance. The luge track is a 750-1250 meter curved ice slide, but the luge race itself lasts for only a minute. "A shift in the shoulder or twist in the foot can mean the difference between winning and losing. This sport is measured in the one-thousandths of a second. What may seem like a minor slip at the top of a run can mean valuable seconds at the bottom," claims Bob Hughes, Marketing Director of the United States Luge Association.

For three years, the 3M Company has been working on ways to improve the luge. The recent 1992 Winter Olympics marked the first year that the United States Luge Team actually competed in American-made sleds. In addition to its technological resources, this St. Paul, Minnesota-based company also provided financial support for the U.S. Olympic Team. Expertise from 3M engineers led to improvements in luger training, sled design, glove spikes and vest weights. 3M's Olympic Program Manager Jim Radford says, "3M's commitment to the USLA goes beyond the financial. We're in this to help the performance of our athletes. We need to show an example of how we make innovation work. For us, the partnership with the USLA does just that."

One of the most important skills in the luge is steering. There are four basic steering techniques: handle steering, head steering, leg steering and shoulder steering. Handle steering is accomplished by simply pulling a handle on either side of the sled. Head steering is done by moving the head slightly to one side, creating pressure on one side and thus turning the sled. Leg steering is the quickest and most powerful, but much speed may be lost if the turns are too abrupt. In leg steering, the luger presses down and in on the front of the runner. If the left leg is used, the sled moves to the right. Shoulder steering is considered the best option, although it often lacks power. By pressing down with the left shoulder, the luger can steer the sled to the left.

We're in this to help the performance of our athletes

Depending on the size, the sleds are designed so that one or two people can lie comfortably on the sled, despite physical differences. Each seat can be adjusted to fit many different athletes. The aerodynamic sled weighs less than 22 kilograms (48.4 pounds) for the single lugers and less than 25 kilograms (55 pounds) for the double lugers. Lugers wear weighted vests in order to balance the weight to make the sled more aerodynamic and efficient. 3M has improved the vests by making denser and smaller weights, allowing for more freedom of movement.

Each luger has special gloves designed for controlling the sled. The gloves have spikes mounted on three fingertips of each hand. The spikes are used to help the lugers push off at the starting gate and also to push off the ice a few times to obtain more speed for peak acceleration. The engineers at 3M have created a new spike design for the gloves which are now manufactured with a laser

The gloves have spikes mounted on three finger-tips of each hand

machining tool that bends the spikes to the proper angle for grabbing the ice. Previously, the gloves were made individually by hand and had to be sharpened frequently.

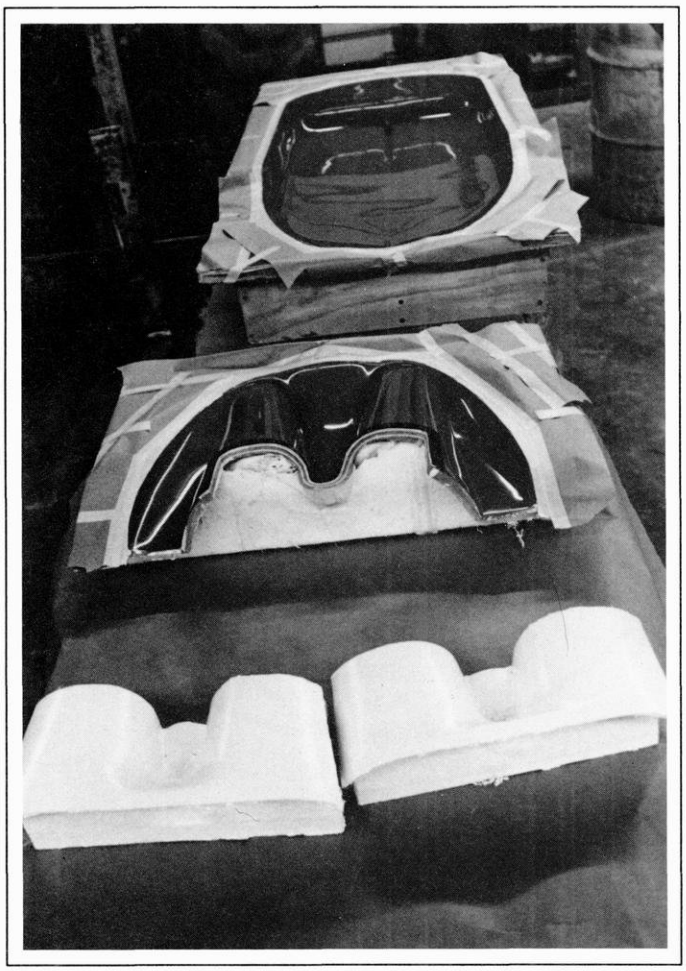
The sled itself has also been improved. Topics such as steering, dynamics, vibration, and runner friction were researched. Engineers at 3M tested the sled's resistance, speed and acceleration with wind tunnels invented by NASA. Working with the Luge Association, the 3M engineers used computers to design the new sled. After testing various designs, one type was found to produce minimal movement of the runners. This change brought greater stability to the sled's structure.

To obtain high speeds, the metal runners must be sanded smooth. By changing the type of abrasive, the time spent sanding was cut from four hours down to one. Through the use of new ideas and materials, the sleds have been drastically improved.

Engineers are currently reviewing the sleds' performances in the recent Olympics and working on new ways to improve the performance for future races. ■

AUTHOR

Amy Erickson is a third year ECE student engineering a way to build a luge in space.



3M

The pod, or seat, of the sled is made of a composite material and can be customized to fit the shape of several different athletes. Whether the athlete weighs 90 pounds, or 190 pounds, the new sled design is capable of suiting the athlete.

Biosphere II

Biology or Business?

AS THE SUN SETS, the sky gradually becomes freckled with stars. Amongst the light of the stars, the neighborhood of planets can be seen. Mars, Earth's closest neighbor, appears as a reddish dot of light on the horizon. Driven by curiosity and persistence, scientists and engineers are investigating a possible colony on Mars. With environmental problems, the world itself is also a concern of many scientists. Today, the Biosphere II project combines the dreams of a colony on Mars and the concerns for the environment on Earth.

Housing over six climates, Biosphere II is currently accommodating eight humans and over 3,800 different species of both plant and animal life. A desert, a marsh, a savanna, a rain forest, a farm and a small ocean are enclosed in a 3.5 acre plot of desert in Tuscon, Arizona. The ocean contains one million gallons of water, a coral reef and even a small beach. Each of the species will live in its natural environment; mosquitoes in the marshes, and pigs on the farm. In order to ensure a proper experiment, the structure is completely sealed and contains multiple sensors to detect any leaks. This closed environment allows only sunlight and radio communication to penetrate the steel and glass of the building. The Biosphere II project, costing a total of $150 million, is privately funded. Testing the endurance of humans and other Earth species, the project may lead to a colony on Mars.

Ed Bass, a Texas oil millionaire, is the largest sponsor of the multi-million dollar project. Interested in ecological preservation organizations, Bass is involved with the boards of the World Wildlife Fund, the New York Botanical Gardens and the Jane Goodall Institute. Bass had purchased a ranch in Australia, not for ranching but for restoration of the natural grasslands and savannas destroyed by years of ranching. Bass shares much of his time and wealth for the sake of ecological ideals. When the founders of the Biosphere project, Margret Augustine, Mark Nelson and John Allen proposed the initial ideas for the venture to Bass, he donated $30 million to the bankroll.

Although the initial experiment will last for two years, there are a variety of additional research experiments that are planned for the years ahead. New species, both of the plant and animal kingdom, will be added and exchanged in the existing wealth of life. Experiments involving carbon readings of the air, soil, plants and animals will provide information on the effects of varying the climates and food chains within the dome. Possible models of the greenhouse effect can be tested by introducing high carbon dioxide levels. The airtight dome structure was designed with an expected lifetime of 100 years. In addition to experiments involving Earth climates and species, the intense enclosed experience will serve as a precursor for a possible colony on Mars.

The ambitious Biosphere II project was influenced by the interest of life outside of Earth, Biosphere I. The world is anxious for new discoveries in space. A voyage to Mars in the 21st century is a goal set by the United States. The new frontier of space is different from any other time periods of exploration the human race has witnessed. There will be no tropical

islands awaiting the first explorers of Mars. In order for humans to travel in space or survive on Mars, they must be self-sustaining. Although present technology for this goal is beyond our grasp, Biosphere II appears to be a foothold in aerospace technology. Yet many experiments can be deceiving; Biosphere II is among them.

Easily edited computer programs, excess food supplies and an abundance of lead-wire air lock tamper indicators are among the deceptions of the Biosphere II project. The computer programs, made to analyze various conditions inside the structure, were written to allow false data entry. Computers monitor conditions throughout the dome including carbon dioxide levels and leaks to the exterior. If any leaks or excess carbon-dioxide levels occur, the project's credibility could suffer. High levels of carbon dioxide were reported in August of 1991, causing possible harm to the ecosystem of Biosphere II. Project participants have admitted to using a carbon dioxide scrubber, creating yet another false condition.

An injured crew member, having left the project for medical treatment, had supposedly brought back lead-wire air lock seals. Although accused by a critic, the project's credibility is in jeopardy due to confessions of project participants. Crew members have admitted to using fresh air as well as previously-stocked food within the closed world. Air conditioning and electricity from outside the dome are also necessities the so-called independent world cannot live without. Deviations from the original plans of the experiment have created a haven for those critical of the project. Larry Slobodkian, University of New York-Stonybrook, declares, "It's an exercise of a very strange kind of living in very close proximity, in almost a prison-like environment."

Is Biosphere II truly an experiment of worth, or is there more than pure science involved?

Employees of the project are sworn to secrecy; they are often cautious to speak freely of the project, if at all. The Biosphere II Company is suing one critic. Rumors of home phones being bugged give way to questions of the secrecy of the experiment. Is Biosphere II truly an experiment of worth, or is there more than pure science involved?

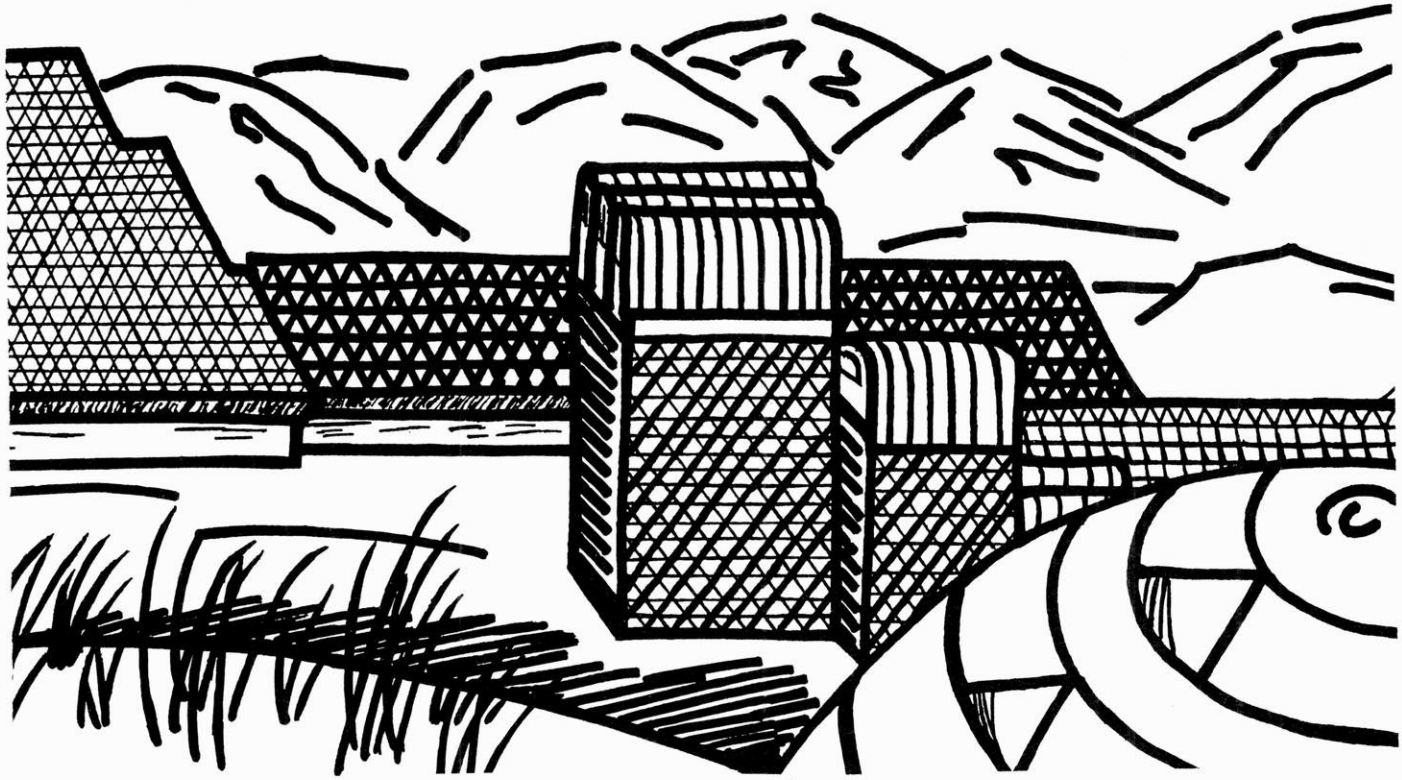
Plans for a hotel and conference center suggest that money is also a factor for the oasis of life in the desert. Visitors are charged $9.95 for escorted tours of the outside grounds. Golf courses and a space camp are also in the running for tourist attractions near Biosphere II. Officials of the project had said it was not a pure science venture but a business based on science.

Although experiments can be deceiving, they might contain more than the critics are giving them credit for. The Biosphere II project created hopes for many people. The stars appear a little closer, but the distance is all relative.

Some of the greatest discoveries were made with experiments appearing to have little value. With good intentions and a will to learn from mistakes, there is always something to be gained. Carl Hodges, a chief consultant of Biosphere II, describes his hopes for Biosphere II, "This one project could allow humans to live on other planets and live better on this one. I think once we've worked with Biosphere II, we'll understand Biosphere I a lot better." ■

AUTHOR

While in Jackson Hole, author Jim Webb hopes to get a little closer to Mars by skiing the Teton Mountains.



Engineering or Geek? Week

ENGINEERING WEEK 1992 IS almost here, and it is time once again to get our plaid, polyester, high-water pants out! You know, the indestructible pair that is used in the sweater closet as a substitute for moth balls. Nothing is going to eat through those pants. The high-waters, pocket protectors, taped black-rimmed glasses, large knot ties, jars of DEP hair gel and calculators make up the attire for this prestigious biennial event. Engineering Week, as you may well know, runs opposite the year of the Engineering Exposition.

This year it was suggested by the L&S students to re-title the week "Geek Week." It is ironic that everyone on the other side of campus stereotypes us as Geeks. What is a Geek anyway? I agree that many of us suffer from a variety of ailments that twist and contort out bodies, reshape our heads and affect our speech.

There are several explanations for our diseases. Sure we walk with a slight tilt to the front or side, but that is due to the numerous textbooks we must carry across campus. As a result, we build our bodies up to an incredible physique. And our foreheads may be a little flat from sleeping on our books all night long or from pressing them against computer screens for hours on end. Finally, our funny speech is attributed to the superior intellect we all possess stemming from logical thought leading to communication in complete sentences. It is better to have all of this than a body by Nautilus and mind like Mattel. Maybe the L&S students have the right idea about us after all.

The one event that will kick off our E/Geek Week will be the ever popular Calculator Toss. The goal is to fling, snap or chuck your calculator the farthest distance. The calculator can be big, small, multi-functional or solar but cannot have anything added to its original form. This stipulation is to prevent those sneaky engineering students from attaching their calculators to a very thin string taped to the bottom of the fuselage of a remote control airplane and flying their calculators right to the winner's circle. Regardless, the winner will be awarded a new Hewlett Packard calculator capable of performing all the monotonous tasks of memorizing the derivations and answers for even the most difficult examinations.

This year it was suggested by the L&S students to re-title the week "Geek Week"

If you enjoy dropping more than chucking, then an Egg Drop from atop a building to its base may be your kind of challenge. Limited by quantity and type of Super Absorbent Material, the goal is to have an unbroken egg after the fall. With the fall season near, we welcome our favorite pastime, baseball. But, spring training during Geek Week involves a baseball, a dean and a big bucket of water. The Dunkin' of the Deans sponsored by Triangle Fraternity is not a humiliating experience; rather, it is an opportunity for the deans and professors to get valuable student feedback.

If X marks the spot, then the dean goes in the drink. If that is too easy for you, then try our Geek Week X Marks the Spot sponsored by AIAA. It is a campus wide treasure hunt for engineering-related clues and rewards. It includes buildings, plaques, fountains, bell towers, antiques and chocolate. But, clues are not easy to come by in this treasure hunt, nor are they when ACSSA along with Alpha Chi Sigma and SPICE sponsor its Geek Week Magic Show. The legend of all times, Houdini, who came originally from Appleton, is honored here through many captivating and puzzling tricks. Of course, all magic tricks are performed in clouds of illusion and secrecy.

Confidentiality is also respected in SWE's Geek Week Computer Dating Service, in which students may fill out questionnaires and personality profiles to match their desires and needs. But, if all you have are needs, then we recommend the Geek Week Santa's Workshop sponsored by the Co-op Association. Originally, this event was serious in nature, and the deans and professors were asked

to be available to answer questions and direct grievances. Santa's Workshop has been modified to ease the confrontation with the deans and make the event a more Santa-like experience many of us have not been able to outgrow. We ask our deans and professors to dress in Santa's clothing, invite students to sit in their laps (just kidding) and ask students what they have on their wish list. Many students beg for an "A" in Thermodynamics; others hope that the design for the Hybrid Electric Car will win a bid, and yet others wish for a high salary job with cash fringe benefits.

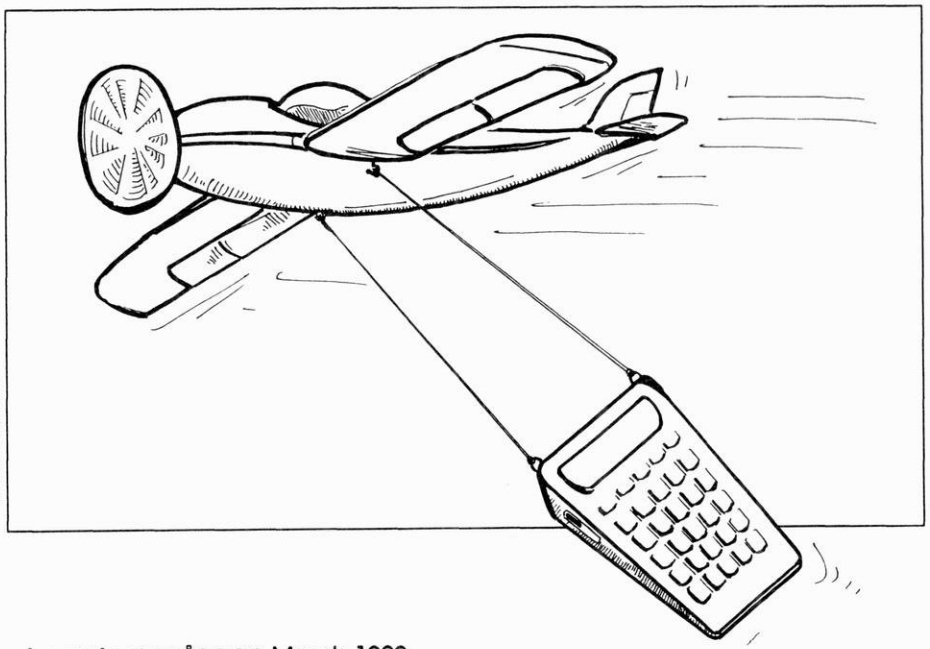
Electronic Data Systems has furnished the Exponent-sponsored Geek Week Jeopardy Game with $2000.00 for cash prizes. The event runs the entire week, and prizes will be awarded at the end of the week. In a lecture sponsored by ANS, representatives from EDS will discuss professionalism in engineering. ANS is also sponsoring the Engineering Blood Drive. Each engineering department tries to encourage its members to donate blood, and the department with the most volunteers wins. If they cannot get your blood this way, Pi Tau Sigma is sponsoring a Dart Tournament with prizes and band-aids to be held at the Retreat Bar. Following this event, Pi Tau Sigma will host a presentation on biomedical engineering. And for all you rocket scientists, ASME is hosting the Geek Week Rocket Launch and Paper Airplane Toss. Students compete and are awarded prizes for distance, altitude, and largest fireball. Also available are Geek Week T-shirts for purchase and as prizes. The shirt has every logo of every engineering student organization on campus.

The Dunkin'of the Deans sponsored by Triangle Fraternity is not a humiliating experience; rather, it is an opportunity for the deans and professors to get valuable student feedback

Please show your support for Geek Week by wearing the traditional outfit sponsored by Geeks of the United States of America. The goal of this registered event will be to acquire a date from the L&S campus and escort the date to the Geek Week Dance. At the G-Ball a Geek contest will be held to determine the ultimate "Geek of the Week" and to frighten the judges into really believing that you portray this character daily.

For all those older students and faculty that have burned out just a tad early this semester, a BEveERage garden will be open at the Geek Week Dance.

Geek Week is traditionally a week of fun and games, so look for Geek Week beginning March 30 to April 3, 1992 and get involved.



Dawn Stanton

Engineering Week Events

ALL WEEK
Engineering Jeopardy
Geek Week T-Shirt Sales
Blood Drive
SWE Computer Dating

MONDAY
High School Student tour and dinner

TUESDAY
Magic Show
1351 Chemistry Building
7:15 p.m.

WEDNESDAY
Speaker: Todd Monson
"Automating the Manufacturing Lifestyle"
159 Mechanical Engineering
12:00 noon

Scavenger Hunt

Speaker: Linda Pate
"From Backpacks to Briefcases-a Game Plan for Success"
106 Engineering Research
7:00 p.m.

THURSDAY
Plant trip to Janesville Truck and Bus
12:45 p.m.

Pi Tau Sigma Dart Tournament
Regent Street Retreat

FRIDAY
G-Ball
Union South
9 p.m. - 1 a.m.

AUTHOR

Brian Lofy is a fifth-year Electrical Engineer with no real writing experience. Any literature in this article remotely resulting in humor in the form of a laugh is purely coincidental. His views and opinions do not represent the views or opinions of *Wisconsin Engineer* Magazine. He is a guest writer from the ECE 350 class.

Spuds in Space

IMAGINE HOW THE FRONTIERSMEN and their families felt exploring and finally settling the American West. They braved the dangers back in the 1800s and opened the door for a new life.

On May 5, 1961 Alan Shepard entered another frontier with the Mercury space capsule flying for 15 minutes and 22 seconds in space. He and six other men braved the dangers of space travel like true frontiersmen and opened another age of exploration and discovery. Since then, many discoveries have been made and new technologies developed, but at least one dream remains: to travel to other planets. Some supporters say the first step toward this dream is the construction of a space station which would be used as a stepping stone for future space travel. On the UW campus, researchers have been developing new technology for a self sufficient space station. Theodore Tibbitts, director of Biotron and professor in the Horticulture Department, and other researchers have been concentrating on growing white potatoes for food on the space station Freedom and testing their growing chamber as a crucial element of the life support system on future space stations.

Why potatoes? White potatoes along with eight other species of plants are being considered because of the large amounts of carbohydrates and protein they contain. Potatoes are also a top candidate because they are almost completely edible with only light stems and dry leaves left to be recycled. They can be stored for a month or longer at cool temperatures and can be prepared in numerous ways from baked potatoes to potato pancakes. Potatoes could easily fit into NASA's plan of automated cultivation compared to tall or sprawling plants like corn and cucumbers.

How do plants grow without gravity? The key is the growing chamber. For the past 13 years Tibbitts has been pursuing the answer to the question "What is the 'best' way to grow potatoes in a controlled environment?" The first step was to determine a suitable method to maintain a favorable temperature and correct pH level, as well as a sufficient amount of light, humidity, carbon dioxide, nutrients and water in the growing chamber. Tibbitts, with the cooperation of others, has been experimenting with different Controlled Ecological Life Support Systems.

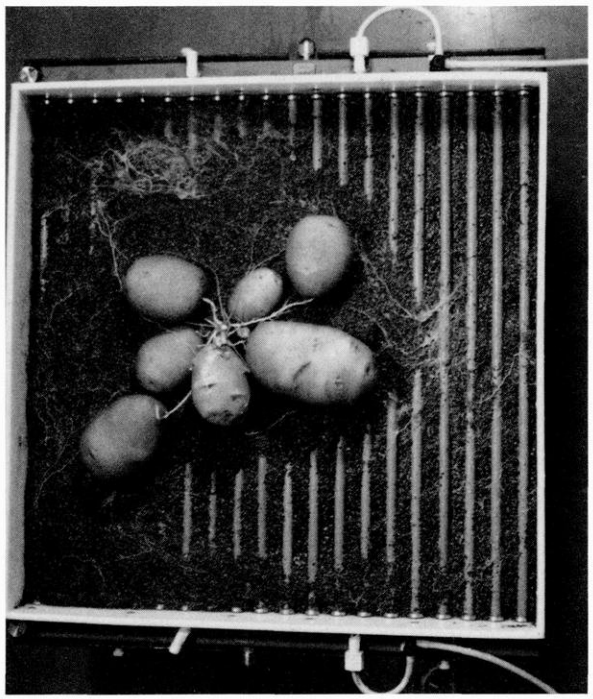
For soil, researchers have been experimenting with two different substitutes, arcillite, which is a mixture of calcined clay particles, and sphagnum moss which forms peat after decomposing. Studies involve the behavior of these substitutes at various depths. For lighting, Ray Bula, from Wisconsin's Center for Space Automation and Robotics, in cooperation with Tibbitts, has been developing the use of a solid form of red light-emitting diodes. The LEDs are semiconductors that contain a chip composed of a gallium-aluminum-arsenide substrate and a reflector that emits the radiation from the mechanism in a cone shape. The light is efficiently reflected to the plants, and provides sufficient light when the diodes are placed close together. Compared to the diodes, commonly used fluorescent lamps are inefficient, producing less light and emitting it in all directions and not directly to the plants.

WCSAR

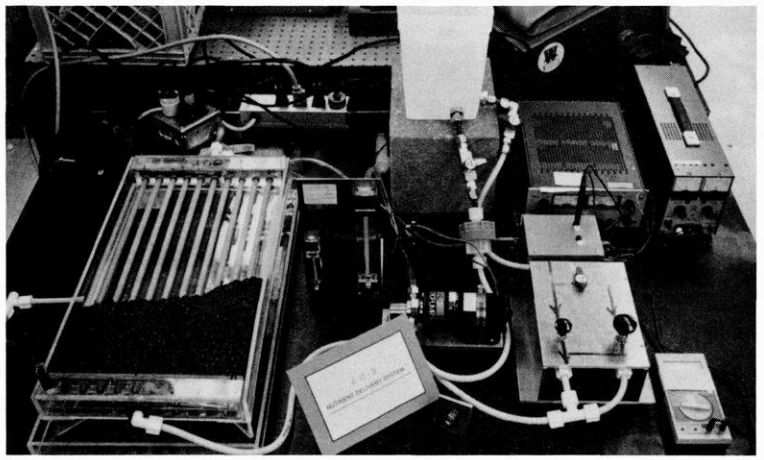
WCSAR's red light-emitting diodes above a couple of lettuce plants.

For delivering water and nutrients, Bula and fellow researchers have developed a porous, stainless steel tube system. Through a negative pressure and capillary effect,

WCSAR



White potatoes growing in CELSS.



WCSAR

CELSS nutrient and water delivery system.

the water and nutrients leak from the tube. The tubes are connected to a pump, and a suction is formed, pulling the water through the tube, similar to a drinking straw. The tubes are spaced one inch apart in the arcillite or moss. In June, these stainless steel tubes will be taken up into space in the shuttle and officially tested in micro-gravity. These tests hopefully will prove that the CELSS system will work in weightlessness and will measure how much water travels through the system.

The next step is to develop a way to use the growing chambers as part of a closed life support system, completely independent of Earth. Tibbitts has been working on a way to regenerate water using plants. Researchers are in the process of studying ways to filter the waste water from the space station through the roots of the plants. The roots would soak up the waste water and the plant cells would "filter" the water, and plants would release "clean" water from the leaves. The water evaporates from the plant's leaves into the atmosphere of the chamber. Researchers are looking for a way to condense that released vapor to water and use it for the crew's purposes. Thus, the space station would contain a closed life support system.

Tibbitts' research is funded by grants from NASA to the Horticulture Department of the College of Agricultural and Life Sciences and through WCSAR in the College of Engineering. Currently, Tibbitts feels his project will be implemented between 1996-1997. The CELSS will be contained in the space station Freedom in an experimental module in a locker area of 54 cubic feet, about the size of an refrigerator.

The Soviets are already growing plants in space. Last June cosmonauts took up potatoes to grow in *Mir*, the Soviet's space station orbiting Earth. In fact, Tibbitts visited a research station in Siberia in March 1990. He stated that the research there is advanced, with welded stainless steel growing chambers that could support three people. Soviet researchers have grown lettuce, radishes, potatoes, mustard and wheat. The wheat chambers have completely supported people for three months in a closed system. When asked about whether or not the Americans should work with the Soviet people, Tibbitts said, "We should work with the Russians, but the language and past prejudices sometimes get in the way. We could always buy space on *Mir* and try our experiments until our space station is functional."

Not only does the research improve the space station's chance of survival, but it may also lead to applications here on Earth. Previous spin-offs like Temper Foam, which is used in cushions in office and medical furniture as well as helmets and other sports equipment, were based on technology from NASA research. Home smoke detectors are also due to technology from Skylab in the 1970s. Tibbitts' research may lead to new ways of recycling, reducing waste on Earth. The new light diodes may someday be used to help grow healthier crops.

The present research here at the UW might in just a few years reshape our lives in space and even on Earth. As the United States takes that first step, building and inhabitating a space station, just as the frontiersmen crossed the Mississippi River, it inspires dreams of the boundless frontiers that lie ahead. ■

AUTHOR

Robyn Ryan is a sophomore in engineering. If she were a planet, she'd like to be Mercury because it's a speed demon. She needs speed to get everything done in one day, week, month, etc....

What Happened at CAE?

The personnel at the Computer-Aided Engineering center were busy over winter break. At their 1410 Johnson Drive location, they added 15 SUN Unix stations in room 160, added five HP Vectra 486 stations in room 170 and moved 24 Mac II's and local laserwriters into rooms 172 and 180. In addition, CAE installed better chairs and more spacious tables and the entire site is now open 24 hours. Yes, even printing! At their B555 Engineering Building location - in the northwest wing of the building, 24 Mac II's from room 170 and eight HP Unix stations from room 160 were installed. This site is also open 24 hours. To open the door: push 5, release, push 2 and 3 together, release, turn silver handle to open. CAE also created a "target lab" for civil and environmental engineering in 1249 Engineering Building by installing 19 HP Vectra 486 systems. This site, like the others, is open to all CAE users when it is not scheduled for courses or priority access by lab users.

Engineering Briefs

by Mike Waters

Survey Results Are IN!

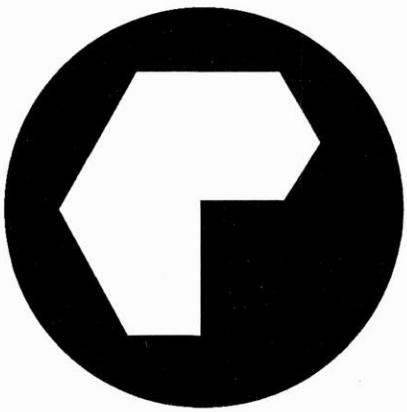
The results of the 2nd Annual POLYGON Engineers' Survey are in! According to the survey, the average College of Engineering student studies approximately 25 hours per week. Overall, students are satisfied with their courses and the Co-op Program, but they are not pleased with the (lack of) communication skills they acquire in their engineering courses. Most students think the facilities at CAE are good, but they want more computers and laser printers. Almost half of the survey respondents said they would use a photocopier located in the Mechanical Engineering Building lobby (coming soon!). Engineering students also want more free electives in their curricula. In addition, the survey showed that the average engineering student does not know much about the Technical Communication Certificate Program or the resources available at Wendt Library. The POLYGON Engineers' Survey was mailed to a random sampling of engineering students late in the fall semester. The reason it was not made available to all engineering students was that last year's survey was not "statistically sound." This year's survey was coordinated by POLYGON Survey Chair Sean Anderson, an industrial engineering and statistics major.

Join the HEV Team!

The University of Wisconsin-Madison is one of 30 schools nationwide to be accepted into the Hybrid Electric Vehicle Challenge. The HEV Challenge is a contest jointly sponsored by Ford Motor Company, the Society of Automotive Engineers and the U.S. Department of Energy. Ford offered a brand new Ford Escort to modify or $10,000 to build a vehicle from scratch. The UW HEV team is made up of students from the College of Engineering and the School of Business. The team is currently waiting for delivery of its *Bucky-Badger*-red Ford Escort. Over $300,000 has been pledged in support of the UW team's project by the UW Foundation and various College of Engineering departments. Students of all engineering disciplines are welcome to participate in the project. Students with leadership or management skills are in especially high demand, so take the *challenge* and join today. The project will reach completion in the spring of 1993.

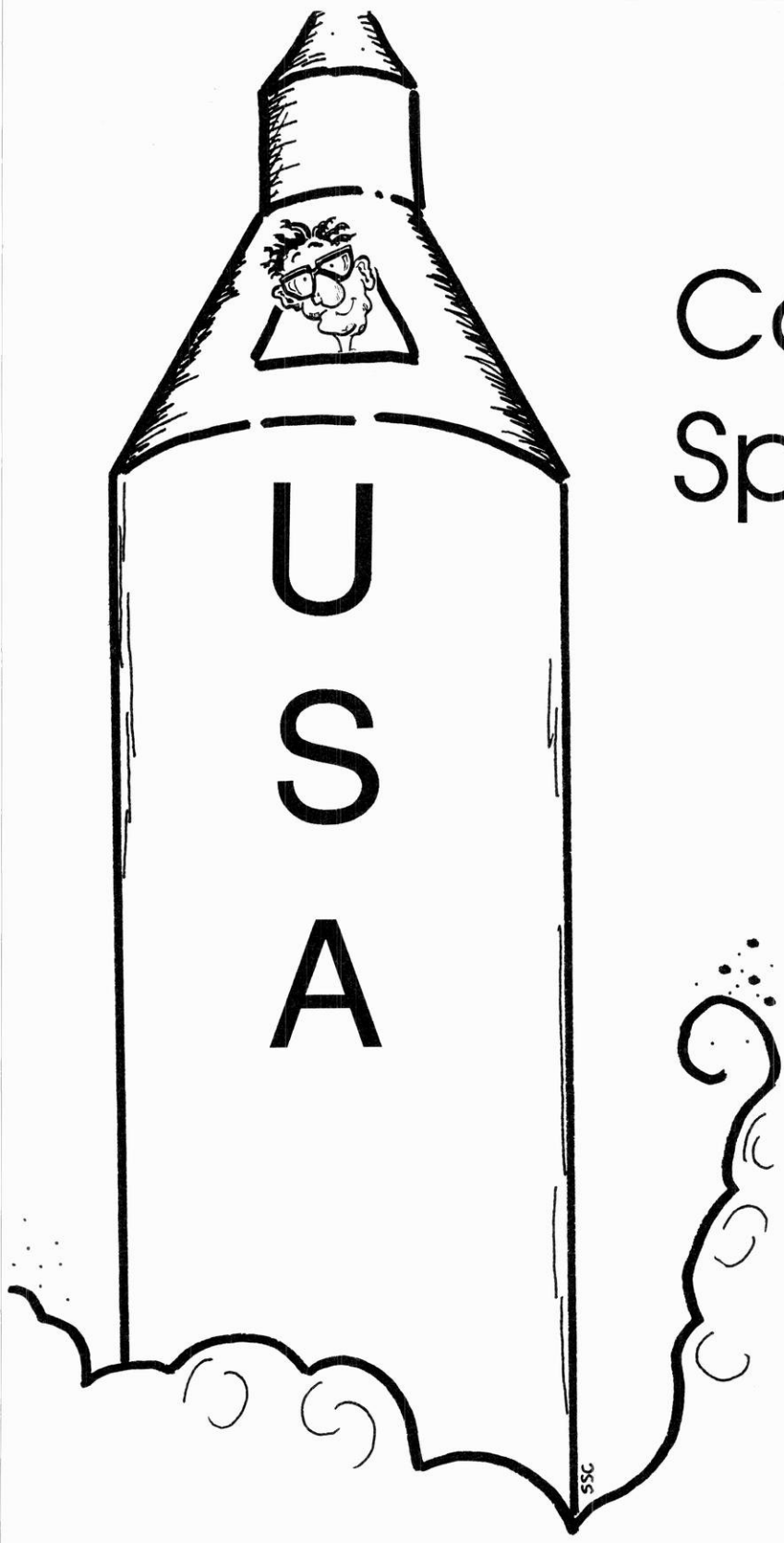
Building Addition Ahead of Schedule

The addition to the Engineering Building, originally scheduled for completion in January of 1993, is now expected to be completed by the end of August 1992. The 73,000 square foot addition will provide laboratory and office space for the Chemical Engineering and Electrical and Computer Engineering departments and centralize the administrative and deans' offices. When completed, the addition will consist of four stories and basement space, with the first floor featuring a large terrace and three auditoria. The cost of the entire project is $16 million. The State of Wisconsin has also pledged $2.9 million for renovation of the existing building.



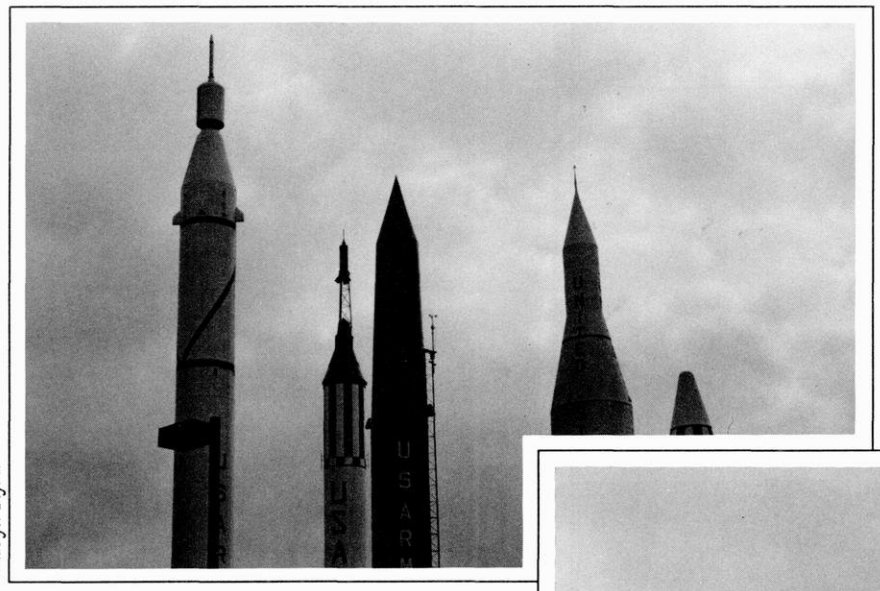
Need $5,000?

Well, dust off that magic pen and start writing! The Steuber Prize for Excellence in Writing is a contest exclusively for juniors and seniors in the UW College of Engineering and $10,000 in prize money is at stake: $5,000 for first place, $3,000 for second and $2,000 for third. The essays can be on any engineering-related subject. All entries must be approximately 2,500 words and be typed, double-spaced, one entry per person. Essays must be the original work of the writer with no outside help. Entries will be judged on writing content and style, composition, organization and grammar. Standard literature citations must be included, but no equations, tables, graphs or figures will be allowed. Essays should be written for an audience of the level of readers of *Scientific American* magazine. Contestants must submit two copies of their essay to Connie Brachman, 277 Mechanical Engineering Building, by March 20, 1992. Prizes will be awarded at the POLYGON Spring Banquet, April 12.



Campin' Space Style

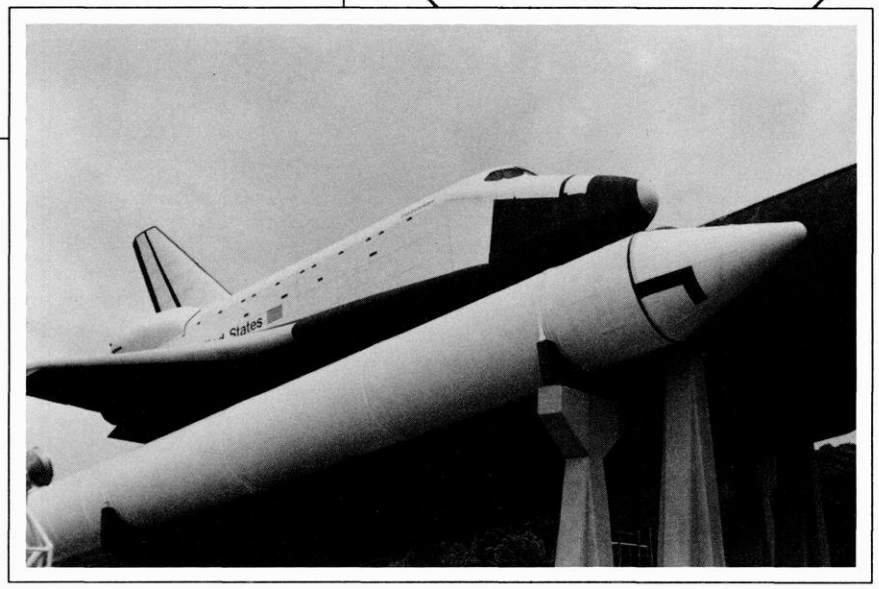
SPACE CAMP ORIGINATED FROM an idea of Wernher von Braun, the rocket pioneer, who wanted to stir up interest in young people for space the way Little League does for baseball. Because of my interest in space, I had wanted to attend Space Camp for many years. I made the decision to find out if my interest in space was one I would like to pursue as a possible career. I wrote to local businesses and clubs for donations to help pay for the expense. In exchange for the donations, I spoke at club meetings and told them of my experience. In the spring of 1990, my dream came true when I attended Space Academy Level II in Huntsville, Alabama. The camp, for high school students, was unlike any other I had ever attended. Level II was an eight-day camp that combined a week of schooling with astronaut training. The trainees received one hour of freshmen science credit through the University of Alabama-Huntsville.



Robyn Ryan

The first rockets in space are displayed in Rocket Park.

Lunar Module on "Moon's Surface" in Rocket Park.



Robyn Ryan

On the first day, 46 high school students and I were checked into the "Habitat." The Habitat reminded me of huge culvert pipes welded together. Inside it portrayed a space station with "waste disposal" describing the bathrooms and "H_2O dispenser" for water fountains. Each dorm room of the Habitat housed six trainees and was "space-aged" like the other areas. After check-in, we were taken on a tour of Rocket Park, which has the only full sized "shuttle" monument, some of the first rockets in space and a number of military missiles and hardware.

Rocket Park also incorporated rides demonstrating how astronauts or pilots feel in flight. One ride, the Centrifuge, demonstrated the pressure that astronauts experience during blast off; it spun at 30 miles per hour allowing riders to feel the force of three G's, or three times the force of gravity. Next, we watched a movie in the Space Dome. The movie screen allowed the viewers to feel like they were right there during the blast off, mission and landing.

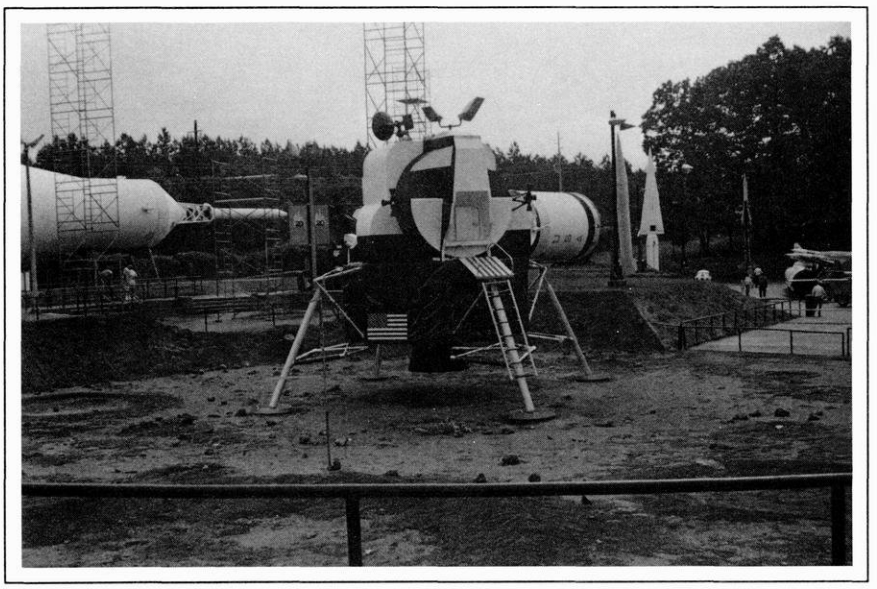
Campers were briefed on the history of flight and broken up into two teams, blue and red. Each team was further broken down into three tracks: aerospace, engineering and technology. The tracks were distinguished by their mission tasks in the shuttle, space station or mission control, as well as by their colored flight suits.

Aerospace members were the commanders or pilots on board the shuttle. They were in charge of take off, shuttle systems and landing. In the space station, these same students were the commanders or officers in charge of the crew and the station's operations. In mission control, the two aerospace participants were the flight director, in charge of mission control, and capsule communicator, in charge of maintaining radio contact with the shuttle to ensure everything is running on schedule.

The aerospace members were educated on flight aerodynamics, space mechanics, meteorology, space piloting and celestial navigation

The engineers were the mission specialists on the shuttle as well as in the space station. They performed extravehicular activities and designed cardboard boxes of specified dimensions. The construction of the inside of the box was up to each individual engineer, but when an egg was placed inside the box, it had to be able to withstand a three story drop without cracking or breaking. In mission control, an engineering trainee was a propulsion/guidance, navigation and control officer, who was in charge of propulsion and control of the shuttle's engines and navigation systems. A trainee could also be an instrumentation and communications officer, in charge of shuttle communications and data systems, along with coordinating experiments.

Technology members were the payload specialists on the shuttle, conducting experiments on a specific payload and treating ill crew members. On the



Robyn Ryan

"Pathfinder," the only "full-sized" shuttle monument.

space station, the tech participants were the physicians and the experimenters. They performed studies on uniform crystal formation in space, depth perception, effects of micro-gravity on the body and analysis of a Mars soil sample. In mission control, tech people were public affairs officers, who were in charge of reporting the mission's progress to the public. I was a member of the technology track.

The blue team, of which I was a member, tested the simulators. The first one was the multi-axis trainer which reminded me of a clothes dryer rotating a person around in all different directions. The purpose was to demonstrate the disorientation that occurs under a microgravity situation. The second simulator was the one-sixth chair, which demonstrated the gravitational pull on the moon.

For the next week, the aerospace members were educated on flight aerodynamics, space mechanics, meteorology, space piloting and celestial navigation. The engineering participants learned about robotics and space automation problems. The technology trainees spent time in the classroom learning about solar physics, plasma physics, fluids, optics and emergency medical procedures. Each track learned about propulsion and astronomy in addition to participating in a water survival lab, two tours, a careers seminar, mini missions, Space Bowl and the design of a model rocket.

The aerospace members were trained on various simulators while the technology and engineering trainees participated in the Underwater Astronaut Trainer. For some, it was the first time they had ever tried scuba diving. The UAT was the only place that we could experience "weightlessness." While I was in the tank, air was added to my buoyancy control device allowing me to float as if there were no gravity. I also spun a 100 pound ball on the tip of my finger.

All the training and schooling of the week prepared us for our final mission, the 24-hour mission. The 24-hour mission was the "biggie." It lasted for 23 hours with an hour debriefing following. It was broken up into four shifts. Each member of the team had three work periods and one sleep period.

During the first and second periods, I was assigned to the space station. My teammate and I performed crew physicals and reaction time experiments, while the engineers prepared for their underwater ExtraVehicular Activities. During the second period, another tech trainee and I grew crystals and checked body fat with a caliper. Toward the end of the second shift, a meteoroid shower hit the space station and the crew had to go below deck. When it was over, we came up and found we had only partial power. The computers were out and we were left with only emergency lighting.

As if that were not enough, we were invaded by "aliens." There were no procedures in the manuals about aliens, and we could not contact Mission Control because the computers were down. We spent the next 15 minutes trying to drag the three aliens out. The aliens, who incidentally looked like bank robbers with nylons over their faces, raided the refrigerator and scattered food everywhere. The space station was "trashed." We finally shoved them out the air lock and secured the door. After disposing of these unwelcome visitors, we found a piece of paper on the floor left by the night counselor. It explained procedures to remove aliens. Unfortunately, it was a little late.

During third shift, I was the doctor on the space shuttle. After the crew physicals were completed, I assisted the engineers with their EVA. A couple of the crew members became ill and I had to diagnose the illness and treat them. Fourth shift came and I headed to the Habitat. Six hours later I reported to the classroom and the blue team was debriefed. The pilot had a perfect landing and everything went well except the night counselor had not heard one of the engineers perform a check on a system to fix an anomaly. Because of the mistake, one engineer spent two hours in the robot arm, which is used for fixing and repairing satellites among other tasks.

After the engineer's egg box drop, the Space Bowl quiz session and evaluations, the red and blue teams graduated. We had earned our wings. It was hard to believe that the week was over. We went our separate ways but lasting friendships had been made. It was one of the best weeks of my life. The movie *Space Camp* does not even come close. ■

AUTHOR

Robyn Ryan is a sophomore in engineering. She plans on majoring in Engineering Mechanics.

Society Spotlight:

American Institute of Aeronautics and Astronautics

All there is to flight

WHICH ORGANIZATION can a UW engineering student interested in aeronautics and astronautics join to attend events such as parachuting or attending the Experimental Aviation Aircraft Fly In at Oshkosh? How can a student find out about aerospace speakers and scholarships? The American Institute of Aeronautics and Astronautics, the foremost organization in its field, offers UW students these opportunities and many others to excel in their field of study.

The history of AIAA is important in understanding this organization's diversity. AIAA was formed when the American Rocket Society and the Institute of Aeronautical Sciences came together in 1963. The American Rocket Society was formed in 1930. During the early years, the ARS desired to explore astronautics and the navigation of the solar system. Through experimentation and research, ARS changed its objective to a more technical and scientific one. Through the years, ARS has actively grown, especially during the 1950s when spaceflight rapidly emerged.

The Institute of the Aeronautical Sciences was formed in 1932. Like ARS, IAS was a scientific and technical society; however, it specifically concentrated on aeronautics. Unlike the first ARS members, most IAS members had engineering or science credentials. The IAS wished to "upgrade professional competence through traditional activities." Similar to ARS, IAS experienced growth alongside technological successes. Thus the merger of the ARS and the IAS to form AIAA in 1963 was, in fact, a beneficial one, not only economically, but scientifically and technologically as well. Today AIAA is the largest professional society concentrating on engineering and science in aviation and space.

Presently, AIAA has more than 40,000 members with three levels of involvement: national, professional and student. These levels form an intricately connected network of information which proves to be beneficial to all three. AIAA publishes six journals expressing their research and current events within their field. They also provide educational opportunities, lectures, books, job-hunting strategies and various seminars.

The UW student branch of AIAA currently meets on alternate Thursdays. Tzu Chuen Huang and Daniel Kammer serve as faculty advisors for AIAA, while John Dube is the current president. The fee for student membership in AIAA is $20, which includes national and local dues. This small fee provides a member with the two student magazines published by AIAA, *Aerospace America* and *AIAA Student Journal*. It also covers the cost of local activities including videos, guest speakers and of course, pizza for the student meetings.

Members may benefit from AIAA through scholarships and the exchange of education and information. According to Dube, a student member can benefit from the closeness of the three AIAA levels. The student sector benefits from the professional sector since the professional level provides lecturers and covers the costs of many student AIAA member activity expenses. The professional sector benefits from the student sector because the student level becomes tomorrow's professional sector. The student AIAA also sponsors an annual picnic for the professional AIAA.

The goal of AIAA is essentially the same for all three levels: "To advance the art, science, and technology of aeronautics and astronautics, and to promote the professionalism of those engaged in these pursuits." AIAA also wishes to strengthen the public understanding of its organization and the professions it involves.

At the Engineering Expo last year, UW AIAA displayed a lunar rover exhibit set against the background of the moon. The project presented the idea of mining helium-3 and using it as an energy source. Through a special TV monitor, Expo visitors were able to experience the time delay that occurs with an unmanned project in space, during transmission between the moon and Earth. These two aspects of the project were inspired by proposed NASA missions.

For Expo '93, AIAA may enter an exhibit dealing with one of their latest projects, hybrid rockets. Dube speculates that perhaps AIAA would further its recent research of hybrid rockets and maybe actually operate a small prototype. If regulations permit, the group might even launch several of these rockets.

Another of AIAA's recent projects, based on an idea from an AIAA alumni who works for the McDonnel Douglas Foundation, involves taking an aspect of the space station and redesigning it to minimize problems. ■

For more information on AIAA, contact John Dube at 251-7980.

AUTHOR

Margaret S. Illemann is a first year student. She is currently orbiting around Pluto, where she is far away from the distress of college life.

ORBITEC

Reaches for the Stars

KEEP YOUR FEET ON the ground and keep reaching for the stars. Many people may remember this sign-off phrase from *American Top 40* disc jockey Casey Kasem but few people have taken it as literally as the team of individuals at Orbital Technologies Corporation.

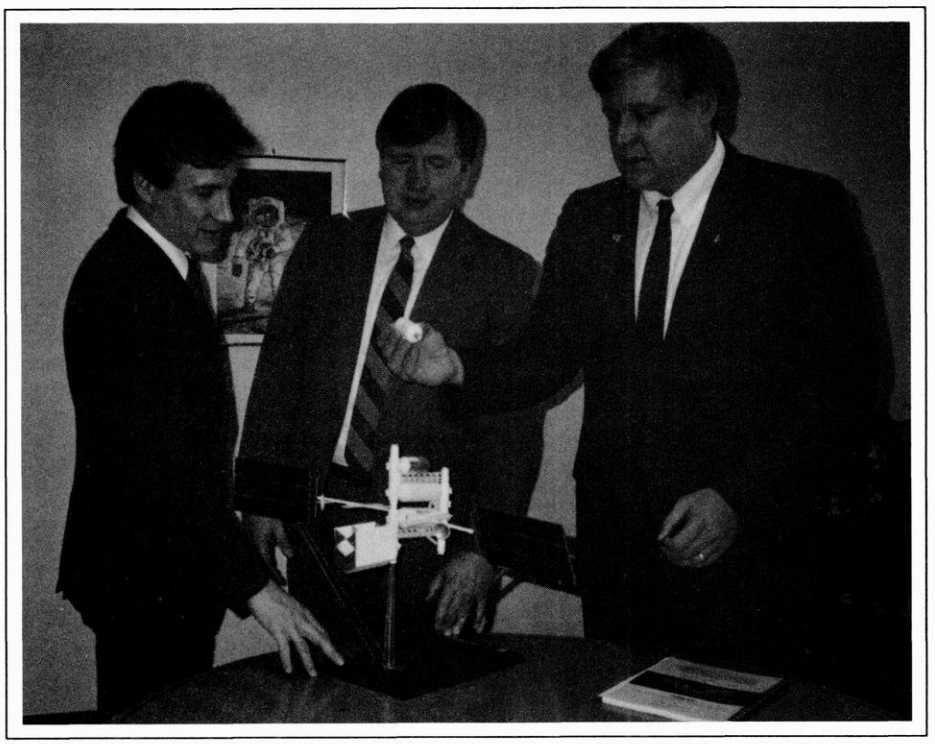
Orbital Technologies Corporation, better known by its trademark name ORBITEC, is an aerospace research and development company in Madison. ORBITEC began operation in 1988 and has become a growing contributor to the nation's aerospace programs. Its three founders, Dr. Eric Rice, Ronald Teeter and Thomas Crabb, have over 60 years of combined aerospace experience, and two are UW graduates.

Rice, ORBITEC President and CEO, received his B.S. degree in chemistry from the UW and a Ph.D. in aeronautical and astronautical engineering from Ohio State University. Rice has over 24 years of aerospace experience and specializes in microgravity, propulsion and environmental protection technology.

Teeter, ORBITEC Vice President and Secretary, received his B.S. in aeronautical and astronautical engineering and M.S. in engineering mechanics from Ohio State University. Teeter has over 25 years of experience and works primarily on robotics and space transportation development.

Crabb, ORBITEC Vice President/ Treasurer, received his B.S. and M.S. in engineering mechanics from the UW. Crabb has over 11 years of experience and focuses his efforts on human systems and advanced missions.

Other ORBITEC board members include former NASA Mercury Astronaut Donald 'Deke' Slayton, UW business professor Robert Bock and Racine businessman Roger Hill.



ORBITEC founders (left to right) Thomas Crabb, Ronald Teeter and Eric Rice

The three founders have all been very active in the American Institute of Aeronautics and Astronautics. Rice was the founding Chairman of the AIAA Wisconsin Section and member of the AIAA Space Systems Technical Committee and is currently Vice Chairman of the AIAA Space Transportation Technical Committee. Teeter previously served on the SSTC and STTC and as Chairman of the AIAA Wisconsin Section and is the founding Chairman of the AIAA Space Automation and Robotics Technical Committee. Crabb is a founding member and past Secretary of the AIAA Space Operations and Support Technical Committee, current member of the SSTC and Chairman of the AIAA Wisconsin Section.

ORBITEC has also supported the establishment of the Wisconsin Space Business Roundtable, a "chamber of commerce" for space-related, profit-oriented industry in Wisconsin. The purpose of WSBR is to increase industrial coordina-

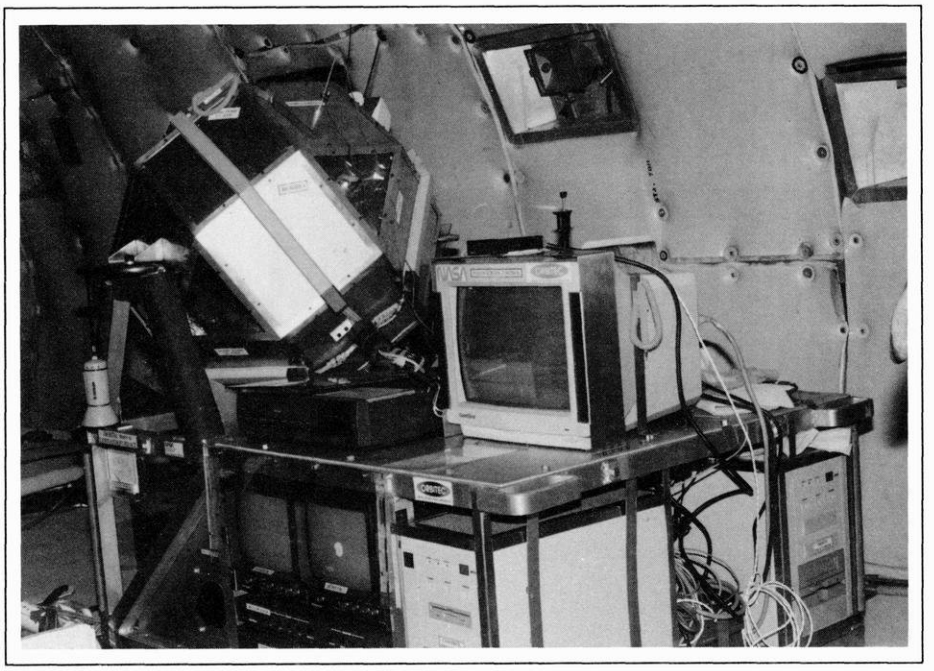
tion and opportunities for space products and commercial spin-offs. Crabb is Vice President of WSBR.

In addition to its strong personal ties to the UW, ORBITEC also has a close working relationship with the UW. Locating in Madison has allowed the company to take advantage of the UW's significant technical resources including laboratories, computers and expert personnel, without major cost to the company. ORBITEC is also a corporate sponsor and member of the Wisconsin Center for Space Automation and Robotics, a NASA-sponsored Center for the Commercial Development of Space.

ORBITEC's corporate mission is to provide products and services to government and industry on a contract basis in system analysis, design and development of advanced hardware and development of application products. The company's research and development activities focus on areas such as microgravity materials processing research, robotic manipulators and control systems, space transportation, environmental and safety technology, remote sensing applications, human support, space power, space technology and spinoff developments. Various NASA facilities, the US Air Force, Lockheed, General Research Corporation and the State of Wisconsin have all sponsored ORBITEC projects.

Some of these projects have included a microgravity containerless processing levitator furnace, a telerobotic control glove system, a robotic finger tip sensor, advanced chemical propulsion systems for low-cost Earth launch and planetary surface vehicles, environmental assessments of the Reusable Solid Rocket Motor, Advanced Solid Rocket Motor and Advanced Launch System, space transportation health monitoring and automated checkout, assessment of tethered instruments for upper atmospheric research and technology development and component testing for an advanced exercise system.

ORBITEC's Microgravity Sonic Pump Furnace is being developed under a Small Business Innovative Research Program with NASA Marshall Space Flight Center. The MSPF will be able to levitate, heat, cool and manipulate materials without influence of gravity or a container. The company has been testing a prototype of the MSPF aboard NASA's KC-135, a plane which flies a parabolic trajectory to provide 20 to 30 seconds of "mili-gravity." These tests will probably lead to development of a Space Shuttle version.



ORBITEC's Microgravity Sonic Pump Furnace is shown aboard NASA's KC-135.

Telerobotics is also a major program area for ORBITEC. They are continuing development of innovative man-machine interfaces for advanced robotic systems for space and other applications, including position control and sensory feedback between human operators and dextrous end-effectors.

Advanced sensors may be the company's first commercial product, spun-off from robotics technology initially developed at the UW and partnered with the Wisconsin Center for Space Automation and Robotics. Several other commercial spinoffs are anticipated from developments internal to ORBITEC and other developments involving industrial and university partnerships.

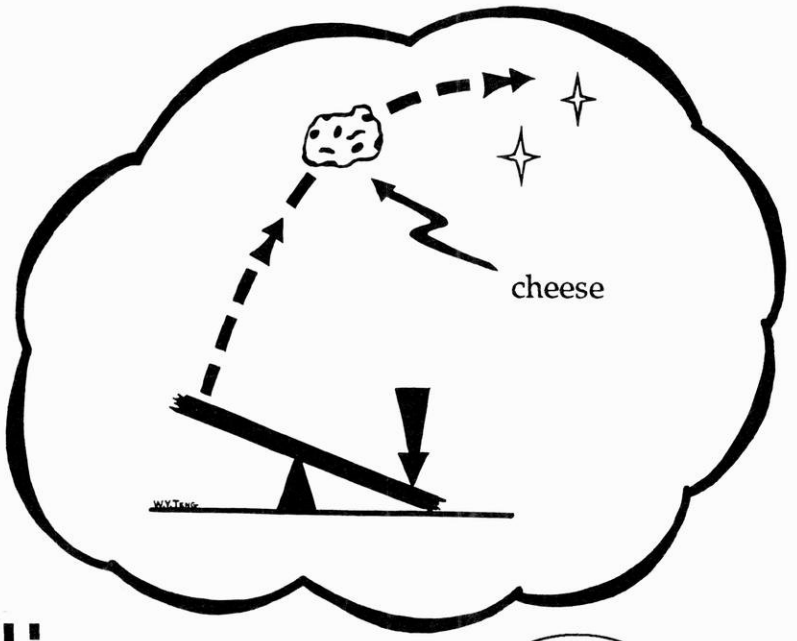
ORBITEC also has significant experience in studies and analysis of advanced space systems and technology planning. The company is in the middle of a multi-year support contract to the Office of Aeronautics and Space Technology at NASA headquarters through the General Research Corporation, addressing systems health management and life support technologies.

ORBITEC formed a non-profit organization called the Wisconsin Space Institute in early 1990 for the purpose of education and research related to space programs and technologies. Through WSI, Crabb leads an outreach program for the Wisconsin Space Grant Consortium, arranging presentations to get the word out about space-related programs and technologies. He recently gave a presentation at the Society of Women Engineers' ORBITEC-sponsored February meeting. He is currently working with a UW Technical Communication Certificate student to develop a slide presentation for middle school and high school students to get young people interested in space, science and technology.

AUTHOR

Mike Waters, a junior in mechanical engineering, is currently involved in a writing internship with ORBITEC to fulfill a requirement for the Technical Communication Certificate program. He was in the EM Astronautics Option, but switched to ME after he finally overcame his dyslexia.

A Cheesy Story of Bovine Brilliance



AS I SAT DOWN ON MY bunk a loud creak caused the eight campers in the canvas tent to scream and giggle.

"Okay guys, time to turn out your flashlights and get into bed," I said, exhausted. I was definitely not in shape to be a summer camp counselor yet. This early in the summer, the kids wore me out quickly.

"Will you please tell us a story?" asked little Katie as she smiled sweetly and tugged on my sweatshirt.

I certainly could not turn down such a nice request. I searched my memory for a good yarn, but nothing seemed quite right. Since final exams had ended mere weeks before, I had been in a strange mood. Instead of reveling in the certainty of numerical answers that math and science usually gave me, I felt like rebelling against all that is logical.

"Of course I'll tell you a story!" I said with new-found energy. "Let's sit in a circle on the floor."

"Thousands of years ago, before man had evolved enough to use his thumbs to carve spears or play Nintendo, herds and herds of wild cattle roamed the place we now proudly call 'America's Dairyland.' Ah, those were happy times for cattle, who roamed freely across the Kettles, munching away on tender grass on lazy summer days. Things were quite different back then, apart from the lack of human civilization. For example, cattle were woolier — they had long coarse hair and were twice as big as modern domesticated cattle.

Cattle were extremely smart in those days, which some scientists refer to as the "Bovine Age." Since the cattle traveled long distances with many calves and older animals alike, they devised a way to solidify their milk and carry it with them so that weak ones could eat during a tiresome journey. The milk was allowed to curdle, and then it was separated into solid curds and liquid whey using thatched birds' nests. Finally the curds were pressed under rocks for a week to form primitive cheese... the beginnings of the perfect food.

A cow named Bessie was on the cutting edge of cheese production at the beginning of the Bovine Age. She experimented with different temperature ranges for making curds into cheese. And, Bessie was special. She wondered about the laws of the Universe while other cows were chewing their cud and gossiping about the various romances within their herd.

She wondered about the laws of the Universe while other cows were chewing their cud and gossiping about the various romances within their herd

Bessie was respected by the herd for her cheese production but was often made fun of for her endeavors to understand the world. She performed many experiments that seemed strange to the other cattle, but that are routinely done today in high school physics classes. She was especially fascinated with gravity and accordingly, kicked many things into the air to watch them stop at the top of their trajectory. Sometimes, she even jumped off of small boulders to feel the effects of free fall herself. What a sight it was to see a two-ton cow barreling off of a rock! Inevitably, the other cattle often picked on her for her strange and mysterious experiments.

Bessie's greatest discovery happened one fine spring day as the herd took a short cut through a forest. As the lead bull stepped on and over a fallen tree, it acted like a lever and fulcrum, and happened to send a rock high into the air.

Astonished, Bessie began experimenting with all sorts of levers and projectiles.

She found that cheese, the perfect food, flew quite nicely when thrown with the aid of a large fallen tree.

Experiments filled Bessie's afternoons, but at night she learned about wonders of another sort. After dusk, the herd would break up into family groups and carry on the ancient tradition of storytelling. Because she usually sat with the elders, Bessie heard wonderful tales about the beginnings of the Bovine age. One clear night, she learned about the sky.

'You know that flies are stupid, don't you?' asked an elder in a weak voice. The circle of cows and mooed softly in agreement. After all, flies always tried to land on a cow's back, no matter how much she swished her tail.

'Well, fireflies are the cousins of regular flies. A long time ago, a whole mess of them went looking for the sun after night had fallen. They got stuck up in the thick black sky and have been glowing ever since.'

Bessie gasped in astonishment. She had never before wondered how the stars came to be. That same night, she decided to devote an experiment to finding out more about the thick sky.

A plan was devised to lure a wooly mammoth into stepping on one end of a fallen lever-tree so that an immense chunk of cheese could be sent into flight. And one night, that is exactly what happened.

The herd was surprised to look up and see a great sphere of cheese in the sky, illuminated by thousands of nearby stars. They were very proud because they knew that now their memory would live past the existence of their species.

Nowadays, the cheese ball in the sky has become a bit moldy and therefore greenish. But it is cheese nonetheless."

"Are you trying to tell us that the moon is made of green cheese?" Katie piped up.

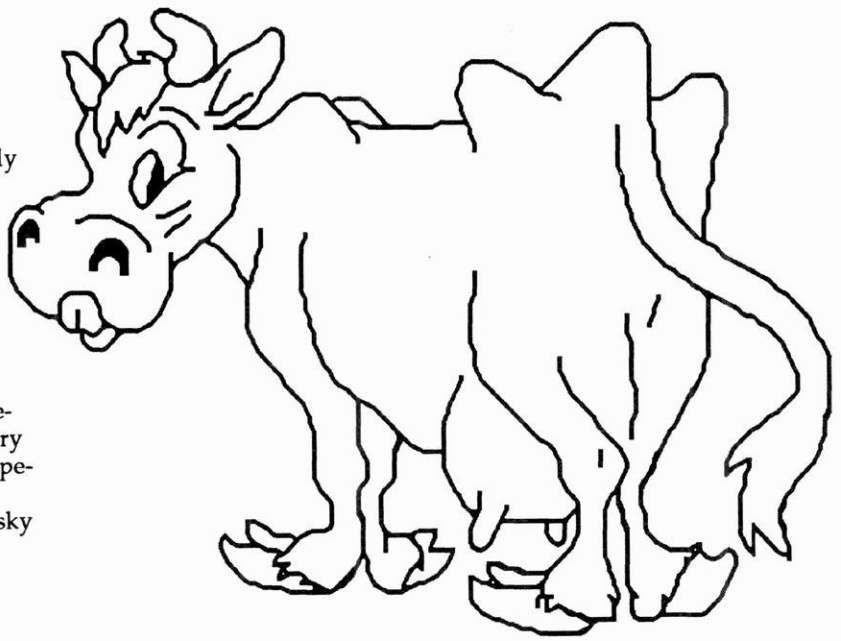
"Absolutely. That story is completely true," I said. "And now it is time to get into bed and go to sleep."

"Can't we sit here and talk for a while first?" begged Mary.

"Well, I would let you, but I think that it's too dangerous. You see, when I was an eleven-year-old camper, I stayed up really late talking with the five other girls in my cabin. We fell asleep in a circle on the floor, with our heads pretty close to each other. When we woke up the next morning in a huge puddle of drool, our hair and braces and headgear were all tangled up. It took two hairdressers, three orthodontists and a firefighter to get our heads apart."

The girls jumped into their beds.

"Good night," I said as I crawled into my own bed. I wondered how bizarre my dreams would be if I could tell stories this goofy in my waking state. ■



AUTHOR

Annelies Howell likes telling goofy stories and wonders about the sky quite often.

Infectious Headsets Plague Campus

(Madison, WI) – Over the past few weeks much controversy has arisen surrounding the College of Engineering's extensive use of video instruction.

Since the beginning of this semester, the University Health Service (UHS) has treated an unusually high number of engineering students for ear infections. Concerned with this epidemic, the Health Service conducted a study on the relationship between these cases. With the assistance of Dr. William Hodgkins, the UHS determined that these infections are the directly related tothe use of headsets attached to the video recorders in Wendt Library.

The poor design of the Techno Shack Model KS600 headphones make them a breeding ground for bacteria. They completely encapsulate the ear, hindering air circulation. Additionally, the headphones are constructed from very poor quality PVC, as opposed to leather or foam.

On the professional advice of Dr. Hodgkins, the UHS recommended the immediate quarantine of the video instruction center. The library directorate attempted a cover-up upon hearing the shocking news. Fortunately a news leak occurred forced the University to conduct a thorough investigation.

Fearing litigation from affected students seeking compensation for punitive damages, the University swiftly assembled an elite legal task force to represent them. This team consists of several U.S. legal heavyweights. Heading this team is Mr. I.S. Uem, who represented Union Carbide in the Bophal disaster. Ata recent press conference, he commented, "We have a rough road ahead of us. This will be my greatest legal challenge yet." When asked what the University had to say about its situation, he stated that his client was advised to decline from answering at the time.

In an attempt to discover what drove the University to choose this model of headphones, we interviewed Professor Earwax, a leading authority in the area of audio reproduction. Responding to our question of what he thought of the headphones, he said, "The dynamic range stinks. The frequency response is atrocious. I do not see any technical merits these headphones have." His other comments suggested that their only redeeming value is their use as door stops.

Professor Earwax's response prompted us to investigate further. If these headphones are really that bad, why were they chosen by the University?

This was not an easy question to answer. We contacted numerous people within the University and at Techno Shack. After numerous interviews, we put the pieces of the puzzle together. The answer came as a great shock.

From an anonymous source, we discovered that Swiss bank accounts had been set-up by Techno Shack for certain University individuals involved in the purchase of these units. As an incentive for certain University employees in the decision-making process, they received a percentage of the business they gave Techno Shack as kick-back. When contacting Techno Shack to meet with the sales and marketing director for the headphone division, we were duly informed that he retired early. Nonetheless, we contacted him in a brief telephone interview, in which he admitted to bribing University officials. He hastened to add however, that he had no choice. He was responsible for a poorly engineered product line that plummetted in sales. His was an act of desperation.

Meanwhile, the University has budgeted for Q-tip dispensers and antiseptic spray, which will be made available to all students using the video equipment. As a temporary measure they suggest that students bring in their own headphones or place plastic liners over their ears.

AUTHOR

Nick Denissen is a veteran writer for the Wisconsin Engineer from way back in the '80s. He is currently enrolled in ECE 350 which means he is actually going to graduate soon.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