

ENGINEERS' FORUM

VOLUME 17 • NO. 3

SEPTEMBER • 1998

Holding Back the Flood:

The Dynamics Behind a Dam

Engineering

Expo '98:

**200+ Companies
Come to Town**

A Twist of Fate:

Predicting tornado strikes

“When Can You Start?”

Tips on Getting the Job You Want—Now!

Lucent Technologies
Bell Labs Innovations



Invent yourself.

Go beyond college. Way beyond. Into the future of global communications.
At Lucent Technologies, we give you the freedom to think out of the box.
To let your ideas fly.

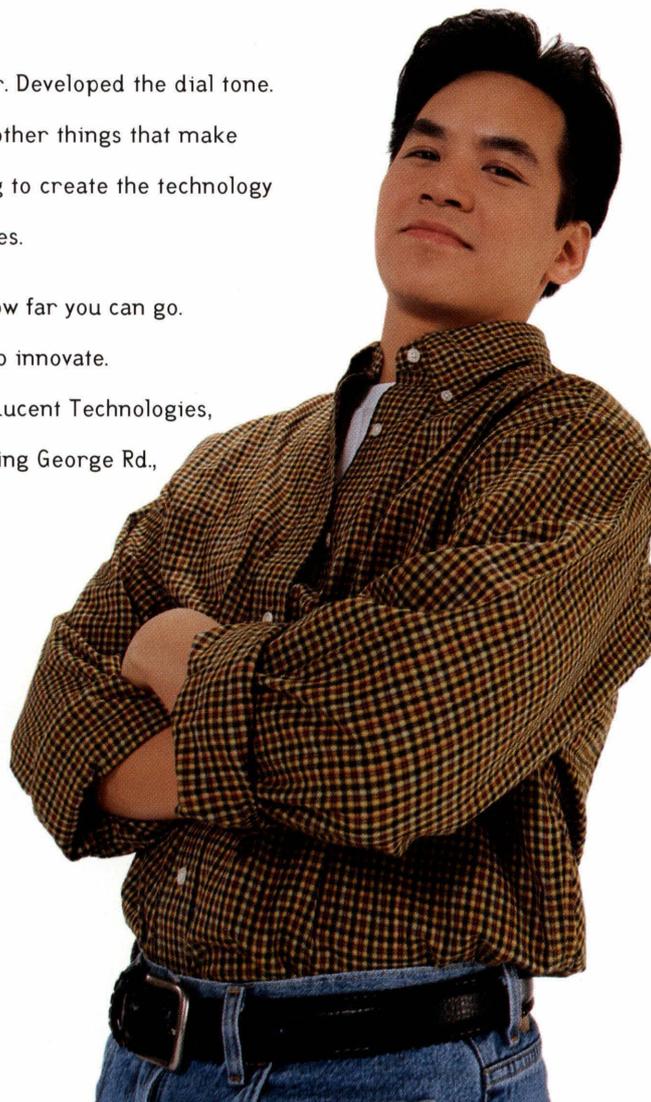
We're the company that invented the transistor. Developed the dial tone.
The cell phone. Fiber optics. And many of the other things that make
communications work. Today, we're continuing to create the technology
that's changing the way the world communicates.

See where you can take us. And discover just how far you can go.
Because at Lucent, to invent is more than just to innovate.
It's to change the world. Send your resume to: Lucent Technologies,
Employment Manager, Dept. FOR/8735/98, 283 King George Rd.,
Rm B2C83, Warren, NJ 07059.

Or apply on-line:

www.lucent.com/college

Lucent is an equal opportunity employer.



ENGINEERS' FORUM

VOLUME 17, NUMBER 3

SEPTEMBER 1998

Shuvom Ghose, AE '00
EXECUTIVE EDITOR

Rebecca Gassler, AE '00
MANAGING EDITOR

Writing Staff

GARRY HALLMAN CPE '01
MICHELLE ROMANOSKI ME '99
CHRIS THAISS AE '01

Doug Kelley, EE '00
PRODUCTION MANAGER

MARIE A. REYES, MKTG '99
BUSINESS MANAGER

Jason Gibbs, ESM '00
PHOTOGRAPHY EDITOR

Bryan Deehring, CPE '00
WEB EDITOR

EDITORIAL ADVISORY COMMITTEE

LYNN NYSTROM
HEAD, DIRECTOR OF NEWS AND EXTERNAL
RELATIONS FOR THE COLLEGE OF ENGINEERING

LISA GROGIN, M.S. CE '98

SAM RILEY
PROFESSOR OF COMMUNICATIONS STUDIES

DESIGN & LAYOUT ADVISOR

DAVID SIMPKINS
GRAPHIC DESIGNER, COLLEGE OF ENGINEERING

ENGINEERS' FORUM is Virginia Tech's student-run engineering magazine. ENGINEERS' FORUM is published four times during the academic year. The editorial and business office is located at 223 Femoyer Hall, Virginia Tech, Blacksburg, VA 24061. Phone: (540) 231-7738. E-mail address: Forum@vt.edu. World Wide Web address: www.vt.edu:10021/eng/forum. Member of Engineering College Magazines Associated, Mike Dorcay, Chairperson. The opinions expressed in the ENGINEERS' FORUM do not necessarily reflect those of the administration, faculty, staff, or student body of Virginia Tech. Copyright 1998, ENGINEERS' FORUM. ALL RIGHTS RESERVED. REPRODUCTION IN WHOLE OR IN PART WITHOUT PERMISSION IS PROHIBITED. PRINTED IN THE USA.

Table of Contents

- 3 A Smorgasbord of Jobs** Engineering Expo '98 will attract over 200 companies looking for the brightest engineering students Tech has to offer. *BY SHUVOM GHOSE*
- 5 Virtual Corporation Produces Real Results** Students from three of Tech's colleges team up to design and test a cheaper rapid transit system. *FROM STAFF REPORTS*
- 8 A Twist of Fate** Predicting tornadoes takes a lot of luck, but through improved technology, our luck is getting better. *BY CHRIS THAISS*
- 14 Engineering "Dam-age"** Building a dam consists of more than pouring dirt and concrete in front of a river. *BY SHUVOM GHOSE*
- 20 Help Wanted** A guide to writing a resume, dressing for success and getting through the interview. *BY REBECCA GASSLER*
- 25 Technical Tidbits (The News)** What are they building across the Mall and why did the National Science Foundation give Tech \$12.35 million? *FROM STAFF REPORTS*
- 27 Hands-on Doesn't Mean Brains-off** The new Frith Freshman Engineering Design Lab will challenge students to think while getting their hands dirty. *FROM STAFF REPORTS*
- 30 Club Page** Apply all that book knowledge, join an engineering club!
- 32 Letter From The Editor** Sports do include measurements, but measurements should not include sports.



On the Cover

Controlling the water's flow: All of us take dams for granted, but how do they really work? And are they causing more problems than they solve? Photo by Jason Gibbs.

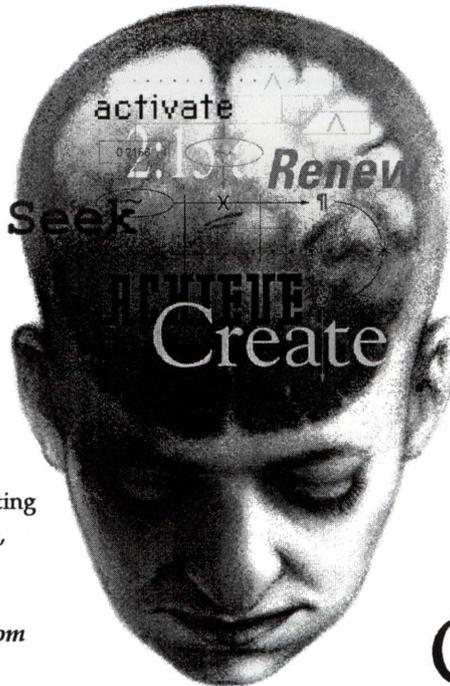
Open for business

It's your brain,
Incredibly malleable.
Infinitely versatile.
Awesomely inventive.

At Andersen Consulting, we want to keep it that way, So we challenge it with a stimulating variety of assignments. Develop it with an average of over 170 hours of advanced training per year. Reward it with advancement. And support it with the resources nearing 45,000 professionals operating across 47 countries. At Andersen Consulting, we always keep you in mind.

Please visit our web site at <http://www.ac.com>

Andersen Consulting is an Equal Opportunity Employer



For More information please visit us at:

Engineering Expo

Business Horizons

Our On-Campus Interview Schedule*

*Application deadline and interview schedule are available at your Campus Career Center!

ANDERSEN CONSULTING



**COMPUTER ENGINEERING • COMPUTER SCIENCE • CHEMICAL ENGINEERING
PHYSICS • ELECTRICAL ENGINEERING • MECHANICAL ENGINEERING • MATH**

Tⁿ

TAKE TECHNOLOGY TO THE NTH POWER.

When something is too extreme for words, it's to the Nth degree. And that's the level of technology you'll experience at Raytheon.

Raytheon has formed a new technological superpower—Raytheon Systems Company, composed of four major technological giants: Raytheon Electronic Systems, Raytheon E-Systems, Raytheon TI Systems and Hughes Aircraft. The new Raytheon Systems Company is driving technology to the limit. And we're looking for engineers who want to push the envelope. Break new ground. Make their mark.

At Raytheon you'll take technology—and your career—to the highest possible level. You'll take it to the Nth. Send or e-mail your resume today, or check out our website at www.rayjobs.com.

SEND YOUR RESUME TO: RAYTHEON COMPANY, ATTN: RESUME DEPT., P.O. BOX 660246, MAIL STOP 201, DALLAS, TX 75266, OR E-MAIL TO: RESUME@RAYJOBS.COM

U.S. citizenship may be required. We are an equal opportunity employer.

Raytheon
EXPECT GREAT THINGS

A Smorgasbord of Jobs

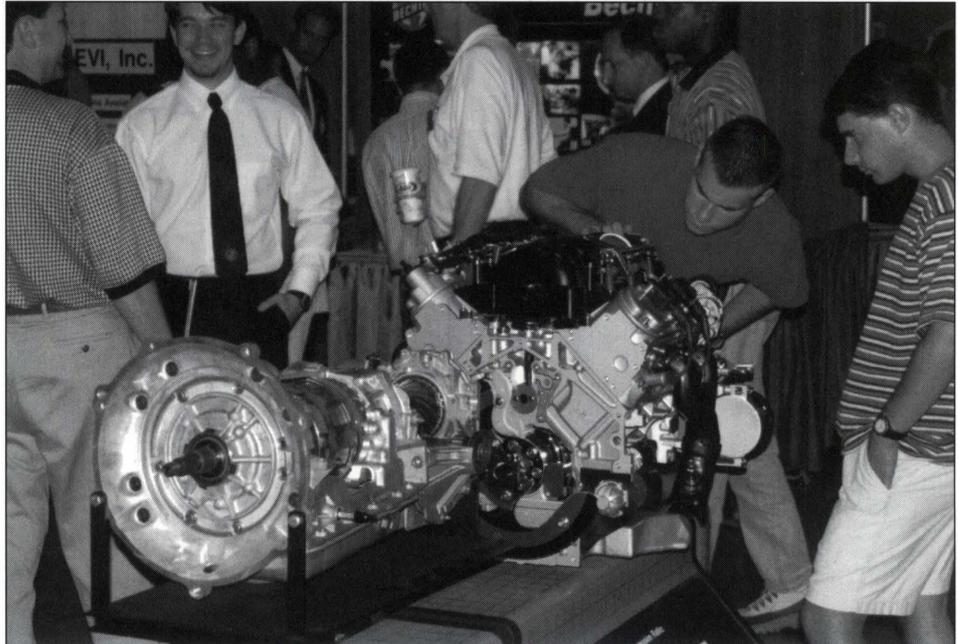
BY SHUVOM GHOSE

Are you looking for a job or internship in your major? Would knowing exactly which skills employers crave interest you? Do you want a truckload of free pens, frisbees, and mousepads with company logos on them? Then Engineering Expo '98 is for you!

The 19th annual career fair produced by the Student Engineer's Council, Engineering Expo '98 is the best chance for students to window-shop the engineering job market. On September 15th and 16th, rooms in both Squires and Owens will contain booths from over 200 businesses, each manned by representatives eagerly awaiting any questions or resumes students can throw at them. In attendance should be blue-chip engineering firms such as Lockheed Martin and National Semiconductor, government agencies like the U.S. Army Core of Engineers and the National Security Administration, and many other smaller companies.

Even if they are not hunting jobs, many students have gone to past Expos to find out what employers really look for in applicants, often to be surprised by the answers. While expected forerunners such as high QCA's and technical knowledge do make the top twenty on the list of most desired qualities, nearly all companies, even engineering-oriented ones, place the highest value on skills like emotional stability, the ability to relocate, and proficiency in working with other people.

Often, students have found out their



Photos by Mitch Hazam

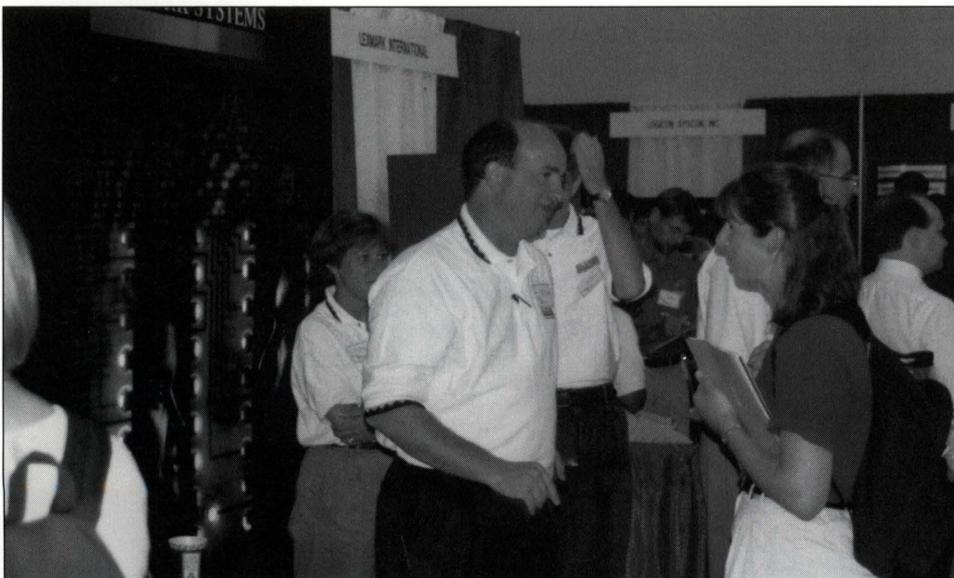
Students take interest in a technical display at last year's Expo.

dream job may reside at a company to which they had not even considered applying. For example, consider some random, arbitrarily-chosen major like aerospace engineering. Two years ago, AE's going to career fairs would have discovered that Lockheed Martin, one of the largest aeronautical companies in the world, had decided to accept applications from chemical engineers, computer engineers, electrical engineers and mechanical engineers only. On the flip side, the Central Intelligence Agency, a company not famous for hiring pocket-protector

types, was looking to employ aerospace engineers to determine the threat foreign ballistic missiles posed to the United States.

One final reason to attend Expo '98 is the opportunity to collect armloads of the free plastic chaff companies seem determined to give away to college students. Whether you crave a mousepad, a frisbee, or a badge that lights up in the dark, if it is plastic and can display a corporate logo, you can be sure someone in a booth will be giving it away. And after handing over the trinket, the person behind the desk may offer some advice which will increase your knowledge of the business world. Or he may even accept your resume, interview you the next day, and offer you the job which will become your endeavor for the next thirty years.

So will it be a frisbee, a further insight, or a future? The choice awaits at Engineering Expo '98. **EF**



Informal interaction with each other benefits both students and firms.

Locations: Squires Commonwealth Ballroom and Owens Banquet Hall
Times and Dates: 11-5 Tuesday, September 15th and 9-2 Wednesday, September 16th

For a list of the companies attending Expo, see page 13.

original thinkers

idea
with a focus
people
on the future

Want to change the world in a hurry? If discovery, momentum and a "make things happen" philosophy top your list of career "musts," we could be just the place for you.

For 40 years, W. L. Gore & Associates has been passionately committed to innovation, both in our products and in our workplace. From high performance fabrics like GORE-TEX® to synthetic blood vessels and surgical sutures, we create hundreds of standout products for the marketplaces of the world. In fact, our global technology teams file several hundred patents annually, putting us among the top 200 organizations worldwide. It's also safe to say that wherever you find Gore people, you'll find a committed workforce with real determination to discover and develop breakthrough products and get them to market quickly.

From process engineering to product development and manufacturing, we have technical opportunities for graduates who combine creative, highly original thinking with the kind of initiative that gets results.

Find out why our unique business philosophy has recently earned us the distinction of being ranked 7th among "The 100 Best Companies to Work for in America" and why so many people are looking at Gore.

If you are determined to do important work in a dynamic and supportive environment which encourages personal growth, send your resume to: **W. L. Gore & Associates, Code AGEN98VPB, P.O. Box 9206, Newark, DE 19714-9206; or FAX (302) 292-4156; or email employment@wlgore.com.**

a commitment to
create,
invent,
discover.



*Creative Technologies
Worldwide*

Virtual Corporation Produces Real Results

FROM STAFF REPORTS

Thirty-five Virginia Tech undergraduates, operating a virtual corporation they formed this year, have devised a way to shave \$1-\$2 million per mile off the costs of a rapid transit system, according to Krishnan Ramu, an adviser of the project.

The virtual corporation is the novel idea of Leonard Ferrari, electrical and computer engineering (ECpE) department head. He envisions the enrolled stu-

three of Virginia Tech's colleges, engineering, business, and arts and sciences, formed a virtual company, the Personal Electric Rapid Transit System (PERTS). Similar to a Fortune 500 company, PERTS divided itself into three main divisions: High Speed Ground Transit (HSGT), Rapid Cargo Transit (RCT), and National Park Transit (NPT).

Their goal was to prepare a feasibility study and develop a prototype of a personal rapid transit system that would combine the efficiency of mass transit with the flexibility of a personal automobile.

tem and will provide the technology needed to allow the vehicle to exit the track for driving on local roads.

Maglev vehicles are magnetically levitated and propelled, riding on a cushion of air, powered by electricity and magnets at speeds that can exceed 300 mph.

Maglev also can be used for cargo transportation at major ports, shipping terminals, and airports. However, the NPT division of PERTS determined that due to economic constraints, a transit system is not suitable for all national parks.

Ramu says the magnetic propulsion system devised by the students reflects a 30 percent reduction in costs over the current propulsion system on the market. The saving is derived from the simpler

Students designed and tested a magnetic propulsion system that undercut the cost of today's technology by a third.

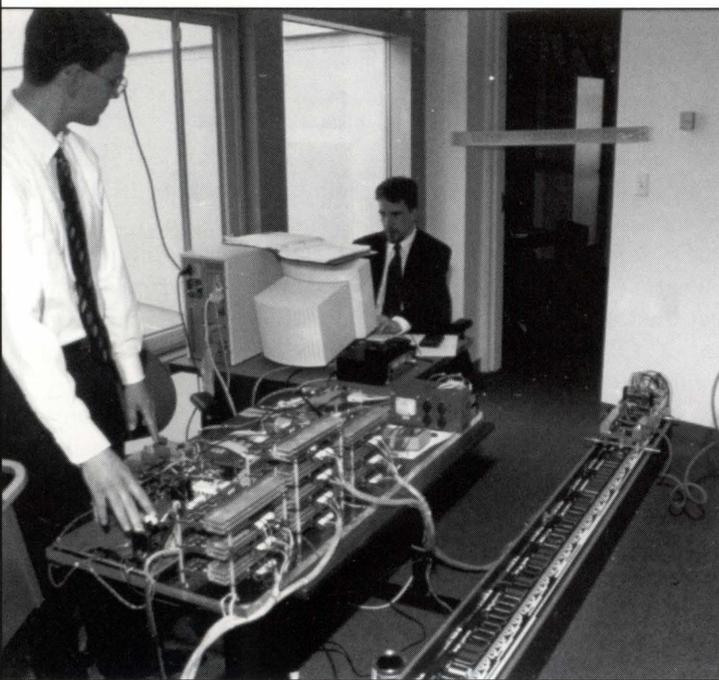
The system would also be adaptable for conveyor systems, replacing belt-driven tracks used in various types of manufacturing assemblies.

"We want the undergraduate students to think globally, to find out what it is like to work in the real world. And we want them to solve an economic development concern for Virginia," Ramu, an ECpE faculty member, says.

The students designed and built a working prototype of a track and an electrically propelled vehicle. Phase II of the project will build levitation into the sys-

structure and construction of magnetic laminations and windings. The proposed system also has a higher reliability compared to other forms of propulsion systems.

An expert in motion control systems, Ramu explains that magnetic levitation and propulsion system may cost \$20 to \$40 million per mile, depending on the design and specifications. Typically, the infrastructure costs are 60 to 70 percent of the total cost and the remaining 20 to 30 percent accounts for the electronics, controls, and machines. With the students' design, the infrastructure costs would remain the same, but the electrical engineering costs would be reduced by six to seven percent of the total resulting



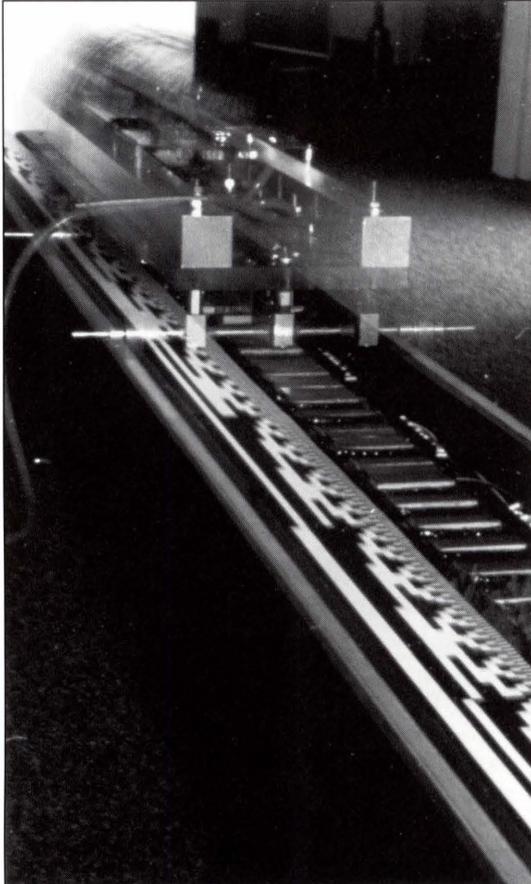
Photos by Rick Griffiths

Testing a small-scale prototype.

dents as going beyond the conventional student project experience. In the virtual corporation, the aspiring professionals from various disciplines at the university will work together as would a team in a corporation, and they must develop commercially viable products or technologies. No other engineering college in the country offers a similar program.

During this first year, students from

"Most magnetic levitation systems lose about 40 percent of their energy in the air. However, with our LSRM....There is almost no energy leakage,"



This electrically-propelled prototype is the predecessor to a true maglev train.

in a saving of about a \$1.2 to \$2.4 million dollars per mile.

The technology the students developed is proprietary. The prototype of the electric propulsion system is 20-foot long and microprocessor-controlled. The key to its success is they used a linear switched reluctance motor (LSRM). "Most magnetic levitation systems lose about 40 percent of their energy in the air. However, with our LSRM, that loss is at a minimum....There is almost no energy leakage," the students wrote in their final report.

A switched reluctance motor (SRM) has the ability for high speed switching as a vehicle is propelled down a track. The SRM also allows for the easy replacement of individual coils which contain the current that produces the magnetic field that propels the vehicle.

The linear part of the motor comes from the students' redesign of a round or rotary SRM. Essentially, they sliced the rotary arm radially and opened it, making the linear shape.

The students also used the patented fiber optic system of ECpE faculty member Kent Murphy to implement fiber optic sensors into their design. These sensors identify position data from the code strip on the rapid transit track.

The business students who were members of PERTS were advised by Ruth Ann Smith, a marketing profes-

sor. They formed teams for publicity, advertising, and promotions. The undergraduates also developed plans to host a conference on RCT with a goal of assisting the Norfolk harbor area to become the leading seaport on the Eastern shore.

Other Tech faculty who are associated with the project are: G.Q. Lu of materials science and engineering and Jan Bohn and Doug Nelson of mechanical engineering.

Shana Hawkins, the vice president of administration for the Virtual Corporation, claims her involvement in this project has been "the most rewarding, most satisfying academic pursuit" she's taken on "because of the diversity of the people involved." She plans to continue with PERTS next year as she enters the MBA program.

In Virginia, a consortium of industries, including Lockheed, Virginia Power, and American Maglev Technologies, is considering a maglev project in southwest Virginia. If it is agreed upon, the project would represent America's first full-scale maglev undertaking.

Ferrari is convinced the students in PERTS and other evolving virtual corporations will "help industry solve their short term design problems". He also hopes that industrial money will fund these virtual corporations. **EF**



TIMMONS

Founded
1953

Engineers • Surveyors • Planners • Landscape Architects • Construction Managers
Environmental Scientists • Geographic Information Systems Consultants •

**Your Professional Growth is Important to Us.
Opportunities for civil engineers,
scientists and planners.**

For career opportunities, send your resume to Diane Wood, HR Manager
711 N. Courthouse Road, Richmond, VA 23236
(804) 794-3500 FAX (804) 794-7639 www.timmons.com

The Cutting Edge in Technology & Career Opportunities

AVX Corporation is a leading global manufacturer of multilayer ceramic, tantalum and specialty capacitors. We have these positions now available at our Myrtle Beach, South Carolina headquarters:

ENGINEERING OPPORTUNITIES

Send your resume or letter of interest in confidence to:
**Denny Overfield, Corporate Human Resources,
AVX Corporation
P.O. Box 867, Myrtle Beach SC 29578**

For more information on these and other positions available see our web site on-line at: AVXCORP.COM

AVX CORPORATION

A KYOCERA GROUP COMPANY

equal opportunity employer m/f/d/v

Field Engineers & Internet Site Administrators

So far in 1998, the techs in our lab have configured and tested 25 different firewall products, 40 anti-virus products, 20 crypto products, and 10 VPNs. We have tested over 50 sites for security practices. We track vulnerabilities, develop tools for Internet use and are in a continuous learning mode.



INTERNATIONAL
COMPUTER SECURITY
ASSOCIATION

If you like to play, make things break, take things apart, put them back together, see what makes them tick; and can occasionally write articles and speak at conferences; we'd like to talk with you about joining our team. We are looking for people with experience in various flavors of UNIX and MS OSs, as well as C, Java and other programming languages to help expand our testing capabilities. TCP/IP networking knowledge is a must. Interest in working with standards bodies such as IETF and ITSEC is a definite worthwhile plus.

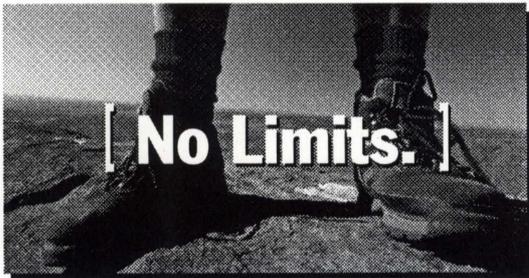
For those who enjoy travel, ICSA also has opportunities for you. Join our team and travel throughout the US, Europe and Asia.

We offer an excellent benefit and compensation package. Openings in DC, MA, GA, CA, IL and PA. For your confidential consideration, please forward your resume to:

**International Computer Security Association (ICSA)
Headquarters · 1200 Walnut Bottom Road, Carlisle, PA
17013-7635 or fax 717/243/8642 or E-mail:
donk@icsa.net**

www.icsa.net

E.O.E.



Schlumberger stands alone at the top
of the technology world.

Because we hire people with the confidence
and ability to challenge the status quo.

If you want a career with no limits,
step into a company that knows none.

We'll give you a chance to
stand on your own two feet.

www.ultimatejob.com

Schlumberger

An Equal Opportunity Employer.

Marconi Web Site

File Edit View Go Favorites Help

Address: <http://www.gec-marconi.com>

WE'RE UNDER CONSTRUCTION!

NEW NAME!! NEW PHILOSOPHY!!!



Marconi North America is a new entity that combines the resources of Tracor, one of America's fastest growing defense companies, and GEC-Marconi, one of the world's largest defense companies. Our goal is to create a level of unparalleled excellence both with our customers and our employees.

By developing leading edge communications systems, weapons & missile systems, imagery systems, and information systems solutions for our customers, we feel that we are well primed to be the government contractor, and employer, of choice going into the 21st Century. We want YOU to join us in this effort.

At over 150 locations nationwide, Marconi is always looking for bright, new talent in the following disciplines:

- Electrical Engineering
- Mechanical Engineering
- Computer Science
- Math/Physics
- Computer Engineering
- Information Systems
- Business/Finance.....

And many more!

To learn more about our many exciting opportunities, please be sure to visit us when we are on campus, or send your resume to:

**Marconi College Relations
1601 Research Boulevard,
Rockville, MD 20850
Fax: (301) 838-6303; E-Mail:
hrtasi@tst.tracor.com**

Applicants selected will be subject to a security investigation & must meet eligibility requirements for access to classified information. Marconi is an equal opportunity employer, m/f/d/v.

A Twist of Fate

The Chancy Art of Predicting Tornadoes

BY CHRIS THAISS

Imagine for just a moment that you are outside on a warm summer day, listening to the ballgame, while the barbecue is slowly cooking lunch. All of a sudden, the sky darkens and winds begin to gust, nearly blowing you out of your hammock. While you are thinking that your barbecue will be ruined because of the imminent rain, you see off in the distance a cloud stretching from the dark sheet above your head to the ground. Who cares about the rain ruining the barbecue, the entire house might be ripped off its foundation! Remembering the local news and its tornado safety tips, you go down to the basement, one of the safest places in a house. As the tornado gets closer, you begin to hear what sounds like a locomotive bearing down on your house. You begin to sweat knowing that anytime now your house might collapse, leaving you trapped inside. The sound is getting louder, and louder, and louder...CRASH! The windows just exploded because of the low pressure outside created by the vortex of the tornado! Wind fills the basement, papers and debris from the outside fly past you. You hold on for dear life. Then it all stops. The tornado has passed, and all that remains of the tornado is the sound fading into the distance.

This story, a very real one, happens every year to thousands of people. Sadly, it does not always turn out as this story did, as is the case with the tornado that touched down in the suburbs of Birmingham, Alabama, earlier this year, where 41 people were killed. The tornado that struck Birmingham packed 250 mph winds, an F4 on the Fujita Wind Damage Scale, strong enough to lift a pickup truck and throw it 100 yards. Because we live in the '90's, tornado forecasting has turned from crude science into an art, so the people of Alabama had time to get ready for the tornado. However, this was not the case in the early 1940's when the only

"It does feel good to spot one, but....All the warnings in the world will not bring back someone's home once it is hit."

forecast for a tornado was a phone call from the actual point of touch down. On March 25, 1948, this all changed when two men, Colonel Robert C. Miller and Major Ernest J. Fawbush, correctly forecasted that the atmospheric conditions were ripe for tornadoes in the vicinity of Tinker AFB, Oklahoma, heralding the beginning of tornado forecasting. The base had been hit by a tornado just four days prior, and the brilliant meteorologists were amazed to see that the weather pattern that day was exactly the same as it had been when the tornado hit four days previously. They called in Major General Fred S. Borum, who alerted the ground personnel on the base and the rest is history. The device used to view the storm up to 100 miles away was an older AN-PQ-13 radar that was used as a bomb-aiming radar on B-29 bombers during World War II. This was 50 years ago, but what do we have now to warn us of upcoming storms and the high winds that they produce?

The main advance in the prediction of tornadoes is Doppler radar. It has the ability to substantially increase the time from a tornado's first detection to when it actually hits an area, improves the measurement of damaging winds, turbulence and wind shear associated with causing numerous plane crashes, and it increases the accuracy of identifying areas that may be threatened by the storm. The radar itself works by bouncing an electromagnetic signal off of an object and measuring the time that it takes for the signal to return. The objects, in the case of meteorology, are particles of ice, water or dust in the atmosphere. Doppler radar also measures the change in frequency related to the speed of an object in relation to a point. Doppler, therefore, gives very accurate calculations when it comes to the size, intensity, speed and direction of a thunderstorm. By measuring wind patterns, Doppler radar can detect a tornado



Inset: After enlargement and digital enhancement, the tornado becomes much more visible.



Not all tornadoes are easy to see—clouds and rain can often hide them. The picture above shows one such storm. Though it's hard to see, a tornado is located inside the white circle.

Fujita Wind Damage Scale

F0	40-72 mph	<i>Some damage to chimneys and signs, branches break off, shallow-rooted trees pushed over.</i>
F1	73-112 mph	<i>Surfaces peeled off roofs, mobile homes overturned, automobiles pushed off road.</i>
F2	113-157 mph	<i>Roofs torn from frame houses, mobile homes demolished, large trees uprooted.</i>
F3	158-206 mph	<i>Roofs and some walls torn off well-built houses, trains overturned, most trees uprooted, heavy cars lifted off ground and thrown.</i>
F4	207-260 mph	<i>Well-built houses leveled, structures with weak foundation blown some distance, cars thrown and large missiles generated.</i>
F5	261-318 mph	<i>Strong frame houses lifted off foundations and disintegrated, debris carried considerable distances, automobile-sized missiles (debris) fly through air in excess of 300 feet, trees debarked.</i>

forming miles above the Earth's surface, giving plenty of time for preparation against high winds. By the mid-1990's in a joint effort by the Federal Aviation Administration, Department of Defense and the National Weather Service, 164 radars have been installed throughout the United States. This network of weather tracking radars will greatly increase the time to prepare for severe thunderstorms that produce tornadoes throughout the country. Doppler has its plusses, but sometimes the radar system is unable to detect the presence of a tornado. This is the reason that the National Weather Service has SKYWARN, a collection of weather spotting groups from around the country, to spot severe weather and tornadoes when Doppler can't see it.

SKYWARN is entirely staffed by volunteers who have a passion for storms. Chris Knauer, a SKYWARN volunteer of six years, relates some of the reasons that he joined the team: "I used to live in the Midwest (Indiana, Michigan) and went through many tornado watches and warnings as a kid. When I got my amateur radio ticket back in the late eighties, SKYWARN was one of the more organized functions that occurred in ham radio – and

still is to this day. It serves a real purpose to the community and keeps up the awareness of amateur radio."

He says that the best part of his job is "getting in the truck, turning on the GPS scanner and going on the road (better when paved)." Although Chris says it does feel good to spot a tornado and report it to the authorities, he adds, "But at the same time it is tempered with the fact that property and lives are endangered by these systems. All the warnings in the world will not bring back someone's home once it is hit."

SKYWARN works closely with their own communities to spot and relay information about approaching tornadoes to the National Weather Service, for the issuing of tornado warnings via television and radio.

With all of the technology that has been developed to detect and notify people of upcoming tornadoes, there is still an extraordinary amount of deaths that occur at the hand of the tornado. This just goes to show that without training people in the proper procedures to survive a tornado, there will still be death related to mother nature's most violent wind storm—the tornado. **EF**

Tornado Sizes

Weak Tornadoes

- 69% of all tornadoes
- Less than 5% of tornado deaths
- Lifetime of 1-10 minutes
- Wind speed < 110 mph

Strong Tornadoes

- 29% of all tornadoes
- About 30% of all tornado deaths
- Lifetime can exceed 20 minutes
- Wind speed 110-205 mph

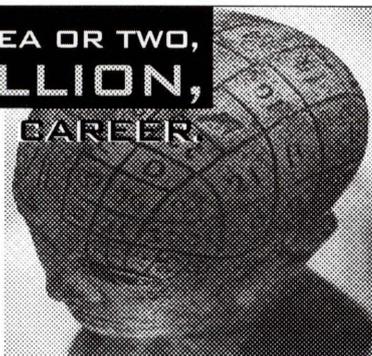
Violent Tornadoes

- Only 2% of all tornadoes
- 70% of all tornado deaths
- Lifetime can exceed 1 hour
- Wind speed > 205 mph

COURTESY OF THE NATIONAL WEATHER SERVICE

**YOU HAVE AN IDEA OR TWO,
OR A MILLION,
ABOUT YOUR CAREER.**

**Explore
every one.**



What if an international powerhouse fostered a "whole brain" approach to IT consulting, services and engineering? Think of the ideas that could be explored and the advancements that could be made across public and private sectors...in enterprise networking, EDI, data fusion, intelligence database design, and beyond, especially definitive web-based solutions (site development, applications, electronic commerce, etc.). With your intelligence, it's not difficult to realize that BTG is doing all this and more. We're also hiring. Come explore opportunities in the following areas:

- Systems Engineering
- Software Development
- Project Management
- Network Engineering
- Oracle Development
- UNIX/NT Systems Administration
- Internet Development

We offer competitive salaries and an excellent benefits package. Interested candidates, please forward your resume to: **BTG, Inc., Attn: Human Resources, 3877 Fairfax Ridge Road, 1G, Fairfax, VA 22030. FAX: (703) 383-4090. EOE, M/F/D/V.**

To learn more about BTG and current employment opportunities, please visit us online at:

www.btg.com

BTG
Forward Thinking



EMPLOYMENT OPPORTUNITIES TECHNOLOGY SERVICE CORPORATION

Technologies Services Corporation (TSC) Washington Operations has openings in our Silver Spring, MD and Dahlgren, VA offices for exceptional new/recent graduates with BS, MS, or PhD Degrees in Electrical Engineering, Physics or Mathematics.

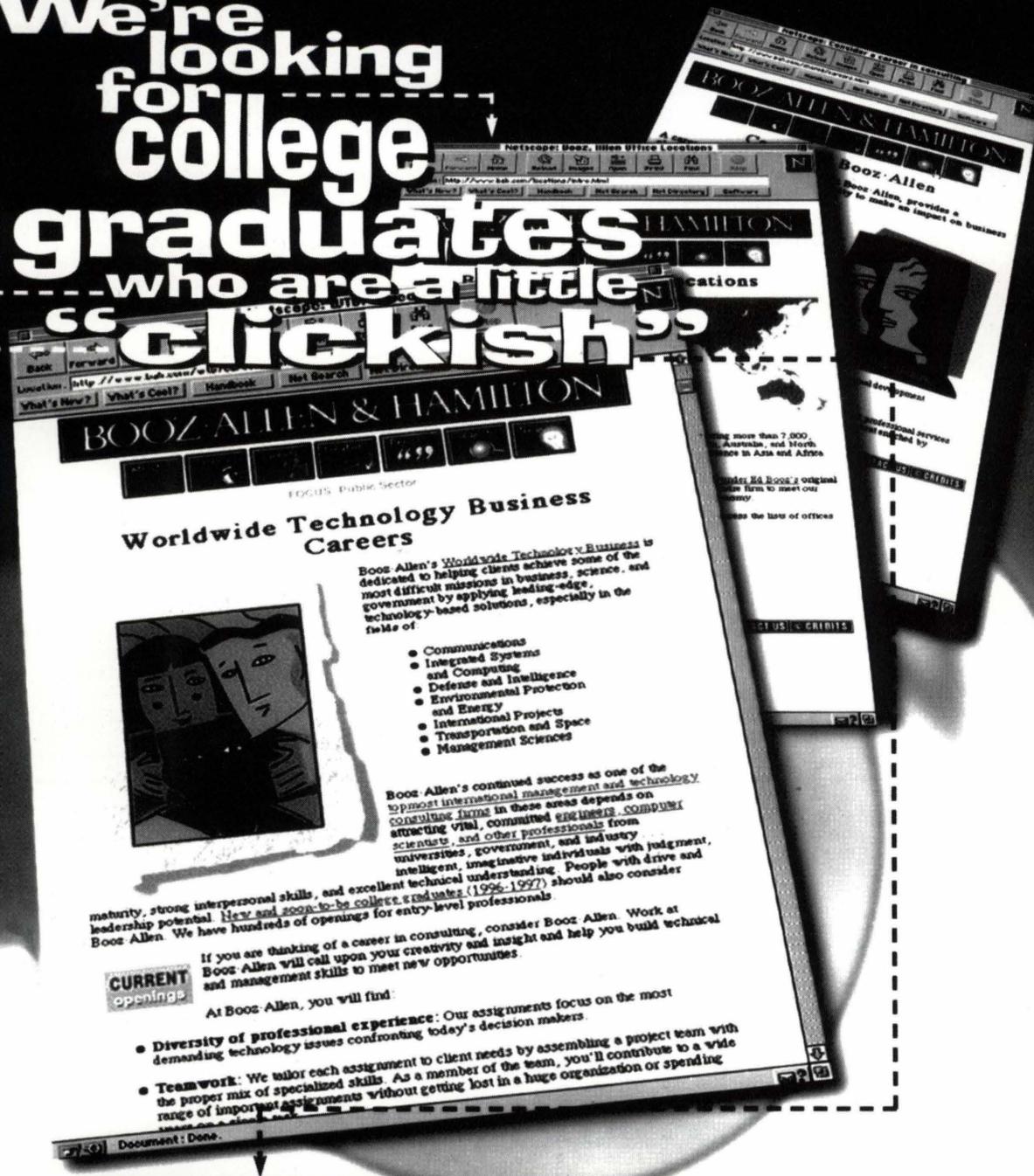
TSC is an Employee-Owned high technology systems engineering company providing research and development on next generation radar, communications and combat systems. Our major Washington Operations programs include assisting the US Navy in development of state-of-the-art phased array radar systems for Aegis Cruisers and Destroyers, and providing the Federal Aviation Agency with surveillance radar technical assistance.

TSC offers highly professional work environment, a competitive salary structure, and a comprehensive benefits package. United States Citizenship is required. Applicants should forward their resumes, indicating the preferred work location (Silver Springs or Dahlgren) to:

**Technology Service Corporation
962 Wayne Avenue #800
Silver Springs, MD 20910
Attn: L. Grieco**

An Equal Opportunity Employer

We're
looking
for
college
graduates
who are a little
"clickish"



Enter and click here: www.bah.com/wtb/careers.html

At Booz-Allen & Hamilton, we have a suggested homework assignment for you. It's easy. It involves exploring our exciting and dynamic Web Site! You'll click here and there, all the while learning about our opportunities to join a rather special group—the Booz-Allen & Hamilton consulting team.

You'll discover that we take on the world's most intriguing challenges as an international management and technology consulting firm. In addition, we focus on something equally compelling: fully preparing and

supporting those candidates who wish to join us...who wish to go beyond traditional consulting horizons.

OPPORTUNITIES IN TECHNOLOGY CONSULTING

Booz-Allen & Hamilton consultants enjoy a wide forum for their technical skills, creative abilities and entrepreneurial drive. They enjoy personal independence and high visibility, exercising their talents in a wide range of areas—information technology,

telecommunications, defense & national security, transportation, environment & energy— for business, industry and government.

If you have an undergraduate or advanced degree in a technical field, plus a keen interest in any of the areas mentioned above, please contact us, Attn: Dept. 9312/MM; E-mail: wtbresume@bah.com (ASCII text); FAX: 703-902-3063; Mail: Booz-Allen & Hamilton, 8283 Greensboro Drive, McLean, VA 22102. Equal Opportunity Employer.

BOOZ·ALLEN & HAMILTON

Achieve SUCCESS

DCS Corporation is an engineering services company committed to delivering value-added technical expertise to solve our customers' complex needs. We are seeking **Virginia Tech** candidates with a desire to establish an exciting and successful career in engineering and technical services using the latest technologies. Positions available in our Alexandria, VA and Lexington Park, MD locations.

We invite individuals with technical talent in:

- Electrical Engineering
- Aerospace Engineering
- Computer Engineering

to learn more about our exciting internship and professional career opportunities!!!!



1330 Braddock Place
Alexandria, VA 22314
www.dscorp.com
EOE

CAREER OPPORTUNITIES

Lambda Electronics Inc. is an international leader in the power supply industry. Our products provide a diverse array of power solutions for an ever-changing electronics marketplace. If you are highly motivated, possess an above average GPA and are seeking a rewarding career, then we would like to talk with you about the following opportunities:

We offer a comprehensive compensation and benefits package including a highly competitive salary, life, medical and dental insurance plans, 401(k)/retirement savings plans and tuition assistance. Mail, fax or e-mail your resume to:

- **Electrical Design Engineers (Analog Circuitry)**
- **PCB Designers**
- **Mechanical Engineers**
- **Associate Engineers**

Lambda Electronics Inc., Dept. VPI, 515 Broad Hollow Road, Melville, NY 11747-3700. Fax 516-752-2603. e-mail: careers@lambda.com. EOE M/F/D/V.



See us on campus
or visit us on the Web
at www.lambda.com

Manufacturer of instruments and distributed control systems for the process industries and dimensional controls for the manufacturing industries. The main office and plant is located in Spring House, Pennsylvania, a suburb of Philadelphia. There are 30 district and regional offices in major U.S. cities plus subsidiaries in Canada, England, The Netherlands, and Mexico. Total U.S. employment is 1000. Industries served include chemical, petroleum refining, petrochemical, pharmaceutical, pulp & paper, and metals. Diversified on-the-job training plus formal classroom instruction in process control theory and application. Moore Products Co. enjoys the reputation in industry for innovative, top quality products and highly competitive personnel.

We have openings for the following positions:

Development Engineers, hardware and software

Project Engineers, design and configuration



MOORE PRODUCTS CO. Spring House, PA 19477
Tel: 215-646-7400 Fax: 215-283-6358

Diversity

Successful teams are able to unify diverse talents. As a Fortune 500 company, YORK International's



is the
strength
of our
team.

success in heating, ventilation, air-conditioning and refrigeration is directly due to the diverse talents and outstanding teamwork of our 21,000 worldwide employees. Our team tackles the most critical air-conditioning jobs on Earth. Our diversity makes us your air-conditioning team for the 21st century.



AAI Corporation
ACX
Adroit Systems, Inc.
AK Steel
Albamarle Corporation
Alcatel
Allied Signal
American Electric Power
American Express
American Management Systems
Andersen Consulting
Annapolis Micro Systems, Inc.

EG & G Services
EIS Systems
Entergy
E-OIR Measurements Inc.
Ericsson Inc.
Ernst & Young LLP
EVI, Incorporated
Exigent International Inc.
Exxon
Facility Engineering Associates,
P.C.
Federal Bureau of Investigation

Lockheed Martin Corp.
Logicon Syscon Inc.
Lord Corporation
Lucent Technologies
Lutron Electronics
M.C. Dean, Inc.
M/A - COM
MacroSonix Corp.
Makino Machine Tool Co.
Malcolm Pirnie Inc.
Manhattan Associates
Mantech Test Systems

Scientific-Atlanta
Sensys Technologies Inc.
Siecor
Space Applications Corp.
Sprint PCS
Square D Company
SRA International, Inc.
State Corporation Commission
Stebe Environmental Controls
Stowe Woodward
Strategic Technologies, Inc.
Swales Aerospace
Systems Management Inc.
Tektronix, Inc.
Tenneco Packaging
Texaco Inc.
Texas Instruments, Inc.
The Boeing Company
The Goodyear Tire & Rubber
Company

Companies Attending Expo '98

ARINC
Armstrong World Industries, Inc.
Arthur Andersen LLP
AT&T
AT&T Solutions
AverStar Company
Avtec Systems Inc.
AVX Corp.
Bayer Corporation
Bechtel
Bell Atlantic
Booz Allen & Hamilton, Inc.
British Telecom North America
BTG, Inc.
Business Data Services, Inc.
Business Impact Systems
CACI
Cadence Design Systems
Capital One
Celanese
Central Intelligence Agency
Cianbro Corporation
Cintas Uniforms
Circuit City Stores, Inc.
CommScope
Compucom
Computer Sciences Corp.
Comsat Labs
Cryovac Division—Sealed Air
CSC Consulting
Cummins Engine Co., Inc.
DCS Corporation
Deloitte & Touche Consulting
Delta Airport Consultants, Inc.
Des Champs Laboratories, Inc.
Dewberry & Davis
Diebold, Inc.
Digex Inc.
Digital System Resources
Dominion Semiconductor
DSC Communications
Duke Engineering & Services
DuPont
DynCorp
Eastern Research Group

Framatome Technologies
Frito-Lay, Inc.
Ford Motor Company
GEC Marconi Hazeltine
General Electric Co.
General Motors
Grayson Wireless
Greenhorne & O'Mara, Inc.
GTE
GTE Data Services
GTE Internetworking
Harris Corporation
Hayes, Seay, Mattern & Mattern,
Inc. (HSMM, Inc.)
Hekimian Laboratories
High Performance Technologies,
Inc.
Hitachi Telecom (USA) Inc.
Honeywell Mx DMC
Hughes Network Systems
Hyperion Software
IBM Corporation
ICF Kaiser International Inc.
ICI Americas Inc.
IMAKE Software & Services
Industrial Systems Associates,
Inc.
Ingersoll-Rand
INRI, Inc.
Institute of Textile Technology
Intel Corporation
International Paper
International Rectifier
J & L Specialty Steel Corp
J. A. Jones Construction
JHU Applied Physics Lab
JMT (Johnson, Mirmiran &
Thompson)
Kenan Systems Corportion
Kiewit Construction Company
Kimberly-Clark Corporation
Kurt Salmon Associates
Lambda Electronics Inc.
Lexmark International
Litton PRC

Manugistics
Marconi
Martin Marietta Materials
McDonough Bolyard Peck
Merck & Co., Inc.
Michael Baker Jr., Inc.
Michelin North America
Microsoft Corp.
Milliken & Company
Mitrotek Systems
Mitsubishi Semiconductor
MLJ, Inc.
Mobil Corporation
Motion Control Systems, Inc.
Motorola
Motorola - SP5
MRJ Technology Solutions
National Instruments
National Security Agency
National Semiconductor
National Starch & Chemical Co.
Naval Career Management Site
Naval Research Laboratory
Naval Surface Warfare Center
New Holland Inc.
Newport News Shipbuilding
Nichols Advanced Marine
Nortel (Northern Telecom)
Northrop Grumman Corp
Parker Hannifin, Compumotor
Div
PBS&J
Platinum Technology
Plexus Technology Group
Price Waterhouse
Price Waterhouse Coopers
Qualcomm, Inc.
Radian International LLC
Raytheon Systems Company
Regent Lighting Corp.
Rexroth - Star Linear Systems
RWD Technologies, Inc.
Schlumberger Technologies
Science Applications
International Corporation

The Summit Group
The Vanguard Group
The Whiting-Turner Contracting
Co.
Thompson & Litton
Tidewater Construction
Torrington
Transaction Network Services,
Inc.
Tridium
Trilogy
TRW Systems & Information
Technology Group
TTC (Telecommunications
Techniques Corp.)
U. S. Navy Officer Programs
U. S. Nuclear Regulatory
Commission
Underwriters Laboratories, Inc.
Uniden San Diego
Unimast Inc.
Union Camp
Unisys Corp.
United States Air Force
United States Marine Corps
United Technologies - Pratt &
Whitney
US Army Medical Department
US Army Recruiting
USG Corporation
Veridian (Veda Inc.)
Viasystems
VSE Corporation
Westinghouse Electric Company
Westinghouse Power Generation
Westvaco Corporation
White Oak Semiconductor
WL Gore
York International Corporation

*For a description of the
Engineering Expo, see
page 3.*

ENGINEERING DAM-AGE

BY SHUVOM GHOSE

Floods have always been bad news. In ancient times, they came without warning and destroyed without restraint. Now, though we purport to know the true causes and habits of floods, we are not always more successful at containing their wrath than our predecessors. When the Mississippi River, the most monitored and controlled river in the world, began to surge over its banks in the summer of 1993, nearly 1400 dams and levees stood in its way to protect the people of the Midwest from flooding. Nonetheless, the Great Flood inundated over 10,300 square miles of previously dry land and caused \$18.1

One of the most often used solutions against floods is the dam. While the basic concept behind one seems simple enough, building a dam consists of more than pouring dirt and concrete in front of a river.

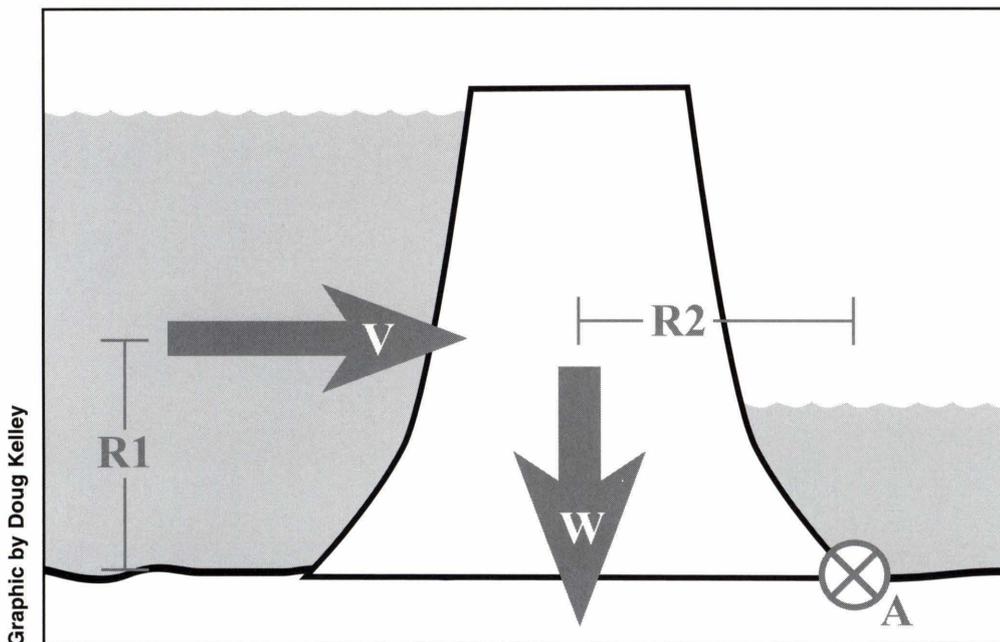
There are two basic types of dams: the earthfill and the concrete gravity. Earthfill dams are usually trapezoidal in shape and made of one material that is permeable to water and one that is not. They work under a simple principal: the impermeable layer keeps the water from soaking through and washing away the porous layer, while the porous layer provides a cheaper way to support the load of the water than making

governed by the delicate balance struck between the moments around the downstream toe of the dam. (See Fig. 1.) Backed-up water creates a torque around point **A** by pushing against the dam with a force (**V**) and a moment arm starting below the waterline and descending vertically to ground level (**r-1**). Engineers counter that torque and stabilize the dam by relying on the dam's own weight **W** and a moment arm reaching horizontally from its center-of-mass to the downstream toe (**r-2**). Since water weighs 62.5 pounds per cubic foot and concrete weighs 150, the dam usually wins the battle. Concrete gravity dams can be expensive, complicated to construct, and utterly awe-inspiring. The Grand Coulee Dam, located 28 miles northeast of Coulee City, Washington, stretches 550 ft from top to bottom, 5,223 ft from side to side, and contains 11,975,520 cubic yards of concrete, enough to fill a football field 1.36 miles high.

One feature common to both types of dams is the outlet structure. Says Dr. David Kibler of the Civil Engineering department, "In addition to the core and the embankment slopes of the structure itself, the most important part from my standpoint would be the outlet structures, which really protect the dam and at the same time, allow it to satisfy its function."

"The first outlet is the principal spillway," Kibler continues. "And that's what lets the water out of the dam for everyday needs, like water supply downstream, or navigation downstream, or irrigation needs."

Principal spillways vary in size just as dams do. The Summersville dam on the Gauley river, a popular location for Virginia Tech rafting trips, has a main outlet consisting of four tubes each capable of delivering 1000 cubic feet of water per second, while the Grand Coulee dam's service spillway can move one million. Though the principal spillways are considerable in



Graphic by Doug Kelley

Figure 1: How the force of the water, *V*, and the dam's own weight, *W*, act on a concrete gravity dam.

billion in damages, making it the second largest natural disaster in American history. Even though that amount of destruction staggers the imagination, the final count would have been much higher if humans had not used all the engineering at their disposal to fight the rising water.

the whole dam impermeable. Earthfill dams are a relatively cheap and easy way to hold back small amounts of water, which is why they are the most prevalent design.

Concrete gravity dams, however, are where the engineering mechanics get applied. These dams of solid concrete are

size, they may not be able to pass enough water through the dam in times of crisis.

“That’s where the emergency spillway comes in,” Kibler says. “That’s the second outlet type. The emergency outlet up on top of the dam only activates when you’ve got really severe flooding. It’s designed usually to activate maybe once every twenty-five years, or once every fifty-years, or in some cases, once every one hundred

they start to expand? Some gravity dams have heated intake gates, to prevent ice from forming against them. Could an earthquake move the dam downward or downstream relative to the stagnant water, and unbalance the moment equation? The Grand Coulee is designed to withstand a peak acceleration of 0.19 times the force of gravity.

To make sure none of these failure

organizations would obviously not take deliberate steps to endanger people, this subject is kin to a question long-debated in the hydrological world. Namely, do big dams and far-reaching levees stifle floods, or actually increase their destructiveness? Sure, dams and levees provide the obvious solution: putting a solid structure between people and the water. Yet, if two cylindrical glasses, one having a smaller base than

IF THE IMAGE OF A TWO OR THREE STORY HIGH WALL OF WATER BARRELING DOWNSTREAM ISN'T TERRIFYING ENOUGH, IMAGINE IF THE DAM CAME WITH IT.

years. You can think of that emergency structure as kind of a notch way up close to the top of the dam, and that notch, if it’s wide enough and deep enough, will pass the so-called design flood without overtopping the crest of the structure.”

Overtopping can spell death for an earthfill dam. “If it’s an earthfill structure, overtopping is the main failure mode. The water goes over the top and peels away from the backside the soil and the grass liner, whatever there is there, and just tears it up from the back side. Once the breach opens, it just eats its way down through from the top. So then you lose the whole dam and the contents.”

For gravity dams, the failure modes are no less spectacular. The most obvious way for one to fail is by overturning, where the sum of the moments trying to rotate the dam becomes larger than the moment due to the weight, and the structure tips over.

If the image of a two or three story high wall of water barreling downstream isn’t terrifying enough, imagine if the dam came with it. Kibler says, “There’s also the possibility that the gravity dam, the concrete dam, can be pushed downstream. I’ve never seen that happen, but we look at sliding resistance also.” Just to quiet some pounding hearts, engineers usually design gravity dams where sliding would entail a loss of life to have a factor of safety of 4 under normal conditions, and 1.5 under extreme conditions. Perhaps that wasn’t as reassuring as intended.

Along with these concerns, design engineers also look at a whole range of possible threats to their structure. Could ice sheets build up on the stagnant water behind the dam, and then push the dam over when

modes happen, all major dams are monitored 24 hours a day, from an operation control center right at the structure. “And every major dam will have a dam tender, so to speak, who lives right at the site of the dam,” Kibler adds. “If it’s an Army Core of Engineers dam for flood control, major navigation control, that sort of thing, there will be somebody maintaining, tending, watching the dam who lives practically on top of the dam. The army core does this deliberately, so that the individual respon-

the other, are placed under identical flows of water, which will fill up faster, and which needs to be higher to contain the same amount of water? Since 1851, some engineers have theorized that, by restricted the Mississippi River to a smaller area by levees and dams, flood control engineering has actually caused more damaging floods. Since the water must go *somewhere*, each new levee necessitates that stronger and higher ones be built downstream.

For these reasons, many have proposed



Photos by Jason Gibbs

Carter D. Martin Memorial Dam as reconstructed in 1996.

sible is immediately at hand. And those people do have a vested interest, they really do.” Note that it is not *official* Army Core of Engineers policy to put the dam tender’s house in the direct downstream path of a dam breach to increase their level of vested interest.

While the Core or other dam-building

the whole philosophy of flood control be revised. “What we’ve got to do,” Kibler says, “Is do a better job of controlling floods in the areas where they occur. In other words, we’ve got to go into the headwater areas, upstream, and try to control the releases at the upstream points, rather than wait till the water concentrates in the

main channel.” Another way to reduce the power of floods is to improve the way we use land. Natural forests absorb the most water per acre, cultivated land the second most, and paved, urban areas close to zero. “Urbanization is the biggest cause of flooding that we have, outside of ungodly rainfalls,” Kibler states. “A real good example of that situation is right here on campus. The Drillfield is at the end of the drainage system. The whole town of Blacksburg comes right into and underneath our Drillfield. When the town of Blacksburg floods, we are the beneficiaries here on campus.”

Thus, regressing paved areas to cultivated land and cultivated land to natural forests is a way we can increase the absorbing power of the land itself, and thus work with nature instead of against it. And truly, though multi-million dollar dams like the Grand Coulee are impressive testimonials to the quality and scope of our technical ability, would not a solution that lets nature do most of the work for us be an even greater job of engineering? 

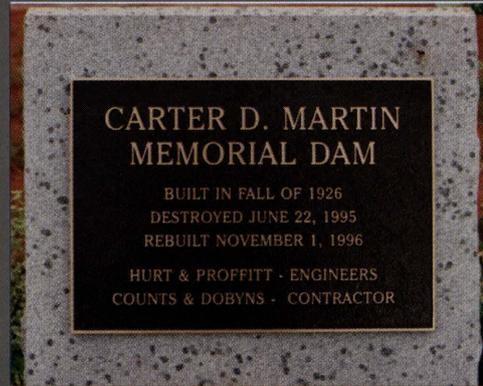
THE DAY THE DAM BROKE

In 1926, an earthen dam was built across Buffalo Creek near Lynchburg in Campbell County, Virginia. The thirty-foot-high dam, put there to form Timber Lake, met all government standards and passed its yearly structural inspections.

In 1991, Radford University Geology Professor Chester F. “Skip” Watts determined that the dam across Buffalo Creek was unsafe because of increased development of nearby land. Urban development is a major cause of flooding (see main article, p. 14). Watts reasoned that because concrete and asphalt absorb

much less runoff than fields and forests, development in the Timber Lake community meant the dam needed to be stronger.

Watts’s findings, hardly noticed in 1991, proved valid on the night of June 22, 1995. A torrential storm brought 10 inches of rain in less than a day and flooding throughout the area. Timber Lake rose enough to overtop the dam, and the earthen structure collapsed. A thirty-foot wall of water barreled down the creek bed, leveling everything in its path. Two were killed in the accident—a motorist named



“I want the opportunity to tackle the tough challenges sooner (much sooner) than later.”

There's a lot going on in the world. New communications breakthroughs every minute. Year 2000 problem solving. Companies and organizations reinventing themselves by leveraging only the latest strategies and technologies at feverish levels. You want to be at the center of the action. You've made the right choice.

We invite you to excel with the subsidiary of Litton Industries that performs as one of the leading IT companies and systems integrators in the nation. You'll join the

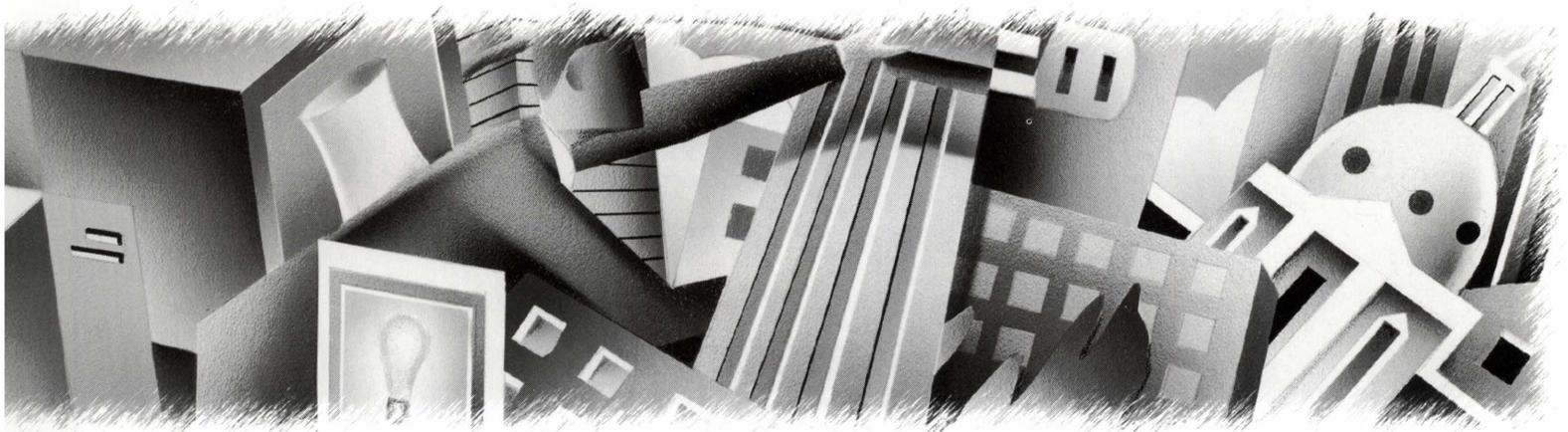
professionals who are setting new benchmarks across commercial and public sector landscapes in areas such as: Year 2000 Problem Solving • Web-Based Solutions (E-commerce, EDI, EFT, security/firewall strategies, etc.) • Imaging Systems (that drive one of the world's largest document management systems) • Enterprise Systems Engineering (that spans the entire lifecycle and maximizes alliances with Netscape, Hewlett-Packard, PeopleSoft, Oracle) • Systems and support for key defense programs...

Doris Stanley and a volunteer fireman named Carter Martin. Martin was on duty, attempting to rescue the occupants of a number of flooding cars stalled on U.S. 460, when the deluge came downstream and he lost his life.

The Timber Lake Homeowners Association gathered donations, took out loans, and rebuilt the dam the next year. The new structure nearly met the fate of its predecessor, though, during heavy rain halfway through its construction. At the builder's suggestion, Timber Lake residents dug a 12 foot emergency spillway to divert the waters. Five feet of water covered the dam, but it survived to be finished—with a concrete top—soon after.



The Carter D. Martin dam, with a view of its spillway.



Now you're thinking like PRC.

This is only part of how we are changing the way our customers perform every day.

Internally, you will find a corporate culture that encompasses the highest level of professionalism, while valuing teamwork and diversity. It is an employee-friendly setting that offers excellent benefits, workplace flexibility and casual dress. As a world-class growth company with 5,500+ employees and 150 offices nationwide—we have plenty of room for your big ideas.

Opportunities Exist Nationwide For Graduates In Hardware/Computer Engineering & Software/Computer Science Disciplines

For consideration, please forward your resume indicating Ad Code LS-107, using one of the following response methods: • E-mail (ASCII text, no enclosures): ACareer@prc.com • Fax: (703) 556-2269
• Mail: Litton PRC, Attn: LS-107, 1500 PRC Drive, McLean, VA 22102.

PRC is a dedicated employer that firmly supports and recognizes the value of workplace diversity.

Litton

PRC

www.prc.com/ACareer

Maximum

At Michelin North America, we realize to appeal to the most innovative and creative minds around the world, we must offer something unique-an attention getter... like a long-term career plan. That's right, at Michelin we hire people for careers, not just jobs. By focusing on each individual, every employee has the opportunity to broaden their skills and talents.

Career

We offer the support and resources each employee needs to improve upon technical and interpersonal skills, so that they may reach both their personal and professional goals. In addition to excellent training, you'll also be provided with competitive compensation, and most importantly, real opportunities for growth!

Mileage

Put your talents to work with ours and become part of our highly skilled team that makes Michelin what it is today: the global leader in the tire industry.

We will be on campus this fall to interview undergraduate and graduate students. See your placement office for more details or send your resume to:

**MICHELIN NORTH AMERICA
ATTN: RECRUITING
P.O. BOX 19001
GREENVILLE, SC 29602-9001**



MICHELIN

*One hundred years of innovation.
Because so much is riding on your tires.*

An Equal Opportunity Employer.

HELPING THE WORLD COMMUNICATE!

This is the mission statement of **ALLEN TELECOM INC.**, a world leader in the wireless telecommunications industry.

Grayson Wireless and Allen Telecom Systems, divisions of Allen Telecom Inc., offer wireless connection products ranging from wireless local loop in developing countries to coverage enhancement products for the World to wireless measurement systems for cellular, PCS and paging systems worldwide. We offer solutions that are scalable and cost effective.

From entire systems to components, we're the wireless connection.

To maintain our strong position in the telecommunications industry, we are recruiting for Software Design engineers, DSP engineers, RF System engineers, Digital Hardware engineers and Sales engineers. Our facilities are located in Lynchburg, Herndon and Blacksburg Virginia and Raleigh, North Carolina. If you're interested in joining a winning team, we invite you to send us your resume.



Jim Burns - HR Manager
ALLEN TELECOM INC.
104 Vista Centre Drive
Forest, Virginia 24551

An Equal Opportunity Employer



We Need Your Brains

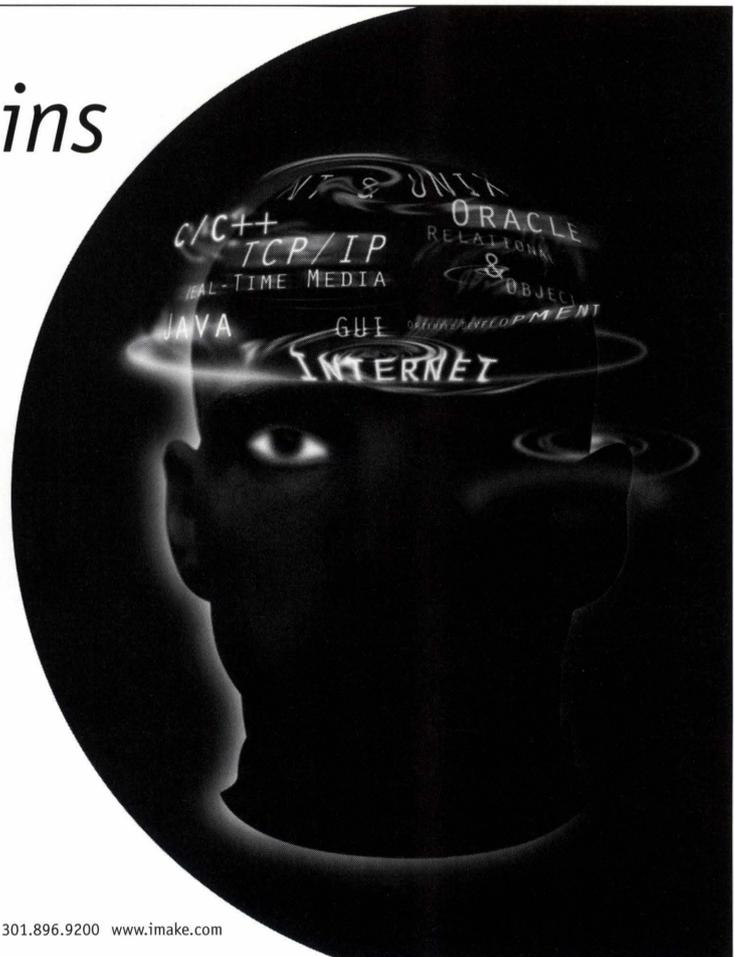
At IMAKE you'll work with cutting-edge technology and up to the minute software. You'll advance with continuing education and training from industry experts. And you'll thrive in a growing company that's friendly, challenging and rewarding.

You could join our ground-breaking software development and systems integration team that specializes in products and services for:

Interactive Media	Digital Entertainment	<input type="checkbox"/>
Business Support Systems	Telecommunications	<input type="checkbox"/>
Internet Solutions	Structured Finance	<input type="checkbox"/>
Java Applications		<input type="checkbox"/>

Each day provides new opportunities to strengthen your C/C++ and Java language skills. Your UNIX or NT operations proficiency. Your technical writing abilities. Your marketing strengths.

Join IMAKE at the forefront. **Visit Our Booth**



HELP WANTED

by Rebecca Gassler

With the Engineering Expo approaching this month, Virginia Tech's engineering students are frantically writing resumes, convincing parents they really do need \$500 to buy clothes for an interview, and practicing answers to questions they will probably never be asked. Hopefully, this article will help you find the job of your dreams.

A resume could be the single most important tool in getting a job. Many job-hunters can tailor theirs to a specific job at a specific company. Those of us talking to the hundreds of companies at the Expo are not so lucky. We must present a generic resume explaining what we want and hope that at least one interviewer thinks that our resumes were written for him.

First, decide what format best fits your qualifications and experience. People who have several relevant job experiences may want to do a chronological or functional resume. Chronological resumes should be in reverse order and functional resumes should highlight those experiences that relate directly to your goals. Most of us will probably want to write a resume based on our skills. With this style, you can list all of those computer applications you learned but never thought would be useful. List skills learned in previous jobs, too. Your skills may be general, such as "Familiar with word processing," or specific, such as "Expert in the use of Microsoft® Word 97." Be careful not to overembellish. If you spent three weeks learning FORTRAN in Engineering Fundamentals and wrote one program, don't say that you are an expert; this will come back to bite you in the future. If you have many job experiences and a few useful skills, too, create a resume that is a combination of the chronological, functional, or skills format.

Now comes the important part—making sure that the content appeals to those that are hiring. First, provide adequate contact information. Most of us have a school and

a permanent address; include both. Give a daytime phone number, and in these days of the electronic era, an e-mail address. Next present a clear, concise objective. Make sure that it adequately represents the



Photos by Jason Gibbs

work that you are looking for. Don't say "I want a job in the engineering field." Instead, say "I want a job that will allow me to use my engineering skills to design aircraft."

The third thing that must be present is

your educational background. Many of us will just have one degree that is not even completed. List the school, location (city and state), type of degree, majors and minors. Include academic awards, scholarships, and publications. Your educational background should also provide your GPA, both overall and in-major. Some companies may also request a transcript, so be prepared.

The most comprehensive section should be your skills and work experience. Take this space to show off and make yourself unique. Include all positions, paid and unpaid, in reverse chronological order. Under each position, take the time to compose several phrases that describe what you did, what you learned, and what your responsibilities were.

Finally, show those employers that you are well-rounded. List organizations and clubs in which you participate, making sure to include any leadership positions that you have held.

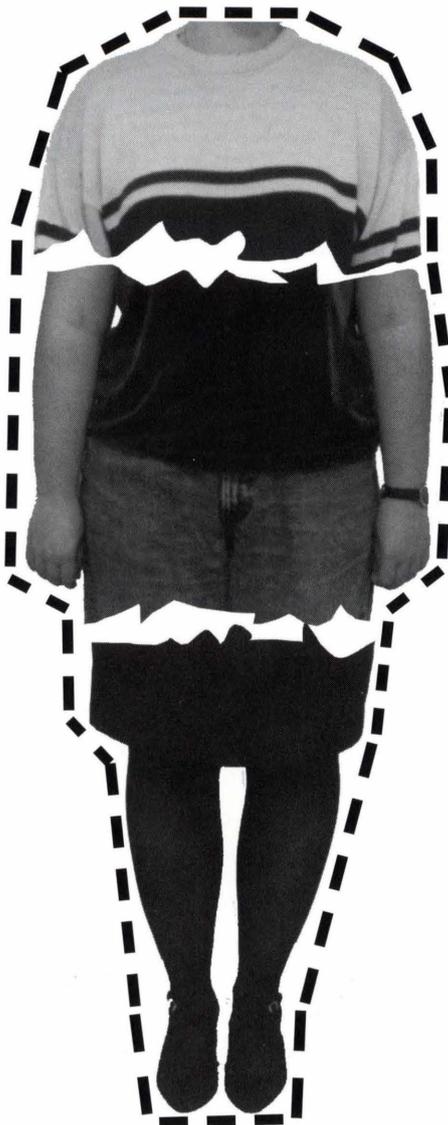
Content is not the only thing that is important in a resume, though. The way it looks can prove that you spent some time and effort to put it together. Invest in some high-quality resume paper, and if needed, matching envelopes. Choose a conservative color, like white, gray, or beige. Take it to a copy center to get it reproduced, or do it yourself with a laser printer. For the Expo, you probably will not need a cover letter because most employers simply ask for the resume itself.

In the job fair situation, both your resume and the way you present yourself are important. Don't throw together the suit you wore four years ago that is a little on the small side with a cartoon character tie and walk out the door. Males should wear a suit or jacket and tie with nice dress slacks. There should be dress shoes on those feet, and some nice dress socks, too. The black hiking boots and white sports socks won't cut it, even if your pants cover them up. Women should wear a skirt and

blouse or a suit. They should avoid flashy colors, and the neckline should not be too low, nor the hemline too high. Jewelry, make-up, and perfume or cologne should be understated. All clothes should fit well and be neatly pressed, even if it means having to take it to the dry cleaners.

Now that you are dressed, it is time for the interview. This is probably the most nerve-wracking part of the job hunt. The first impression is important. Greet your interviewer, offer a strong handshake, and make eye-contact. Don't be afraid, they need you, too. Often the interviewer will ask questions about how school is going, if you like the campus, about where you are from, and so on, just to relax you. Typically he will have your resume in front of him and will have already reviewed it. The questions may be based on the characteristics of the job to be filled or on your resume. Be ready to draw parallels between your skills and experience and the duties of the job. The interviewer will also provide information on the company, allow you to ask questions, and explain the next step in the hiring process.

After all that, you just have to sit and wait. You should have an approximate date when the next contact will occur. If you do not hear from the company after that date, go ahead and follow up with a phone call. Hopefully it will be good news. Happy hunting! 



WHAT TO WEAR?

MALES

- *Shirt and Tie*
- *Slacks or a Suit*
- *Dress shoes and socks*
- *Little or no cologne*

FEMALES

- *Dressy, conservative blouse*
- *Nice skirt or a suit*
- *Dress shoes and pantyhose*
- *Understated makeup, perfume, and jewelry*

EVERYONE

- *Neatly pressed clothing*
- *Well-manicured appearance*

TEN INTERVIEW QUESTIONS YOU WILL EVENTUALLY BE ASKED:

1. *What are your career goals or objectives?*
2. *Why did you choose those goals?*
3. *How do you expect to achieve them?*
4. *What do you have to offer our company?*
5. *What classes do you like best/least?*
6. *What leadership experiences have you had?*
7. *What is your ideal job?*
8. *How are your previous experiences relevant to your future?*
9. *What do you look for in a company?*
10. *Is there anything specific that you'd like to know about the company?*

DESIGN YOUR FUTURE

Architecture and Building Services
Land Design and Survey
Municipal and Environmental Engineering
Transportation and Structural Engineering
Water Resources
Federal Programs Management
CADD Mapping and GIS Services
Design-Build

Dewberry & Davis is committed to providing quality service to our clients, advancing the state of architectural and engineering technology and standards of practice and, above all, providing employees with rewarding and challenging careers.

26 offices throughout the United States

Headquarters:

Dewberry & Davis
8401 Arlington Boulevard
Fairfax, Virginia 22031-4666
703/849-0525 (tel)
703/849-0185 (fax)

www.dewberry.com

EOE

M/F/D/V

Feel the fresh, crisp wind in your hair,
the warm glow of sun on your face,
the surge of cool, new ideas. . .

i2 a typical day at **i2**

i2 Technologies has created an aggressive presence in supply chain optimization. Our premier suite of products streamlines work flow and cuts costs for Fortune 1000 companies, recouping millions of dollars by cutting inventories, reducing cycle time, and improving delivery.

We currently have openings for the following professionals:

- Supply Chain Management Consultants
- Software Developers
- Application Product Management

Bring your entrepreneurial attitude and the desire to work where you're encouraged to express opinions, and discover how much fun work can be. Please forward your resume and cover letter to: **FAX: 214.860.6886; E-mail: collegejobs@i2.com**

We are an Equal Opportunity Employer.

Our spirited team of i2'ers thrive in an atmosphere of initiative, creating innovations that often change the rules of the game in many industries.

With unprecedented growth comes the need for more savvy, talented i2'ers at various locations across the country.

i2 Technologies
www.i2.com

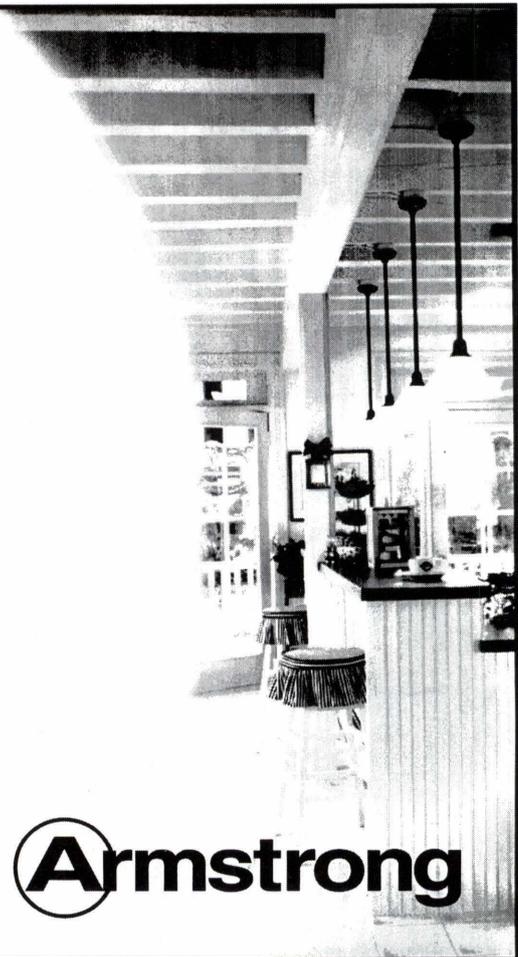
Muy Bueno! 很好 Très Bien! Sehr gut!
いい (i2) 7 あ

In any language, from any corner of the world, people positively love Armstrong products. That's because we can pull a room together better than anyone else, thanks to our engineering, technology and marketing teams whose original ideas create top-quality interior finishing solutions for residential and commercial use. We design and make everything from floor coverings to ceiling systems and entire lines of specialty building products. With sales exceeding \$2 billion last year, we've earned these recent distinctions:

- 1995 Malcom Baldrige National Quality Award
- 1996 Department of Labor EVE Award
- 1997 Fortune's 100 Most Admired Companies in America
- 1997 Lowe's President's Award for Supplier of the Year

Chemical/Industrial/Electrical/Mechanical Engineers, Business Administration, Marketing, and Production & Operations Management Grads, please reply with resume to resumes@armstrong.com or send to: Armstrong World Industries, Inc., P.O. Box 3231, Lancaster, PA 17604-3231. FAX: (717) 396-6203. By choice, Armstrong is an equal opportunity employer.

Armstrong



From the e-mail bag . . .

WHAT IF DR. SEUSS WROTE COMPUTER TECH MANUALS?

If a packet hits a pocket on a socket on a port,
And the bus is interrupted as a very last resort,
And the address of the memory makes your floppy disk abort,
Then the socket packet pocket has an error to report!
If your cursor finds a menu item followed by a dash,
And the double-clicking icons put your window in the trash,
And your data is corrupted 'cause the index doesn't hash,
Then your situation's hopeless, and your system's gonna crash!
If the label on your cable on the gable at your house,
Says the network is connected to the button on your mouse,
But your packets want to tunnel to another protocol,
That's repeatedly rejected by the printer down the hall,
And your screen is all distorted by the side effects of Gauss,
So your icons in the window are as wavy as a souse,
Then you may as well reboot and go out with a bang,
'Cause as sure as I'm a poet, the sucker's gonna hang!
When the copy of your floppy's getting sloppy on the disk,
And the microcode instructions cause unnecessary RISC,
Then you have to flash your memory and you'll want to RAM your ROM—
Quickly turn off your computer and be sure to tell your mom!

A boy was crossing a road one day when a frog called out to him and said, "If you kiss me, I'll turn into a beautiful princess." He bent over, picked up the frog and put it in his pocket.

The frog spoke up again and said, "If you kiss me and turn me back into a beautiful princess, I will stay with you for one week." The boy took the frog out of his pocket, smiled at it and returned it to the pocket.

The frog then cried out, "If you kiss me and turn me back into a princess, I'll stay with you and do ANYTHING you want." Again the boy took the frog out, smiled at it and put it back into his pocket.

Finally, the frog asked, "What is the matter? I've told you I'm a beautiful princess, that I'll stay with you for a week and do anything you want. Why won't you kiss me?"

The boy said, "Look I'm an engineer. I don't have time for a girlfriend, but a talking frog is cool."

More on page 29

HUGHES SPACE AND COMMUNICATIONS COMPANY

If you've always wanted a job that's out of this world, we invite you to join us in building the Wireless Expressway . . .

From Syncom, the first Hughes-built communications satellite, to the newest Hughes satellite - when satellite history is made, HSC is there. In the past 35 years, we've built and launched well over 160 satellites for a variety of government and commercial customers. Our customers tell us that when they need something done that's never been done before, we're the company of choice.

Right now, from our integrated satellite factory in El Segundo, California, we're building and launching satellites as fast as we can - working with our customers on direct broadcasting services, mobile communication systems, and data communications systems for users on land, at sea, and in the air, and a large number of other cutting-edge technologies that are transforming our world with increasing speed.

If you're looking for an opportunity to use your scientific or technical skills in an environment that supports and encourages creativity, take a look at HSC. The work we are doing now will shape the world for many years to come. Join us, and help build the future.

Hughes Space and Communications Company

Staffing - VPI
Building S10, MS S368
P.O.Box 92919
Los Angeles, CA 90009-2919

FAX: (310) 364-4026 · **EMail:** staffup1@mail.hac.com



SUCCESS COMES IN MANY FORMS.

No matter what the size, shape or direction of your talent, Union Carbide has unlimited opportunities to reach your goals in style.

Through the encouraged contributions of our employees, we've become one of the nation's leading chemical companies with approximately 12,000 employees in over 40 countries. Our products are used around the world everyday. Our global success creates some great benefits, exceptional opportunity, constant challenge, and an atmosphere that fosters your unlimited achievement. If you want to make the right move for your future, make the smart choice for your career... Union Carbide.



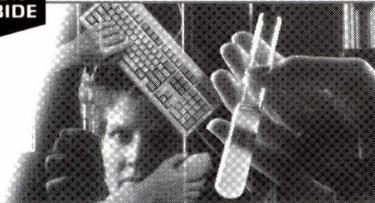
Research and Development
Engineering
Manufacturing
Distribution and Purchasing
Information Technology
Technical Sales and Customer Service

Our prestigious internship program has been recognized as one of the nation's best by the Princeton Review for two consecutive years.

Experience. Achievement. Success. This is where it all comes together. For more information about Union Carbide opportunities, please forward your resume to: Union Carbide Corporation, Staffing Skill Center, P.O. Box 8004, Bldg. 82/Rm. 830, South Charleston, WV 25303. E-mail: aucreply@ucarb.com.



SMART PEOPLE. SMART CHOICES.
An Equal Opportunity/Affirmative Action Employer.



Visit our web site at: www.unioncarbide.com

Major locations include **WV, TX, NJ, LA, & CT**

REAL SUPPORT!

We support CAD Students with the best drafting and design tools to prepare for the globally-competitive marketplace.

CADKEY® 98 Full 3D Mechanical CAD with Built-in Hybrid Modeling!



Shelby Series 1 Designed Using CADKEY
(Image Courtesy of Shelby American, Inc.)

✓ Excellent Pricing!

- \$279 or less for Schools.
- Only \$149 for Faculty, Staff and Students!

✓ Fast Learning Curve!

- 3D Design in Minutes!

✓ Built-In Solid Modeling Power!

- World's 1st PC 3D Wireframe to Solid Model Converter!

See firsthand why over 250,000 design professionals and major universities world-wide have selected CADKEY!

Visit Our Web Store at
www.TECedu.com!



Support isn't an option - it's our product!

Tech Ed Concepts, Inc. of North America

800.338.2238 or www.TECedu.com

35 South Main Street, Concord, NH 03301

TEL: 603.224.8324 FAX: 603.225.7766

CADKEY is a trademark of Baystate Technologies, Inc. and DataCAD is a trademark of DataCAD LLC.

PLOT IT!

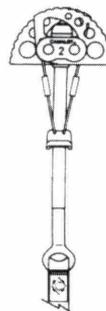
Whether your plotter needs fiber-tip, liquid ink or rollerball pens, we can meet your needs in outfitting your Hewlett Packard, Houston Instruments or most other brands of plotter.

We also carry papers for plotters, laser and ink jet printers.



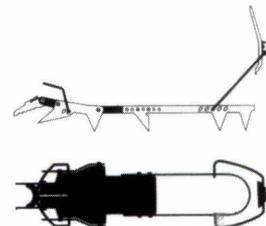
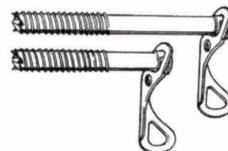
email: mishmish@bev.net
204 Draper Rd.
Downtown Blacksburg
552-1020

Blue Ridge Outdoors



ENGINEERING FOR
THE ASCENT OF MAN

211 Draper Rd.
Blacksburg, VA 24060
(703) 552-9012



Technical Tidbits

Construction of the controversial Advanced Communication and Information Technology Center has finally begun in front of Brodie Hall. Scheduled for completion in June 2000, the Center will house programs in fiber optics, wireless and satellite communications, human-computer interaction, and parallel computation labs. The Center will also be home to a multimedia lab and the Cave Automatic Virtual Environment.

Opposition to this project has been active since the University first proposed it in 1994. The main bone of contention is the single span bridge slated to connect the Center to Newman Library. Many of the students, faculty, and alumni who have reviewed the building plans point out that the bridge blocks the view of the War Memorial from the Mall and is too large for a rural setting like Blacksburg. While the architects' sketch included in the 1995 master plan shows that the Memorial, trees, and sky are all visible through the underpass,

"There is a tremendous difference between what we see and what we get," said Paul Tubach in 1996. Tubach, then an under-

graduate student in the Landscape Architecture Department, led the coalition to oppose the construction of the bridge.



Photo by Lisa Groggin

An architect's model of the Center, showing the bridge across the Mall.

The National Science Foundation has pledged \$12.35 million to create an Engineering Research Center (ERC) in power electronics centered at Virginia Tech. This pledge follows a \$1.5 million commitment from Governor Jim Gilmore and support from over 100 companies in industry.

"Enormous prestige is associated with an ERC," said Tech's Dean of Engineering F. William Stephenson. "Some 80 percent of the top 25 engineering programs in the country are home to one of these select centers. Our program is clearly the premier power electronics curriculum in the country."

A recent survey conducted by the Institute of Electrical and Electronic Engineers (IEEE) indicates that power electronic loads (motor drives for heat pumps, ventilation, air conditioners and other industrial and residential applications) account for more than 60 percent of the total electric power consumed in the U.S. This fact, coupled with the uncertainty of fossil fuel supplies and the increased priority placed on efficient conversion and control of electrical power, has led power electronics to emerge as a profession of major importance, said Fred Lee, a professor of electrical and computer engineering.

Lee is the director of Tech's Virginia

Power Electronics Center, which submitted the proposal for the new ERC. He predicts the center's work in the next 10 years will result in a 30 percent savings in electric

power consumption, and says the center's vision is to "make the U.S. the most efficient user of electrical energy in the world."



BT North America Inc.

*We're Creating Global Communications Solutions
For The World's Largest Corporations*

BT North America Incorporated is a subsidiary of British Telecommunications PLC. British Telecommunications (BT) is already one of the world's major communication companies. While it is among the largest corporations in Europe; we are determined to grow our business in North America and to provide world-class customer service.

In the fast moving world of telecommunications, success is about grasping opportunities for growth and making them happen. With that in mind, at the United States Systems Engineering Center (USSEC), a unit of BT North America Inc., we specialize in technology services, systems integration and research and development along with other technical activities. Our expertise is world-renowned and is shared internationally among a consortium of high profile clientele in order to advance the art of telecommunications. With this in mind, we are actively seeking individuals who are strong minded, task-centered, and who have excellent skills along with an ability to work with both drive and initiative.

This is an exciting time in your life and during this time you will make decision that set your path for your working life, so it is important that you take this opportunity to talk to BT North America and give yourself a head start to a successful career in systems engineering.

BT North America offers a highly competitive compensation and benefits package. To find out more, candidates should stop by our booth at Virginia Tech's Engineering EXPO and meet a member of our team.

For more reasons to join us have a look at the information about USSEC on our web site at www.ussec.btna.com.



VIASYSTEMS

Our Vision...Your Future

Viasystems is the world's second largest manufacturer of printed circuit boards and backplanes. Our Richmond location is the largest printed circuit board and backplane manufacturing facility in North America, with more than 2,100 talented professionals and 700,000 square feet of manufacturing space.

Viasystems' primary markets are telecommunications, computer, industrial and automotive. On-site research and development and state-of-the-art design capabilities provide our customers with the latest interconnection technology.

As one of Richmond's top 20 employers, we offer outstanding growth potential, excellent benefits and salary commensurate with experience.

We typically seek qualified graduates in the following areas:

- Mechanical Engineering
- Industrial Engineering
- Electrical Engineering
- Management Information Systems
- Marketing

Please forward your resume to:

**Management Staffing
Human Resources
4500 South Laburnum Ave.
Richmond, VA 23231**

"Computer Solutions For Your Home & Business Needs"



intraTECH

Retail & Business	Microsoft Certified Professional
Hardware	Software
Upgrades	Repairs
Training	Parts

FREE Estimates
FREE Training - Call For Details
4 YEAR Limited Warranty

MOST MAJOR CREDIT CARDS ACCEPTED

540-951-0200 2401 S. MAIN ST
BLACKSBURG



KOLLMORGEN

Motion Technologies Group

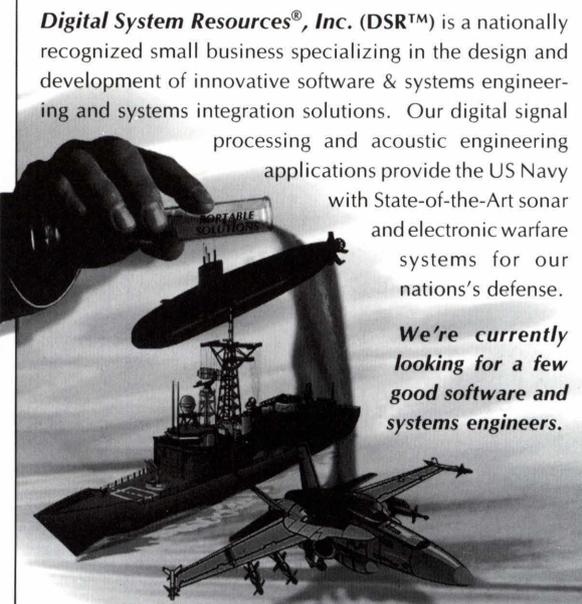
INDUSTRIAL DRIVES
201 Rock Road
Radford, VA 24141

INLAND MOTOR
501 First Street
Radford, VA 24141

A LEADING EMPLOYER IN THE NEW RIVER VALLEY FOR OVER 35 YEARS, KOLLMORGEN MOTION TECHNOLOGIES IS KNOWN WORLDWIDE FOR ITS EXCELLENCE IN MOTION CONTROLS AND ELECTRONICS. ITS SUCCESS HAS BEEN BUILT ON TEAMWORK AND A STRONG TECHNOLOGICAL BASE.

Digital System Resources[®], Inc. (DSR[™]) is a nationally recognized small business specializing in the design and development of innovative software & systems engineering and systems integration solutions. Our digital signal processing and acoustic engineering applications provide the US Navy with State-of-the-Art sonar and electronic warfare systems for our nations's defense.

We're currently looking for a few good software and systems engineers.



Most positions require a security clearance. Please respond in confidence to:
Human Resources Group
12450 Fair Lakes Circle
Fairfax, VA 22033
Tel: 703.263.2800
Fax: 703.263.2829
jobs@dsrnet.com or www.dsrnet.com



Digital System Resources[®], Inc.

Hands-On Doesn't Mean Brains-Off

FROM STAFF REPORTS

Issuing a quiet hum, 60 freshmen in a lecture hall sit with heads bent over Kodak disposable cameras and carefully dissect the mechanisms, using only their hands and paper clips as tools.

Working in pairs, the 17- and 18-year-olds are focused seriously on their task; after they take the cameras apart they will have to reassemble the Kodaks to a working condition. Along the way, they must answer questions and draw sketches of the mechanisms. And they seem to be enjoying it.

This is the hands-on engineering lab, where freshmen learn by practicing

their lab reports, the students write answers to three pages of questions on everything from environmental factors of the camera's production to the cost-effectiveness of the design.

"I was a Lego freak as a kid," says freshman John Harris as he and partner Stephanie Gerke disassemble their camera. Harris, who plans to major in mechanical engineering, believes this type of hands-on work "helps us get inside the engineering process."

Engineering labs like this one were offered three nights a week during spring semester 1998, making it possible for the

Education (SUCCEED) to establish the freshman lab program.

"Moving students from an attitude of 'What is the assignment and how can I get it done?' to 'Wow, this is interesting!' is the best approach to engaging them in their classes," says EF Assistant Professor Richard Goff, co-principal investigator with Gregg for the lab program.

SUCCEED is not the only sponsor Gregg and Goff have found for the program. Kodak donated 700 cameras for the lab and Lockheed-Martin awarded \$80,000 over three years for materials and equipment.

Gregg, Goff and EF Assistant Professor Pat Devens also have made their own donations—they have worked voluntarily with the program to ensure its success. "The labs are not a required part of the EF curriculum," Gregg notes.

Gregg, Goff and a graduate teaching assistant are offering eight sections of the lab during the current fall semester. In addition to working with cameras, this year freshmen will analyze computer hard drives, internal combustion engines, and electric drills.

Thanks to the generosity of Ray and Violet Frith of Bassett, Virginia, engineering freshmen soon will have their own lab space. Mr. Frith, a 1951 agricultural engineering graduate of Virginia Tech, and his wife have donated \$250,000 in support of the Frith Freshman Engineering Design Laboratory.

The new lab will be located in the basement of Randolph Hall, where the Car Factory and other student projects were housed (these projects now are in the recently completed Joseph F. Ware, Jr. Student Projects Laboratory in the Old Laundry Building).

The Friths' endowment is being used to renovate the Randolph basement space and to establish the Frith Practical Learning Endowment Fund, which will support the lab with resources for curriculum design, instruction tools, and maintenance. The College of Engineering plans for all of the

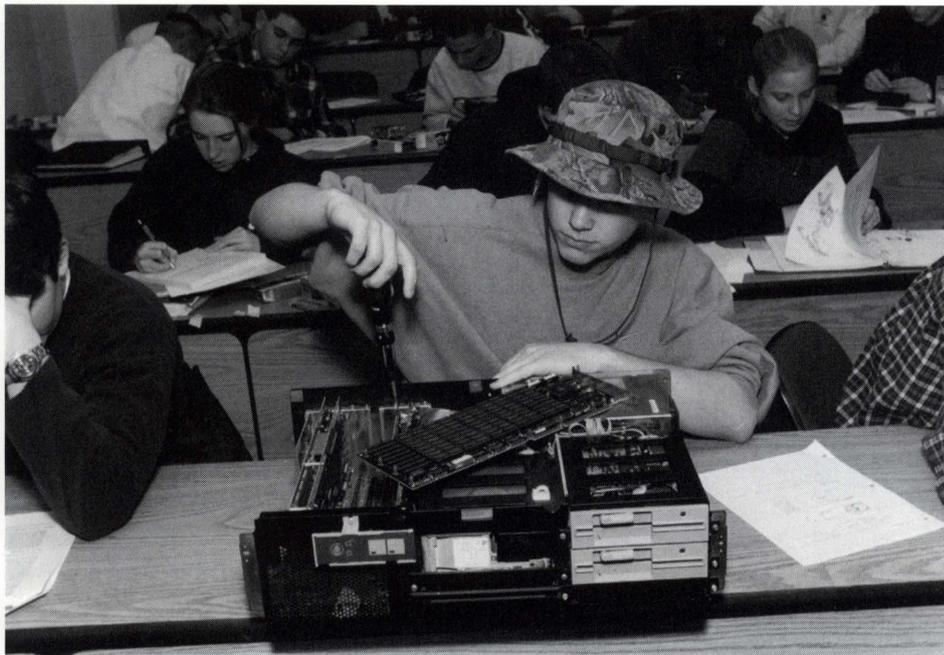


Photo courtesy of Richard Goff

Freshman will explore a range of devices in the Frith design lab.

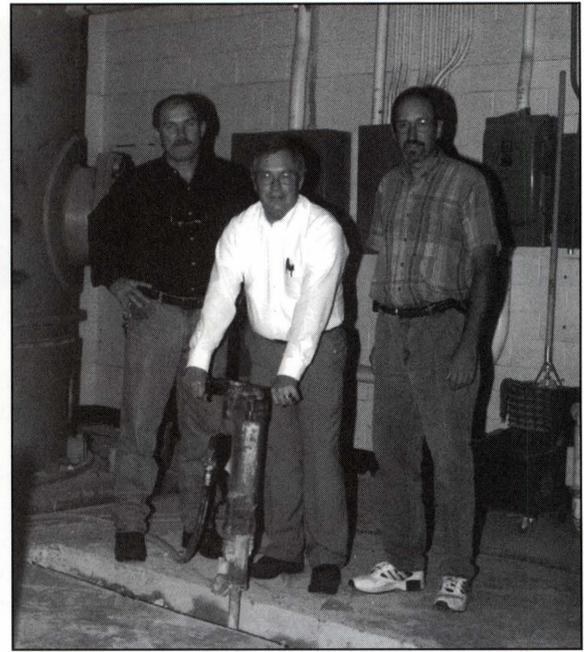
"reverse engineering"—taking things apart and putting them back together.

"This exercise makes them think about the things engineers have to consider in designing mechanisms," says Steve Hughes, a graduate student in aerospace and ocean engineering who is helping instruct the lab. "For some of the freshmen, this is a first-time experience."

The cameras have 17 parts that have to be separated, studied and reassembled. In

more than 1,000 freshmen in Engineering Fundamentals (EF) classes to go through a hands-on experience.

"One reason these labs are so important is that many of the students who come to Virginia Tech today are more computer literate than mechanically inclined," says EF Associate Professor Michael Gregg, who wrote a proposal that garnered funding from the Southeastern University and College Coalition for Engineering



Left: The Frith Lab, under construction in Randolph Hall.

Right: Professor Gregg, Dean Griffin, and Professor Goff have led in the lab's construction.

1,400 to 1,500 freshmen who enroll each year to become involved in activities in the Frith design lab.

Gregg says the hands-on Practical Engineering Laboratory being offered this fall will be held in classrooms during the first part of this fall semester and will

move into the Frith lab as soon as renovations are completed. Hayden Griffin, head of EF, expects the lab space will be ready by early November. "Our goal for the Frith lab is that every student in EF 1015 will have some hands-on experience," Griffin notes. In addition to the reverse

engineering portion of that experience, he adds, the work undertaken by freshmen in the Frith lab will include projects involving computerized data acquisition and control and experiments related to engineering issues such as manufacturing and environmental problems. **EF**

**THE NEXT WAVE
IN TECHNOLOGY
WILL BE A
SOUND WAVE.**

Cited by The American Institute of Physics as "One of the Top Physics Stories of 1997," Macrosonix is harnessing the power of sound waves in ways never thought possible. If you are actively pursuing any of these disciplines, contact us at <http://www.macrosonix.com>

- Mechanical engineering
- Electrical engineering
- Acoustical engineering

EOE

MacroSonixSM Corp.
Unlocking the Power of Sound™
www.macrosonix.com

William A. Hazel, Inc.
QUALITY * EXPERIENCE * INNOVATION



- Total Site Development Contractor
- State-of-the-Art Equipment
- Excellent Reputation

William A. Hazel, Inc., headquartered in Chantilly, Virginia, has been engaged in all aspects of site development and road construction throughout the Northern Virginia area for over 30 years.

We are looking for Estimators/Project Managers for our construction management team. We provide competitive salary, excellent benefits, health insurance, 401k, vacation, incentive plans and educational assistance.

For consideration, please fax or mail your resume to:

William A. Hazel, Inc.
P.O. Box 600
Chantilly, VA 20153
fax (703) 378-7623
E-mail: miking@clark.net

Visit our website at: <http://www.wahazel.com>

William A. Hazel, Inc. is an Equal Opportunity Employer.

**PLANNING
CONSULTANTS
INCORPORATED**

**Engineering Weapons Systems
for Tomorrow's Navy!**

**(540) 663-2739
FAX (540) 663-2633
www.pci-dahl.com**

PO Box 1676, Dalhgreen, VA 22448

The Fire Sprinkler Design People!

GBA

GAGE-BABCOCK & ASSOCIATES
WASHINGTON OFFICE
3975 Fair Ridge Drive
North Lobby #310
Fairfax, VA 22033-2924

**(703) 934-6440
FAX (703) 934-4421
E-Mail: GBADC@aol.com**

ENGINEERS • CONSULTANTS • FIRE PROTECTION • SAFETY • SECURITY

You know you are an engineer if...

- you have no life—and you can prove it mathematically.
- you know vector calculus but you can't remember how to do long division.
- you chuckle whenever anyone says "centrifugal force."
- you've actually used every single function on your graphing calculator.
- it's sunny and 70 degrees outside, and you are working on a computer.
- you always do homework on Friday nights.
- you know how to integrate a chicken and can take the derivative of water.
- you think in math.
- you've calculated that the World Series actually diverges.
- you hesitate to look at something because you don't want to break down its wave function.
- you have a pet named after a scientist.
- you laugh at jokes about mathematicians.
- the Humane society has you arrested because you actually performed the Schrodinger's Cat experiment.
- you can translate English into Binary.
- you can't remember what's behind the door in the science building marked EXIT.
- you have to bring a jacket with you—in the middle of summer—because there's a wind-chill factor in the lab.
- you are completely addicted to caffeine.
- you avoid doing anything because you don't want to contribute to the eventual heat-death of the universe.
- you consider ANY non-science course easy.
- when your professor asks you where your homework is, you claim to have accidentally determined its momentum so precisely that according to Heisenberg, it could be anywhere in the universe.
- the "fun" center of your brain has deteriorated from lack of use.
- you'll assume that a horse is a sphere in order to make the math easier.
- you understood more than five of these indicators.
- you make a copy of this list and post it on your door.

A physicist and an engineer are sitting next to each other on a long flight from LA to NY. The physicist leans over to the engineer and asks if he would like to play a fun game. The engineer just wants to take a nap, so he politely declines and rolls over to the window to catch a few winks. The physicist persists and explains that the game is very easy and a lot of fun. He explains, "I ask you a question, and if you don't know the answer, you pay me \$5. Then you ask me a question, and if I don't know the answer, I'll pay you \$5."

Again, the engineer politely declines and tries to get to sleep.

The physicist, now somewhat agitated, says, "OK, if you don't know the answer you pay me \$5, and if I don't know the answer, I'll pay you \$50!"

This catches the engineer's attention, and he sees no end to this torment unless he plays, so he agrees to the game. The physicist asks the first question. "What's the distance from the earth to the moon?"

The engineer doesn't say a word, but reaches into his wallet, pulls out a five dollar bill, and hands it to the physicist. Now, it's the engineer's turn. He asks the physicist, "What goes up a hill with three legs, and comes down on four?"

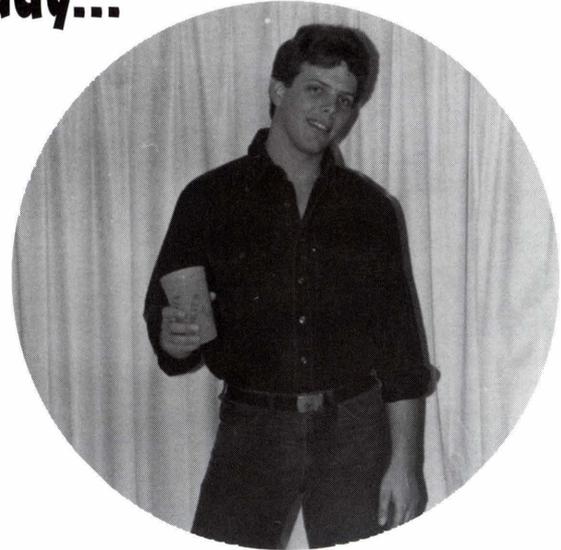
The physicist looks up at him with a puzzled look. He takes out his laptop computer and searches all of his references. He taps into the Airphone with his modem and searches the Net and the Library of Congress. Frustrated, he sends e-mail to his co-workers—all to no avail. After about an hour, he wakes the engineer and hands him \$50. The engineer politely takes the \$50 and turns away to try to get back to sleep.

The physicist, more than a little miffed, shakes the engineer and asks, "Well, so what's the answer?" Without a word, the engineer reaches into his wallet, hands the physicist \$5, and turns away to get back to sleep.



**If it seems like your life is
filled with hours of
endless study...**

...or "swinging" parties...



**...why not join a team with
enough pull to get things
done while having fun?**

**American
Institute of
Aeronautics and
Astronautics**

The AIAA aims to get students involved in aeronautical and aerospace activities above and beyond the classroom. The society has speakers from industry and sponsors the Design/Build/Fly Electric Unmanned Aerial Vehicle competition.
Contact: E-mail Dr. Fredrick Lutze at lutze@aoe.vt.edu

**American
Institute of
Chemical
Engineers**

AIChE is for chemical engineers interested in meeting other chemical engineers and learning about the different types of companies that employ them. The club has a corporate speaker at every meeting, sponsors plant visits, and does service projects.
Contact: E-mail Diane Patty at dpatty@vt.edu

**American
Society of
Mechanical
Engineers**

ASME is part of a national, professional organization for Mechanical Engineers whose activities include plant trips, corporate speakers, socials, and national/regional meetings. Freshman have free membership!
Contact: E-mail asme@vt.edu or call the ASME office at 231-4175

**Student
Engineers'
Council**

The SEC represents the student body of the college of engineering and unites all the engineering societies. They provide many leadership positions and organize events such as Engineers' Week, the Engineering Leadership Conference, and the Freshman Planner. Any engineering major is welcome!
Contact: E-mail sec@vt.edu

**Society of
Automotive
Engineers**

SAE's official objective is to enter student design competitions sponsored by the national branch of the Society of Automotive Engineers.
Contact: Visit their homepage at www.vt.edu:10021/org/sae

We've saved a place for you!



Are you creative? Do you want to improve your skills in photography, writing, graphic design, and marketing? Then the

ENGINEERS' FORUM

was made just for you!

R.S.V.P. to Forum@ut.edu to reserve your place at the kiddie table!

FUMBLING THE FACTS

While reading an article about a border dispute in *The Economist*, I came across the phrase, "...a strip of land, 'the Tin Bigha Corridor', 178 metres by 85—not much larger than a football field..." At the time, I continued through the article without a second thought. Later, I was scanning a piece about asteroid impacts in *Astronomy* magazine and found, "small Earth-crossers—objects smaller than 50 meters in diameter, half the size of a football field..." Though a little irked, I managed to restrain myself. Then, I read a blurb in *Time* that contained an inspired sentence: "For aerospace contractors, it is the prize of a decade: a \$17 billion U.S. space station the size of a football field." In medical terms, I think my reaction could be best described as "a massive hissy fit."

Who told these people it was preferable, or even acceptable to use a football field as a unit of measurement? Like the Hokie Pokie, this is one of those things that seems to make a lot of sense until you think about it. When asked, I'm sure most people would be quick to reply that a football field is 100 yards long, but how many would know its width? I don't offhand, and I played for four years in high school. Furthermore, while the field of play is 100 by 53.3 yards, an actual football field, including the endzones, is 120 by 53.3 yards. Which are the writers using? And if the writer hails from north of the border, is he then using the 150 by 65 yard field of the Canadian Football League?

Those inconsistencies aren't what bothered me most about the three pieces above. In the first article, the area of the Tin Bigha Corridor is almost three times that of a football field with endzones. If this print suddenly got three times larger,

it'd look like this.

Does that seem "not much larger" than before? As far removed as *The Economist's* comparison is, the second and third pieces literally contain analogies from another dimension.

Like the acre, a football field has no height because it is a two-dimensional object. This means the size of a football field is really its area. In the second article, what exactly is half the area of a football field—the asteroid's diameter, which is a length, or its size, which is a volume? Neither make any sense at all.

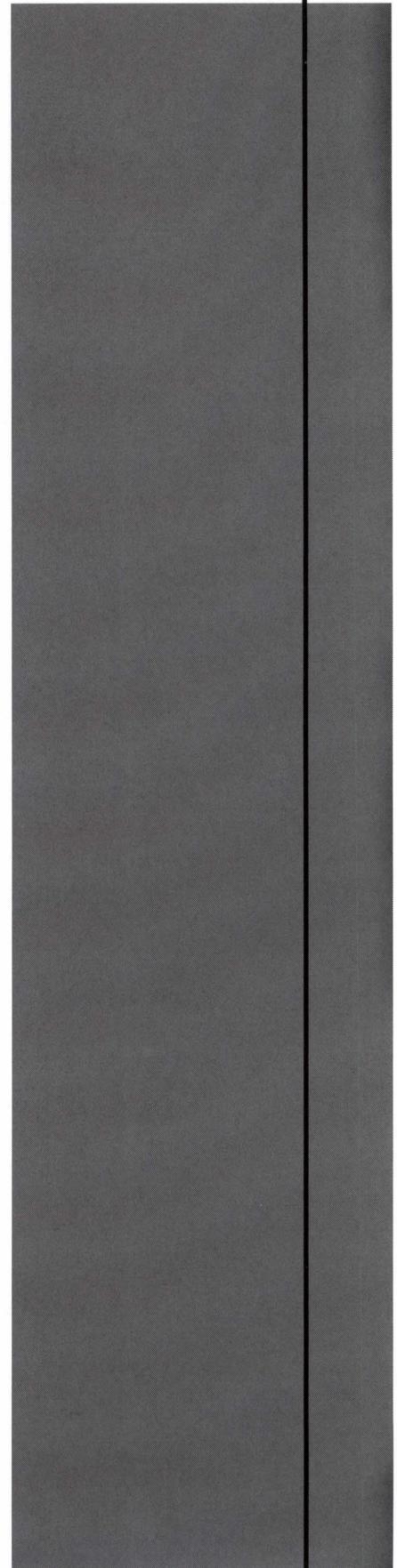
Then there's the even more ambiguous sentence in *Time*. I almost wish NASA would build a space station as close to the size of a football field as they could approximate. Then, the whole planet could gawk upwards in awe at an object so flat and thin it could serve as nothing but an orbiting billboard to advertise our national fondness for using two dimensional analogies for three dimensional objects!

Unfortunately, not even the coming of the metric system will solve this analogous epidemic. When the American inch is replaced by the International centimeter, and the American pound by the International kilogram, the American football field will have a ready replacement. I can already see it coming: "In other news today, lightning in Washington State felled a Redwood tree the size of a soccer field..."

Shuvom Ghose

Executive Editor

Who told these people they could use a football field as a unit of measurement?



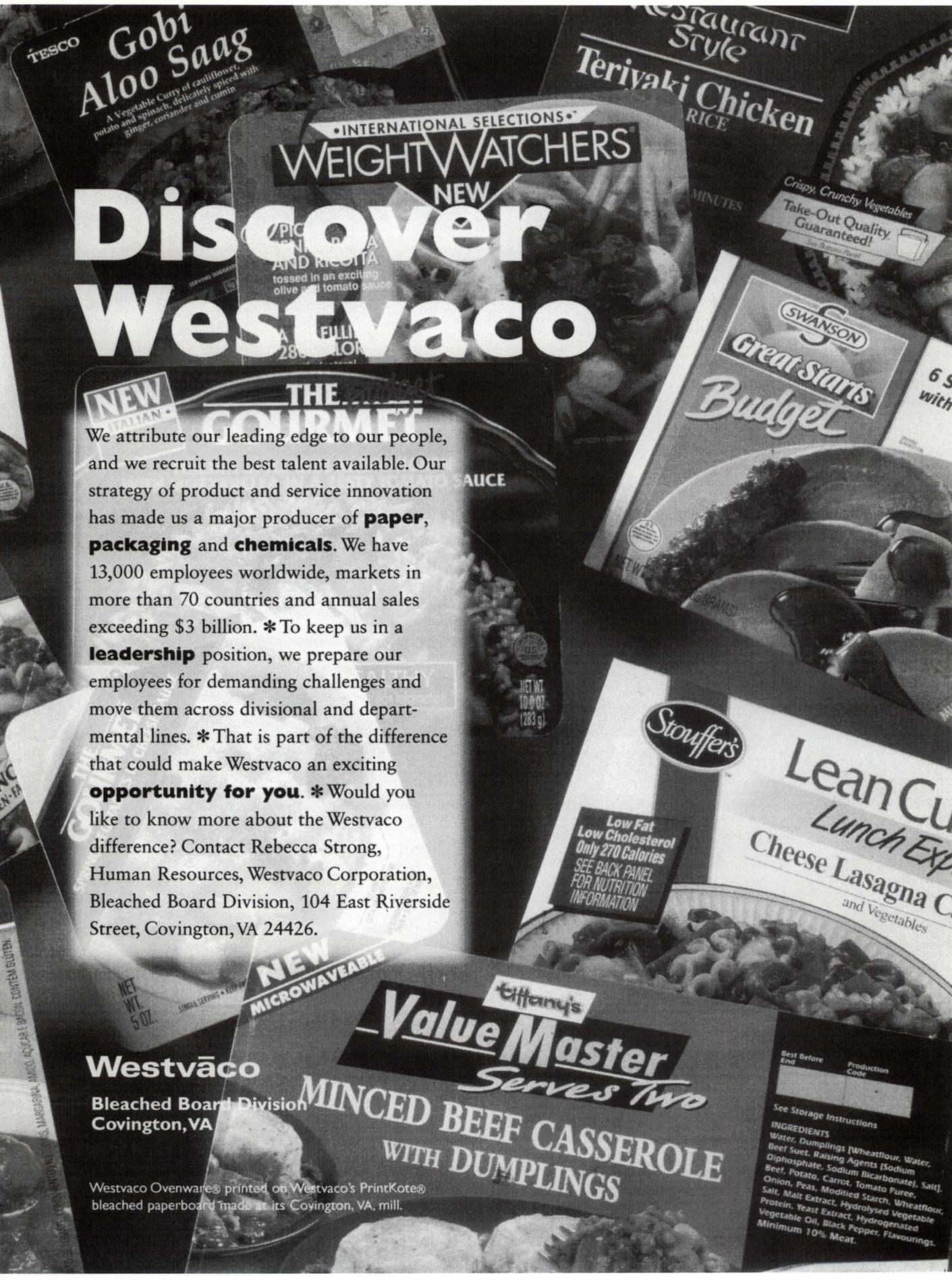
Discover Westvaco

We attribute our leading edge to our people, and we recruit the best talent available. Our strategy of product and service innovation has made us a major producer of **paper**, **packaging** and **chemicals**. We have 13,000 employees worldwide, markets in more than 70 countries and annual sales exceeding \$3 billion. *To keep us in a **leadership** position, we prepare our employees for demanding challenges and move them across divisional and departmental lines. *That is part of the difference that could make Westvaco an exciting **opportunity for you**. *Would you like to know more about the Westvaco difference? Contact Rebecca Strong, Human Resources, Westvaco Corporation, Bleached Board Division, 104 East Riverside Street, Covington, VA 24426.

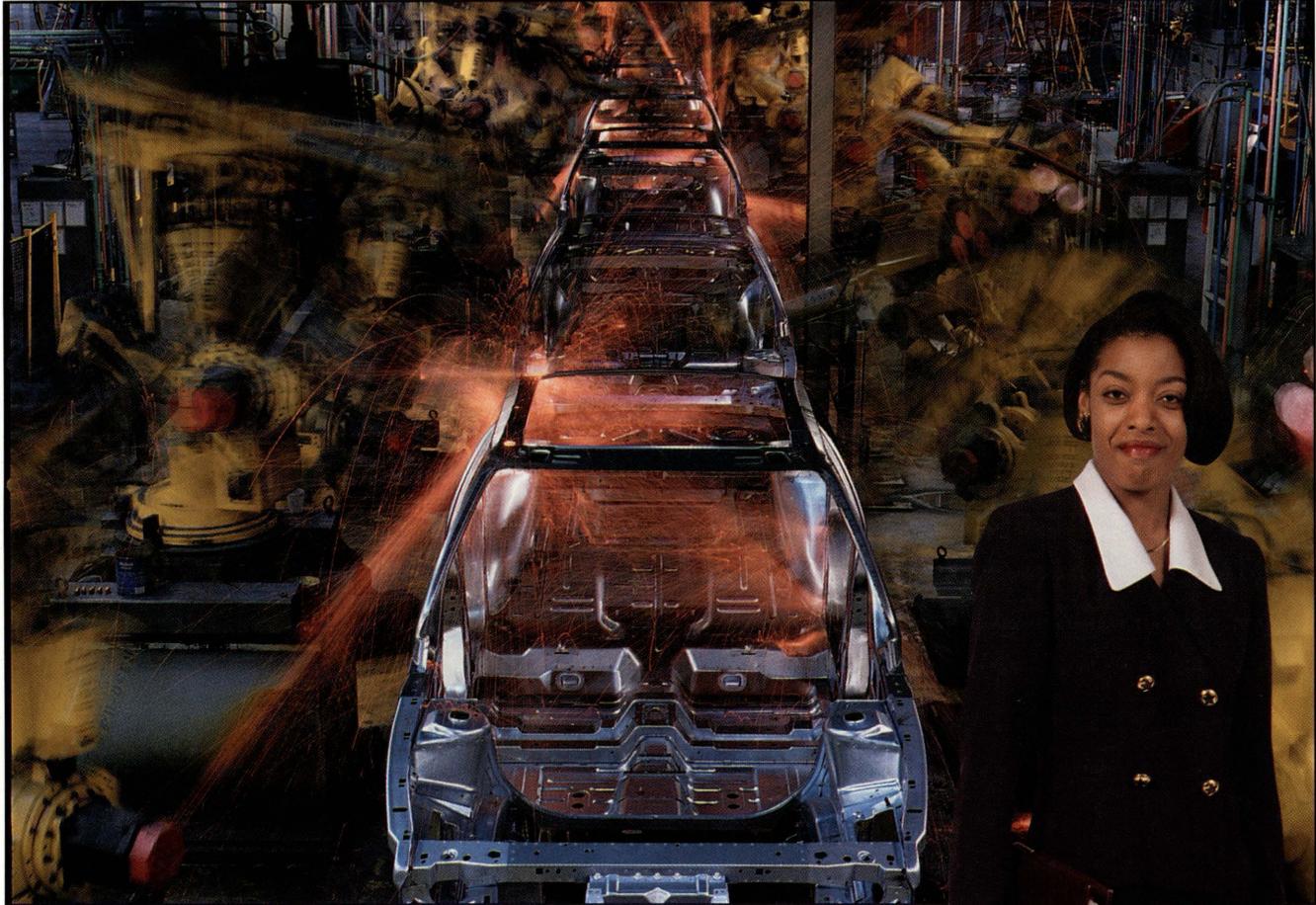
Westvaco

Bleached Board Division
Covington, VA

Westvaco Ovenware® printed on Westvaco's PrintKote® bleached paperboard made at its Covington, VA, mill.



*"What I've learned in the classroom,
I'm perfecting at GM."*



At General Motors, we're rewriting the book on succeeding in the automotive business. We're knocking down walls. Placing a greater emphasis on an open exchange of new ideas. Even underwriting non-formula product development programs that help formulate new thinking.

We're also recruiting the best and brightest to join our teams of world-class engineers, scientists and managers in one of the world's most important industries. To put your learning into action, send your resume to: GM Mid Lux Personnel, Fax: (810) 575-4468. For additional information, visit our web site at: <http://www.gm.com/careers>
Teamwork that touches the world.

General Motors®

An Equal
Opportunity
Employer

Theojuana Turner
GM Powertrain Group, Project Engineer

