ENGINEERS' FORUM

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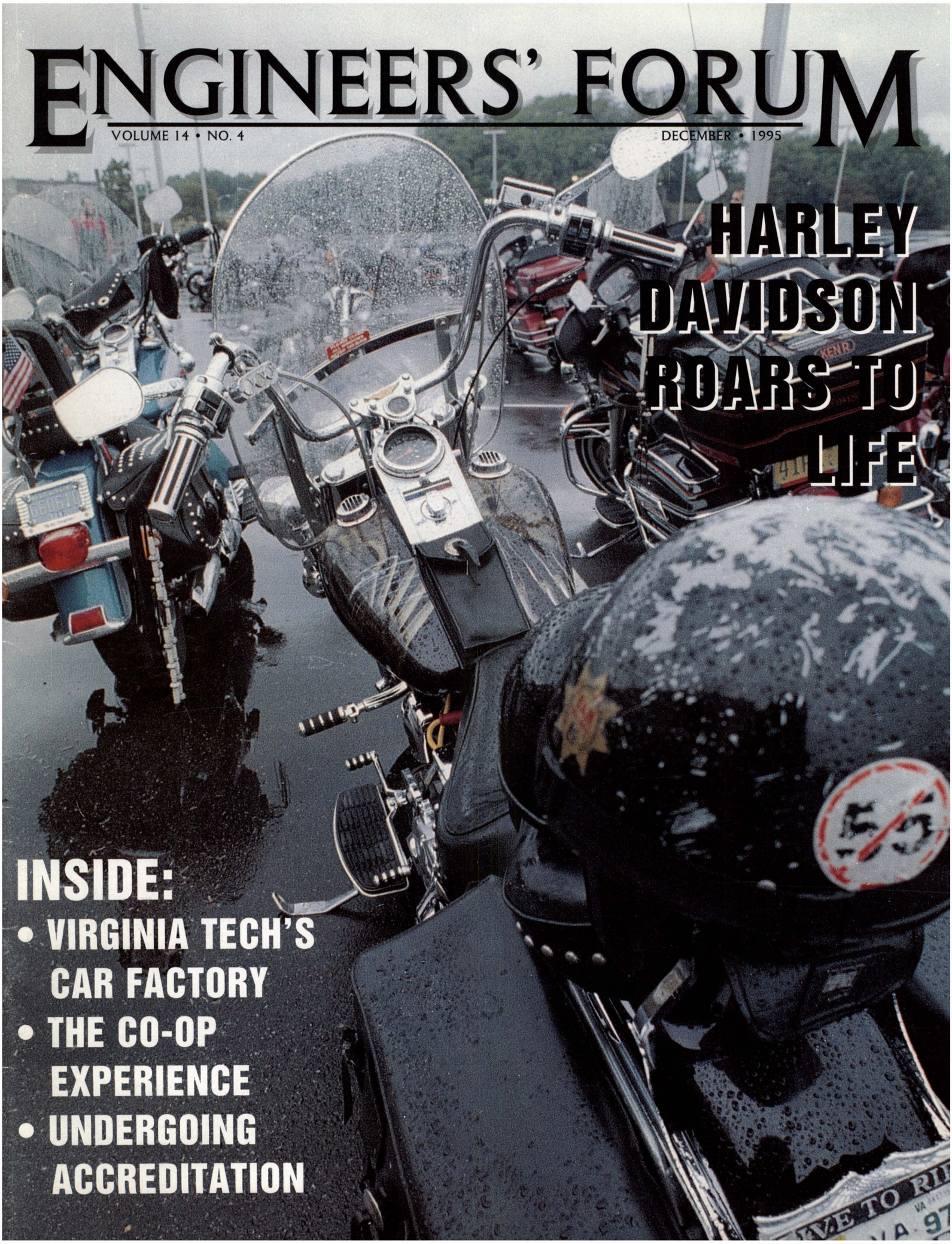


HARLEY DAVIDSON ROARS TO LIFE

INSIDE:

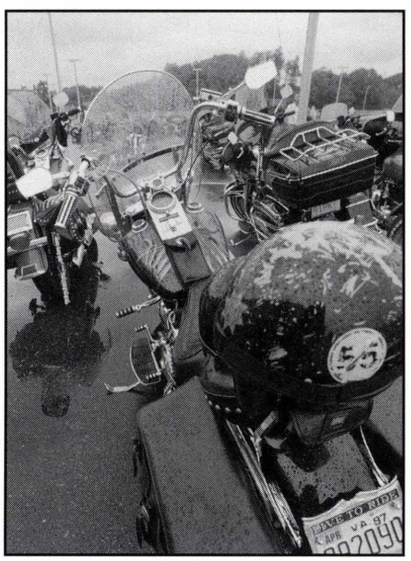
- VIRGINIA TECH'S CAR FACTORY
- THE CO-OP EXPERIENCE
- UNDERGOING ACCREDITATION

Letter from the Editor December 1995

ENGINEER YOUR CHILDREN

Darwin's concept of "survival of the fittest" would be relegated to history books.

On the Cover



Live to Ride: Harley owners regularly gather at conventions such as this recent one in Roanoke. Photo by Nicole Popovich.

The pursuit of scientific achievement is one of the greatest disciplines in existence. It aids humankind through finding cures for the many maladies which ail society.

It seems, however, that these ailments are caused by the surge of violence which plagues our cities, our schools and our communities. Violent aggression makes the front pages of newspapers daily, it is on the nightly news and the fear of it lingers in the back of everyone's minds when they walk home alone at night.

The question is, of course, if it were technically possible to ensure a peaceful, non-aggressive society, would it also be morally right to do so?

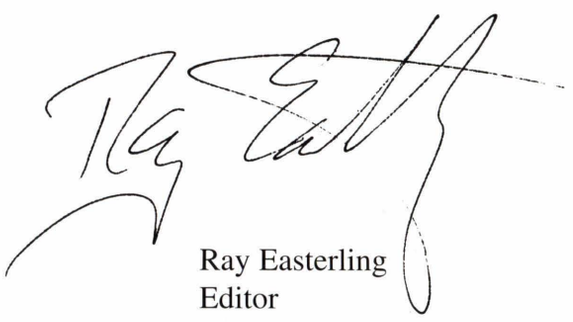
Recently, researchers have located a gene in mice and humans which inhibits aggression. Tests on the mice have shown that when this gene is absent or damaged, the subject exhibits violent tendencies and is prone to inflicting those aggressions upon other mice. This behavior, however, is only apparent in male mice.

In the wake of these findings, analysts, journalists and politicians are proposing the possibility of using this information to test children for any gene abnormality which might lead to future aggressive behavior. What scientists and genetic engineers must now ask themselves is should we test and then, if there is a gene deficiency, "repair" children so that they fit socially acceptable parameters in the future.

There are obvious benefits of such maneuvers. It might be possible to cure children of many debilitating diseases. However, as with any issue or new technology, there are both positive and negative connotations.

It is conceivable that such technology could be instituted into a regular testing of children at birth to determine possible future behavioral tendencies. After this, it becomes just a short step to genetic engineering of our children. Darwin's concept of "survival of the fittest" would be relegated to history books if society takes the move toward the production line approach to reproduction.

Perhaps literature studies should be emphasized more during the education of future technological leaders. It would be sad to see Aldous Huxley's Brave New World become a prophecy of society's actions.



Ray Easterling
Editor

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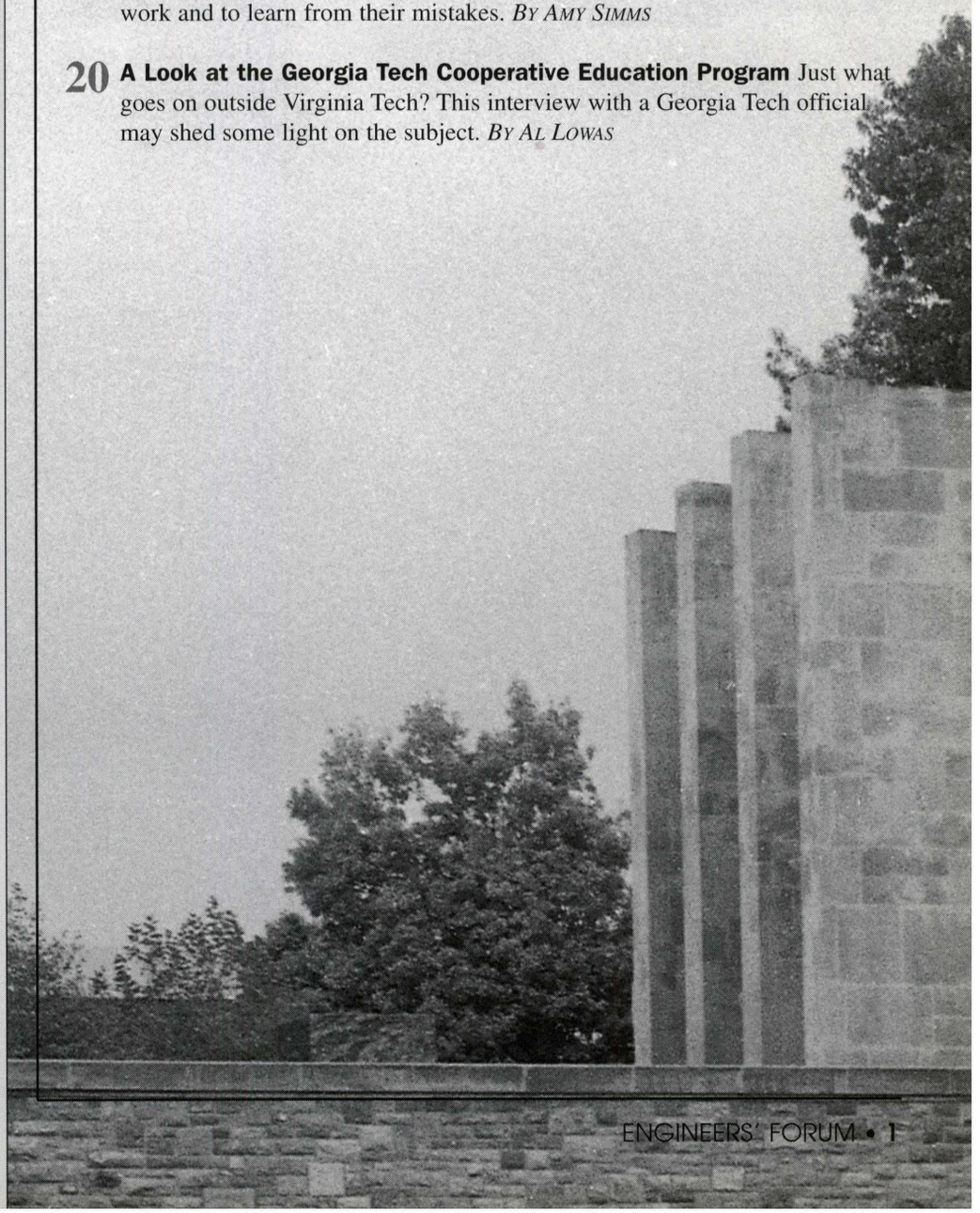


THE

TOTAL QUALITY HOG

BY MICHELLE ROMANOSKI

They thunder down the shimmering lines of asphalt. Clad in leather, they evoke images of the rebel. The road warriors straddled across their throaty Harley-Davidsons have two voices. The raw and unfinished open road gives volume to the tongue of the roaring engines. As they fly through the wind toward the sunset, the second, everyday voice is silent. This is the image of the motorcycle. Several generations of movie legends patterned on real drivers have all come together to form the archetype of the Harley-Davidson biker.

"Harley-Davidson is Americana," said Virginia Tech engineering professor Craig Rogers, "There is a culture and mystique that still surrounds [them]." Rogers has owned a Harley-Davidson 883 Sportster for three years.

Harley-Davidson Motor Company originated in 1901 when William Harley, then 21, joined up with Arthur Davidson with the idea that there could be a market for a motor driven bicycle. Production began two years later in a shed in Milwaukee, Wis. By 1917 "the hog" was the number one American motorbike. Roy Holden, a Wisconsin native, was well known for the Harley-Davidson motorcycle that he drove around Tech at that time. Holden Hall was eventually named after him, Tech's first head of Geology.

Harley-Davidson managed to weather the Great Depression to become the only American motorcycle company in 1953. American Machine and Foundry acquired the company in the late 1960s. Throughout the 1970s, the American motorcycle market was virtually lost to overseas competition, and the motorcycles produced by Harley-Davidson were plagued with oil leaks and breakdowns. So, in 1980, Harley-Davidson was offered for sale. At the time, it was believed that the American motorcycle industry was doomed.

In a last ditch effort, the company was bought by 13 Harley managers for $80 million. The new owners, among other things, had discovered a new management style called Total Quality Management (TQM) and ordered its implementation in the flagging motorcycle factories.

"Total Quality Management," said Brian Kleiner, an assistant professor

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Rolling Thunder: *An example of the Harley-Davidson archetype (opposite). Production workers check for dimensional accuracy and flaws at one of the Harley plants (right). Improvements in the assembly line (next page) have led to direct increases in the quality of the Harley-Davidson product. Photos courtesy of Harley-Davidson.*

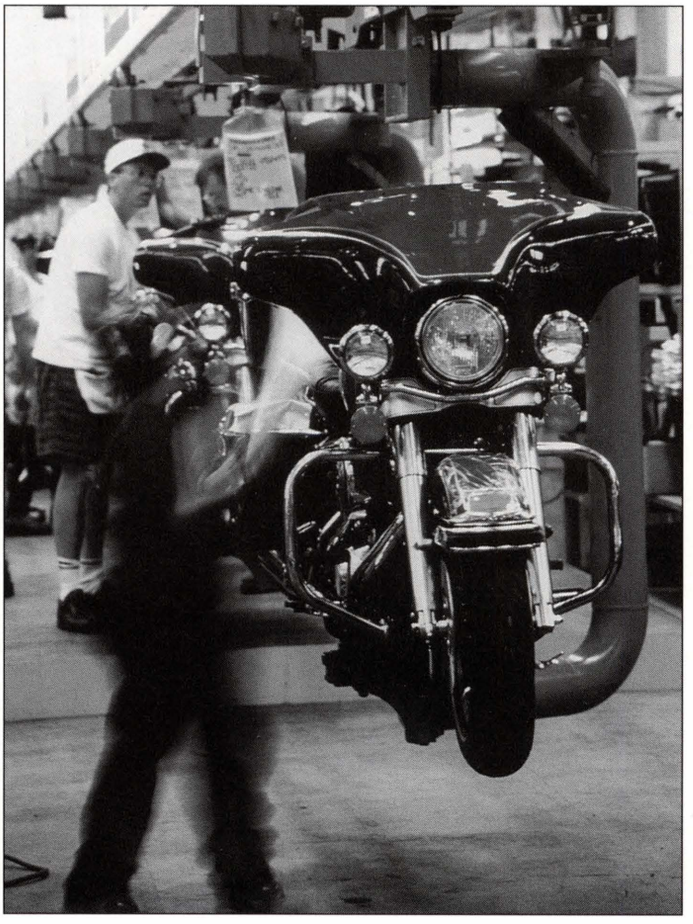
The Total Quality Hog

Continued from page 3

in Tech's ISE department, "is a people-centered organizational approach which focuses on redesign of processes for continuous performance improvement." It is estimated that 95-98 percent of Japanese companies use the Total Quality approach introduced by William Deming. Deming was brought to Japan as part of the treaty that ended World War II. His approach to management worked with three main concepts that are a part of traditional total quality organizations: teamwork, customer focus and continuous improvement.

Total Quality Management is a relatively new buzzword in industry. The idea behind TQM is the importance of the workers. Deming said, "The wealth of a nation depends on its people, management and government, more than on its natural resources. The problem is where to find good management." Deming maintains in his book, Out of the Crisis, that most of the problems in the workplace are functions of the system rather than of the worker. His management philosophy attempts to correct the problems through management instead of punishing workers for poor performance. He uses teams from all parts of industry, including customers, to identify and to solve problems. TQM also focuses on continuous improvement in all areas.

The start of TQM at Harley-Davidson brought drastic changes. Inspectors on the factory lines were eliminated. This made the workers responsible for identifying problems in the products as they were being made. Other changes were made in the production and organization of parts, and designs were changed to fix fundamental problems in the bikes. "It's taking care of all the small ones that gives you the overall [success]," said John McCambridge, manager of Training and Development at the Harley-Davidson York, Penn. plant. This includes such details as fixing scratches on the wheel hubs to correcting paint defects. So when TQM was brought to Harley-Davidson, McCambridge said, "Quality really wasn't lip service, it was real."



Total Quality Management has many advantages over Re-engineering, another common management style. Re-engineering focuses on automation, using technology to redesign the workplace for dramatic improvements.

These improvements often come at the cost of jobs, so Re-engineering frequently promotes fear in the remaining employees. Total Quality Management takes the opposite approach by using the employees to create better quality in the products. Customers enjoy the focus and, while the results are not as dramatic as those caused by Re-engineering, the improvements are continuous, rather than a one time growth. Because of its success in Japan, many American companies are turning to TQM. Kleiner said, "Most companies today do TQM. That doesn't mean they do it well." The incredible results obtained through TQM at Harley-Davidson reflect the situation at the time. "The key variable at the time ... was the place was ready to close," notes McCambridge. "The senior management was ordering people to fix quality. [It was] intravenous feeding to save the patient." Today at Harley-Davidson, everyone is involved in TQM; it's part of their job. EF

Tech undergoes accreditation

BY **BETH OBORN**

Many engineering students complain and complain about the required humanities courses in the university core curriculum. Some groan about those awful English courses the college makes them take. Well, it is not Virginia Tech's fault. Half a year of humanities courses are required by the Accreditation Board for Engineering as part of the complete education a university must offer for its engineering degrees to be accredited.

The board is made up of about two dozen professional engineering societies. As an organization they set the standards for an engineering education, in general, and for each degree program. After an evaluation process they grant accreditation. Their opinion is vital to the school and to the student trying to earn a degree. A student who doesn't graduate from an accreditation program cannot take the Engineer-In-Training exam to later become a professional engineer. As well, many graduate schools won't accept the student.

Tech's accreditation is up for renewal. On Nov. 13 and 14 a committee of 14 engineers from the academic and corporate communities visited Tech to see the labs, meet the students and determine whether we live up to their standards.

This visit is one of the last parts in the accreditation process, which involved a series of cooperative steps between the board and the university. It began with Tech sending a letter to the board asking for a review leading to the renewal of the accreditation, as it is due to run out in Sept. 1996. The board sent a list of possible committee heads back for the college to eliminate any who might have conflicts of interest.

The College of Engineering and each department had a big preparation job. Associate Dean Hayden Griffin was put in charge of organizing the process. Each department had to create a self-study which included detailed descriptions of their facilities, their faculty and each course they offered. When completed, the packets "tell anybody that reads it everything about the College of Engineering," Griffin said. The packets were submitted in July 1995 to the board.

Each committee member received the College of Engineering packet in addition to the packet about the degree program they would be evaluating. The committee head received all of them, and had to read each one. Original impressions and concerns were recorded and submitted. The next step was the visit, where these impressions would be confirmed or contradicted and additional information gathered.

Aside from the committee head there is one engineer for each department up for accreditation. Since the primary focus of the board is undergraduate education only the lowest level of any program at a given university can be accredited. All of Tech's 12 undergraduate engineering degrees and its Environmental Engineering graduate program are currently accredited.
Each of the members also visits one of the areas that support the engineering programs. some examples are the library and the math, chemistry and physics departments.

The evaluation visit is a stressful time since everything that was put into writing is probed for truth. Students are questioned to find out if what looks good on paper is actually happening. Labs are examined. However, that situation is "steadily improving in terms of the rapport between the visiting team and the university," Griffin said.

Their final reports will be submitted to the Engineering Accreditation Committee in July 1996.

Three things can happen. Tech will be accredited, and the college can relax, though not decay, for the next six years. Or an interim report will be required in three years. Or, in three years, the department must show cause and explain why it shouldn't be shut down immediately. Each department and the entire college, will receive one of the labels. To Griffin's knowledge no department at Tech has ever needed to show such cause.

Last time the committee came to Tech they pointed out some dents in the program. The college has to show "what we've done to fix things that might have been wrong or things they didn't really like," Griffin said. When asked about his expectations for the results, Griffin said, "There's nothing I'm really worried about. I think we have some programs that have improved a lot and some that we should be particularly proud of." EF

LIFE IN THE

- BY -
STEFFANIE LISKEY

"Science and technology multiply around us. To an increasing extent they dictate the languages in which we speak and think. Either we use those languages, or we remain mute."

J.G. Ballard, English novelist

PHOTOS BY LISA TRAUB

It began about 10 years ago, with the birth of the Mini-Baja Car project. Slowly it grew, bringing forth the Formula team, the Solar team, two hybrid vehicles and most recently, CALVIN. What most people do not realize is that it encompasses all of the projects that go on in the basement of Randolph Hall. It is the Virginia Tech car factory, and it is a learning tool more valuable in today's world than purely a traditional pencil-and-paper education.

Walter O'Brien, head of the department of mechanical engineering, is very pleased with what these opportunities can provide for the students here. It is a very positive experience and a very large enterprise within the college.

"It is an opportunity that the classroom experience can not attempt to duplicate," he said. It is for the most part extra-curricular, although some of the teams do meet as a class once a week.

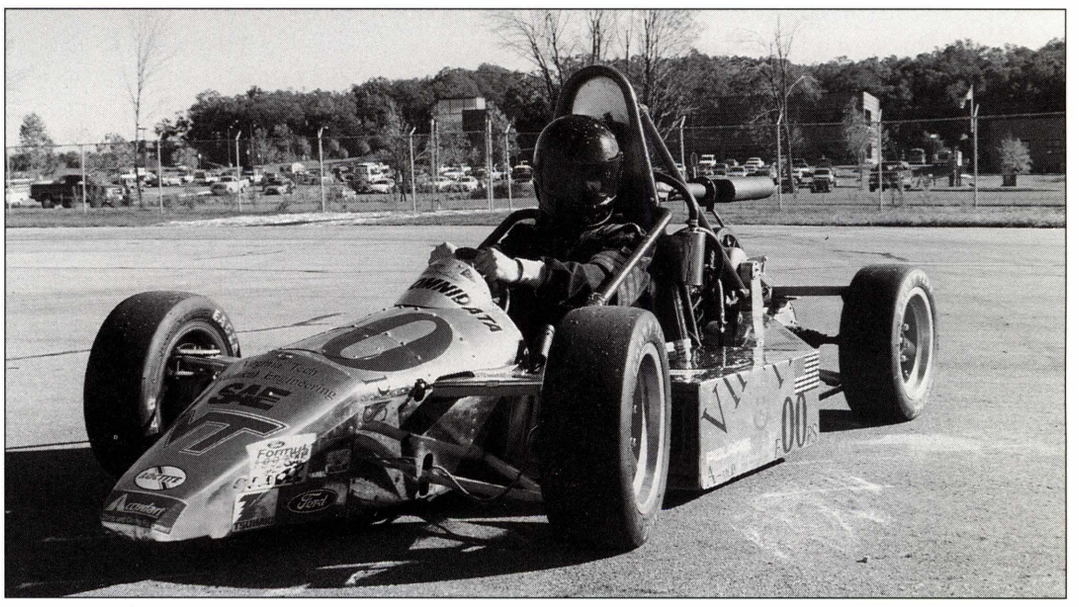
In deciding whether a team is beneficial to the college, O'Brien said he uses the following four criteria to evaluate each project: if it is a positive engineering experience for the student, if it involves some element of advanced technology and provides a real world engineering program, if it reflects positively on the College of Engineering and the departments within the college and if it is related to a field of study or interest of the faculty advisor.

O'Brien is not the only administrator pleased with the projects that are offered to the students. Dean F. William Stephenson said he believes in their beneficial qualities very wholeheartedly.

"It is very unfortunate that budget cuts have caused the teams to be affected as each one has this year," Stephenson said.

Stephenson maintains, however, that substantial financial support is being provided by the College of Engineering and the involved departments. The effects of the budget cuts vary from team to team, but on the whole most have caused the teams to find more outside support from sponsors and local businesses. It is Stephenson's hope that eventually the college can support the team by providing more working space, however, that is a goal for future years. He said that he finds it very fortunate that these projects can exist because they focus attention on the college locally as well as nationally.

"The student's ability to start a project and work through it to completion will definitely help them after graduation," Stephenson said. O'Brien is also concerned about budget cuts this year. It was believed at one point that some of the teams would have to be abandoned this year to



FAST LANE

make funds stretch far enough. However, that has not happened, though the teams are working on a more restricted budget. With every negative this brings along, it also has its positive points. It provides a new challenge to the teams.

"They have to work smarter," O'Brien said.

Robert Comparin, Student Projects Laboratory engineer, runs the car factory, as he has affectionately named it. He finds it a useful and exciting tool to learn from. Comparin very strongly points out where one's misconceptions of the car factory occur. First of all, the car factory is not limited to car projects. There are many other projects, completely unrelated to vehicles. An example is the Nautilus project, which develops exercise machines in cooperation with the well-known exercise equipment company. Also, many departments are involved with the teams; they are not exclusively intended for mechanical engineering majors, and many women are involved with the teams. In addition, students involved are not necessarily engineering majors.

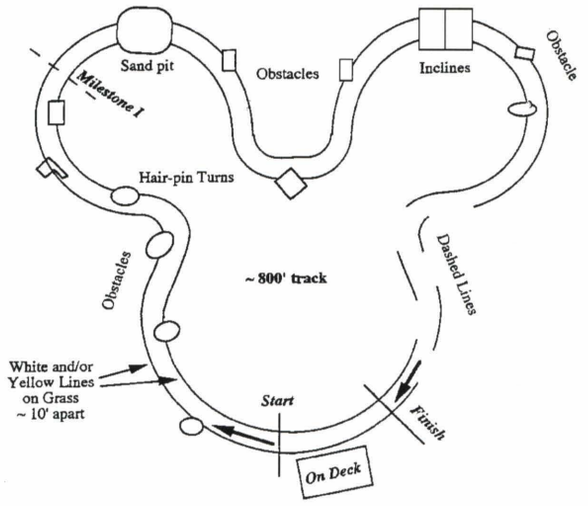
"We are teaching them how to be an engineering team. No one person has all the smarts to do the whole thing," Comparin comments.

Comparin is also the faculty advisor for the Formula team. He points out to all who inquire about the team, "This is just one project among many." Overall, almost 300 students are involved with the many projects that are run in the car factory.

Autonomous Robotic Group

It was written by George Orwell that, "Men are only as good as their technical developments allow them to be." In that case, the Autonomous Robotics Group just may be what Tech's been looking for. The group, in its debut year, is the latest project to be introduced in the car factory. CALVIN, the team's vehicle, is an acronym which stands for Computerized Autonomous Land Vehicle with Intelligent Navigation.

The project's main goal is to produce an unmanned vehicle which will navigate through an outdoor obstacle course through use of computer vision and other sensors. The obstacle course must be finished in a prescribed amount of time within a five mph speed limit, and the vehicle must avoid increasingly more difficult obstacles which are on the track. In the four years that the competition has been running, no team has ever finished the entire course. This does not imply that nobody has ever won at the competition, however. Judging is merely based on adjusted times and adjusted distances. Thus, either the first team to cross the finish line or the team to get the furthest in the prescribed amount of time is awarded first place. This year's competition will take place in Walt Disney World, Orlando, Fla., and appropriately, the course follows the shape of Mickey's head.



Autonomous Vehicle Obstacle Course

Support for the team comes from a wide array of places. Both the mechanical and electrical engineering departments are lending support to the team, as well as the College of Arts and Sciences. Additional outside support, in the form of money and equipment, has been donated from private companies, including Altira Inc., Cybermotion and Kollmorgen.

The team is a result of interest in such a project by Susan Larkin. As an undergraduate at West Virginia University she was involved with a similar type of project. Last May, she went to her advisor, Charles Reinholtz, and inquired as to why Tech did not have a similar project.

"The only thing I could tell her was, 'Do it!'" Reinholtz said.

Larkin found both faculty and student interest in the project. Since then, it has grown and many students have shown interest in the project. About 60 students are involved with the team, which is further broken down into a web of sub groups. The students come from several departments within and outside of the College of Engineering.

Mini-Baja Car Team

Philosopher Frederick Nietzsche said that what doesn't kill you makes you stronger. Although it has suf-

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Life in the Fast Lane

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fered some budget cuts, faculty changes, a change of location and a late start, the Mini-Baja team will definitely be competing this May. This project, one-of-five in the Tech car factory, is in its 10 year, and is fortunate to be running at all this year.

At the end of last year it was believed that the team would not be able to run for several reasons. Bob Salerno, a visiting professor in the mechanical engineering department, was last year's faculty advisor, and since he would not be returning to the university, the team was in need of an advisor. To make matters worse, budget cuts had taken a large bite out of what money the College of Engineering and the mechanical engineering department had to offer to all of this year's teams, thus making funding a big issue in the discussion to discontinue certain projects. However, thanks to the efforts of Brian Bean, Tony Ganino and Justin Reynolds, past team members, enough people were convinced that you shouldn't kill something successful, and the project was brought back from the dead. Change has been endured, and it has made the team stronger.

Coming to the team for the first time, Hayden Griffen, the associate dean of the College of Engineering, is this year's faculty advisor for the Mini-Baja team. However, it is not likely to see him hanging out in the car cage very often. He feels this is the students' project, and thus, he has taken a hands off approach with the team. When problems arise, the team members are encouraged to discuss them with Griffen, but it is ultimately the team's problem to solve.

"The things they are learning are the things that an employer would have to teach them," Griffen said.

About 15 students are involved with the team this year. Brian Bean, a senior in mechanical engineering, has been involved with the Mini-Baja car for four years. As a freshman, he came down to the car shop because he was interested and did any type of work that he could find. This year he is the overall team leader as well as suspension team captain.

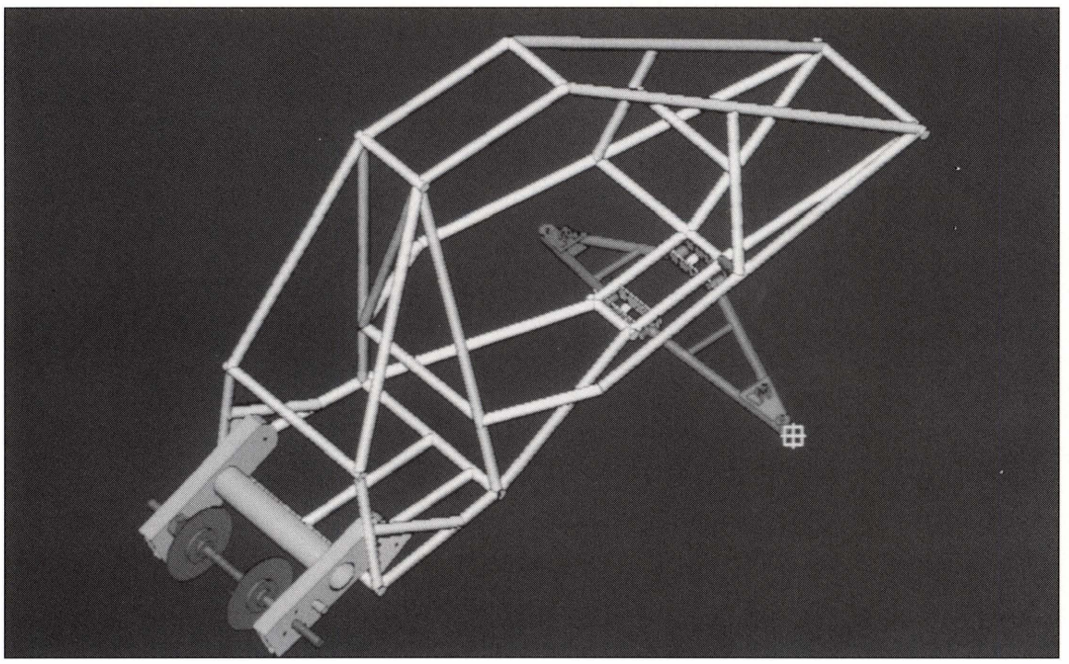
"This is a very good team project. It is not cutting edge as far as technology is concerned, but it possibly offers a better learning experience because of the simplicity and basic design principles," said Bean and team member Ganino, a graduate student and past team member who has been involved with the team team for two years as a graduate.

This year, the team has an especially large task on their hands. Due to budget cuts, $5,000 which had been provided by the College of Engineering and the mechanical engineering department are not available. This has caused the team to rely on outside sponsors and alumni support, and has made more aggressive fund raising necessary.

Physically, the team will be rebuilding the entire car, with the focus being placed on redesigning the front suspension. Rather than using coil overload shocks, the team will be using bungee cords. This is not a new concept for the team, as it has won first place in design at competition for the past two years. Using bungee cords saves weight, a very important aspect of the design of the vehicle, and is cheaper. The average set of shocks cost $300, compared to $50 for bungee cords. The idea to use bungee cords was first brought to the competition by the Tech team, and no other school since has used this concept in their vehicles.

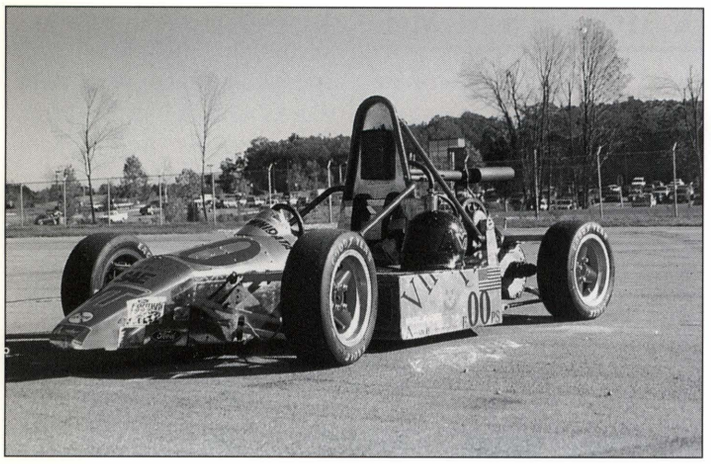
The vehicle goes through many tests at competition, and is judged in two main areas. The static judging takes into consideration design, safety and cost, while the field competition deals more with the maneuverability and endurance of the vehicle. At this time, the team has not yet decided in which competition they will participate. They hope to be able to be more efficient with time this year, and would like to have the vehicle built by the beginning of March. This will leave enough time for the team to run the car and do crucial fine tuning before the competition in May.

"It's a large project where the design of smaller sub-parts must effectively be incorporated into the whole, and from a design standpoint, you have to progress beyond the conceptual designs you do in classes and attack the nuts and bolts details of actually getting it running," Ganino said.



VT Motorsports Formula Team

It brings to mind the word exhilarating. Just ask the people involved with this year's VT Motorsports Formula team. It's not just driving it that's exciting though, everything that goes into it is cutting edge, and this year there is a new car for them to get excited over.



The team will concentrate more on chassis design this year, that being the primary weak point in last year's car. The car ran well last year, and most of the systems have been designed well enough that only small modifications will be necessary, however, improvement is always welcomed. The team will be turbocharging the car this year rather than using a naturally aspirated system. In everyday terms, this means they will be using a separate system to force air into the engine, and can be compared to the idea of a person being put on a respirator in order to help them breathe. Turbocharging increases the amount of air that is forced into the engine and gives the vehicle more power. The team will also be running a pneumatic shifter this year, as is done in most Indy cars. In the past, the team has used a simple shift lever, which was difficult to handle and required the right hand to leave the steering wheel for a brief moment while shifting. The pneumatic shifter will eliminate this problem. It is also possible that the team will build their own fuel injection control system this year, rather then using a purchased control system, depending on how the prototype model tests.

Many of these new ideas have come from the experience of the older members. As the season progresses, details arise and are spread among the entire team to be worked out. Between 25-to-30 students are involved with the actual design of the vehicle, and 10-to-15 more are involved with the work done in the shop.

Ethan King, team leader, has been involved for the last three years.

"Many of the people who get involved here have future goals that are closely related to the things they experience here,"he said.

Comparin, the faculty advisor for the team, is happy to note that many women are involved with this project, and the students involved are from every area of engineering.

Of course budget cuts have done their best at eating up departmental support for the Formula team as well. The mechanical engineering department is still supporting the team, though the amount of support that is available is significantly less this year. Many new tools are needed due to use and damage to old tools, but the number the team is able to purchase has been reduced. The team is also supported by large corporations, such as GM, Allied Signal and Goodyear, and hopes are high that private sponsorship will increase this year.

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THE CO-OP EXPERIENCE

BY **AMY SIMMS**

The ins and outs, dos and don'ts and pros and cons of cooperative education at Virginia Tech. Hear from some of the students that choose to co-op.

The cooperative education program at Virginia Tech takes the phrase "Ut Prosim" at face value by helping students find gainful employment during their college career.

Co-oping gives students the opportunity to learn useful skills in a work environment. It also helps them discern what they want and do not want in a future job setting. Although individual experiences with co-oping vary greatly, most who participate in this program will take away valuable experience and insight.

Before a student can begin such work, however, he or she must decide which companies to apply with for positions. The Cooperative Education Office, located on the third floor of Henderson Hall, keeps an updated list, indexed by major, of companies interested in hiring co-op students. Some things to consider when deciding which companies to apply to are reputation of the company, size, and location.

Location, especially, seems to be a factor in many students' decisions, and the opinions on this are diverse.

Typically, a student wishing to co-op has three location options: live at home, live in Blacksburg, or live nowhere near these two. According to students who have co-oped, all three of these have advantages.

Gigi Leiberman, a junior in computer engineering, currently co-ops for Intel in Albuquerque, NM. Leiberman said, in a phone interview from her office at Intel, that living so far away from her home and friends, has been a good experience, although it is difficult at times.

"I have learned a lot from going out on my own," she said. "Co-oping and living in New Mexico has not just been a work experience, it is a life experience."

Curt Hensel, a junior in forestry who worked for Rayonier Forest Resources Southeast in Fernandina Beach, Fla., also enjoyed living away from home and school. "It was fun to be in a different environment ... and I got to live on the beach!" he said.

Some students who co-op choose not to leave home or friends and live in Blacksburg during work sessions.

Ted Daniels, a junior in mechanical engineering, commutes from Blacksburg to his co-op job at Norfolk Southern in Roanoke. "Living in Blacksburg allows me to remain active in organizations at Tech," he said, "and I don't have any homework."

A few students are even lucky enough to find jobs in Blacksburg. Josh Marder, a junior in marketing and psychology, works for Teleworks, a small information systems company located right here in Blacksburg.

Marder said that living in Blacksburg is "the best of both worlds. I can work in a professional environment, and still remain active in organizations and hang out with my friends."

Many students forego exotic locales and seeing their friends and live with Mom and Dad to save some cash. Although living with the parents may feel like high school all over again to the independent college student, there are advantages. After a few years of living off dining hall food and Ramen noodles, the niceties of the nest, such as home-cooked meals, comfortable beds and air-conditioning, are more noticeable.

Steve Swanchara, a senior in electrical engineering, worked for TRW Government Informations Systems Division in McLean, Va. and lived with this parents in Springfield. "I wasn't spending any of my money on rent, so I was able to save a lot more money than if I had not lived at home," Swanchara said.

He also said that home-cooking was a prime reason to live at home.

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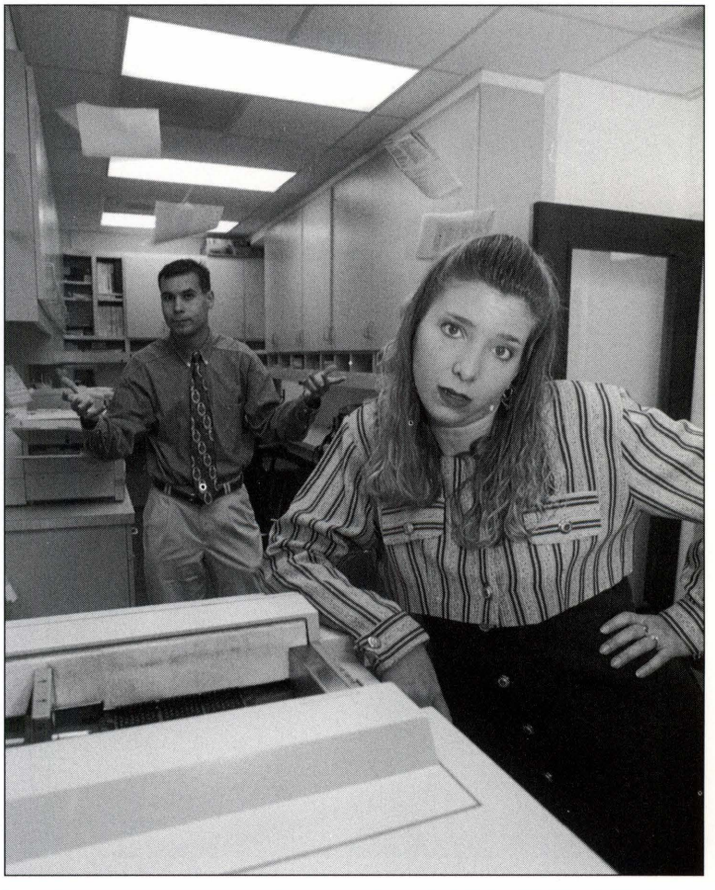
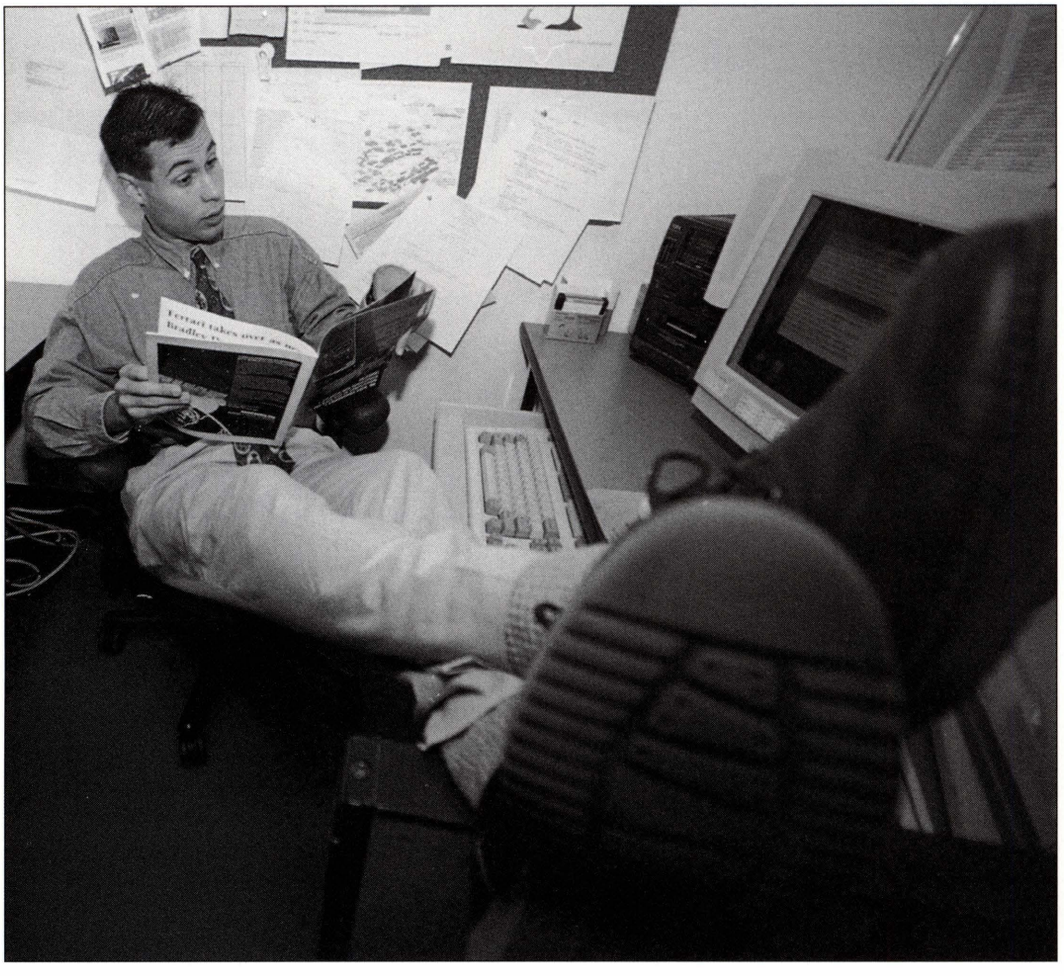


One of Several Extremes: The co-op experience can be many different things for many different people. Some students may find themselves in a clerical position initially, however typically, the work load increases and becomes more engineering oriented as the student's time with a company increases.
All photos by Nicole Popovich.



The Co-op Experience

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Once a student has decided on the optimal location and sent out resumes to companies that fit the criteria, the interview process starts. It is not uncommon to be interviewed by several companies before being hired, but most co-ops do eventually find jobs. When students accept an offer from a company, they are officially co-ops. At this point, the first major hurdle is the first work term. Some students get discouraged at the beginning, usually because they do not feel like they are getting real work. Most students who have been through this, however, find that the work load gets harder and more interesting as the term progresses.

It generally takes a few weeks to train the student on job and company procedures that the average college freshman or sophomore would not be expected to know. Swanchara said, "I was inundated with software packages to learn the first few weeks. It was definitely a learning experience." Hensel and Daniels also said that the beginning of the first work term was mostly dedicated to training. It is normal for a co-op to want to get started with the real work right away, but training is necessary and beneficial in most cases. Some companies will even spring for off-site classes.

Leiberman was sent to

Reap What You Sow: Some students will gain valuable work experience from co-oping. However, in many cases, it is necessary to be self-motivated to benefit from these work experiences.

Seattle for a week by Intel and received training that helps her perform her job today: developing an automated testing program for applications on the Office Local Area Network software at her New Mexico site.

If mundane tasks continue beyond the first work term, however, the co-op should use the proper channels to rectify the situation.

The purpose of the cooperative education program is to prepare the student for a future career, so if a great deal of time is being spent photocopying and hole-punching, changes need to be made.

According the Kimberly Ware, assistant director of the Cooperative Education Program, a student should first discuss the problem with the supervisor. If a solution cannot be reached, the next step is to talk to the co-op contact at the company, if this is a different person than the supervisor. When all avenues have been exhausted, the co-op counselor will assist the student.

"We encourage a student to stay with one employer throughout the co-op program", Ware said. "However, if the student feels strongly that he or she is in an inappropriate situation we will work with the student and help them to change companies if that step is necessary."

Although some students complain of getting paid to make copies, most perform exciting and varied job tasks. Swanchara, for instance, received a plaque and monetary award for his assistance in the development of a breakthrough project for the SURTASS (Surveillance Towed Array Sensor Systems) project at TRW.

Other students are involved in money saving projects. During one of his work terms at Norfolk Southern, Daniels said he "designed a fixture for a milling machine that can be used for the next 15 years and will save NS a substantial amount of money." This kind of innovation is the sort of thing that will attract potential employers when the co-op begins to hunt for a permanent job.

Some co-ops, however, do not even have to participate in the usually extensive search for a job after graduation.

Although he is only a junior, Marder has already signed a contract to work for Teleworks, the company he is co-oping with, for six months after graduation. Marder's experience in itself, is unusual and very impressive. He is currently the director of operations in the twelve-person company, and is doing the accounting and making payroll decisions. This is extremely unusual for someone who has not even graduated from college yet, but the co-op program has made it a possibility for at least one person.

Basically, the co-op program can be whatever a student makes it. As Marder advised, "work for a company that meets your needs." Weighing all factors to choose the best co-op job and making the most of the experience once hired is the best way to ensure a pleasant and productive co-op experience. Don't forget that the co-op counselors are there to help students - so utilize these resources.

A co-op job can be challenging and rewarding and, most importantly, it can keep you from making coffee, copies or burgers after graduation! EF

THE SCHOOL OF

Atle Larsen, Tech engineering student and athlete, shows dedication on and off the playing field.

- BY -
ANNA WEGMAN

Stress is a common word heard in the College of Engineering. At Virginia Tech, classes are challenging and professors expect 100 percent from their students at all times. It is much the same way on the football field as Tech strives to win each week in front of thousands of fans. But just think how the stress factor multiplies when you are both an engineering student and a football player.

Atle Larsen, mechanical engineering student and place kicker for Tech's nationally ranked football team, ambitiously pursues a very active schedule and handles his stress very well.

As a youth growing up in Sola, Norway, Larsen played soccer. He grew to appreciate the team aspect of European soccer, where everyone works together to win the game.

Larsen came to the United States five years ago as an exchange student. His host mother recognized his skill as a kicker and encouraged him to try out for the high school football team. Larsen found his niche in this country on a football team and the rest is history.

When he finished his high school career, Larsen decided to attend college in the United States. He also wanted to play football. He originally attended Moorehead State as a football player and pre-engineering student. In 1994, he transferred to Tech to continue his education and his football career. Larsen has succeeded at both of these goals.

This is the first year that Larsen has proceeded to the forefront in football. Though the former starting kicker Ryan Williams graduated, Larsen's skills and commitment have made a smooth transition for Tech. His practices typically last for three-to-four hours a day.

His experience and knowledge allow him to coach himself on and off the field. Self-discipline is a must for such an involved person.

Disciplined academically, Larsen chose to study mechanical engineering because of a professed love of math, physics, fluid mechanics and vibrations.

Mechanical engineering provides a diverse background and allows for a wide range of job opportunities. Larsen said he likes the idea of a diverse job where he will get to use many different aspects of engineering. Though he is very dedicated to his studies, he sometimes feels as though he doesn't understand the material as well as he could if he had more time. His solution to this dilemma is to return to Tech

LISA TRAUB

Atle Larsen kicks off against Akron in Lane Stadium. Though he is Tech's leading scorer this year, Larsen's parents, who live in Norway, have never seen him play football.

HARD KNOCKS

next year to attend graduate school so he can learn more. But Larsen has been splitting his time between football and studies for so long, he said, "That is the way I think it should be."

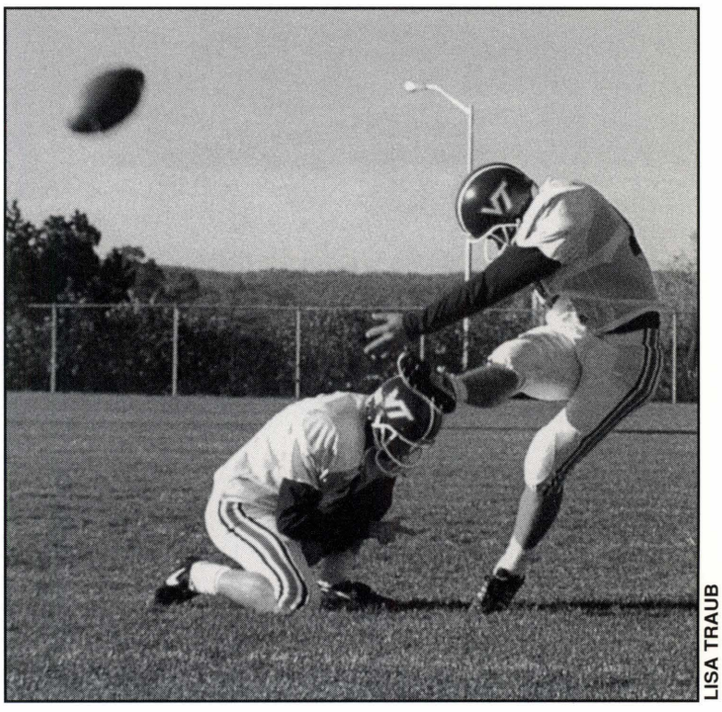
Larsen has learned many lessons from his busy lifestyle. When asked how his academic and sports lives balance, Larsen said he tries to separate the two. He has learned that his life runs smoother if the two don't mix because both activities require a great deal of concentration and effort. Larsen knows he can not do both at the same time. Therefore, when he studies, he doesn't think about football, and on the field he concentrates on football. Larsen is a focused person who never loses sight of other people amidst his frantic life.

In a school where sports are such an integral part of student life, football is no exception. Athletes are respected for their efforts, and the teams are supported by enthusiastic fans. The excitement of the fans is something Larsen truly appreciates. He has noticed in his classes that his professors are pro-sports, and the students often discuss football games. Larsen said he really enjoys the support. He is obviously proud to be a Hokie.

Unfortunately, Larsen's biggest fans have never seen him play. Because football is not as popular in Europe as in the United States, Larsen's parents have not really been aware of the significance of their son's athletic achievements. Larsen is the highest scorer on the 9-2 Hokie football team.

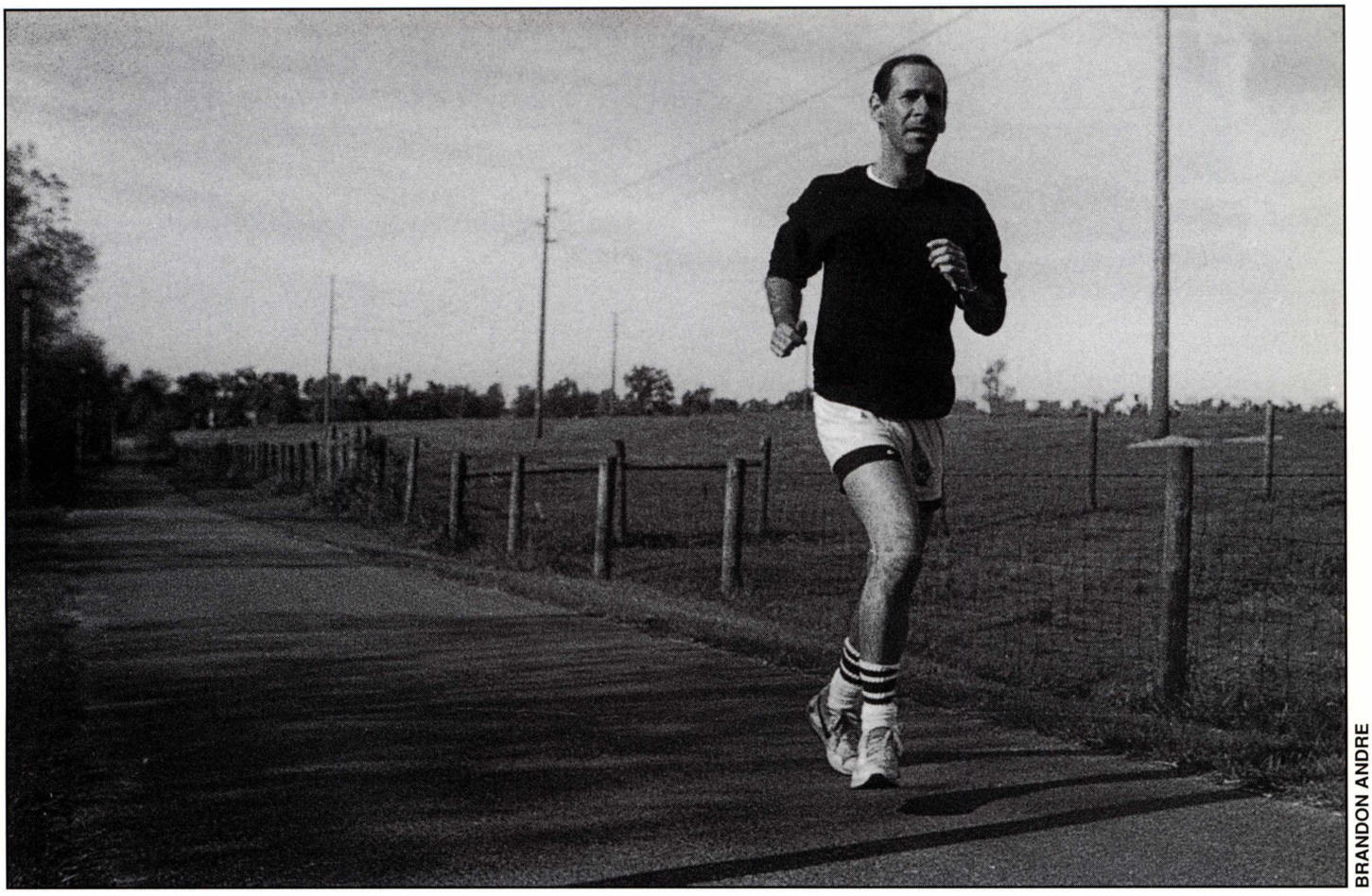
LISA TRAUB

Larsen's parents are beginning to appreciate the game of football and their son's contribution to Tech's success. Larsen said he hopes his parents will be able to come and see him play when Tech plays in a bowl this year. But Larsen's parents have more to be proud of than just his athletic and academic achievements. His accomplishments go beyond the field and the classroom. He is a man dedicated to his commitments, friends, family and fans. EF



LISA TRAUB

Larsen is able to get the extra point off (above), eluding the defensive onslaught. The kicker (right) practices three or more hours each day.



BRANDON ANDRE

Teaching For Great Strides

Professor Sheldon Jacobson endeavors to teach his students to learn from their mistakes, clearly communicate their ideas and have a passion for their work.

BY **AMY SIMMS**

Sheldon Jacobson, assistant professor in the department of industrial and systems engineering, believes in balance.

"I believe in working hard and playing hard," said this Montreal native, who averages 60 hours a week on campus, runs about 40 miles a week, is the director of the Simulation Optimization Laboratory, a member of numerous committees in the industrial and systems engineering department and the College of Engineering, and still manages to spend a day every month volunteering for Radford Fairlawn Daily Bread, an organization that provides meals for the needy.

He spent about 10 years getting his education and holds both a bachelor's and master's degrees in mathematics as well as a master's and doctorate in operations research and industrial engineering. Jacobson has

been an educator for the past eight years and said he loves his job.

Jacobson believes firmly in passion, in all aspects of life. "If you don't have a passion for what you do, you shouldn't be doing it," he said. Listening to Jacobson talk about education, such passion is evident. "I believe in breaking down barriers," he states. "I feel that the dichotomy between teachers and students should not exist." Jacobson sees education as a two-way exchange. "I try to establish an environment conducive to learning, but the student must want to learn." As a professor, Jacobson always has some affect on his students. "Students either love me or hate me" he said. Currently, Jacobson spends much of his time teaching Systems Analysis, Operations Research and Computer Simulation.

Jacobson said education should include research as well as teaching. As the director of the Simulation Optimization Lab, he does "work which tries to look at ways to improve performance of industrial systems, generally in manufacturing and service areas, using simulation models."

Jacobson has recently received a grant from the Air Force Office of Scientific Research to conduct research in discrete event simulation modeling and analysis. Through this research, he attempts to bring diverse ideas together to create new, more efficient tools for problem solving. With the Air Force project, he is developing models and algorithms that will aid in the transformation of initial alloy forms into those more suitable for manufacturing and building turbine engines. The research creates a rather unique union between the manufacturing processes of complex alloys and operations research. This creative approach to problem solving is a typical example of Jacobson's philosophy of creativity and innovation.

Jacobson said the creativity is key in research and in industry. His advice to engineering students headed for jobs or for advanced degrees is to be innovative and create new ideas. Jacobson also stresses the importance of communication, which he said "is the key to success as an engineer. If a person cannot communicate his or her ideas clearly, then that person will not succeed." Jacobson said verbal and written communication skills are absolutely necessary to any profession, especially engineering.

Jacobson said a truly wise person is one who learns from the experiences and mistakes of others, and avoids making those mistakes again. Jacobson admits to learning from his own mistakes. He started his teaching career at Case Western Reserve University and he said, "I learned how to teach at Case Western. I made all of my mistakes there." Starting his teaching career at age 27 was difficult, Jacobson said, because many of his students were almost as old as he was.

As a mathematician and engineer, he also found it disconcerting to be teaching in the school of management. Jacobson said "starting a career is academia is arduous. In order to succeed, one must have passion."

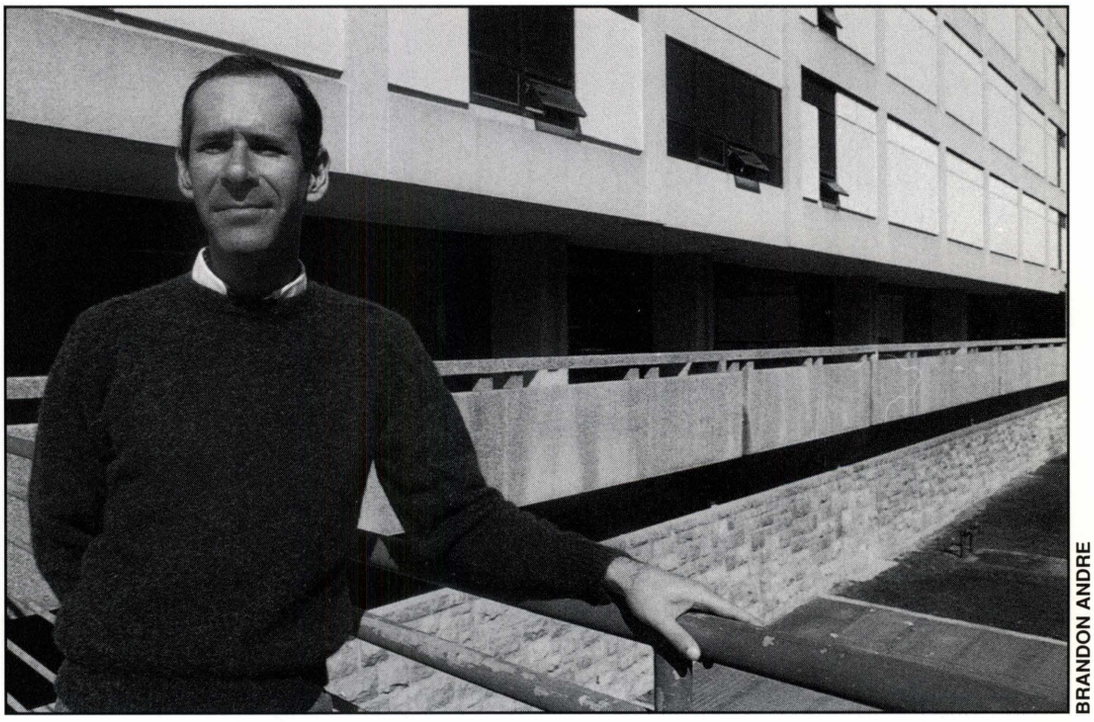
Now in his eighth year as an educator, Jacobson said he loves his profession. He feels it is his job to "serve those who need information." He said he provides the "information that is the means to a thinking process." This thinking process should be the important part of an engineering education. As Jacobson puts it, "the information will always change, but the thought process is constant."

Failure is a necessary part of this thought process, Jacobson said. "If I am not failing, then I am not doing enough. Many of my greatest successes have been born out of failure." He applies this philosophy to his research, where he attempts to constantly come up with new ideas. In research, Jacobson feels that "quantum leaps are better than simply improving the status quo" and that researchers should avoid shortsightedness. This is why much of his research is fundamental rather than applied.

"Fundamental, basic research should continue," Jacobson said, "because many of the greatest and most useful discoveries have come out of it. The country will suffer without it."

As a scientist and an educator, Jacobson has a passion that is evident in every aspect of his life. He will continue to break down barriers and build bridges, both in the laboratory and in the classroom. "My goal is to help someone's life change for the better," Jacobson said.

With his strides in education, research, service and volunteerism, Jacobson is on his way to accomplishing this goal. EF



BRANDON ANDRE

In addition to 60 hours a week on campus, Sheldon Jacobson also finds time to run 40 miles, direct the Simulation Optimization Laboratory and volunteer time at the Radford Fairlawn Daily Bread.

Life in the Fast Lane

Continued from page 9

"Overall, spending should not change too much as far as quality of the car is concerned, just the means of production," King said.

More attention will be focused on the small details this year, and the team proposes to follow a more efficient time schedule. Tech has always been among the top contenders as far as technology, however, time seems to be the team's nemesis. In the last two years, most of the problems with the car have stemmed from a lack of testing time, with most of the problems being freak failures that were not foreseen. Ample testing time will improve the reliability of the vehicle. As it should be to any engineer, King said that it is important to him that the design is a good one from the start.

"No amount of tuning will correct a bad design, but the right amount of tuning can improve a good design and allow it to work at optimum performance," King said. The team hopes to have two cars running at the competition this year. One will be a new car and the other will be a modified version of BOOH, last year's car. The design of both is essentially the same.

BOOH placed 12th last year in competition in its debut performance. The 1991 car, FOOPS, is still intact. It placed first and third nationally in its first two years running. Since then, the new cars have not ranked out of the top 20, including a sixth, 10th, and 12th finish place among their best.

"The engineering program here is wonderful, but anytime you spend that much time in the classroom the emphasis tends to be a design on paper and everything is given to you to find a solution," King said. "When you get down here, there are no real answers and nobody is going to hand you what you need to solve a problem. This is real, hands-on engineering. It's a real world problem."

Hybrid Electric Vehicle Team

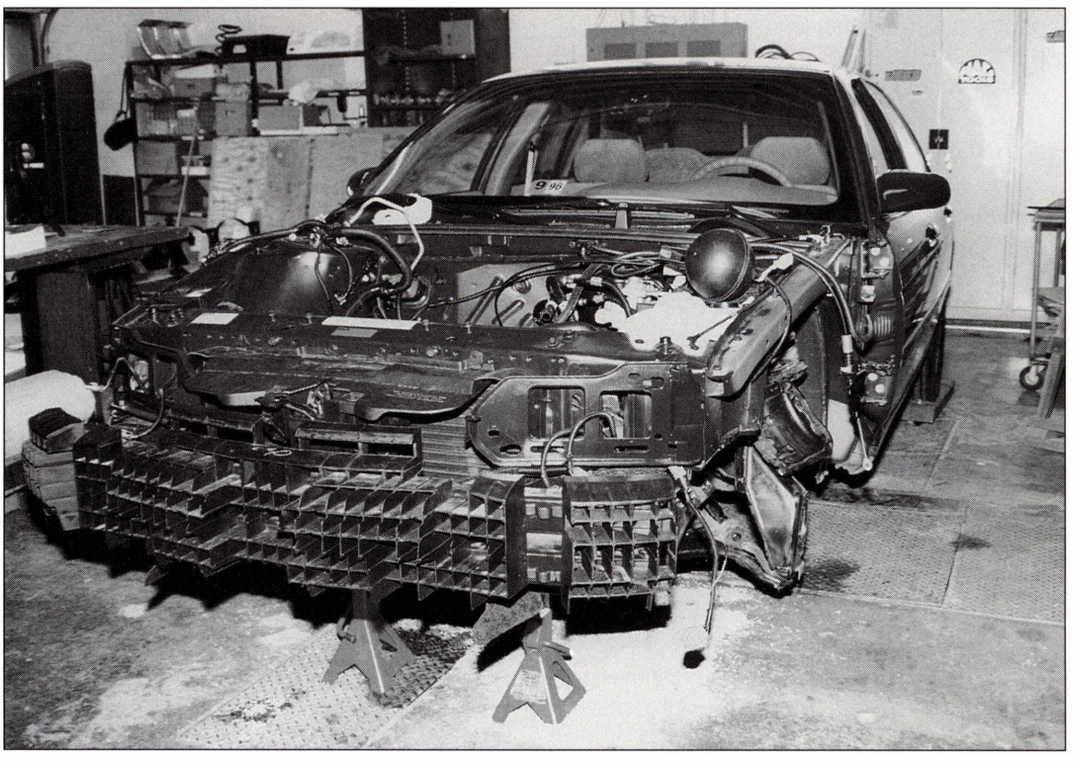
In their second year running, the Hybrid Electrical Vehicle Team is gaining much momentum and running full speed on the road to success. Last year's team converted a Dodge Neon into an electrically powered vehicle. The ideas applied in this vehicle may be the solution to many of the United States' current fuel problems and offer several benefits. Most importantly, it is more efficient, offering almost 49 percent more efficiency than internal combustion engines. This year the team will be facing a new challenge as they transform a Chevrolet Lumina into a hybrid electric vehicle.

A hybrid electric vehicle can be one of two system types. The first, which Tech uses for their vehicles, is a series drive configuration. A positive to this system is that it is generally more efficient and not as mechanically complex, however, it can also be more difficult to design a control strategy for this configuration. The other system, a parallel drive, directly provides drive power via a small electric motor and the hybrid engine.

The HEVT is overseen by faculty advisor Doug Nelson of mechanical engineering. A distinctive quality of this project is the broad range of engineering disciplines which are obviously needed to produce the end result. The team, made up of approximately 70 students, consist of primarily mechanical and electrical engineering students. This year, however, professor Schetz of the aerospace and ocean engineering department will also be involved. His involvement will deal mainly with the aerodynamics of the vehicle, not only externally, but internally as well. Professor De La Ree from electrical engineering heads up the electrical team for the vehicle with the help of graduate student Matt Merkle. Heading up the mechanical team is Randy Senger.

Just as it has affected the other teams and the entire university, budget cuts have taken away the cushion that last year's HEVT used to cover expenses not covered with funds raised by the team. Seed money from the United States Department of Energy will be available to the team this year. Other sponsorships will also come from large corporations, such as General Electric, in the form of parts and financial support.

This year's challenge, the FutureCar Challenge, is the premier government and industry Transportation Technology Competition. Only 12 schools nationally are chosen by the United States Consortium for Automotive Research and the DOE to participate in this challenge. Tech's proposal was one of 29 received, making it an honor



to be among the chosen teams.

A letter sent by the DOE to O'Brien states, "The reviewers felt that your proposal demonstrated the technical capability, the organizational strength and the institutional and outside support needed to develop the vehicle of the future. The sponsors believe that the 12 schools selected to participate in the 1996 FutureCar Challenge represent the very best automotive talent in our North American colleges and universities."

Solar Car Team

It is possible those not interested with the Solar Car team before this year did not know that it was on the brink of being discontinued. Never fear ... it has survived and it is thriving as it has in the past. Plagued by budget cuts, safety concerns and space limitations, it seemed the SOLARAY IV might not make it through the many obstacles in its way. The team was also in need of a faculty advisor for the full year because Charles Hurst, one of the current advisors and the advisor in the past, will be leaving the College of Engineering at the end of the fall semester. Joining him this year as a faculty advisor is Daniel Chen from the electrical engineering department. Chen will continue as faculty advisor through the spring semester. However, it is primarily the students on the team that run the project. This year's team leader is senior Todd Westley, and serving as electrical engineering leader is Ed Lunney.

Budget cuts have great affected the team this year. Support for the various car projects is normally given in part by the mechanical engineering department. However, in the case of SOLARAY IV, primary support for the project has shifted to the electrical engineering department. Other funding for the project is coming from the mechanical engineering department, the College of Engineering and monetary and material donations from companies.

Always a main concern in any project is safety. The concern was brought to light more heavily than normal this past year because of accidents in the SunRayce 95. The speeds reached by the car can be as high as 55 mph.

"These accidents invariably involved a flat tire in the single rear wheel of three wheel cars," Westley said.

The SOLARAY IV was not involved in any of these accidents, mainly due to the fact that it does have four wheels, and the team places great emphasis on safety.

The SOLARAY IV is the fourth solar powered vehicle designed and built by Tech students. It competed last year in the SunRayce 95, a race which began in Indianapolis, Ind., and ended in Golden, Colo. The Tech team was one-of-38 colleges and universities to compete in the nine day race in June. Unfortunately, large energy losses found in the drive train prevented the car from covering the distance as well as hoped, causing a 35th place finish. This year's SOLARAY team is not discouraged by these results, though. They are hard at work to improve upon the problems from last year.

The team is examining the operating characteristics of the current car in a laboratory setting this year, something not done by past teams. They are designing a new suspension, frame and drive train. Management has also changed this year due to increased efficiency of the meetings.

Everybody involved in the team is expanding their knowledge of drive trains, composites and fund-raising this year as well, in order to create a team which is fully aware of everything that is happening with the organization itself.

"A poor performance in SunRayce 95 is causing us to redesign many parts of [the car] ," Westley said. EF

For more information regarding any of the car teams, contact any of the appropriate people listed below.

Autonomous Vehicle Group

Susan Larkin	231-6637
Praveen Paripati	231-6200
Dr. Lynn Abbott	231-4472
Dr. John Bay	231-5114
Dr. C. Reinholtz	231-7820
Dr. John Roach	231-5368
Dr. W. Saunders	231-7295

Mini-Baja Car

Brian Bean	951-9311
Dr. H. Griffen	231-6641

Formula Car

Ethan King	953-0251
Dr. R. Comparin	231-5459

Hybrid Electric Vehicle

Dr. Doug Nelson	231-4324

Solaray IV

Todd Westley	231-7190
Dr. Daniel Chen	231-7790
Dr. Charles Hurst	231-7190

A Look at the Georgia Tech Cooperative Education System

BY AL LOWAS

What In The World Happens Outside Virginia Tech? An ENGINEERS' FORUM Interview with Mr. Tom Aikens: Georgia Tech's Cooperative Education Director

Just what do other schools do in administering their Cooperative Education programs? To find out, the Engineers' Forum recently spoke with Tom Aikens, Director of Georgia Tech's Cooperative Education program, and found indications that the Georgia Tech's co-op program may have some strong similarities to that at Virginia Tech—and some differences. Here are his comments:

Engineers Forum: Let's start with the basics, if we could. How many of Georgia Tech's engineers are enrolled in the Georgia Tech Co-op program?

Tom Aikens: About forty percent are enrolled.

EF: And do all have positions?

Aikenes: No, a few percent of those are still looking for positions. Almost everyone in our HOPE program that applies does have a position, though.

EF: Those are fairly large numbers: are they all employed in the Atlanta area?

Aikenes: No. Of about 500 active employers (those who currently employ at least one Georgia Tech co-op), only about 50% are in Atlanta and a total of about two-thirds are in close proximity (Georgia, Alabama, North Carolina). There are also a few west of the Mississippi and overseas. Our oversees program has had varying success over the years, but is very popular due to the expanding overseas markets.

EF: And are most of these active employers government or corporate?

Aikenes: Most of our active employers are corporate. We used to have a large number working for the government (local, state, and federal), but with overall cuts in the government the numbers have decreased. Including all agencies, the U.S. government is now Georgia Tech's third largest Cooperative Education employer.

EF: Does the Georgia Tech co-op program offer any specific job fairs to help its students find positions?

Aikenes: No. We did have a co-op job fair at one time, but it was too much work without enough benefit. A large number of other (primarily student) organizations on campus have job fairs, and many of the employers who come are looking for co-ops, too. We usually just set up a booth at these fairs to let students know about the program.

EF: So do you have any special interviewing sessions?

Aikenes: We've found the best way to do interviews is to let employers conduct interviews during about a four week window in the middle of each quarter. It seems to fit better into people's schedules.

EF: And do you have any special orientation programs to tell students abut the co-op program?

Aikenes: We have a two hour orientation session that we require everyone to go to when they enroll in the program. Our students are also required to read an introductory package. Beyond just the policies of the program, the big thing that we make sure they know is that the program is ABET accredited.

EF: ABET accredited?

Aikenes: Yes, of course. Georgia Tech's co-op program, like most in the nation, is ABET accredited. It's much like accreditation of degrees. What it means is that some of the time on co-op applies toward your Professional Engineer's License. In Georgia, it applies as a six month credit toward a PE License; in some states it is up to a year of credit. You ought to ask about the Virginia Tech program. Is Gary Boley still with the program?

EF: Yes, in fact, he is still there. So you are familiar with the Virginia Tech program?

Aikenes: Yes. Most of the major engineering colleges with co-op programs get together to share information. Sometimes it's successes, usually it's a lot of what doesn't work. As I remember, though, Virginia Tech has moved its co-op program to Career Services.

EF: Yes, it has. Do you think that is a wise move?

Aikenes: I'm not sure. I am convinced, however, that the success of the Georgia Tech program lies in the fact that it has remained part of the academic program. It has the full support of the academic program, all the way up to our University President.

Aikenes went on to speak about how, like most colleges across the country, there has been a decrease in offers of permanent positions to cooperative education students by their co-op employers, but noted that the rate of offers was still over fifty percent of those graduating. As for concluding remarks, Aikenes further emphasize the importance of keeping the cooperative education program within the academic side of the school, and noted again his strong belief in the relationship between the strength of the Georgia Tech Cooperative Education Program and the strength of its administrative support.

As for some of the special programs that Aikens spoke about, HOPE is Georgia's program of full tuition sponsorship for any in state college student with a B average or better. Virginia Tech's program is not currently ABET accredited, although it has always followed the guidelines of the ABET accreditation process. Many students have been given PE license credit for their Virginia Tech Cooperative Education work experience and the program is currently applying for accreditation this year. EF

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