



Engineers' Forum

Volume 24 • No. 3 • September 2005



Design Considerations For Formula One

- Discovering Discovery: Discovering A Dream
- VT Engineering Ranks Among Top 15
- VT Engineering Students Sweep Competition
- Dean Watford Accepts Post with NSF
- Thole Receives Endowed Professorship
- Nelson is Outstanding Advisor
- Love Investigates Enzyme Link to Disease
- Benson is new VT Dean of Engineering
- Good Time to Jump on R&D Bandwagon

DDI
TOYOTA

EBBON
CS



If we believed in limits,
Michelin
would be out of business. Instead, we
dream, we design,
we build. We push the limits.

At Michelin, our reputation for quality is reflected in our products and our people. We take pride in providing employees with long-term careers and excellent opportunities for advancement. If you're a driven individual who wants a lot of mileage out of your career, consider employment with us.

We are currently looking for ME, CHE, EE & IE graduates for the following positions:

- **Process/Quality Engineer**
- **Industrial Engineer**
- **Mechanical Project Engineer**
- **Electrical Project Engineer**
- **Tire Research and Development Engineer**
- **Reliability Engineer**

If you're ready to move into a rewarding career with excellent growth and advancement opportunities, please visit our web-site to view detailed job descriptions.

www.careers.michelin-us.com

An Equal Opportunity Employer.



NO LIMITS 

inside



page 4 | feature
Discovering Discovery: Discovering A Dream
by Sarah Lewis

page 6 | cover story
Design Considerations for Formula One
by Daniel Cirulnick

page 10 | feature
VT Engineering Ranks Among Top 15
from Staff Reports

page 12 | photo feature
This Issue's Question
by Sarah Lewis

page 14 | feature
VT Engineering Students Sweep Competition
from Staff Reports

page 16 | feature
Dean Watford Accepts Post with NSF
from Staff Reports

page 17 | feature
Thole Receives Endowed Professorship
from Staff Reports

page 18 | feature
Nelson is Outstanding Advisor
from Staff Reports

page 19 | feature
Love Investigates Enzyme Link to Disease
from Staff Reports

page 20 | feature
Benson is new VT Dean of Engineering
from Staff Reports

page 24 | opinion
Good Time to Jump on R&D Bandwagon
by Enoch Dames

GE Transportation
Aircraft Engines

The world's most powerful turbofan engine, the GE90, is backed by some of the boldest technical innovations in aviation history.

That's why we're also big fans of engineering students from Virginia Tech, whose technical contributions can help us shape the future of aviation.

We're
big fans of
aviation



Executive Editor

Enoch Dames

Managing Editor

Sarah Lewis

Layout and Design

Position open, apply today!

Copy Editor

Position open, apply today!

Business Manager

Position open, apply today!

Distribution Manager

Position open, apply today!

Writers

Dan Cirulnick
Enoch Dames
Sarah Lewis

Art & Design

Position open, apply today!

Photography

Position open, apply today!

Editorial Advising Committee

Lynn Nystrom

Director of News and External Relations
for the 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
Email: forum@vt.edu
URL: <http://fbox.vt.edu/eng/forum>

Member of Engineering College Magazine Associated, Mike Dorcey, 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 2005 *Engineers' Forum*. All rights reserved. Reproduction in whole or in part without permission is prohibited. Printed in the USA.

F R O M T H E E D I T O R



The *Engineers' Forum* magazine serves to promote and discuss local engineering and related topics that occur throughout the year. We are a group committed to our professional publication, and compete each year in a conference with other universities across the country. The *Engineers' Forum* is composed of students from different academic backgrounds; membership is not limited to engineers.

We currently need several positions filled, so please don't hesitate to email us. Because the journal is printed four times per year, becoming a member does not required a very large commitment.

To the students, I hope you enjoy some of the articles, and feel free to email us with comments or suggestions.

— Enoch Dames

Discovering DISCOVERY

Discovering a dream

BY SARAH LEWIS

Since the earliest history man has looked to the stars for his dreams, imagination, and inspiration of discovery. Now, since the mid twentieth century, the stars have become the dream. The world watched in awe as the beginnings of the space program began, and they continue to watch in awe as science and engineering crosses a new barrier each day.

The nation's collective memory stores few events every man, woman, and child can remember or has heard many time about. War does not always define all of those memories, however. The space program provides continual food for that collective memory — the first moon-walk, the Apollo program, the Challenger disaster, the Columbia tragedy, and most recently the successful mission of Discovery to bring



Charles Camarda, a 1990 Ph.D. graduate of aerospace and ocean engineering, was one of the seven astronauts who successfully flew on the Discovery mission. He is fifth from left.

supplies to the International Space Station.

On Tuesday, July 26, 2005 the Nation watched and held its breath as the space shuttle Discovery blasted into orbit propelled by a massive controlled explosion from the solid rocket boosters. The boosters use 6.6 million pounds of thrust to send the shuttle's 4.5 million pound weight at launch into orbit, according to Jim Banke in a story posted at Space.com.

The launch of Discovery marked the first manned space mission since Columbia broke apart on re-entry in early 2003. It wasn't until 15 days later, on Tuesday, August 9, 2005 at 8:11:22 a.m. EDT, that the nation

could breathe again when Discovery made a text-book landing at Edwards Air Force Base in California. Then, the shuttle will be sent piggy-back on its personal 747 jet back to Kennedy Space Center in Florida.

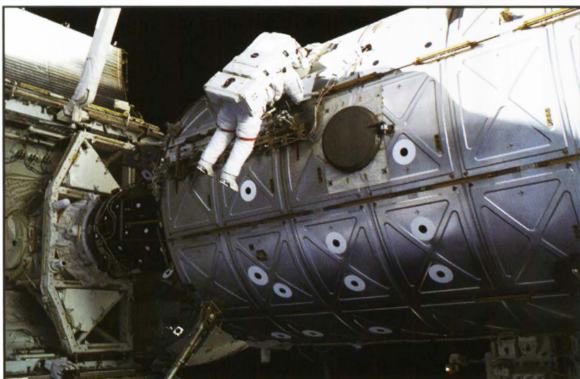
On the planned 14 day STS-111 mission the Discovery's seven-man crew delivered much-needed supplies to the orbiting international space station. The U.S. is one of 15 nations collaborating to build and maintain the station. During the mission a few crew members performed spacewalks to repair the hull, test new safety procedures, and conduct maintenance tasks.

Of course any good Hokie knows that we can't be left out of such an amazing event. You can find us everywhere — even in space. Rookie crew member Charles Camarda earned his PhD in Aerospace and Ocean Engineering in 1990 from Virginia Tech.

He grew up in Queens, N.Y. and graduated from Archbishop Malloy High school in 1970. He then headed to the Polytechnic Institute of Brooklyn, and graduated with his bachelor's degree in 1974.

He never gave up on his dream of becoming an astronaut, even after he was turned down for the opportunity shortly after beginning work at NASA. He has worked at NASA's Langley Research Cen-

Continued on next page



The tiles are repaired on the Discovery space shuttle.

Continued from previous page

ter for 22 years, and now his resolution and Hokie determination paid off. In 1996 he finally realized his dream and became a NASA astronaut, according to the Stanner Alumni Association webpage for the high school.

"It was a time when spaceflight was so intriguing. It was natural for me to want to be an astronaut, to dream of being an astronaut," Camarda reminisced for NASA's crew information web pages.

Dr. Raphael Haftka, his advisor and a former Virginia Tech professor, gave glowing praise for his engineering skill and understanding to Kevin Miller at The Roanoke Times. Camarda finally got to put that knowledge to work as one of the crew to analyze the shuttle for possible damages while in orbit, using a new laser system.

The new laser system was designed to detect damages like those believed to have caused the Columbia trag-

edy when the foam was damaged during liftoff. This time, the foam problem was quickly detected and repaired during one of the spacewalks made by fellow crewmen Steve Robinson and Soichi Noguchi.

In the NASA crew biography information at www.nasa.gov. Camarda declared that "Spaceflight will always be an experiment; it will never be an operational, routine venture, and we need to learn from every flight," Camarda said. "We need to improve and make sure that we're ever-vigilant that we can make this vehicle as robust and as safe as we possibly can," in response to the newest mission being termed a "test mission."

Now with the safe return of Discovery to Edwards Air force Base, NASA is turning its attention to Mars and possibly even eventual colonization. On Friday, August 12, 2005 the Mars Reconnaissance Orbiter shot into space to spend the next several months traveling to the red planet to

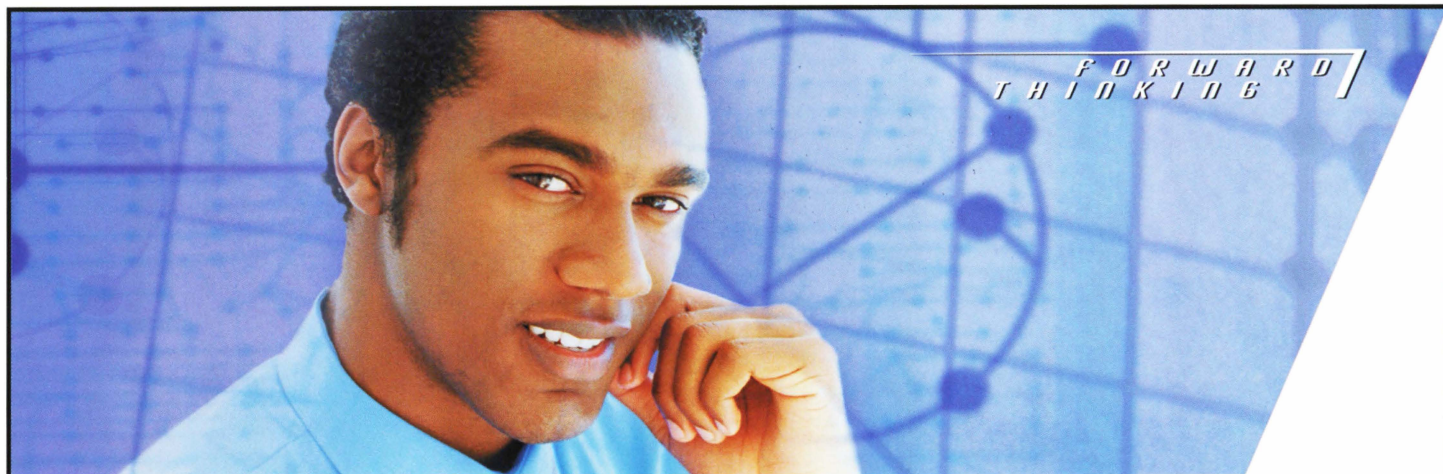


NASA will next turn its attention to Mars.

continue the search for water and possible life.

The dream of space travel is not limited only to the math-whiz or engineer.

See Discovery, page 9



Examine the Possibilities.

Now Hiring — Immediate Openings

Stand at the center of scientific and technological progress at the United States Patent and Trademark Office, securing exclusive rights for inventors over their discoveries worldwide. The United States Patent and Trademark Office continues to experience significant growth in the filing of patent applications, which translates into immediate opportunities for engineers and scientists to become Patent Examiners. Visit our website at www.USPTOCareers.gov to learn more about how your engineering skills can help keep American ingenuity on the cutting edge.

Patent Examiners

As a Patent Examiner, you will analyze patent applications using your specialized engineering knowledge and technical research

skills to evaluate concepts and designs. Your responsibilities will involve determining the acceptability of patent protection, while meeting weekly performance goals. You must possess a BS or advanced degree in engineering or science, technical competence in the area for which you are hired, and strong oral and written communications skills to be successful.

Examine your career possibilities. Our excellent benefits include enhanced federal salary rates, flextime schedules, paid overtime, health coverage, vacation and sick leave, law school tuition reimbursement and more. Visit www.USPTOCareers.gov to learn more about our exciting opportunities. US citizenship is required. Equal Opportunity Employer.



Please visit our website at:
www.USPTOCareers.gov

Design Considerations

for Formula One

By DANIEL CIRULNICK

Designing a car to meet Formula One (F1) regulations presents both a difficult and expensive task. Major car manufacturers (Ferrari, BMW, Toyota, Renault, Honda, and Mercedes) have spent up to 400 million dollars per year to design a successful F1 car. Toyota, being relatively new and craving immediate success, is spending nearly half a million dollars this year. Not only does this task require massive amounts of capital, but it also requires a streamlined and effectively managed team of engineers. Design teams in recent years have swollen to 900 members. The design considerations these massive (in both resources and people) organizations must take into account each year are outlined in the following article.

Aerodynamics

Aerodynamics is considered to be the most important part of the design, assuming a team's car is not short 150 hp, or has the suspension of a VW Beetle, or the rigidity of a Cabriolet. If a team lacks



Figure 1 – View of a F1 car's front wing

in horsepower, even the best aerodynamics will not bridge the gap. Fortunately, for competition's sake, this problem has not occurred in the last few years. With aerodynamics being as important as they are, we will first focus on the 'front wing,' the part of the car that first encounters oncoming airflow.

The front wing serves to "push" the car into the ground. At only 100 MPH, one of these machines can "stick" to the ceiling. Poor design considerations could leave a F1 Formula One car traveling upside down. A formula car is required to weigh a minimum of 600 kg at all times during a race weekend. Thus, at roughly

100 mph, a F1 car produces over 600 kg of downforce. The front wing introduces 30 percent of this downforce. The front wing, and other downforce producing elements on an F1 car (some include winglets, a diffuser, and a rear wing) all work similarly, and in turn, all work much like an upside-down airplane wing.

The wings fitted to these cars produce negative lift by inducing a lower pressure below the wing, which is created by higher-velocity airflow below the wing surface. (Conversely, an aircraft wing speeds up the air above the wing surface.) For those without a technical background (i.e., those who have not taken fluid mechanics), it should be noted that an increase in velocity results in a pressure decrease. However, the negative lift comes at a cost. For any amount of lift gained, drag (a friction force) also increases. The goal of any designer in the wind tunnel is to maximize negative lift while also minimizing drag. The greater

Continued on next page

Continued from previous page

the Lift-to-Drag ratio, the faster the lap times, the faster the lap times are.

As a result of falling lap times, the ruling body for F1 (Formula One) has introduced a host of rule changes. New rules for this year have raised the front wing 50 mm in an effort to slow the cars down around corners. The higher the front wing is from the road, the less efficient it can be. Because the front wing contributes almost all of its downward force to the front wheels, raising the front wing will reduce the amount of grip available for the front tires, and subsequently necessitate a decrease in corner speeds.

Another rule change for this year brings the rear wing forward; this serves to move the rear wing into "dirtier" air. Airflow becomes turbulent as it travels around the bodywork, and the closer the wing is to all this commotion, the less efficient it is. Almost all that has been covered concerning front wings also applies to rear wings. The front and rear wings are used to create downforce, and also to stabilize the car. With such highly-tuned machines, dynamic weight balance is very important. If a front wing is producing much more downforce than the rear wing, the car will appear much heavier to the front tires at high speeds. If such a condition exists, the driver will have a very difficult time making the rear of the car behave well.

The final major aerodynamic

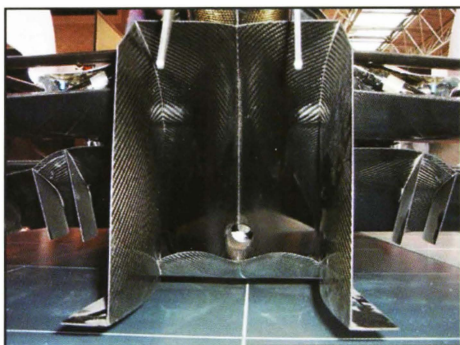


Figure 2 - A typical diffuser used in F1 cars

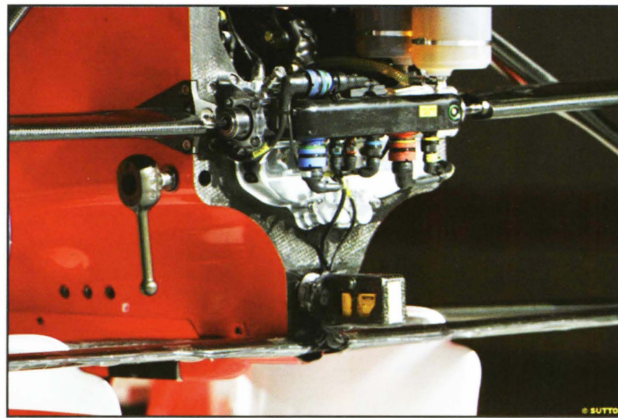


Figure 3 - Ferrari Single Keel Front Suspension

component is the diffuser. The air flowing through the diffuser exits through the rear of the car. Figure 2 depicts a close-up of a diffuser exit, from the perspective below and behind a Ferrari. Although wings and diffusers work similarly, they are based under different concepts. A diffuser serves to eject air out from the underside of the car. This pulling action increases the velocity of the air below the car, so that the more slowly moving air above the car will push the car into the ground. Diffusers, when working properly, can be extraordinarily important to the aerodynamics of a car.

When F1 cars travel around the pit lanetrack, the they diffusers produce 40 percent of the total downforce. When not working properly, these devices can befuddle even the most experienced drivers.

If a driver believes he has a certain grip level while taking a corner, he will take it at the highest speed possible assuming this level of grip. A common problem for the Jordan team (one of two non-manufacturer teams) last year was "diffuser stall." While braking, their car pitched forward, as you might notice when you see a car on the road braking moderately. This forward pitch lifts the rear of the car. If not designed properly, a diffuser will lose a very large percentage of its effectiveness if lifted a small amount (with the stiffness of F1 suspensions, this

"small amount" is 1-2 mm). When this happens a large amount of downforce is lost, and in turn, a large amount of grip is lost. If most of the 40 percent of a driver's aerodynamic grip is lost mid-corner, it is very difficult to keep the car from twitching. For those who follow F1 closely, you will remember how nervous the Jordan car looked on track, and how

often the car looked as if it was "hunting."

However, when all aerodynamic components are working in harmony, the result is a group of the fastest cars in the world racing on twisting road courses. Great aerodynamics in Formula One is necessary, but not sufficient. Two other major components contribute a top-tier F1 car.

Mechanical Considerations

The mechanical workings of a F1 car are just as detailed and difficult to optimize as the aerodynamic factors. Suspension design, chassis rigidity, center of gravity, weight balance, and a host of other considerations must be made when designing a F1 car.

Suspension design has been seemingly stagnant the last few years. Double Wishbone A-Arm suspension has been the norm. The suspension arms have been made out of carbon fiber for several years; this material is extremely strong and light. Carbon fiber suspensions maintain little flexure, which is important for predicting the response of the car as it travels over undulating wavy surfaces. The only design innovation recently seen is the attachment of the lower A-arms to the chassis. The majority of the grid has a "Single-keel" (see figure 3) suspension set up. (This is where the left and right lower wishbones attach at the same point, im-

See Formula One, page 8

Formula One

Continued from page 7

mediately behind the front wing.)

A few teams, including McLaren, Williams, and Sauber have at least experimented with a "Twin-keel" design (see Figure 4). This is where the left lower suspension arm and the right suspension arm attach at different points. Instead of attaching immediately behind the rear wing, engineers move the suspension pick-up points are moved outward, opening up room for air to flow more freely over the front wing. While some teams have found that the aerodynamic benefits have outweighed the mechanical setbacks, others have not. Ferrari has stuck with the single-keel design, and has had considerable success. A single keel allows for better front suspension geometry, and it is also more rigid. As with most engineering disciplines, the trade off for some is too large, and for others the benefits seemingly

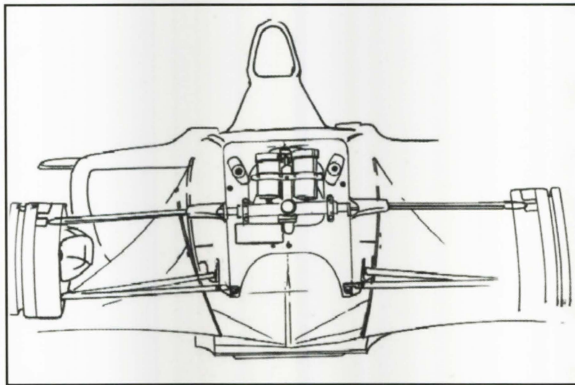


Figure 4 – Sauber's Twin Keel Front Suspension

outweigh the drawbacks.

Weight balance has become a major concern for teams this year. As carbon fiber has begun to dominate the makeup of a Formula One car, teams have been able to reduce the weight of the entire package to nearly 500 kg.

As stated above, however, regulations require a car to be a minimum of 600kg. The lighter a team can make the

car, the more ballast it can place around the bottom of the car for stability. This not only brings the center of gravity down, but also allows for weight placement mobility depending on how the car is handling.

These two weight considerations are very important for the handling of the car. As the center of gravity of the car is lowered, drivers experience less weight transfer during

turns. This is important because as weight is transferred to a certain wheel (depending on which direction the car is turning, or accelerating/decelerating) the loads on the other wheels change as well. This reduces the total amount of tire grip available, thus reducing the car's ability to corner or accelerate.

As for balancing the car, having

Continued on next page

**Join
Our Team**

Career Achievements
Start at Dominion



Dominion
It all starts here.

- Environmental Consultant
- Accountant
- Offshore Geologist
- Engineer
- Energy Asset Trader
- Financial Analyst

These are just some of the career opportunities available at Dominion, one of the nation's largest producers of natural gas and electricity.

Join our team.

The excitement of change and the promise of growth. That's what you'll find in today's energy industry and in a career with Dominion.

Apply online.

Search for a position and submit your resume online at our Web site.

Earn while you learn.

Check out our co-op, intern and diversity scholarship programs at Dominion's online Campus Connection.

Dominion, headquartered in Richmond, Va., is ranked by *Fortune* magazine as one of the most admired companies in the country.* For more information on Dominion, visit www.dom.com.

* 2004 Survey, "Most Admired Companies," *Fortune* magazine

© 2005 Dominion

Continued from previous page

almost 100 kg's of weight to move rear-ward can be a great help when tweaking a cars turning performance, as well as acceleration. Last year, Renault had light-ning quick starts. It was rumored that they had a novel launch control mechanism. Eventually, it was discovered the secret came out that not only did they have a trick clutch, but they placed 55 percent of the weight on the rear wheels (10 percent more than the other cars' averages). This helped them get off the starting line quickly because there was more grip available for accel-eration.

When optimizing these two design factors (aerodynamic and mechanical), cars may average a 140 MPH trip through twisting street circuits, obtaining a top speed of 220 MPH. Cars racing in this Formula are the fastest on both the road and street courses. There is a reason for their jaw-dropping performance — massive amounts of money, large groups of talented engineers using the latest tools, the right materials and processes, and wind tunnels in operation 24 hours a day.

Discovery

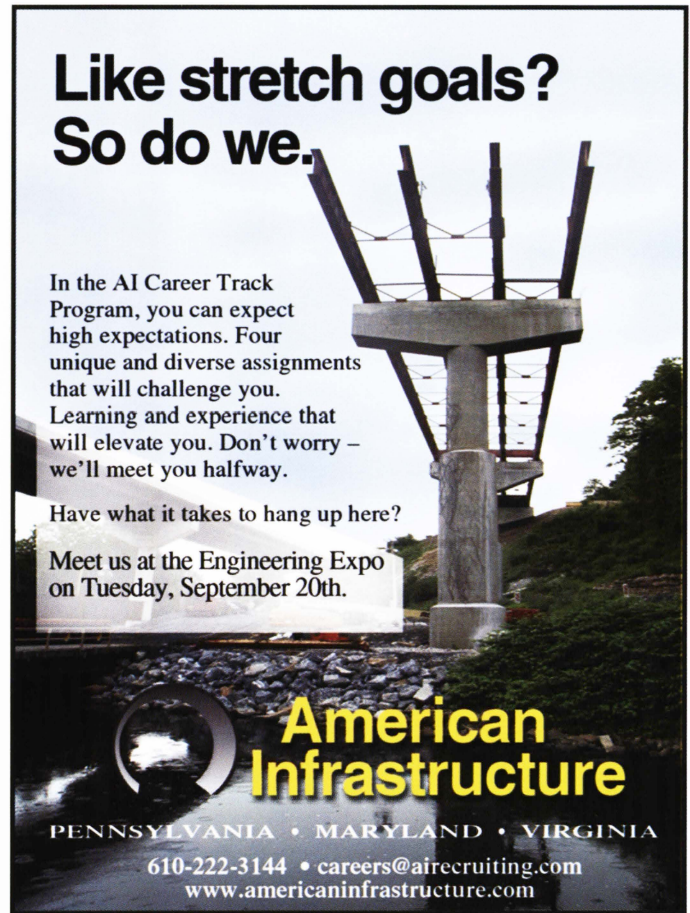
Continued from page 7

NASA recruits employees from all disciplines and talents, and they post current career opportunities on their website at www.nasajobs.gov.

According to Jacqui Goddard for news.scotsman.com, trips to the moon have now become a private operation. For about one-hundred million dollars you can fly to the moon on vacation through a joint venture with American Space Adventures. Instead of watching the sunrise on the Atlantic Ocean, travelers can watch the Earth Rise over the Sea of Tranquility. By 2008 you may even be able to book your trip at competitive rates on Expedia.com®. Businessman Richard Branson created The Spaceship Company and partnered with Burt Rutan, the designer of Space Ship One, and they have joined the newest space race.

Soon it may be more common to see Hokies in space as private trips become more common and affordable. But if science is still your love, NASA is still the best way to fly.

*Engineers' Forum —
not just for engineers.*



**Like stretch goals?
So do we.**

In the AI Career Track Program, you can expect high expectations. Four unique and diverse assignments that will challenge you. Learning and experience that will elevate you. Don't worry — we'll meet you halfway.

Have what it takes to hang up here?

Meet us at the Engineering Expo on Tuesday, September 20th.

American Infrastructure

PENNSYLVANIA • MARYLAND • VIRGINIA

610-222-3144 • careers@airecruiting.com
www.americaninfrastructure.com



We offer careers in:

- Aviation
- Facilities Planning & Design
- Water Resources
- Oil & Gas Pipelines
- Emergency Management
- Water/Wastewater
- Transportation
- Architecture
- GIS/GIT
- Environmental Services

Take the Baker Advantage!

Success today requires a distinct competitive advantage. Your advantage is an outstanding education from Virginia Tech.

We're a nationally-recognized industry leader with excellent career opportunities in engineering, GIS/GIT, architecture, transportation, planning, and environmental infrastructure. Come join the future.

For more information contact:

Erin Windes
770 Lynnhaven Parkway
Suite 120
Virginia Beach, VA 23452
ewindes@mbakercorp.com

Baker

Baker is an Equal Opportunity Employer

Virginia Tech engineering ranks among top 15, business in top 50 in undergraduate survey

FROM STAFF REPORTS

Virginia Tech's College of Engineering jumped to a ranking of 14th and the Pamplin College of Business retained its top 50 ranking in *U.S. News & World Report's* "America's Best Colleges 2006" survey.

Overall, Virginia Tech is ranked among the top 100 in the magazine's annual survey of the nation's undergraduate programs.

The Virginia Tech College of Engineering, which traditionally is ranked by the survey among the top 20 of all accredited engineering schools in the nation that offer doctorates, rose in the rankings from 19th

a year ago to 14th this year, tied with the engineering colleges at Johns Hopkins University, Northwestern University, and

neering college shares the rank of eighth with Texas A&M. Engineering college rankings are based solely on a peer survey of deans and senior faculty at the more than 550 schools accredited by the Accreditation Board of Engineering and Technology.

"I've never been one to get excited over small changes in the *U.S. News & World Report* rankings, but it was gratifying to see the five point jump for the Virginia Tech College of Engineering in the new rankings of undergraduate programs," said

Richard Benson, who became dean of the college on Aug. 10.

Continued on next page

"Our rank of 14th puts us squarely among the finest engineering colleges in the nation. Virginia Tech will always be at the forefront of engineering education — attracting and graduating engineering students of unsurpassed skill."

~ Dean Richard Benson

Texas A&M University.

Among engineering schools at public institutions, the Virginia Tech engi-



BOHLER ENGINEERING, P.C.

YOU'LL GO AS FAR AS YOUR AMBITION WILL TAKE YOU

BOHLER ENGINEERING, P.C., is a rapidly growing, multi disciplined Civil Engineering Consulting Firm specializing in servicing the East Coast. Our seven offices provide coverage from Maine to the Carolinas. Due to continued success and growth, we are seeking motivated individuals to supplement our staff in all locations.

Please Visit www.bohlereng.com for more information!

Interested parties should send resume and cover letter to Peter Schiller, Director of Staff Development and Recruiting, pschiller@bohlereng.com

Corporate Headquarters:
776 Mountain Boulevard
Watchung, NJ 07069
908.668.8300

Sterling, VA Office:
22630 Davis Drive, Suite 200
Sterling, VA 20164
703.709.9500

JK John J. Kirlin inc.
Mechanical Contractors



Do you want a career...not just a job?

See if you can make the grade!

Visit our web site:

www.johnkirlin-inc.com

Continued from previous page

"Our rank of 14th puts us squarely among the finest engineering colleges in the nation, and speaks to the notice we're receiving for our innovative work as educators," said Benson, formerly head of mechanical and nuclear engineering at Pennsylvania State University. "This trend will continue. Virginia Tech will always be at the forefront of engineering education — attracting and graduating engineering students of unsurpassed skill."

Among undergraduate business programs, Virginia Tech's Pamplin College of Business is ranked 40th overall along with six other schools, and 24th among those at public universities. Last year, the college was 38th overall and 23rd among public institutions.

The Pamplin college's overall ranking keeps it among the top 10 percent of the 458 U.S. undergraduate programs accredited by the Association to Advance Collegiate Schools of Business International. The business rankings are solely based on a survey of deans and senior faculty at schools accredited by the association.

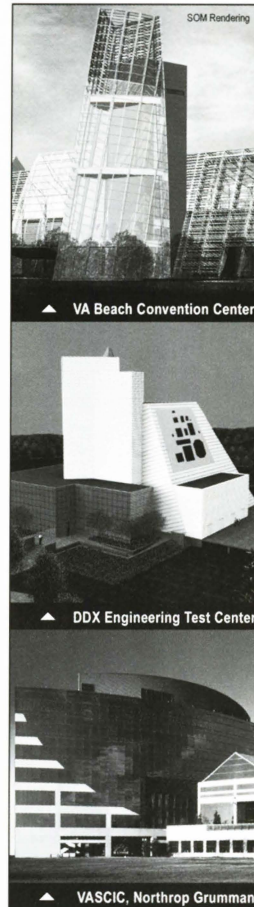
Among national universities, Virginia Tech stepped back one ranking slot from last year, now sharing the 78th slot with Baylor University, Clemson University, North Carolina State University, St. Louis University, and the University of Colorado. Last year, Virginia Tech was one of seven universities tied for the rank of 74th.

All of the universities ranked in the top 20 this year are privately funded schools, with the exception of the University of California-Berkeley. Among publicly funded universities, Virginia Tech is ranked 33rd along with Clemson, Colorado and North Carolina State.

"Virginia Tech is pleased to be ranked among the nation's top universities," said Larry Hincker, associate vice president for university relations. "High performing students continue to be attracted to our challenging academic environment.

"Although we improved on several *U.S. News & World Report* indicators of quality, the university dropped slightly in the rankings," Hincker said. "This speaks to the increasing competitiveness among colleges and universities and the need for continued public and private support for our university."

U.S. News & World Report bases the university rankings on data gathered from a national survey of schools. The magazine uses a number of criteria, including peer assessment, retention, faculty resources, student selectivity, financial resources, graduation rates and alumni giving.



Where SUCCESS is THE CORPORATE CULTURE

Since 1920, Clark Nexsen has been a firm that prides itself in our commitment to our employees and exceptional client service.

We offer you an opportunity to work with one of ENR's Top 500 design firms* on some of the highest profile projects in the Hampton Roads area.

COME AND MAKE YOUR MARK...

CLARK • NEXSEN

Architecture & Engineering

WWW.CLARKNEXSEN.COM

Norfolk Charlotte
Alexandria Raleigh Roanoke

*Engineering News-Record April 19, 2004

There's a Place for You at Today's FBI. Opportunities in Professional Support

You've chosen to explore one of the most important and rewarding careers anywhere. When you join the FBI, you join the organization that plays a central role in ensuring the safety of our country and every U.S. citizen.

Whatever your background or expertise — whether you are a lawyer, chemist, administrative assistant, computer engineer, or file clerk — you can apply your skills in a support position at FBI headquarters in Washington, D.C. or in one of our 56+ field offices. Opportunities of particular interest include but are not limited to:

- **Intelligence Research Specialists** • **Intelligence Operations Specialists** • **Linguists** • **Computer Scientists/Specialists** • **Electronics Technicians**

Please apply on-line at: www.fbijobs.com Only those candidates determined to be best qualified will be contacted to proceed in the selection process. An equal opportunity employer.

For additional employment opportunities with the FBI, please visit our website:



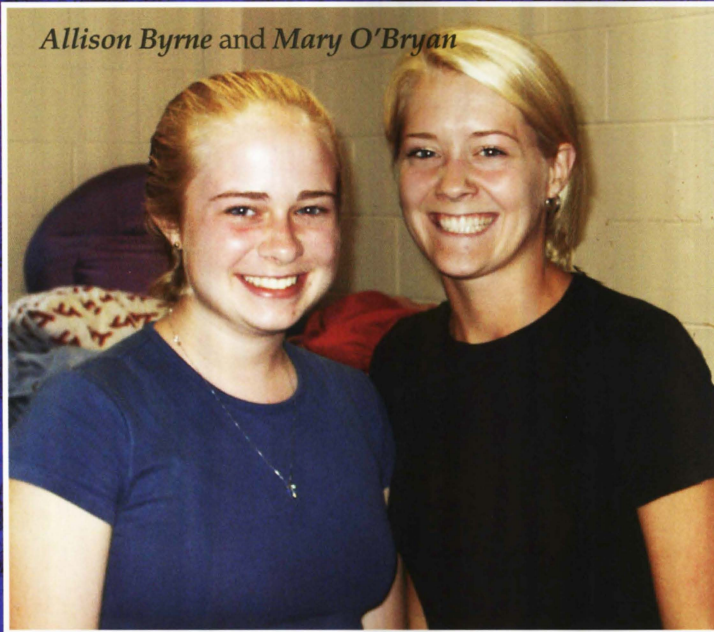
www.fbijobs.com

The Federal Bureau of Investigation

question

What are you looking forward to the most this year?

Allison Byrne and Mary O'Bryan



Christi Krohn



Erin Wallis



Brandy Cash



Name: Brandy Cash

Year: Junior; Major: Communication

Answer: "Meeting new people"

Name: Christi Krohn

Year: Junior; Major: Biomedical Engineering

Answer: "Meeting new people, making new friends, and going to more football games"

Name: Erin Wallis

Year: Sophomore; Major: Interior Design

Answer: "Getting to know people and becoming more concentrated in my major"

Name: Tatsuya Nakamura

Year: Junior; Major: Mechanical Engineering

Answer: "Trying to get a good internship this summer"

Name: Drew Duncan

Year: 2nd; Major: Architecture

Answer: "Change in residence from Slusher Wing to New Residence Hall East, and that each year I get to focus in more on my major"

Name: Allison Byrne and Mary O'Bryan

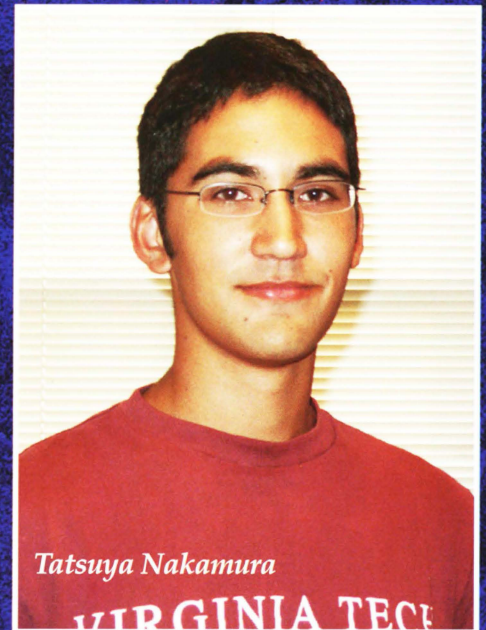
Year: Freshmen (both); Major: University Studies and Food Science

Answer: "Football games"

Name: Mary Hatcher

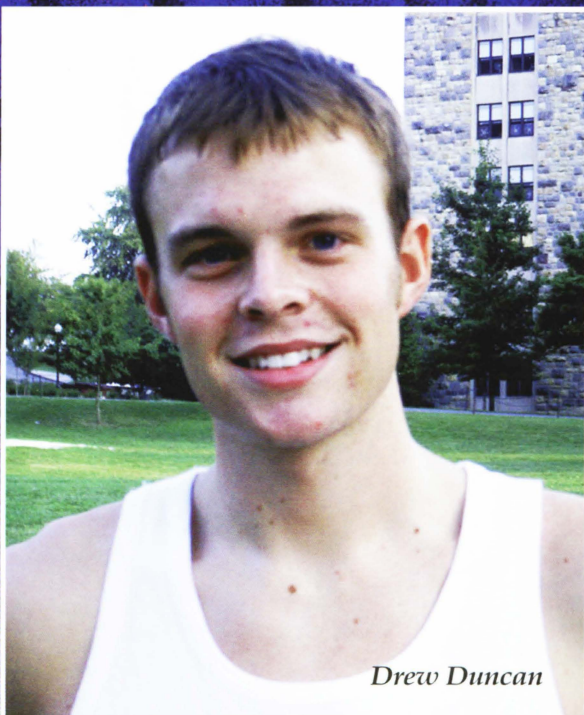
Year: 5th Year Senior; Major: Business Information Technology

Answer: "GRADUATION!!!!"



Tatsuya Nakamura

VIRGINIA TECH



Drew Duncan



Mary Hatcher

Virginia Tech engineering students sweep international intelligent vehicle competition



Members of the Virginia Tech Autonomous Vehicle Team display their competition-winning vehicles. Standing (l to r) are Jon Weekly, Jeremy Blodgett, Tony Johnson, Nick Miller, Colin Todd, Andrew Bacha, Alfred Wicks, Sean Baity, David Eargle, Mike Avitabile and Brett Gombar; kneeling are Jordan Felps and Bobby Mott with the team's vehicles *Polaris*, *Gemini* and *Johnny-5*.

FROM STAFF REPORTS

The Virginia Tech Autonomous Vehicle Team swept the international Intelligent Ground Vehicles Competition (IGVC), placing first, second and third and, winning eight out of nine event categories, along with \$15,000 in prizes. The event took place June 1-13 in Traverse City, Mich.

Dominating the IGVC is becoming a tradition for the Virginia Tech team, led by faculty advisors Charles Reinholtz and Alfred Wicks, professors of mechanical engineering (ME). In 2004 the team placed best overall, won six of nine categories and was the only group from the U.S. to place in any category. The team also

won the competition in 2000 and 1998.

Much of the design and build work for the three vehicles entered in the 2005 IGVC was performed under the guidance of ME graduate students Andrew Bacha of Reston, Va., Sean Baity of Westminster, Md.; and Brett Gombar of Montclair, Va.

Several members of the team graduated from Virginia Tech in May with bachelor's degrees in ME:

Jeremy Blodgett of Scotia, N.Y.; David Eargle, Charlotte, N.C.; Jordan Felps, Moseley, Va.; Jake Greene, Arnold, Md.; Tony Johnson, Richmond, Va.; Nick Miller, Cockeysville, Md.; and Jon Weekley, Cin-

cinnati, Ohio. Mike Avitable of Chatham, N.J., earned his degree in electrical and computer engineering.

The other team members are returning ME seniors Bobby Mott of Ashburn, Va.; David Oatley, Washington, N.J.; Sylvia Rigsby, Mineral, Va.; and Colin Todd, Columbus, Ohio.

The Virginia Tech team entered three of the 37 autonomous vehicles that competed in this year's IGVC.

Autonomous vehicles are equipped with computer, sensor and navigational technologies and programmed to maneuver without any human interven-

Continued on next page

tion. During the IGVC, vehicles must navigate a course outlined by painted white lines, while maneuvering around construction barrels and other obstacles. The vehicles also must autonomously navigate to a series of GPS (global positioning system) waypoints while avoiding numerous obstacles, including mesh fences.

In addition, the entries are judged on design innovations.

The three Virginia Tech vehicles – Gemini, Johnny-5 and Polaris – are equipped with navigational sensors, including digital cameras to determine course boundaries, scanning laser range finders to identify obstacles, global positioning systems (GPS) and digital compasses.

The sensors on each vehicle are linked by LabView software developed by National Instruments, the team's major industry sponsor. LabView analyzes sensor

input and commands vehicle motion. The primary differences in vehicle operation are the result of variations the Virginia Tech students implemented in the software. The

"Our team has done well because we have great students. It's a great apprenticeship program, where more experienced members teach the newer members."

~ Professor Charles Reinholtz

vehicles also have variations in body construction and power sources.


Gemini, which placed first in all three event categories – navigation challenge, autonomous challenge and design – is powered solely by batteries. Johnny-5 and Polaris have hybrid electric

power systems that use gasoline generators as well as batteries.

"Our team has done well because we have great students," Reinholtz said. "Also, the team has continuity. Sean Baity, Brett Gombar and Andrew Bacha started as undergraduates and have stayed with the team as graduate advisors. Another example is Mike Avitabile, who joined the team as a freshman – this year was his fifth competition. It's a great apprenticeship program, where more experienced members teach the newer members."

For more information about the Virginia Tech Autonomous Vehicle Team, please contact Dr. Charles Reinholtz at (540) 231-7820 or email creinhol@vt.edu.

The team's Web site is <http://www.avt.me.vt.edu/>.



Drawing A Line On Quality. Since 1947.

Interesting HSMM provides a challenging and stimulating environment for our personnel without losing sight of our corporate principles. We offer excellent opportunities for career growth and development in a respectful, professional work environment.

Challenging

Rewarding

We serve clients at all levels of government and throughout the private sector. Our team of over 500 professionals develop creative, yet practical, designs and engineering solutions for clients worldwide.

Professional and technical employment opportunities available in various disciplines and locations. Submit your resume today! www.hsmm.com

EEO M/F/D/V

HSMM ARCHITECTS ENGINEERS PLANNERS



Albert Einstein
Leonardo da Vinci
Marie Curie
Wolfgang Amadeus Mozart

(In every generation there are those who make their mark.)

Fulfill your destiny.

Send your résumé to college@pec.com

PEC Solutions will be on-campus Fall 2005 and Spring 2006 conducting interviews. For more information, please contact your Career Services Center.

Billy Taylor (eager beaver)

PEC
Solutions
An equal opportunity employer.

www.pec.com

Dean Watford accepts one-year post with the National Science Foundation

FROM STAFF REPORTS

Bevlee Watford, associate dean for academic affairs for Virginia Tech's College of Engineering, has accepted a temporary assignment for one year at the National Science Foundation (NSF). She started in August.

Watford will be serving as a Program Director in the Division of Undergraduate Education (DUE).

Housed within the Education and Human Resources Directorate, DUE's current programs represent a comprehensive approach to strengthening science, technology, engineering, and math education at two and four-year colleges and universities.

Recently Virginia Tech was award-

ed a \$2 million grant from DUE to provide academic support services to College of Engineering students. Watford will be leading the proposal review and program evaluation for a specified program within DUE.

Mike Deisenroth, professor and assistant department head of industrial and systems engineering at Virginia Tech, will be acting associate dean for academic affairs while Watford is at NSF.

Deisenroth will oversee all academic undergraduate engineering programs and students.



Watford

"Join me in congratulating both of these individuals on their new assignments," said Ed Henneke, an associate dean of the College of Engineering.

Watford received her bachelor's degree in mining engineering from Virginia Tech in 1981. She also earned her master's and Ph.D. degrees in industrial engineering and operations research at Virginia Tech in 1983 and 1985, respectively. Her research areas of interest are related to the recruitment and retention of engineering students, particularly under-represented students.

» Named one of the Best Small & Medium Companies to Work for in America by the Great Place to Work Institute and SHRM, June 2004 & 2005

Exponential ingenuity

Mitretek Systems is a nonprofit, 501(c)(3), scientific research and engineering corporation that operates in the public interest. Our expertise in conjunction with our objectivity and independence allows us to effectively address challenges of national significance. Since we are a company of "idea people" our core strength is a highly trained and educated staff with wide-ranging experience in science, engineering and technology.

Our unquestioned objectivity and independence are hallmarks of an organization with no corporate ties to product vendors or service providers. The results? Your objectivity remains intact as you make recommendations with motives purely to serve the public interest. There has never been a more pressing or exciting time to join us in creating the solutions that will redefine our time.

For confidential consideration please direct your resume to: staffing@mitretek.org; Mitretek Systems, Corporate Recruitment Dept. VT-9/05, 3150 Fairview Park Drive, Falls Church, VA 22042. Fax: (703) 610-1533. EOE.

Applicants selected may be subject to a government security investigation and must meet eligibility requirements for access to classified or other regulated information.

Innovative Technology in the Public Interest™

MTS™
Mitretek Systems

www.mitretek.org

Esterline

Pressure Systems Sensing the Environment™

Precision Level and Pressure Instrumentation from Transducers to Systems for Environmental, Industrial and Aerospace

Visit us on the web:
www.PressureSystems.com

On-line Transducer Store:
www.LEVELandPRESSURE.com

Thole first female recipient of an endowed engineering professorship

FROM STAFF REPORTS

Karen A. Thole, Virginia Tech professor of mechanical engineering, is the first female recipient of an endowed engineering professorship at the university. Thole has received the William S. Cross Professorship in the College of Engineering, established in 1984 by a generous gift from William S. Cross Jr., of Greensboro, N.C.



Thole

Thole received her Ph.D. from the University of Texas at Austin in 1992 and joined the Virginia Tech faculty in 1999. Thole's primary areas of expertise are heat transfer and fluid mechanics specializing in turbulent boundary layers, convective heat transfer, and high freestream turbulence effects.

Thole has published more than 80 peer-reviewed papers with a number of these presentations given to international audiences, and has advised more than 25 graduate theses. She serves as an associate technical editor of the American Society of Mechanical Engineers' *Journal of Heat Transfer*.

She received the National Science Foundation CAREER Award in 1996, which was directed at developing a better understanding of turbine heat transfer and at teaching a lab course to first-year women engineering students. In 2004, Thole was selected to be a Fellow of the American Society of Mechanical Engineers and was inducted into the University of Texas at Austin Mechanical Engineering Distinguished Alumni Academy.

Thole is also one of the principal investigators on the Institutional Transformation Award from the National Science Foundation's Advance Program. The Advance Program is aimed at increasing the participation and advancement of women in academic science and engineering careers. Thole is an AdvanceVT professor of mechanical engineering at Virginia Tech.

During the past several years, Thole has developed a number of unique testing facilities directed towards gas turbine heat transfer issues including a combustor simulator that replicates the flow field effects relevant to those entering the turbine section of an engine. Resulting from this work, the Air Force Research Lab requested her to duplicate this capability in their multi-million dollar turbine research facility.

She is the chair of the Academic Advisory Board of the U.S. Department of Energy's University Turbine Systems Research Program. Her two patents for a fillet design, developed

to reduce heat transfer at the leading edge of turbine airfoils, are now being incorporated into the most recent turbine design.

Thole has been solely responsible for attracting funding of more than \$5 million from such agencies as the Department of Energy, U.S. Air Force, Pratt & Whitney, Modine Manufacturing, and Siemens-Westinghouse.

Engineers' Forum.
Not just for engineers.

ENGINEER

WE'RE NOT LIKE EVERY
OTHER HIGH TECH COMPANY.
WE'RE HIRING.

No one told you the hardest part of being an engineer would be finding your first job. Of course, it's still possible to get the high tech work you want by joining the U.S. Air Force. You can leverage your degree immediately and get hands-on experience with some of the most sophisticated technology on earth. To find out how to get your career off the ground, call **1-800-423-USAF** or visit our Web site at **airforce.com**.



U.S. AIR FORCE
CROSS INTO THE BLUE

Virginia Tech professor wins NSF outstanding advisor award

FROM STAFF REPORTS

The National Science Foundation (NSF) presented the Outstanding Long-Term Faculty Advisor Award to Virginia Tech mechanical engineering professor Douglas Nelson during the Challenge X 2005 Competition at General Motors' Milford Proving Grounds near Detroit, Mich., this summer.

Nelson is the founding advisor of Virginia Tech's Hybrid Electric Vehicle Team (HEVT), which has participated since 1994 in national alternative-fuel, student-designed vehicle competitions sponsored by the U.S. Department of Energy (DoE) and U.S. automakers. Nelson's award from NSF includes a \$15,000 grant to help fund undergraduate participation at Virginia Tech in the Challenge X competition.

Under Nelson's guidance, the HEVT won a number of awards while participating in the previous FutureCar and FutureTruck challenges. During those competitions, Nelson and his student teams created the world's first student-designed fuel-cell-powered car and sports utility vehicle (SUV).

Challenge X, sponsored by DoE and General Motors, is a three-year competition aimed at encouraging university students to develop designs and technology for the next generation of energy-efficient, low-emissions vehicles. During the recent event, the 17 university teams in Challenge X presented the designs they created over the past academic year. Soon each team will receive a GM Equinox SUV to modify according to those designs.

Nelson and the Virginia Tech team will re-engineer their Equinox into a hybrid SUV powered by electric motors and an engine fueled primarily by ethanol. During the design presentation competition, the HEVT won a \$3,000 cash prize for placing



Doug Nelson, the founding advisor of the Hybrid Electrical Vehicle Team at Virginia Tech, was named the Outstanding Long-Term Advisor by the National Science Foundation.

fourth overall among the 17 teams and a \$2,000 prize for placing second in the best written reports category.

"We received keys to our Equinox during the event," Nelson said. "We expect the SUV will be delivered by GM by the end of June, so we can begin the vehicle design integration and testing phase for the second year of Challenge X."

Nelson, who joined the Virginia Tech faculty in 1986, is director of the Center for Automotive Fuel Cell Systems, a DoE Graduate Automotive Technology Educa-

tion center.

In 1996 the Society of Automotive Engineers presented Nelson with the Ralph R. Teeter Educational Award in recognition of his outstanding contributions as one of the nation's top engineering educators in the field of automotive technology. In 1998 he received the NSF FutureCar Challenge Faculty Advisor of the Year Award.

Nelson earned his bachelor's and master's degrees in mechanical engineering at Virginia Tech and his Ph.D. at Arizona State University.

Virginia Tech engineer investigates enzyme link to neurological disease

FROM STAFF REPORTS

Several neurologically based afflictions, such as Huntington's, Parkinson's, and Alzheimer diseases, have been correlated to a higher than normal presence of a specific type of enzymes, called transglutaminases (TGase) in the human body. TGases, whose function is to catalyze covalent bonds among proteins, are commonly found in several different human tissues.

In the presence of unusually high levels of these enzymes, some proteins tend to form denser clusters than normal in vivo. If the aggregates grow in size, it can lead to a build-up of insoluble plaques that can block neurovascular transport and cause neural cell death.

"If higher TGase concentrations in cerebrospinal fluid and in the brain lead to protein agglomeration, then their inhibition could reduce symptoms, delay the onset of agglomeration, and maintain viable neural cell health extending the quality of life for those afflicted," hypothesizes Brian Love, a professor of materials science and engineering (MSE) at Virginia Tech.



Virginia Tech's Colleges of Engineering and Wake Forest University's School of Medicine have established a pioneering joint venture, the School of Biomedical Engineering and Sciences (SBES). This educational and research collaboration between a high-quality engineering program and an equally well-regarded medical school represents both a unique model and a powerful combination of resources. Pictured above is a tissue engineering laboratory in the College of Engineering.

Love, who focuses his research on tissue and cell engineering, and Elena Fernandez Burguera, a post-doctoral research associate, are evaluating specific therapies to fight the abnormally high TGase binding. Based upon the prior work of several others who are conducting clinical trials, Love and Burguera are developing an in vitro model

to evaluate the ability of several inhibitors to block protein aggregation by TGases.

Again, based on the work of other scientists, "several compounds show some positive effects," Love says. These include creatine, cystamine hydrochloride, and a few others. "The development of an inhibition protocol may help test the efficacy of other inhibitors as well," the engineer adds.

See *Enzymes*, page 23

BLUERIDGE FARM CENTER, INC.

We offer a complete line of John Deere farm equipment, lawn and garden, and commercial lawn equipment, as well as **Hardy** rotary cutters

JOHN DEERE
U.S. 11 SOUTH
Buchanan, Virginia 24066
(540) 254-1441 or (540) 992-1442
800-262-5039

Go Hokies!


Onan

Cummins Atlantic Inc.
Sales, Parts, & Service
Diesel Engines &
Power Generators
Tel: 540-966-3169
www.cumminsatlantic.com

Lawrence Transportation Systems

VA Tech's full service mover
Let us help you move up in the world!

800-336-9626
www.lawrencetransportation.com

Penn State administrator becomes Virginia Tech's Dean of Engineering

FROM STAFF REPORTS

Richard C. Benson became Virginia Tech's new dean of the College of Engineering on Aug. 10. Benson came from Penn State University where he headed its Department of Mechanical and Nuclear Engineering..

"Dick is an outstanding candidate from a pool of outstanding engineering educators and brings an impressive record of accomplishment from Penn State and the University of Rochester. I am exceedingly pleased to find in Dick the leadership qualities and vision to lead our college. I know that he will work well with all components of the university to advance the college and the university strategic goals," said Mark McNamee, University Provost.

Says Benson of his decision, "I've long been aware of the university's excellent reputation ... This college has so many assets including top-rate curricula, internationally recognized research programs, and tremendous depth and breadth of the faculty, that I am confident we can achieve our goals of greater national prominence and impact."

Prior to being named department head at Penn State in 1995 he was at the University of Rochester, where he served as chair of the Department of Mechanical Engineering and prior to that was associate



Benson

dean for graduate studies in the university's College of Engineering and Applied Science.

Benson's research at the University of Rochester was primarily focused on the mechanics of highly flexible structures. He and his advisees modeled magnetic disks and tapes, paper sheets, soft contact lenses, photographic film and other easily deformed structures. He has twice been honored by the American Society of Mechanical Engineers (ASME). In 1984 he received ASME Henry Hess Award, which honors a research publication by a young author. He became a fellow of ASME in 1998.

Benson's teaching interests are in structural mechanics, design, and applied mathematics. In 1981 he was honored as the top teacher in the College of Engineering and Applied Science at the University of Rochester.

Prior to beginning his university career, he spent three years with the Xerox Corporation as a technical specialist and project manager specializing in the behavior of paper and paper transport devices.

Benson holds a Bachelor of Science in Engineering degree in aerospace and mechanical science from Princeton University, a Master of Science degree in mechanical engineering from the University of Virginia, and a Ph.D. in mechanical engineering from the University of California, Berkeley. He is slated to begin his duties in Blacksburg August 10.

Bowman
CONSULTING

www.bowmanconsulting.com

Design Your Future ...

<p>Engineering Planning Surveying Environmental Sciences</p>	<p>Outstanding Career Opportunities Leader in the Industry Nationally Recognized Firm Diverse, Dynamic Professionals</p>
--	--

*Looking for a company with
**opportunity, integrity &
excitement?***

One that offers challenging career growth and a proven track record?

Consider the **Danaher** team. Danaher is a \$4B Fortune 500 corporation with more than 50 companies worldwide including Fluke Instruments and Craftsman Tools. Danaher Motion, with operations in Radford, VA., is a leading manufacturer in electronic motion control products and solutions.

Visit DanaherMotion.com or Danaher.com to learn more about our company. We offer competitive compensation, excellent benefits and the opportunity to make significant contribution to the growth of the company.

DanaherMotion
Kollmorgen • Pacific Scientific • Superior Electric
www.DanaherMotion.com

Equal Opportunity Employer, M/F/D/V

Excerpts from Dean Benson's open letter to faculty

Below are excerpts of Dean Benson's opening letter to faculty, dated Aug. 10, 2005:

"...Our inspiration, our reason for being, is of course our students. Each year some of the finest minds in the country come here to challenge us, to demand the very best from us in the classroom and in the laboratory. They invigorate us. Our students will always come first, above all else.

This is a time of increased demand for highly skilled engineers and scientists, and we are well positioned to meet that need. Virginia Tech is renowned for producing many of the nation's most accomplished engineers — young men

"Virginia Tech is renowned for producing many of the nation's most accomplished engineers — young men and women trained in the fundamentals, adept in the 'hands on' aspects of our craft, diverse in their backgrounds, and possessed of strong leadership abilities."

~ Dean Richard Benson

and women trained in the fundamentals, adept in the "hands on" aspects of our craft, diverse in their backgrounds, and possessed of strong leadership abilities. For our sake and our nation's sake this adherence to our Land Grant tradition won't change.

Research Center. ... Because the AMCF will be built at the Corporate Research Center it can be completed more quickly and we expect to take occupancy by the end of 2006 or early 2007...Furthermore, the new building in the Corporate Research Center will accommodate the AMCF and provide an additional 15,000 square feet of new space for other critical research needs in the College of Engineering.

... Regarding the timetable on (the Institute for Critical Technology and Applied Science) ICTAS-I, I am happy to report that the re-design is nearly complete and the strategy that the university has employed will result in 98,000 square feet of new space in the engineering quad. This is over and above the 30,000 square feet that will be constructed at the Corporate Research Center. Construction of ICTAS-I will begin early next year with occupancy slated for late fall 2007.

Another piece of good news is that we are moving forward on the 77,000 square foot ICTAS-II Building. This building will support our efforts in bioengineering, biomaterials, bio-nanotechnology, communications technology and sensor technology. ICTAS-II is currently under review by the Virginia Department of Planning and Budget and we are optimistic that approval will be received in the 2006 session of the General Assembly. Occupancy should occur in late 2009 or early 2010. ...

Among other recent developments, we are collaborating with the Vice
See Benson, page 22

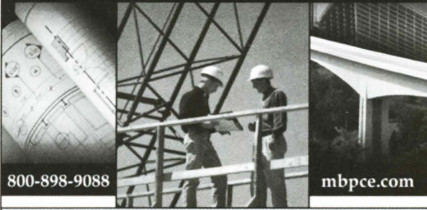
I have been able to secure the university's commitment to begin construction of the Advanced Materials Characterization Facility (AMCF) in the Corporate

... In the last few weeks

Research Center. ... Because the AMCF will be built at the Corporate Research Center it can be completed more quickly and we expect to take occupancy by the end of 2006 or early 2007...Furthermore, the new building in the Corporate Research Center will accommodate the AMCF and provide an additional 15,000 square feet of new space for other critical research needs in the College of Engineering.

McDONOUGH BOLYARD PECK
CONSTRUCTION ENGINEERING

ACHIEVING QUALITY THROUGH TEAMWORK



800-898-9088 mbpce.com

Excellent Professional Opportunities for Inspectors, Civil Engineers, Mechanical Engineers, Electrical Engineers, & Architects interested in Construction Management.

SERVICES

- Construction Management
- Construction Claims Analysis
- Resident Engineering
- Program Management

Send Resume to:
Attn: Human Resources
8315 Lee Highway, #400
Fairfax, VA 22031
Fax - (703) 245-5993
employment@mbpce.com
EEO/AAE

Branch Locations
Fairfax, VA
Williamsburg, VA
Raleigh, NC
Roanoke, VA
Columbia, MD
Atlanta, GA

"Human energy is the primary resource of the organization. Tapping into it, unleashing it, focusing it, perpetuating it - these form the cornerstone of the future."

And Corning, committed to the future, and a recognized world leader in technology - provides a continuing opportunity for human energy to achieve its maximum potential - in an environment that nurtures talent, creativity and ambition.

Whether your interest is in science & technology, worldwide telecommunications and information display markets, technically advanced scientific and life science products, there is a life-time of opportunity for you at Corning.

If you're interested in making a long-term contribution - if you're interested in helping to define and shape the Future - we invite you to join the Corning Team!



CORNING
www.corning.com
Corning is an Equal Opportunity Employer M/F/V/H
Corning Incorporated, Corning, New York 14831

Benson

Continued from page 21

President for Information Technology on the transition of System X into a production computing environment to support the research community. It is hard to imagine that we can surpass the justifiable acclaim that came with the creation of System X, but with this supercomputer readily available to the Virginia Tech research community we will also become celebrated for research backed by simulations of stunning complexity and depth.

We have made good progress this summer on the establishment of a School of Construction, which will unify and magnify efforts by faculty in two colleges: the CAUS Department of Building Construction, and the COE Vecellio Construction Engineering and Management Program in the Department of Civil and Environmental Engineering. Pending the acquisition of founding endowments and a successful governance review we will have the nation's premier program for construction education, research and outreach.

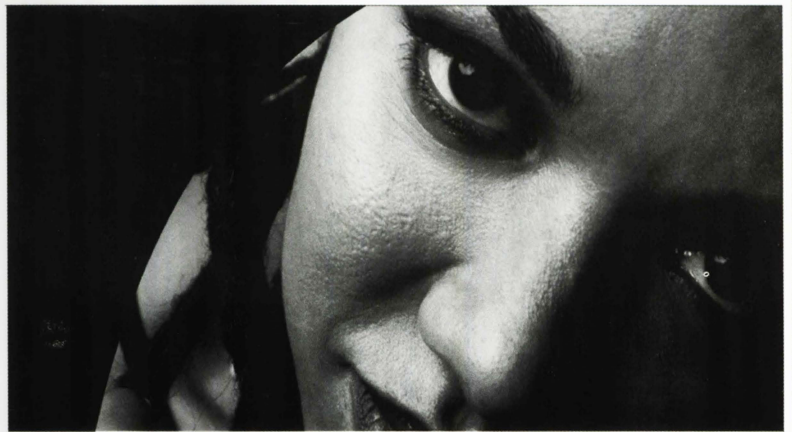
Our research productivity continues to rise in all metrics. The recent release of the National Science Foundation

rankings of research productivity showed Virginia Tech moving up from 14th to 13th in engineering-related expenditures. New awards continue to climb at a double-digit rate, up 14 per cent last year.

Indicative of this growth has been the performance by the School of Biomedical Engineering and Science. The biomedical awards received by the school's faculty have increased by \$1 million in each of the last three years. This was one of the initial programs of ICTAS and it is particularly satisfying to see the results of this major initiative bearing fruit. The future productivity also looks bright as the value of new proposals submitted by the College was up 37 per cent in 2005.

These are just a few examples of the cause of my optimism for the Virginia Tech College of Engineering. (A very few examples; apologies for the many other accomplishments that I could have cited, but didn't.) I commend my predecessor, Hassan Aref, and all members of the College of Engineering for building and sustaining such excellence during a time when financial stringency forced many colleges and universities in our nation to make deep cuts and retrenchments...."

TAKEN STOCK OF YOUR CAREER POTENTIAL?



Associate Engineers - (Various Disciplines) - Do you need blue chip marketability and mobility to achieve your career goals in the knowledge economy? Will you have the opportunity to leverage your skills into a successful career move?

You will at CSC. We are seeking talented individuals with a Bachelor's degree in a technical discipline, who are ready to put their talent to work on exciting projects in cutting-edge technology in the defense industry. At CSC, we invest in our largest asset -our people. We provide the resources, training and opportunities you'll need to grow your intellectual capital. Ours is a learning environment where your colleagues from around the world share their stock of knowledge and best practices driving business innovation as well as your success.

As a leading provider of technology services for clients worldwide, CSC commits to excellence in our client relationships, marketplace performance, products and services. A global \$10 billion company, we promote a culture of collaboration, innovation and entrepreneurial spirit in a friendly, collegial atmosphere.

Compound your career equity with CSC. You'll see that our investment in our people pays substantial dividends; we offer competitive salaries, excellent benefits, ongoing training, and opportunity for professional growth and development. Please forward your resume to: Email: federalsector@csc.com referencing **Pettenatti** in the subject line. Fax: (703) 876-1090. Or call Craig Pettenatti at (703) 876-1045 for more information. <http://careers.csc.com>



CONSULTING • SYSTEMS INTEGRATION • OUTSOURCING

An Equal Opportunity Employer M/F/D/V

Enzymes

Continued from page 19

They are looking at the enzymatic binding of protein-bound polystyrene particles as models. Groups of particles are dispersed in calcium-rich aqueous solutions containing TGases. Once mixed, the particle binding begins. The bigger agglomerates attempt to settle out of the solution, and Love and Burguera track particle sedimentation.

The tracking method, called Z-axis Translating Laser Light Scattering (ZATLLS), is unique to Virginia Tech and

based on key concepts in transport phenomena. It has been used to gauge how other complex fluids, such as paints and sealants, are dispersed. Now Love and Burguera are resolving when protein coated particles are effectively dispersed in vitro and under what conditions that they are unstable enough to agglomerate.

They track in situ sedimentation of protein-coated particles exposed to transglutaminase, both in the presence of and without transglutaminase inhibitors. "We

can use ZATLLS to resolve whether inhibitors prevent agglomeration of protein coated particles by TGase if the inhibitors lower the particle sedimentation velocity," Love says. "Our goal is to find the safest and most effective inhibitors that prevent the agglomeration-based cross-linking found throughout these neurological disorders."

This work is funded by the Commonwealth Health Research Board.

Love is a participating member in the School of Biomedical Engineering and Science (SBES), a joint venture between Virginia Tech's College of Engineering and the Wake Forest University School of Medicine. SBES is the partnership of the two eminent educational institutions.

Virginia Tech's highly acclaimed engineering college has long been the university's educational centerpiece. Since 1987, when *U.S. News & World Report* started ranking the top undergraduate engineering program, and later, the graduate schools, Virginia Tech's College of Engineering has consistently appeared in the magazine's listings. And, today, the National Science Foundation lists the College among the top 15 for research expenditures.

Wake Forest University Baptist Medical Center gained nearly \$10 million in funding from the National Institutes of Health (NIH) for the fiscal year that ended on Sept. 30, 2004, reaching \$114,768,124 and ranking 36th overall among 125 American medical schools.



ENGINEERS' FORUM OF VIRGINIA TECH

... the university's student-run engineering magazine, published four times per academic year.



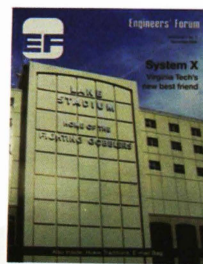
Develop valuable professional skills in fields such as writing, business, and graphics, with a nationally recognized and award winning student publication



The Engineer's Forum is not only for Engineers'. Our organization requires a highly interdisciplinary and integrated staff, with students from all across the academic board. As for the writing, engineers are notoriously horrible at it, but the Engineers' Forum gives those few engineers with writing talent a chance to illustrate their skills to potential future employers. No matter what your future plans are, any career you wish to thrive in will require an effective means of written communication.

Positions open:

- Graphics Editor/Photography
- Business Manager
- Layout Editor
- Distribution Manager
- Writer
- Copy Editor



"Ability is of little account without opportunity"
- Napoleon Bonaparte

Regardless of the kind of work you want to do after you graduate, whether it is designing layouts for Cosmo, managing advertisements for Newsweek, or pursuing journalism, the Engineers' Forum is a great introduction to the environment of a professional publication.



The Engineers' Forum

223 Femoyer Hall
Virginia Tech
Blacksburg, VA 24061

forum@vt.edu
(540) 231-7738
<http://fbbox.vt.edu/eng/forum>

Please email us with your interests ▶▶▶

Engineers' Forum.
Looks great on a resumé.

opinion



Now is the time to jump on the R&D bandwagon!

by Enoch Dames

Everyone knows that as time progresses, it becomes increasingly competitive to get into a good university. For instance, entrance SAT scores and overall GPAs of incoming freshmen increase each year. In general, many professional and academic aspects of life become more competitive with time. Subsequently, you should expect the "undergraduate academic market" to become more competitive with time, and it has. But, just as one can learn how to take the SATs or GREs and do well, one can learn how to make the most effective time of their undergraduate career for the purposes of reaching whatever goal(s) you may have.

There always exist certain measures that can be taken that will make reaching your goal easier. No, it's not cheating the system; it's developing the skills to most effectively orchestrate the tasks leading to your goals. Competitiveness after graduation is composed of academic record, a well developed resume, and recommendations. Along with that, for most future researchers, comes a list of publications you may have completed along your undergraduate path. Every time you do conduct research or take part in a design project, written reports at the end of your term (whether or not you have reached your goals or completed the project) are also beneficial to your resume. Do not undermine the importance of getting your hands wet early. If it's research you want to try out, get some experience before the end of your second year. If you really want some dirty engineering hands-on work (and I'm not talking about required labs), then offer your services to a design team; there are all kinds of team projects going on, most of which take part in yearly competitions.

It is not just the students who need to step up and become fiercely active in aspects of research and design, but the university as a whole also needs to do its part. A more collaborative effort between the different schools, research centers, and majors needs to be taken. More specifically, opportunities to display posters and give presentations such as the newly formed Symposium for Undergraduate Research in Engineering, or the Virginia Tech Undergraduate Research and Potential Graduate Student Conference should be advertised on the primary Virginia Tech Research website. Similarly, the University should make it as easy as possible for students to go online and sift through the various student design teams, and across all engineering majors. I am not stating that our university has not already done a great job in this respect, but it can do better. Increased collaboration will help one of Virginia Tech's main goals: to become one of the top research institutions in the country by the year 2010.

As a student, the best thing you can do is to go to your department's website, find the list of faculty, and search through each of their research interests. Most faculty members have vested interests in making sure their students turn out with five golden stars, so finding research within your department is usually the best place to start if it is your first time. Nevertheless, don't feel limited to research potentials within your own major; engineering research today is becoming increasingly interdisciplinary. Email a professor whose research interests you.

If you happen to find a professor who's office is crammed with textbooks you just can't get your head out of (yes, I might be taking it too far here), then there's no harm in staying

in his lab for as long as you like, or until he kicks you out; this way you have an opportunity to make a significant contribution to the project underway, and maybe even get a couple solid journal papers under your belt before you graduate. Of course, another approach is to discover different possibilities first-hand. Have you no idea what you want to do after you graduate? Try single-semester research appointments, or become part of an engineering design team for a while. You should be able to find something you like, and better yet, you may discover that you've got an uncanny talent for something like fluids transport or computer modeling.

The Office of the Vice President for Research – www.research.vt.edu

This is a good place to search through research centers by topic, and the website probably includes every center at Virginia Tech

The Virginia Tech Expertise Database – www.research.vt.edu/vted

This database "is designed to give business, industry, government, and media representatives access to the expertise information of participating Virginia Tech faculty members." However, this database also serves as an excellent tool for finding a faculty member whose research interests you.

The Institute for Critical Technology and Applied Science – www.ictas.vt.edu

This is a fairly new institute, but if you work your way to the research section, then to the list of different institutes, centers, and labs, you will find a battery of different potential places to investigate.

Take off with AAI

At AAI Corporation, innovation isn't enough. As the premier manufacturer and integrator of tactical unmanned aerial vehicles, our customers rely on products that work the first time, every time. That's the hallmark of our success – Innovation That Works.SM Join our team of innovators and point your career in the right direction.

Careers in:

- Mechanical Engineering
- Aerospace Engineering
- Electrical Engineering

For current openings or to submit a resume, visit our Web site at www.aaicorp.com. We offer excellent benefits, including 401(k) and tuition reimbursement. Headquartered in Hunt Valley, Md. EOE



INNOVATION THAT WORKS.SM

Innovation That Works is a service mark of AAI Corporation

Every day, the world's economy sees enormous sums of money change hands. Person to person. Business to business. Nation to nation. At all levels that business is being done, money moves. Securely. Reliably. Round the clock. And at the heart of it all, is SWIFT. A community of financial organisations, linked together by one of the world's most stable, scalable and pervasive messaging systems. SWIFT is how the world exchanges financial information. And you could be part of it.

early career professionals

with a degree in computer sciences, computer engineering and electrical engineering.

step forward

talent

swift

Information Technology

As part of a team of 700 IT and operations professionals, providing software development, support and maintenance ensuring that our systems stay robust and future-proof.

Customer services

As part of a team of 300 engineers and technicians managing relationships with our 7,000 customers in over 190 countries, providing the highest quality of technical support.

We offer

A dynamic, multinational community which promotes talent and growth. Excellent training, development opportunities and competitive rewards.

If you have the will to make a difference, apply now!

Send your application by email, together with your resume to jobs.us@swift.com

growing our people in international finance and technology

www.swift.com



CENTRAL INTELLIGENCE AGENCY



ANALYZE POTENTIAL THREATS WITHIN THIS GEOMETRIC PARAMETER.

Biological. Chemical. Nuclear. Conventional. Threats to American security come in all shapes and sizes. As an analyst working at the Directorate of Intelligence, you will analyze security issues such as foreign weapons development and proliferation, information warfare and emerging technologies. More importantly, you'll ensure the safety of our nation. Professionals with diverse skills are needed:

• Weapons Analysis • Technology Analysis • Signals Analysis • Information Operations Analysis

• Geospatial Analysis • Proliferation Analysis • Denial and Deception Analysis • Counterintelligence Threat Analysis
• Energy Security Analysis • Arms Control Verification
• Strategic Assessments Analysis

Staff and student positions available. Apply online at www.cia.gov

Applicants must have US citizenship and the ability to successfully complete medical examinations and security procedures including a polygraph interview. EOE



THE WORK OF A NATION. THE CENTER OF INTELLIGENCE.