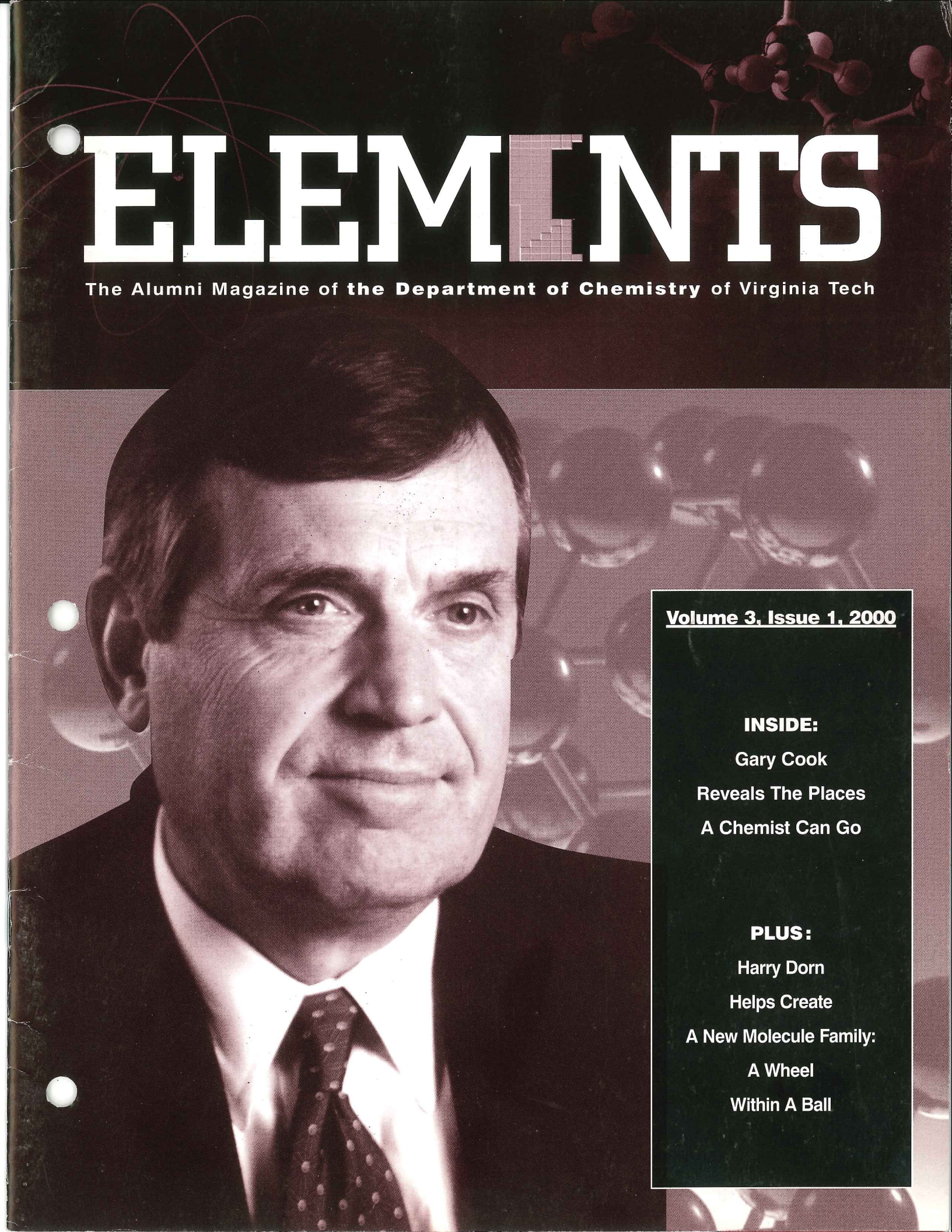
# ELEMENTS

The Alumni Magazine of **the Department of Chemistry** of Virginia Tech



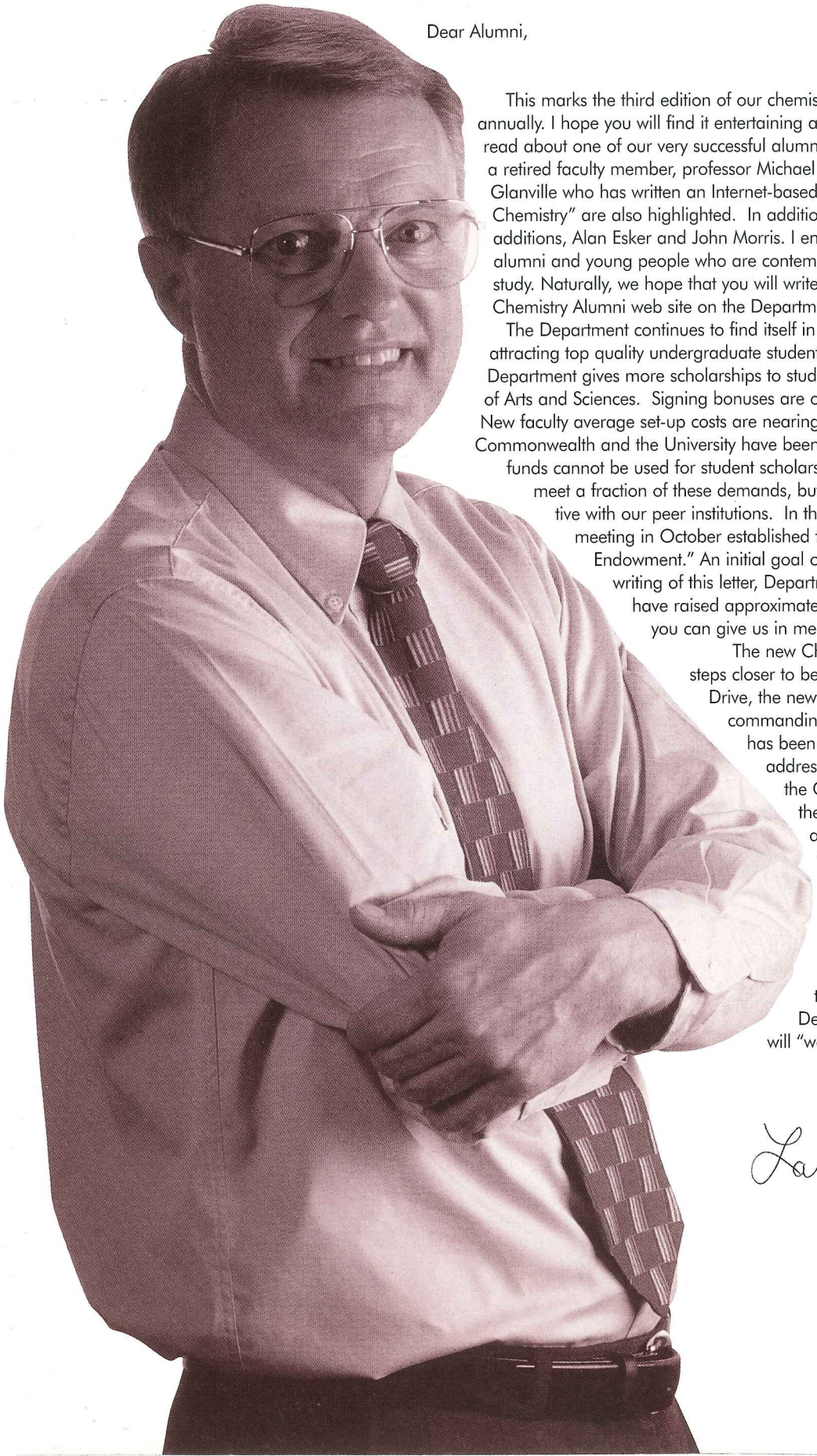
**Volume 3, Issue 1, 2000**

**INSIDE:**

Gary Cook
Reveals The Places
A Chemist Can Go

**PLUS:**

Harry Dorn
Helps Create
A New Molecule Family:
A Wheel
Within A Ball



Dear Alumni,

This marks the third edition of our chemistry magazine, *ELEMENTS*, which is published annually. I hope you will find it entertaining and informative. Within these pages you will read about one of our very successful alumni, Gary Cook, and the secret acting passion of a retired faculty member, professor Michael Ogliaruso. The activities of professor Jim Glanville who has written an Internet-based textbook for "Engineering General Chemistry" are also highlighted. In addition, you will read about our two newest faculty additions, Alan Esker and John Morris. I encourage you to share *ELEMENTS* with other alumni and young people who are contemplating coming to Virginia Tech for additional study. Naturally, we hope that you will write us either on the enclosed card or via our Chemistry Alumni web site on the Department of Chemistry homepage.

The Department continues to find itself in a most challenging situation as it relates to attracting top quality undergraduate students, graduate students and faculty. The Department gives more scholarships to students than any other Department in the College of Arts and Sciences. Signing bonuses are offered to outstanding new graduate students. New faculty average set-up costs are nearing $200,000 per faculty. While the Commonwealth and the University have been able to meet most of the set-up cost, state funds cannot be used for student scholarships. Alumni contributions have helped us meet a fraction of these demands, but more funds are needed to remain competitive with our peer institutions. In this regard, the Chemistry Advisory Council at its meeting in October established the "Friends of Chemistry Scholarship Endowment." An initial goal of $25,000 was set for May 1, 2000. At the writing of this letter, Department of Chemistry faculty/staff and alumni have raised approximately $14,000. I would appreciate any help that you can give us in meeting and then exceeding our goal.

The new Chemistry/Physics building continues to take steps closer to becoming a reality. Located on West Campus Drive, the new building will be attached to Hahn Hall with a commanding view of the Duck Pond. The project, which has been approved by the state for $25,194,000, will address the antiquated teaching laboratories in both the Chemistry and Physics Departments. Pending the receipt in July, 2000 of another $2 million authorization from non-general fund resources, two 200-seat lecture theaters will fan off the Campus Drive side. Ground should be broken in about 12 months.

Many other "things" are happening in Chemistry, but lack of space prevents me from detailing these. Please plan a trip back to your alma mater for new insights into the Department of Chemistry. Hopefully *ELEMENTS* will "wet your appetite".

Sincerely,

Larry T. Taylor
Professor and Chairman
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As a publication for you, the alumni of the Department of Chemistry of Virginia Tech, your feedback is welcome. Please feel free to contact Linda Sheppard by phone, 540-231-5966; fax, 540-231-3255, or e-mail, lsheppard@chemserver.chem.vt.edu And be sure to visit our web site at www.chem.vt.edu.

# WHAT'S NEW

## Laboratory on Wheels Ready to Ease on Down Virginia Highways

By Sophie Wilkinson

Public high schools in Virginia that have to put up with substandard teaching laboratories or have no labs at all can now make use of a new self-contained mobile chemistry lab which is filled with state-of-the-art equipment, lab benches, running water, fume hoods and other safety equipment and facilities for the handicapped.

Barbara B. Bunn, director of Chemistry outreach at Virginia Tech, says the project, which is aimed at providing a support structure for teachers, has prompted enthusiastic response from the Chemistry faculty. About 10 retired faculty members will take turns accompanying the lab on the road.

Bunn, an assistant professor who spearheaded the project, originally had a smaller scale undertaking in mind.

"Over 100 schools in the U.S. have mobile vans that go around and take preplanned experiments and equipment into existing labs at schools, " she says. "These van projects have been highly successful."

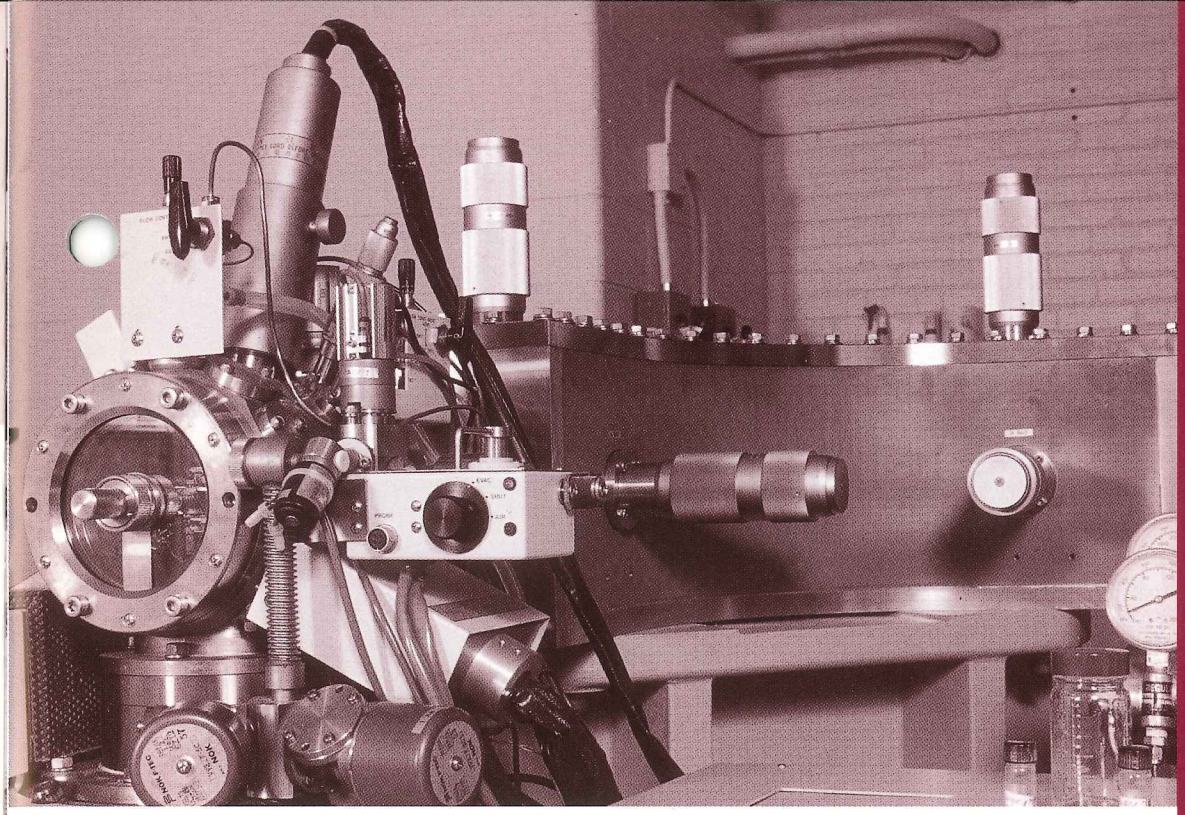
She thought this kind of project could serve as phase one of Tech's Chemistry outreach program with a mobile lab as phase two. But Department Chairman, Larry T. Taylor, suggested they approach a Volvo Trucks North America plant in nearby Dublin to ask for a donation of a small U-Haul-style truck for phase one. Volvo vice president Thomas Murphy Jr. explained they didn't make such a vehicle, but they would be happy to provide a "road tractor" to pull a trailer.

"So we quickly changed gears," recalls Bunn, "due to Volvo's generous donation of a $125,000 tractor, $100,000 from the College of Arts & Sciences and $25,000 from the Outreach Division."

Featherlite in Cresco, Iowa - a company that builds custom trailers, including those to transport Nascar racecars - then constructed the lab unit in the 53-foot trailer. From start to finish, the project took five months and cost about $560,000. Tech hopes to set up an endowment to support the lab in the future, but for now the state is considering providing funds to cover two years of operating expenses, which Bunn estimates will run about $150,000 per year.

High school teachers and faculty from Tech's Chemistry Department as well as from the College of Education & Human Resources, are collecting and modifying experiments suitable for the mobile lab, which can serve up to 30 students and gives them a significant chemistry experience. A pool of retired truckers will drive the lab around, teamed with faculty members who will be able to help the local teacher, who will provide the instruction. Eventually, the lab will be available to all public schools at the primary, middle and high-school levels, as well as at community colleges.





## Department Receives New Mass Spectrometer

Bristol-Myers Squibb has donated a JEOL-HX 110 mass spectrometer (above) to the Department, which if purchased new would cost more than $620,000.

A mass spectrometer determines the molecular weight of molecules and will enhance the capabilities for biomedical research, veterinary medicine, chemistry, biology and biochemistry.

## Department Contributes Funds

The Department of Chemistry will contribute $5,000 towards the total cost of a new MALDI-mass spectrometer which will be housed in the Biochemistry Department and will enhance research and lab capabilities

## Advisory Council Helps to Establish Friends of Chemistry Endowment Scholarship

The Department of Chemistry's Advisory Council endorsed the Department's objective to establish an endowment with the Virginia Tech Foundation Inc. to provide additional undergraduate and graduate-student scholarships for the recruitment and retention of the best chemistry majors.

A challenge was issued to faculty members to raise the initial $25,000 required to establish the endowment, of which $15,000 has been raised. But the fund must grow in order to provide earnings capable of supporting future scholarships and the participation of all friends — including alumni, parents, employers and others - is encouraged. Checks should be payable to VTF Inc., Attn: Chemistry Friends Scholarships Fund, c/o Larry T. Taylor, Department of Chemistry, Virginia Tech, Blacksburg, VA 24061.

## Advisory Council Update

Since its inception a year ago, the Alumni Advisory Council has been busy. The group held its third meeting Homecoming weekend, finalized its charter and officially named the external advisory group the Virginia Tech Department of Chemistry Advisory Council (D/CAC).

Additionally, the D/CAC endorsed the Department's objective to establish an endowment with the Virginia Tech Foundation Inc. for the purpose of providing additional student — undergraduate and graduate — scholarships, and as such issues the following challenge to alumni and friends of the Department:

"A challenge is hereby issued by the D/CAC to help raise the initial $25,000 required to establish an endowment, and then be able to accept on-going donations."

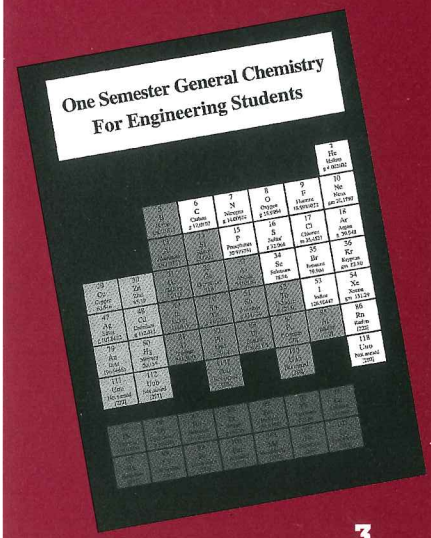
To date, the fund acquired $8,000 in faculty contributions; $6,375 from the Advisory Council, and other donations of $600.

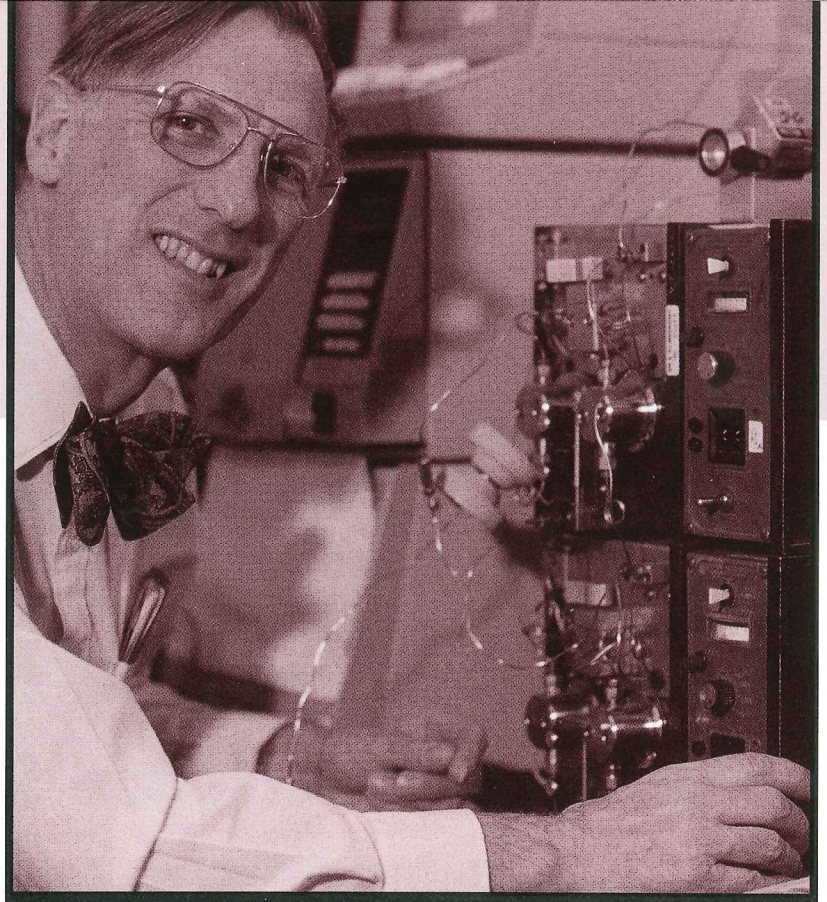
To participate, simply send gifts directly to the Virginia Tech Foundation, made payable to VTF, Inc., Attn: Chemistry Friends Scholarship Fund, or clearly designate any future gifts to this specific fund.

Your continued support does make a difference.

## Jim Glanville Publishes Textbook

**Jim Glanville, an associate chemistry professor at Virginia Tech, authored and published a new textbook that is currently being used for the one semester general chemistry course taught to all undergraduate engineering majors (more than 1,200 students). The 300-plus page book presents 15 weeks of course materials, blending chemical facts and chemical principles that will remain valuable to a practicing engineer who plans to retire in the year 2035. But perhaps more importantly, it condenses what used to be taught in two semesters into one semester ... a tough challenge for both faculty and students.**





Virginia Tech's David Kingston works with plants and natural products to treat cancer.

# Researchers Race to Cure Disease, Preserve Sources of Future Medicines

*By Susan Trulove*

When threatened, plants stand and fight. They use chemical warfare.

"Plants are chemical factories," explains Virginia Tech chemistry professor David G. I. Kingston. "They produce an array of complex compounds, both to grow and to avoid being eaten, as well as resist disease and fungi."

His fascination with the complex molecules created by plants is what drew Kingston into chemistry research. The potential uses of the natural compounds gave his interest direction.

"The major motivation for what I do is to find a cure for cancer," he says. "When I was about 8, my grandmother died of cancer. So, I was aware of the problem; but I didn't think I could do anything because I hate blood and killing animals." Then, while he was a graduate student at Cambridge in the '50s, he attended a conference in London on cancer and chemistry. "I learned that chemists can make a contribution."

For 30 years, Kingston has been working to adapt the natural products of plants to treat cancer. He is also looking for natural products that can be used to treat fungal infections, malaria and mycobacterial diseases.

Fungal infections are a common complication for people with AIDS. (Malaria and mycobacterial diseases, from the Madagascar periwinkle) A compound from periwinkle was part of the chemotherapy that, in combination with surgery and radiation, helped Kingston's graduate student, Joe LeFevre (now on the chemistry faculty at SUNY-Oswego) recover from Hodgkin's Disease.

Plants produce complex structures that would take scientists years to produce in the lab. For instance, it would take 25 steps to duplicate the Madagascar periwinkle compound that reduces white blood cells.

However, one of the most significant compounds in the fight against cancer was discovered in the bark, and at low levels in the needles, of the relatively rare Pacific Yew. In the 1970's, the Natural Cancer Institute tested plants in a number of collections, including an extract from the Pacific Yew collected by the U.S. Department of Agriculture in 1962. The result was paclitaxel, which — as Taxol® — has become one of the most effective drugs against breast and deacetyl baccatin III) from the needles of the English Yew. "Baccatin is 10 times easier to isolate than paclitaxel," explains Kingston, "and since it comes from the needles, it can be a renewable source." The English Yew is also common in Europe and the United States. Holton's procedure for synthesis is now being used by Bristol Myers Squibb to convert baccatin into Taxol®.

Improved analogs of Taxol® are still needed to overcome difficulties in administration of the drug and cancer's ability to mutate and resist the drug. Kingston has devoted much of his career to understanding the chemical structure of Taxol® to discover what part of the compound is the enemy of cancer and how it acts on the cancer cell. Supported by the National Cancer Institute and Bristol-Myers Squibb, he has created analogs with various enhancements, such as a Taxol® that is soluble in water so that it is more easily administered.

Kingston is also leading efforts to find new compounds - by discovering new

plants and by screening extracts with sensitive assays for sources of new pharmaceuticals. It is not only a race against increasing incidence of disease, but against third-world economics.

"The tropical rain forests of the world represent one of the last preserves of biodiversity, and hold the potential for the discovery of new pharmaceuticals and other valuable products," he says. But biodiversity loss is a major threat. Tropical forests cover seven percent of the earth, down from 16 percent 45 years ago. Even that seven percent holds 50 percent of the plant varieties on earth. "We think we are losing 5,000 plant species per year," Kingston says. "That's 5,000 pharmaceutical factories."

As principal investigator and group leader, he is working with the Missouri Botanical Garden, Conservation International, Bristol-Myers Squibb Pharmaceutical Research Institute, and the Suriname drug company BGVS to develop a model program for drug discovery and biodiversity conservation in Suriname, South America.

"Plants are collected and screened for bioactivity. Any royalties from the resulting drugs will be shared with Suriname as an economic incentive to maintain their tropical forests. If we find a Taxol®, with $1 billion per year in sales, that would be a large percentage of the national budget of a small country like Suriname."

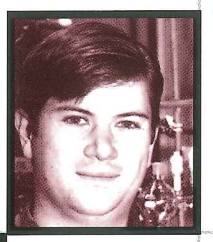
The Suriname project was supported by a grant from the National Institutes of Health's Fogarty Center and National Cancer Institute, and the National Science Foundation. In addition to Kingston and Russell Mittermeier of Conservation International, team members are Jim Miller of the Missouri Botanical Garden, Jan Wisse of BGVS, which is carrying out plant extraction and data management, and Dinesh Vyas of Bristol-Myers Squibb Pharmaceutical Research Institute. As of September 1998, the project was extended an additional five years and expanded to include Madagascar. Dow Agrisciences and CNARP of Madagascar also joined as partners.


*"The major motivation for what I do is to find a cure for cancer."*

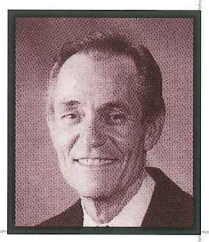
*— Kingston*

# PEOPLE IN THE NEWS

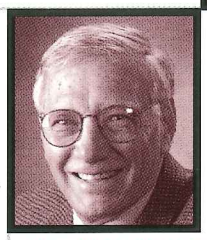
**Kay Castagnoli,** senior research associate, has been selected to participate in the first Van Cliburn International Competition for Outstanding Amateur pianists at Texas Christian University this summer.



**Paul Deck,** assistant professor, has been elected as the SERMACS steering committee chair elect and has been invited to attend a " Workshop on Graduate Education in the Chemical Sciences: Issues for the 21st Century" that is sponsored by the National Research Council's Chemical Sciences Roundtable.

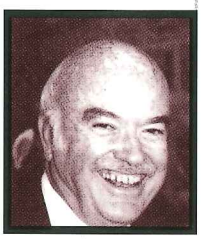


**Neal Castagnoli,** professor of chemistry, has been named the Virginia Scientist of the Year for 2000 and was awarded A Support Program for Innovative Research Strategies (ASPIRES) grant in the amount of $31,200 to further his research efforts.

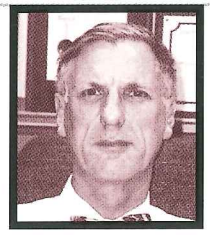


**Harold M. McNair,** professor, has been selected as the 2000 winner of the American Chemistry Society's Division of Analytical Chemistry's J. Calvin Giddings Award for Excellence in Education. The honor included a $4,000 stipend, a plaque and $1,000 towards travel expenses to the symposium in Washington, D.C. In addition, he will teach a full day multimedia short course on gas chromatography.

**Paige Phillips,** an organic lab instructor, assisted with the Virginia Tech outreach program "hands-on" day for area high school science teachers and demonstrated the advantage of microscale techniques.



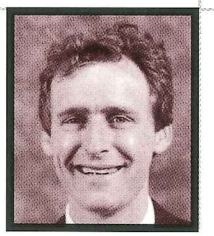
**Jim McGrath,** a University Distinguished Professor, Ethyl Chaired Professor and director of the National Science Foundation Science and Technology Center, had a honorary symposium held in recognition of his 65th birthday and 24 years of service to the Chemistry Department. He also serves as the co-editor of Advances in Polymer Science, a Springer publication.



**David Kingston,** professor, has been named a University Distinguished Professor and is one of two professors in the Department to earn such a distinction. He has also been selected as the 1999 recipient of research achievement award from the American Society of Pharmacognosy.

**Patricia Amateis,** instructor; Mark Anderson, associate professor; and William Ducker,, assistant professor; will attend the New Tradition Project, a two-day workshop sponsored by the National Science Foundation. Amateis has halso been selected as a finalist for the Diggs Teaching Scholars Award.

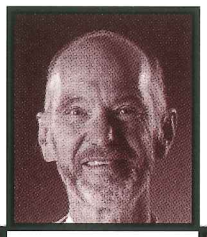
**Karen J. Brewer,** associate professor, has received Clemson University's first Annual College of Engineering and Science Outstanding Young Alumni Award.



**William Ducker,** assistant professor; and Tim Long, assistant professor, have been invited by the National Starch and Chemical Company to participate in several adhesive formulation and application sessions.

**Tim Long,** assistant professor, has been invited to serve on the executive board of a London-based company, Polymer International, and will set up the North American office in Blacksburg. In addition, he received a $40,000 A Support Program for Innovative Research Strategies (ASPIRES) grant to further his research efforts.

**Larry T. Taylor,** professor and Department chair, was awarded the Reverend Alfred Payne Award by Omicron Delta Kappa National Leadership Honor Society. He also was appointed to the editorial board for Chromatographia and Journal of Supercritical Fluids..



**Ray Dessy,** professor emeritus, will be a presenter at the Gordon Research Conference and Symposium this summer. He is also a member of the editorial board for Internet Journal of Chemistry, the Journal of the Association for Laboratory Automation and the Automation in Threat Reduction and Infectious Disease Research.

**Judy Riffle,** professor; and **Jennifer Hoyt,** a graduate student; won the Adhesion Society Peebles Award and The Allen Gent Best Paper Award. Riffle has been awarded a $17,232 A Support Program for Innovative Research Strategies (ASPIRES) grant for her research. Riffle has been promoted to full professor.

**Barbra Bunn,** COTA fellow, along with others chairs in the Arts and Sciences Department will establish the Torgerson Lecture Series that has been entitled: Great Minds of the Millennium. She was also one of the hosting professors for the Virginia Tech Chemistry Department's "hands-on" day for local high school science teachers.

**Thomas C. Ward,** Adhesion Science Council (ASC) endowed professor, sponsored the new ASC web discussion group. Interested individuals can post questions and get answers to the debuted topic on "accelerated testing".

**Alan Esker,** professor of chemistry, received $5,000; and **A.J. Pasquale,** a chemistry graduate student,was awarded $2,500 by Ray Weinert from Omnova at the Omnova Signature Awards presentation for their research efforts.

**John Morris,** assistant professor, received a $40,000 A Support Program for Innovative Research Strategies (ASPIRES) grant to further his research.

**Herve Marand,** professor, has joined the editorial advisory board of the Journal of Polymer Science-Polymer Physics and has been promoted to full professor.

**Jim Glanville,** associate professor and director of general chemistry, served on the external advisory council board for Southern University, in Baton Rouge, La., to evaluate a Ph.D. program in science and mathematics education.

**Melissa Witmer,** a senior chemistry major, has received one of the Senior Challenge Book Scholarships for the academic year, a $200 award to to help offset book costs.

**The following staff and faculty have served Virginia Tech for an extended amount of time and received University Service Awards.**

**10 years:**

Mark Anderson,
associate professor

Ronna Cadorette,
laboratory coordinator

Jeanine Eddleton,
instructor, general chemistry

**15 years:**

William Bebout,
spectroscopist, NMR

James Coulter,
electrical engineer

Frank Cromer,
surface analysts, ESCA lab

James Glanville,
associate professor,
director of general chemistry

**20 years:**

Brain Hanson,
professor

Geno Innaccone,
director, analytical services

Larry Jackson,
computer systems engineer

Linda Shepard,
department chair secretary

**25 years:**

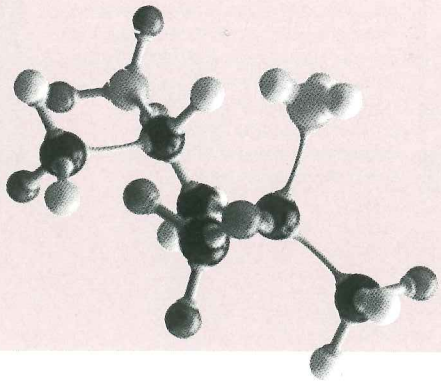
Harry Dorn,
professor

Melba Edwards,
department accounts

Judy Spicer,
research accounts

**30 years:**
Tom Ward, ASC endowed professor

**ALUMNI PROFILE**



## Gary Cook Reveals The Places A Chemist Can Go

*By Christina Motley*

The journey through life is usually full of many surprises, many challenges, many twists and many turns. And that has certainly rung true for Gary Cook.

Since his "chemical career" began as a high school student more than 35 years ago, Cook's journey has taken him many places from his birthplace of Birmingham, Ala, to his current retirement home and life of leisure in Jacksonville, Fl., as well as over a dozen other cities and states he once called home. Since earning his bachelor's degree in chemistry from the University of Virginia in 1966 and his Ph.D. in quantum chemistry from Virginia Tech in 1970, his career path has taken him through many jobs from that of a research chemist with DuPont in Orange, Texas, to CEO and chairman of the board of Witco Corporation in Greenwich, Conn. And throughout his 55-year lifetime, he's been able to find time to pursue such interests as contributing to and participating in numerous civic organizations and community enhancing initiatives, especially that of United Way; enjoy being father to four children in his and Brenda's combined family, and jog five to seven miles a day (at a considerably slower pace with each passing year, he admits). And now, without a full-time job to attend to, he's even mustered up the energy to indulge in all the reading he has always wanted to do, begin to learn to speak Spanish and learn the new skill of boating without sinking.

"I have had a special opportunity to have unusual variety in my career," says Cook. "That has kept my life exciting, challenged me to learn new environments quickly and provided me with a window into industrial America that has been absolutely fascinating. And for me, chemistry, as a technical degree, was the wonderful key that opened one door of opportunity after another."

Cook's initial interest in chemistry was sparked in high school.

"It was after Sputnick and science had begun getting a lot of attention, but really a good high school chemistry teacher turned me on to the subject," he recalls. "Without really thinking about it, I chose it as a college major, went with it and liked it."

That approach to life has worked more than once for Cook. In fact, it was chance that led him to the University of Virginia (UVA).

"I was chosen to participate in The Jefferson County citizenship Tour, a program wherein students from each high school in the county were thrown on a Trailways bus and driven to different places, including Williamsburg, Charlottesville, Washington, D.C., New York and Boston and forced to learn more about our forefathers and American history," he explains.

"UVA was striking to the eye and a place of living history. I found out while I was in Charlottesville that UVA had a regional scholarship program. I applied and was accepted."

But it was more than that.

"I always say I went to UVA because of arithmetic," says Cook. "The difference between the cost of attending college there and the scholarship offered was the smallest. Then, in between his junior and senior year, luck again played a major role in determining his future.

"I applied and received a National Science Foundation Scholarship," he says.

Providentially, the program sent Cook to Virginia Tech to work with professor John Schug (who remains active with the Department today).

"It was the first of many great experiences," recalls Cook. "That summer, I was exposed to John's fields of study and decided I liked both him and his research."

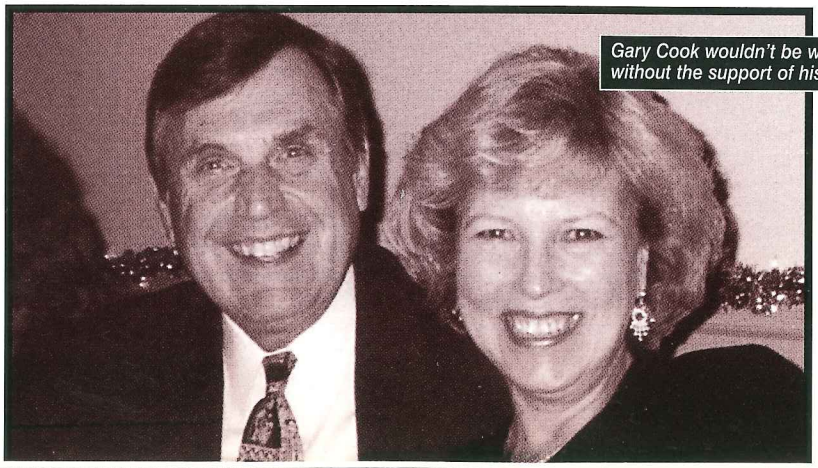
And so Cook made the decision to attend VPI for his Ph.D studies.

But a personal necessity required that he work the summer following college graduation.

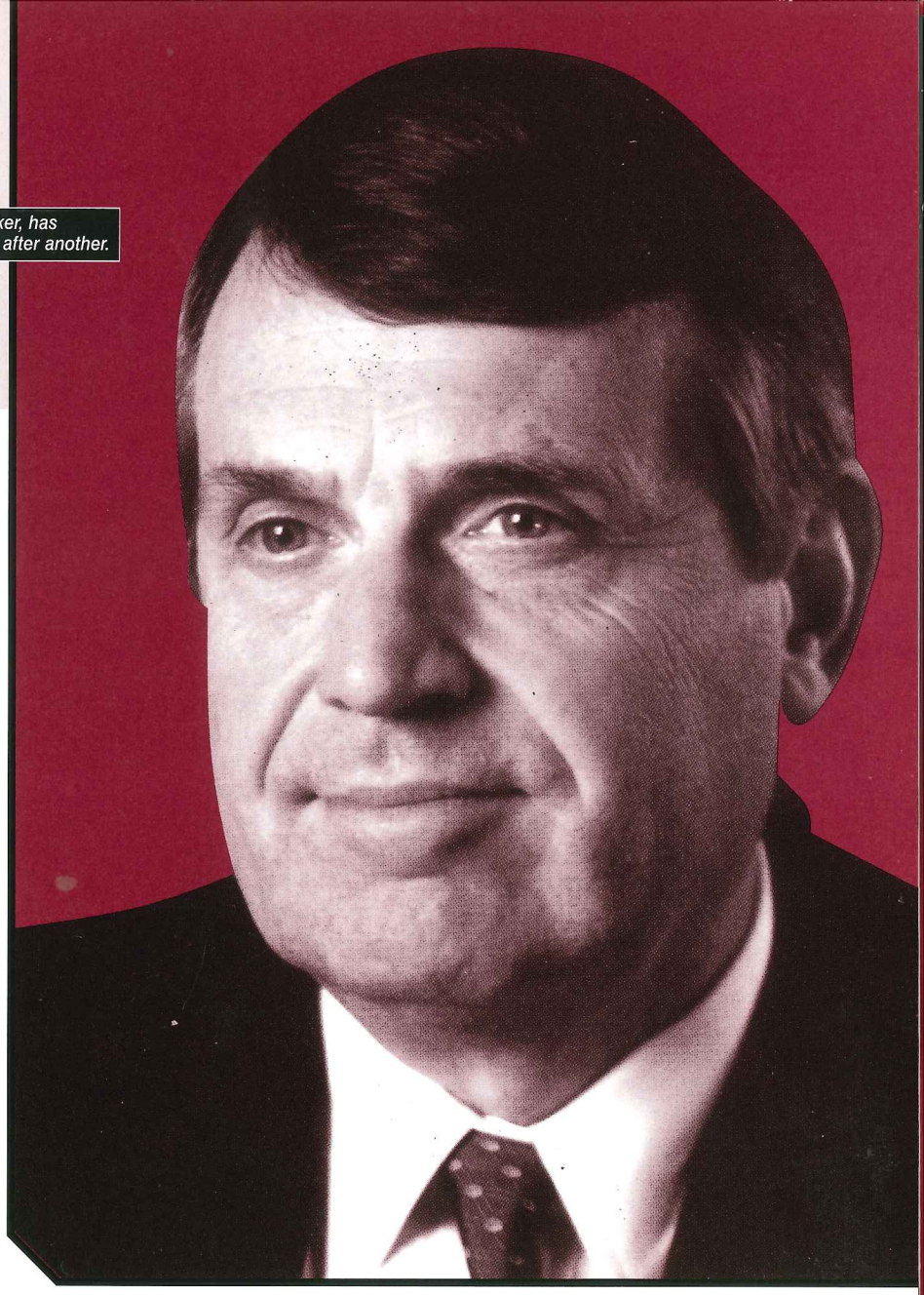
"My thousand year old car was falling apart so I had to make money to buy another one," says Cook, who became the first graduate student of professor Schug to earn a Ph.D. "So I took a summer job with DuPont and started at Tech in the fall. That summer position at DuPont convinced me that industry was my destination, not academics."

Apparently, Cook seems to have a knack for landing one opportunity that smoothly turns itself into another and after completing his work at Tech, he returned to DuPont as a research chemist. Little did he know at the time, but DuPont became a 23-year employer. Obviously skilled at what he does, Cook easily moved from one position to another, from one division to another, climbing his way up the corporate ladder through research and development, project management, and marketing into upper management where he became a vice president and chief planning officer, at the time, one of the youngest officers that DuPont had named.

Among one of his greatest challenges was to manage the combination of the



*Gary Cook wouldn't be where he is today without the support of his wife, Brenda.*



*Gary Cook, a mover and shaker, has sucessfully led one company after another.*

strategic planning processes of DuPont and Conoco. When it was accomplished, the DuPont acquistion of Conoco was the biggest industry takeover at $8 billion, although Cook notes that by today's standards, it was a small deal.

"My job was to figure out how to combine the interests of the chemical company and the oil company when the people of each industry didn't share a common language," shares Cook. But he did it. As a result, he kept moving forward and continued an upwardly mobile career path that took him into such other management positions with DuPont as vice president of medical products and eventually vice president of printing and publishing.

"To get into the chemical business, I had to leave DuPont," he jokes. Really, it was just a matter of the right timing and Cook took a job offer to head the chemical division of Ethyl Corporation in Baton Rouge, Louisianna.

Subsequently, that division was spun-off as an independently traded company, Albemarle Corporation of which Cook served as president. Finally, he was recruited to become the CEO and chairman of the board of Witco Corporation, which in 1999 merged with Crompton and Knowles.

"I've really enjoyed the variety," says Cook. "Also, the most rewarding part of being a manager is helping people develop their capabilities, either directly by personal coaching or indirectly by helping to create an environment where individual development thrives. I have been especially proud to have been a part of the chemical industry. The chemical industry influences almost everything we do. Just think about all the things I've worked in personally, from shoe soles to golf ball covers, bacon packaging to Mylar balloons, film for space applications, medical diagnostic equipment, pharmaceuticals, desktop printing, flame retardants, car finishes, fabric softeners and I could go on. It is of no doubt to me that chemistry is the most interesting industry because it affects all the others."

Cook saw the merger through to the end of the year and then retired. Or so he says. Technically, maybe, but not really "retired."

He continues to serve as a board member and business consultant for many companies and organizations, and will most likely get involved with something else.

"I don't think I would ever want to accept the intense day-to-day challenge of running another company," he says. "but now I have complete flexibility and can take my time making any decision about what I would like to be when I grow up."

Until then, he remains committed to his "retirement" and enjoying spending every day with his wife Brenda, truly, he says, "his greatest pleasure."


(Note: Gary Cook will be the featured commencement speaker for graduating chemists at Virginia Tech, May 13.)

**FACULTY PROFILE**

*Hary Dorn's work will change the industry forever.*

# Harry Dorn Helps Create A New Molecule Family: A Wheel Within A Ball

*By Susan Trulove and Christina Motley*

If 56-year-old Virginia Tech Chemistry professor Harry C. Dorn was a gambling man, 1109 would certainly be one of his lucky numbers.

For about eight years, he has been (along with researchers worldwide) puzzled by a mysterious mass spectral peak with a mass-to-charge ratio of 1,109. Many of those hard-at-work hours, have been spent in his office, room 1109 Hahn Hall. And then, in November of 1998, Dorn and Virginia Tech post doctoral fellow Steven Stevenson, solved the mystery.

Sure enough, leaky lab equipment and Virginia Tech researchers' eagle eyes, resulted in the creation of a new family of molecules with potential applications ranging from medicine to optical-electronic devices and beyond. In fact, researchers (including Dorn and Roy Bible, who earned his chemistry degree from Tech in 1948 and now works for Searle) reported in the Sept. 2, 1999 issue of Nature that they can produce C80 fullerenes containing three metal atoms in high yield and pure form.

Discovered in 1985 and named after Buckminster Fuller, designer of the geodesic dome, nicknamed the "Bucky Ball", fullerenes — a new form of carbon atoms — are clusters of carbon with an even number of atoms that form a ball-shaped cage. Since determining that clusters with even numbers of atoms, in particular in the range of 60 to 80 atoms form a stable molecular structure, scientists have been trying to insert metals into the cages and to produce the structures in useful quantities.

While there has been some success in getting fullerenes to carry one or two metal atoms, chemists, until Dorn and Stevenson's discovery, couldn't do so with ease or in high quantity.

"Not only is this unique and beautiful," says Dorn, who served as the lead researcher and along with Stevenson, has applied for a patent for their inexpensive, high-yield process, as well as for the new family of molecules, "but it has many potential applications, depending upon the metals and metal mixtures inserted."

Insert certain metal atoms, for example, and there are semiconductor and, perhaps, superconductor applications. Insert other metals for fluorescent and other optical properties and amplify fiber optic applications. Insert radioactive atoms and use the molecule as a tracer in medical applications, with the carbon cage protecting the radioactive center. Fluorescent and optical tags can also be used as tracers for medical and other applications. The carbon cage can also protect paramagnetic atoms used as contrast agents in MRI procedures. Quantum computing devices can be created by including atoms that have unpaired electrons and/or spin active materials.

Perhaps even more impressive is the fact that even when destroyed, the molecule remains useful.

"It doesn't decompose until heated to 400 degrees centigrade," explains Dorn, who earned his bachelor's degree in chemistry from the University of California in Santa Barbara in 1966 and his doctoral in physical organic chemistry from the University of California in Davis in 1974 before becoming part of Virginia Tech's Chemistry faculty in 1974. "Then it turns from black to white as the carbon burns off, leaving metal oxide particles with different properties than the original metals. This is a new way to prepare metal oxide, such as for protective surfaces or as a catalyst when materials are bonded."

The cages can also be formed into nano-tubes or "nano-pencils" to record and store data or draw lines that could only be seen with powerful electronic scanning microscopes.

"Not only wouldn't you be able to see the lines, you wouldn't be able to see the pencil," adds Stevenson. In addition to being able to record a lot of data in a small area, the tubes could draw conductive lines on tiny chips for a host of modern applications.

The discovery of the stable metallo-fullerene is a result of tracking down a small, unexplained peak in the data that accompanied virtually every analysis of fullerenes the Virginia Tech team created.

Dorn — who has been married to wife Linda for 37 years and has four sons — first reported 1109 in 1994.

"The level would vary in different mixtures as we produced different fullerenes," he says. The researchers would drill holes in graphite rods, insert metals, place them in a sealed chamber, then burn the rods with an electric arc generator, forming carbon atom cages around the metal of choice. Once the appearance of 1109 was consistent, he probed further.

"Steve and I took reams of data - NMR readouts, mass spectrometer readouts, XPS (X-ray photo-electron spectroscopy) data — and went to a food court on campus," explains Dorn, who spends his time outside of his university life with his wife, gardening, listening to classical music and reading poetry. "We spent two or three hours pouring over it. After about the fourth cup of coffee, we had it narrowed down to the most likely material."

The mystery material? Nitrogen.

"Then everything made sense," says Dorn, noting that part of his research was funded by Blacksburg-based Fiber & Sensor Technologies, Inc., a firm now known as Luna Innovations. In its earliest years, the project received some funding from the National Science Foundation. "The equipment was letting atmospheric nitrogen into the chamber. The arc disassociated it into nitrogen atoms. The metals latched onto the nitrogen — three atoms of metals onto one atom of nitride — and as it cooled, the carbon cage formed. That gave us a molecule with a non-metal core, the three metals, then the non-metal cage. It looks like a whirling Mercedes Benz emblem inside a ball."

Dorn's discovery — for which the technology has been licensed to Luna Innovations and is currently being marketed — is huge. It is the first example of isolated four atom molecular clusters in a fullerene cage, and the first example of such a cluster with a nitrogen atom at the center. As such it has made the headlines in such magazines as Nature, as well as more than a dozen other trade journals and publications. And today, groups across the globe — which continue to call on Dorn to make presentations in far away places — are anxious to get their hands on these molecules and compounds.

While the bucky ball discovery is a career highlight, it is not Dorn's first big accomplishment.

In fact, in the early 80s, he developed the technique of direct coupling of liquid chormotography using magnetic resonance (LC-NMR) that allows chemists and lab technicians to rapidly analyze chemical and drug interactions ... a process that used to be long and tedious, but now takes only minutes. That technique helped move the pharmaceutical industry into the billion-dollar giant it is today.

Then, in 1992 he worked with IBM to research the synthesis, separation and characterization of fullerenes and enhohedral metallofullerenes. The result of his research provided the first direct confirmation of metal encapsulation in a fullerene cage. And that discovery did not go unnoticed. In fact, Dorn received the prestigious Yearly Achievement Award from IBM in 1992.

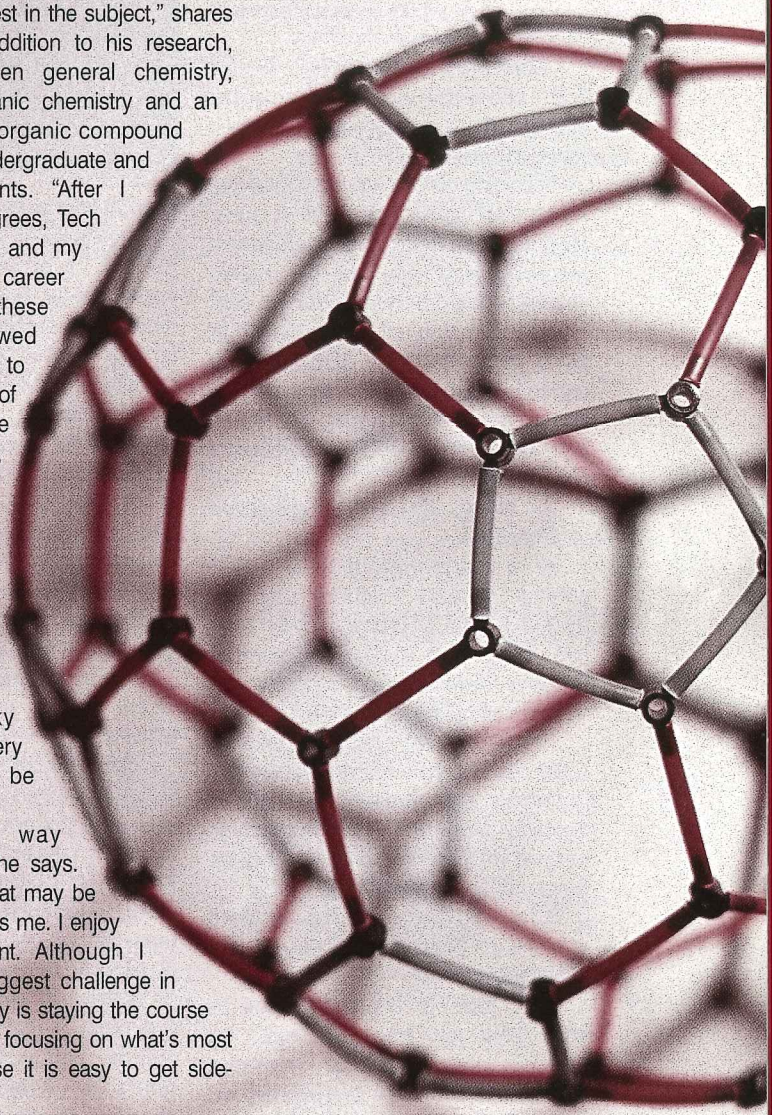
"A good high school chemistry teacher peaked my interest in the subject," shares Dorn, who in addition to his research, teaches freshmen general chemistry, sophomore organic chemistry and an identification of organic compound class to both undergraduate and graduate students. "After I received my degrees, Tech offered me a job and my academic career evolved. All these years, it has allowed me the freedom to pursue any area of chemical science that I want. Today, I wouldn't be here without that freedom, or without the support of my wife, family, friends, colleagues and students."

The bucky ball discovery probably won't be his last either.

"I go the way science goes," he says. "Whatever trail that may be the research leads me. I enjoy the scientific hunt. Although I must say the biggest challenge in scientific discovery is staying the course until the end and focusing on what's most important because it is easy to get side-tracked."

In the immediate future, he plans to follow up on some other leads that have stemmed from the bucky ball research.

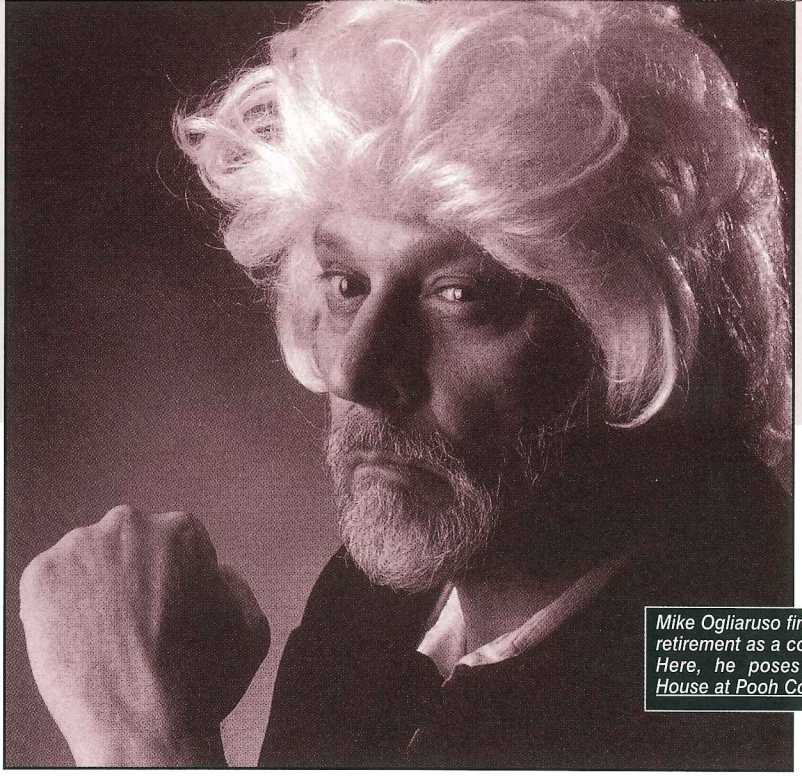
"Of course, I don't know if that path will lead me into dark allies or to roads paved with gold," says Dorn. "I'll simply see when I get there."



**RETIRED FACULTY PROFILE**

# Professor Mike Ogliaruso's Retired, But Not "From" Anything

*By Priscilla Richardson*



*Mike Ogliaruso finds life after retirement as a community actor. Here, he poses as Owl in the House at Pooh Corner.*

"Don't retire from anything," Virginia Tech chemistry professor emeritus Michael A. Ogliaruso says. Rather, "retire to something."

Following his own advice, Ogliaruso - who took early retirement in June, 1996, after teaching undergraduate and graduate level courses in organic chemistry and continues to be "on call" - retired to writing a fourth book and to being on call to teach. But mostly he retired to the theater. Now 61, he works as an actor, set builder, controller, and board member in Blacksburg's community theater.

But theater isn't a life-long passion for Ogliaruso.

As a young man, "I knew I liked science," he says. Fortunately for him, his home town of Brooklyn, New York, had a rigorous science program at Brooklyn Technical High School where he majored in chemistry.

"I had a great chemistry teacher, Louis Sorotto, who helped me along," he recalls. As a result, he attended Brooklyn (now New York) Polytechnic Institute where he earned his bachelor's degree in chemistry in 1960.

Why did he choose organic chemistry? Simply put, because the knowledge is vital.

"You have to know chemistry to know how your body functions," he explains. And because this knowledge is vital, he helped create, and still teaches, when called, the organic chemistry section for Virginia Tech sophomore non-chemistry majors.

Financing his college with four years of ROTC required a year for the military.

"ROTC was my father's idea, but I came to appreciate it," he says. "I learned how to deal with people."

Then back in Brooklyn, he finished his Ph.D. in organic chemistry in 1965 from Brooklyn Polytechnic Institute. He remembers professor Ernest Becker, a college mentor, who then chaired his doctoral committee.

"He kept me on the right path and directed me," explains Ogliaruso. After two years at the University of California in Los Angeles (UCLA) on a post-doctoral and teaching assignment, he came to Blacksburg and Virginia Tech for good, courtesy of an assist by mentor Saul Winstein, a now-deceased well-known organic chemist on the faculty at UCLA.

With two Nobel prize winners on the UCLA faculty, you might think he'd rather stay there, but that wasn't so.

"The graduate students who came to UCLA all wanted to work with the prize winners and weren't interested in joining me in my research," he says. "I wanted to be at an institution where there'd be more opportunity to do my own research on reaction mechanisms in physical organic chemistry."

Along with professor James Wolfe, now also a part of the retired Tech faculty, Ogliaruso published three reference books for professional chemists. These, along with his current book in progress, bring together data and research literature about the sythesis of lactones and lactams, the synthesis of carboxylic acids, esters as well as their derivatives, and the chemistry of tetracyclones.

One big advantage to being at Tech he couldn't have anticipated when he arrived was his early use of the internet.

"The books, written between 1989 and 1991, were edited on the internet, long before everybody else was using it," he shares. "My editor was in Israel. I would get his requests in the morning, work on them during the day, send them out and get his additional comments the next morning."

By relying on internet technology, Ogliaruso estimates he cut the edit time down to about a month from at least what would have taken several months.

Ogliaruso, better known as "Mike" to his theater friends, started his theater life by helping out in the Summer Musical Enterprise, a 10 year old group that produces a musical every summer.

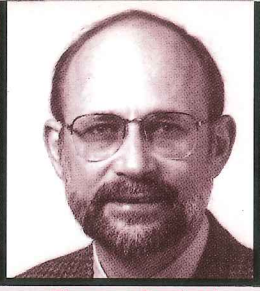
Every April they audition and in June they start to rehearse. At the end of August they present their show with a 26 piece orchestra.

"My wife got me interested," he says, noting that Babs also enjoys theater. The couple met in college at a fraternity-sorority event and married in 1961. "She was on stage in the first ones while I worked backstage building sets. By the time the fourth show came around, they got me on stage (in 1992)."

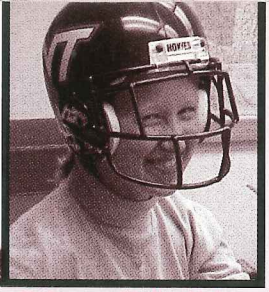
Soon he was acting, handling finances and serving as a permanent member of the production board.

**continued on page 16**

Phillip Silverman



Thomas Perfetti



Rebecca Linkenhoker Gudgeon
Class 2000

# CLASS NOTES

**'43 Ingram O. Robertson Jr,** Richmond, retired from Reynolds Metal Company.

**'43 Benjamin P. Rouse Jr.,** (B.S.'43, M.S.'48, Ph.D.'49), Aiken, S.C., has relocated from Florida to S.C. after 20 years.

**'44 James G. Hilton,** Galveston, Texas, has retired after teaching University of Texas medical students for 42 years.

**'56 John LaRue,** died last year. He was an active member Virginia Tech's Alumni Advisory Council.

**'69 Michael B. Smith,** Stoors, Conn., is an organic chemistry research professor at the University of Connecticut and has authored several textbooks.

**'74 John E. Davis,** Cedar Bluff, married Debra (B.S. Biology, Virginia Tech'75) and works as a pediatric doctor.

**'77 Thomas Perfetti,** (Ph.D.), Winston-Salem, N.C., serves R.J. Reynolds Tobacco Co. as a principal scientist and has finished a chapter which will be published in a book about determinations of nicotine.

**'78 Joseph Thrasher,** (Ph.D.'81), a professor at the University of Alabama, guided the research of undergraduates who held prestigious Moissan fellowships.

**'82 Deanna Miller Emory,** Westbury, N.Y., started her own company.

**'82 James F. Haw** (Ph.D.'82), professor of chemistry at the University of Southern California at Los Angeles, won the ACS George A. Olah Award in hydrocarbon or petroleum chemistry.

**'86 Michael William Shockley,** Bartonville, Ill., works for Caterpillar in the tribology and advanced fluids group.

**'87 Matt McIntosh,** (Ph.D.'98), Fayetteville, Ark., serves as an assistant professor of chemistry at the University of Arkansas and received his postdoctorate from Stanford in 1996.

**'87 Bruce R. Outland,** Boyertown, Pa., teaches honors and advanced chemistry at Methacton High School and completed his master's degree in chemistry from West Chester University.

**'87 Richard D. Reid,** (Ph.D.) Richland, Wash., has been promoted to vice-president of chemistry and health physics and was co-winner for a research and development top 100 award.

**'88 John Severynse,** Rockville, Md., offers advice and help to those in the chemistry field through the Tech Outreach Alumni Program.

**'89 Gregory M. Porta,** (Ph.D.), Mt. Vernon, In., is the cycoloy technology manager with GE Plastics.

**'89 L. Phillip Silverman,** Athens, Ga., finished his master's degree in organic chemistry at the University of Georgia and now works for the U.S. Navy as an aerospace physiologist. He completed his Officer Indoctrination Course at the naval station in Newport R.I.

**'89 Shane Street,** Northport, Ala., works as a assistant professor at the University of Alabama, after receiving his Ph.D. from the University of Illinois, doing his postdoctorate work with Texas A&M, and getting married.

**'90 John Walton** and his wife Elizabeth are the proud parents of their first child, Clara.

**'93 Scott Gayor,** the assistant director of the Center for Macromoloecular Engineering at Carnegie Melon University, won the 1999 Unilever Award for outstanding Ph.D. work . While at Tech, he conducted research in the Gibson Lab.

**'94 Patrick Fromal,** Richmond, works as a technical sales engineer for Shimadzu Scientific Instruments, serving the Commonwealth of Virginia.

**'94 Rebecca Linkenhoker Gudgeon,** Martinsville, married Mike Gudgeon in October and works as a color chemist for CP Films.

**'94 John Scherrer,** Denver, Colorado, works for TRW and is married to Suzanne Swartwood Scherrer (B.S. '92 biology, M.S. biology,'95 Virginia Tech).

**'94 Gregg Kauffman,** helped re-establish the Nu Chapter of Alpha Chi Sigma fraternity at Penn State.

**'94 Michael Ramey,** Gainesville, Fla., is working on his graduate degree in organic chemistry at the University of Florida.

**'94 David Porter,** (B.A.), Kingsport, Tenn. works for the Eastman Chemical Company

**'95 Shelley Porter,** (B.S. '95, M.S. '97), Kingsport, Tenn. works for the Eastman Chemical Company

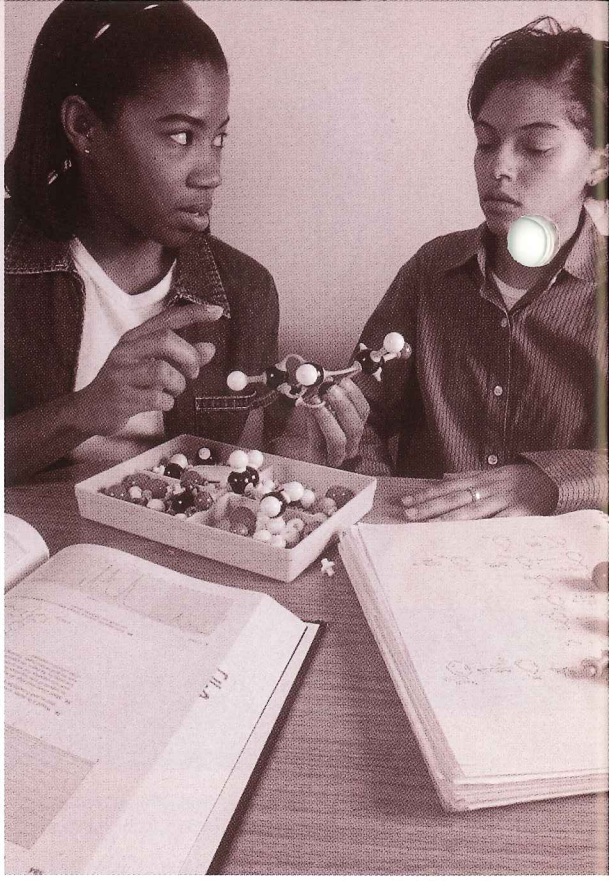
**'96 Donna Osburne,** is pursuing a master's degree from Seton Hall University in South Orange N.J.

**'96 Karen Yang,** (M.S. '96, M.S. '99), Germantown, Md., relocated to Washington, D.C.

**'97 Michael T. Combs,** (Ph.D.), South Charleston, WVa., is part of the Union Carbide Corporation team.

**'98 Lucy Ying Zhou,** (M.S.), Kalamazoo, Mich., works with Pharmacia and Upjohn.

**'99 Lori H. McDaniel,** (Ph.D.), Narrows, accepted a position with Hoechst Celanese.



## Ellen Burts Follows A Fascination

*by Beth Pullin*

Things don't always go as planned. Just ask Ellen Burts, a fourth-year graduate student in polymer chemistry at Tech.

"I always thought I would be a lawyer," says the 25-year-old, who graduated in 1992 as valedictorian of her West End High School class in Birmingham, Ala., where she was part of an honors program that focused on government issues and conducted mock trials. "I was planning on going to law school, knew that's what I wanted to do and nothing was going to stop me."

But change is inevitable and something did stop her — a newfound fascination for polymers.

The youngest of seven children and the first to go to college, Burts received the Eckard Scholarship to attend Stillman College in Tuscaloosa, Ala. While at Stillman, she received a scholarship from the National Science Foundation that required a science internship.

"That's how I became interested in chemistry," she explains.

Her sparked interest grew into a true fascination during that internship where she worked as a research intern with the Department of Chemistry at the University of Alabama in Birmingham her sophomore year as an undergraduate.

"Every part of the world we live in involves some type of chemistry" says Burts, who's grades reflected a natural knack for math and science anyway.

Burts admits she's not completely sure how she has ended up on the path she's traveling, but she does believe the result of her journey is a combination of things that have happened over time.

It was during another internship at Lucent Technologies-Bell Laboratories that Burts was introduced specifically to polymers and saw firsthand how the long chains of molecules linked together could provide a higher molecular weight material. When a high molecular weight is used, better properties can be achieved, which is particularly helpful when a light material with high strength is required.

"Polymers is a fast-growing field," explains Burts, "because almost everything today — plastics, rubbers and nylons, for example — are polymers."

In addition, polymers can often be used to replace other materials because of their ability to be chemically modified to improve their properties.

With a bachelor of science degree in chemistry and a minor in mathematics from Stillman under her belt, Burts knew she was going to pursue a graduate degree in polymer chemistry. And for her, Virginia Tech was an easy decision.

"I picked Tech because they had a strong polymer program and I wanted to work with professor Judy Riffle, who is very well-known in the field."

And professor Riffle has been a large part of Burts' positive experience at Tech.

"People say she's committed to her research," says Burts. "But I'd say she is even more committed to her students."

Perhaps surprisingly, it wasn't until Burts actually got to Tech that she learned the polymer program is ranked fifth in the country. That, of course, was an added benefit.

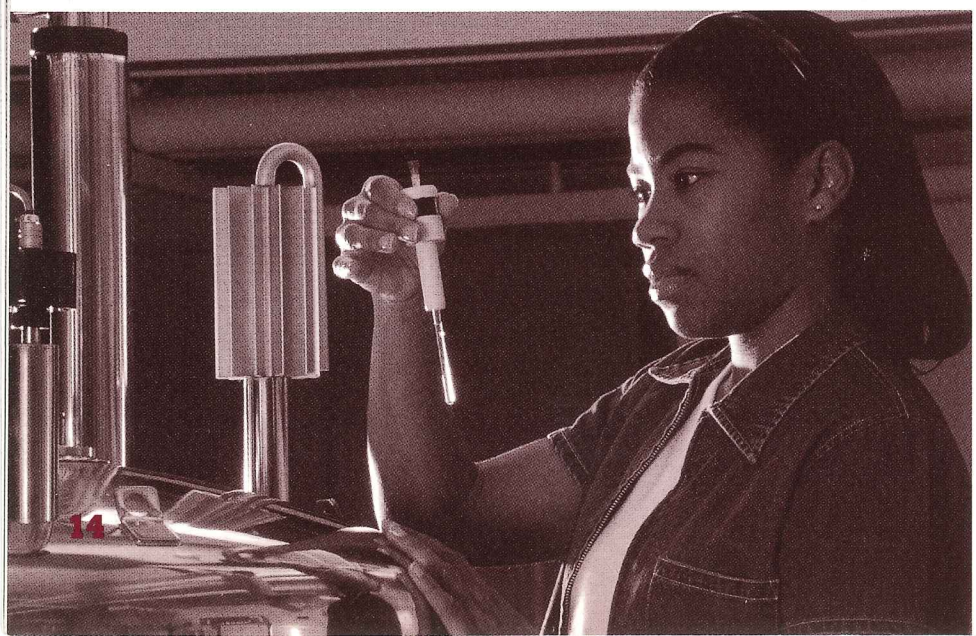
The splendid scenery didn't hurt either.

"I love the blue mountains and just think it's gorgeous here," she says.

Burts' love for Tech goes far beyond its prestige and rolling landscapes to the research she's had the opportunity to do while at the university.

Burts examines the network formation of thermoset materials to see how the structure affects the material's overall properties, including toughness, hardness and strength. Network formations are long polymeric chains entangled together and connected through chemical reactions that form solvent resistant structures.

In a collaborative effort with Dow Chemicals, Burts characterized various



vinyl ester resins that the company provided to determine which ones had better properties. By characterizing materials, Burts hopes to produce better materials.

"I want to make a bigger impact on infrastructure applications, like bridges," says Burts.

Burts has already witnessed the impact vinyl esters can make. She's seen firsthand that vinyl ester resins when used in composites — carbon fibers bound together — can replace and improve upon traditional steel metal. Since vinyl ester composites don't corrode and have similar strengths to steel, it can form better, longer-lasting bridges.

Burts believes that reviewing a material's network formation has a strong bearing on developing better materials that can make a difference in the construction industry. "A lot of people look at vinyl esters, but they have not looked at network formations and how that affects properties," says Burts.

Through her research, Burts has studied the arrangement of network formations due to various curing procedures, or the way materials go together, as well as molecular weight and molecular weight distributions. And she has evaluated their physical and mechanical properties.

While Burts' has found her research to be satisfying, she says her most gratifying experience has been working with college-bound high school students through Tech's Upward Bound Talent Search program. Basically, teachers like Burts offer high school students an opportunity to truly experience college life in every curriculum.

So, for two Saturdays each month, Burts tutors students in general chemistry.

"I enjoy my research, but it's exciting to think that something you have said or done may get a high school student interested in this field or college," says Burts, who also serves as a teacher's assistant in organic chemistry.

In addition to her academic and research efforts, Burts stays active with Alpha Kappa Alpha, a sorority that focuses on community service-oriented initiatives such as offering free help to younger students and raising money to provide college scholarships for area high school students.

It would seem obvious from Burt's hectic schedule that she believes teaching is a priority, however, she isn't sure if it will be part of her future plans.

"I haven't decided if I want to teach or work for industry," she says. "For now, I hope to secure a post-doctoral research position for a year or two."

While she may not be sure of which direction her path will continue, she is certain of one thing. She isn't taking her journey alone.

"My family has really helped me and I don't think I'd be here without them," she says, noting that her dad, who retired from the construction business, provides a lot of mental and emotional support and her mother, who died a few years ago, always stressed a solid education. Not to mention her six siblings, who serve as mentors.

Because of her hard work — another thing she's learned from her father — Burts has been able to attend Tech and get her graduate degree with the help of two fellowships from both Lucent Technologies-Bell Laboratories and the David and Lucile Packard Foundation.

"I am very grateful," says Burts, who probably wouldn't have pursued a graduate degree without the fellowships. "We have to remember we never do it all by ourself."

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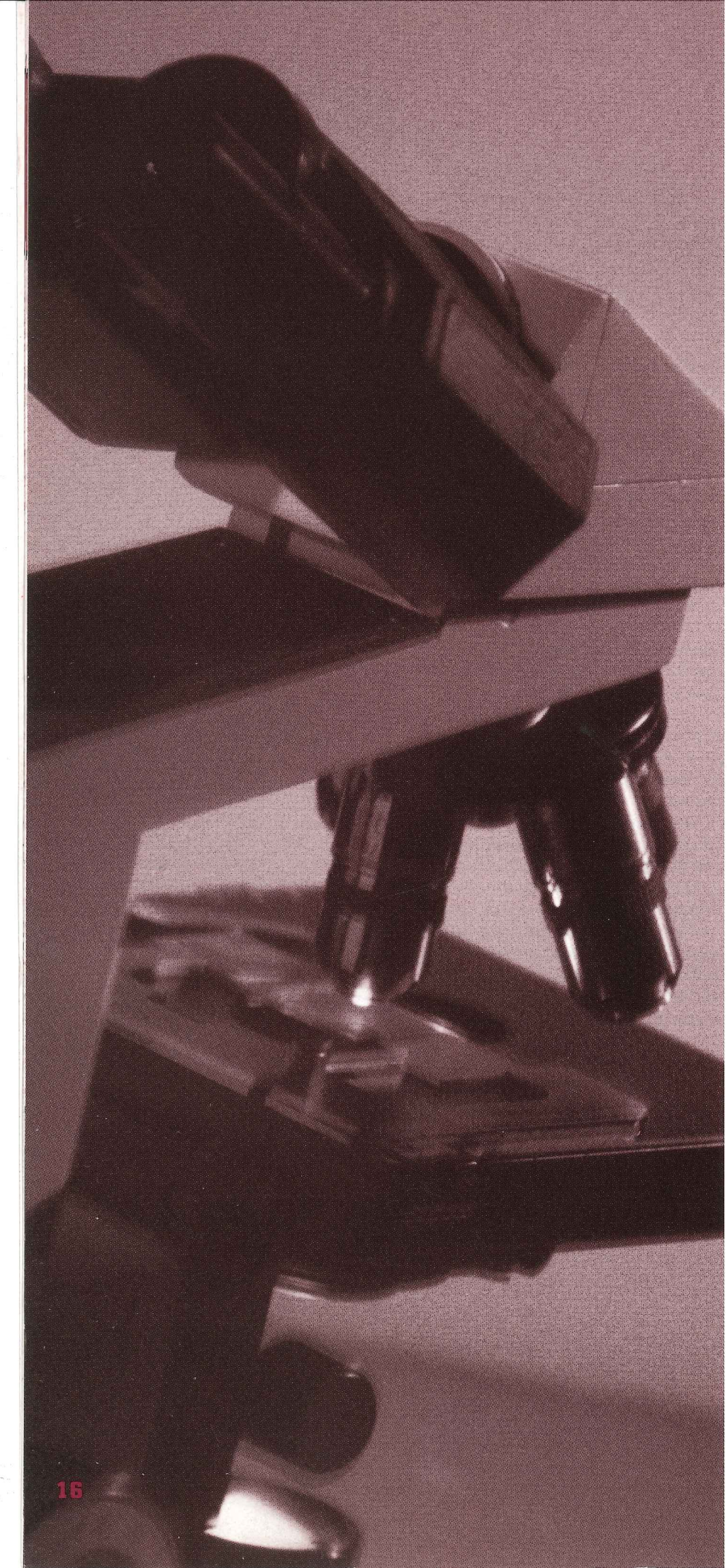


**from Ogliaruso, page 12**

Musical theater favorites such as *Music Man, Fiddler on the Roof* and the *Wizard of Oz* featured Mike in various roles. But his most memorable role of the more than 50 or so productions he has performed in, was that of Colonel Zapt in the *Prisoner of Zenda*, which is an original piece with book and music by Steve Brown, a Virginia Tech employee. The story concerns a kidnaped king and a look-alike who fills in for him until the real king can return. The Colonel Zapt character serves as advisor and mentor to the king.

Mike isn't just a musical-one-note. He participates in theater productions for children in the schools via the HaeBo group, which performs during reading month to stimulate children's interest in reading. The most recent production, the *House at Pooh Corner*, "seemed to work very well. It helped them visualize the characters, including me as Owl," he says.

Yet another theater group Mike participates in is Black Dog. Once every three months he joins the company in their interactive murder mysteries. They perform at the Chateau Morrisette Winery on the Blue Ridge Parkway and also the Warm Hearth Village retirement community in Blacksburg.

This full acting, teaching and writing life doesn't leave much time for his hobby of fine woodworking, an interest that his father introduced him to back in Brooklyn.

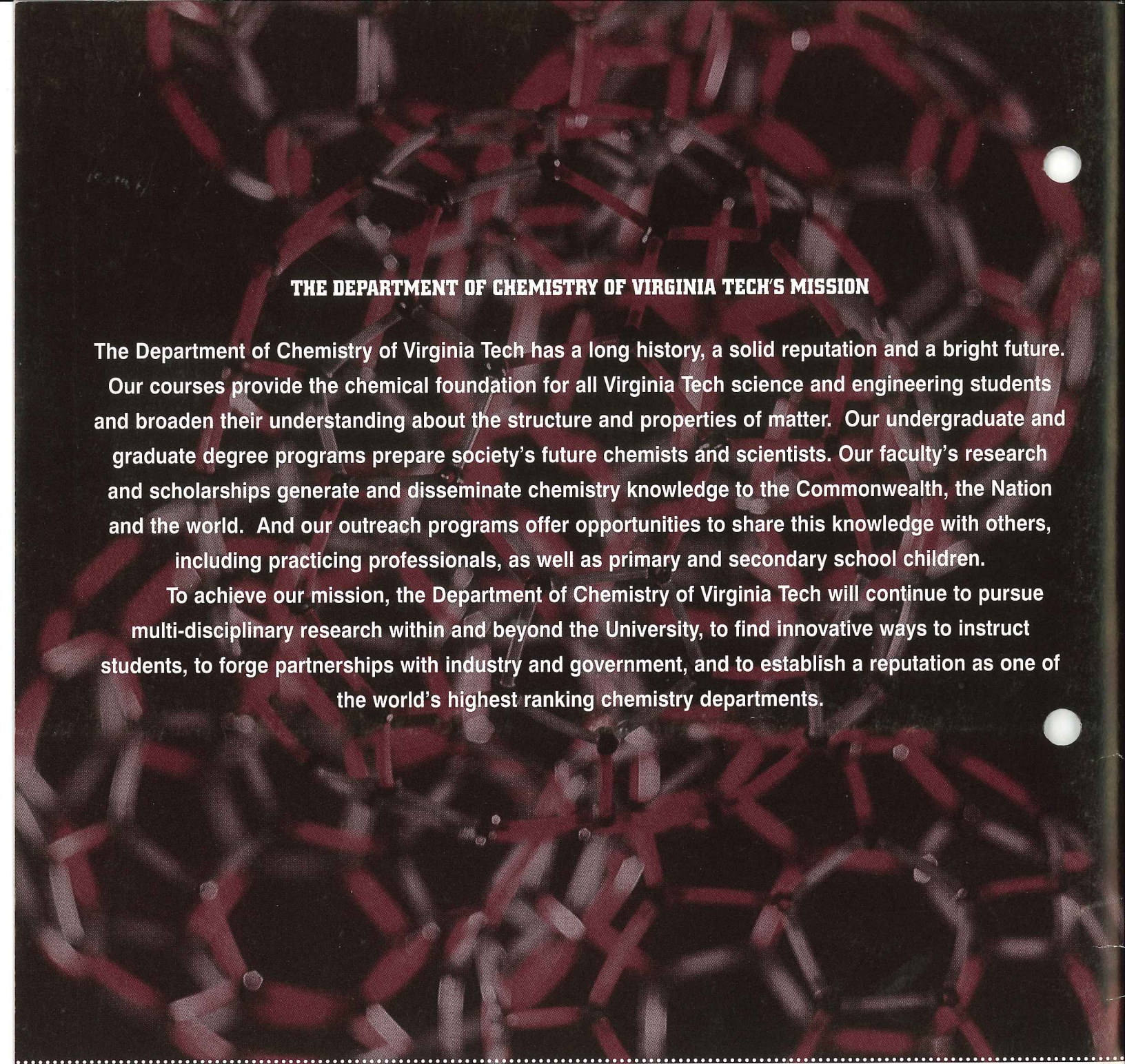
"I make desks and grandfather clocks to order," he says of his "spare time." In fact, he just finished a built-in L-shaped desk in red oak that "had to be made so the owner could move his chair up and down the desk without hitting his knees."

Somehow, he occassionally finds time to fish with his retired Tech buddies. He also tries to work out somewhat regularly with his son Michael, the text book supervisor at Volume II, Tech's off campus bookstore.

From scholarly book to pretend play, Mike gives a new twist to his own admonition to "retire to something."

"Don't retire from anything. Retire to something"

— Mike Ogliaruso



## THE DEPARTMENT OF CHEMISTRY OF VIRGINIA TECH'S MISSION

The Department of Chemistry of Virginia Tech has a long history, a solid reputation and a bright future. Our courses provide the chemical foundation for all Virginia Tech science and engineering students and broaden their understanding about the structure and properties of matter. Our undergraduate and graduate degree programs prepare society's future chemists and scientists. Our faculty's research and scholarships generate and disseminate chemistry knowledge to the Commonwealth, the Nation and the world. And our outreach programs offer opportunities to share this knowledge with others, including practicing professionals, as well as primary and secondary school children.

To achieve our mission, the Department of Chemistry of Virginia Tech will continue to pursue multi-disciplinary research within and beyond the University, to find innovative ways to instruct students, to forge partnerships with industry and government, and to establish a reputation as one of the world's highest ranking chemistry departments.

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