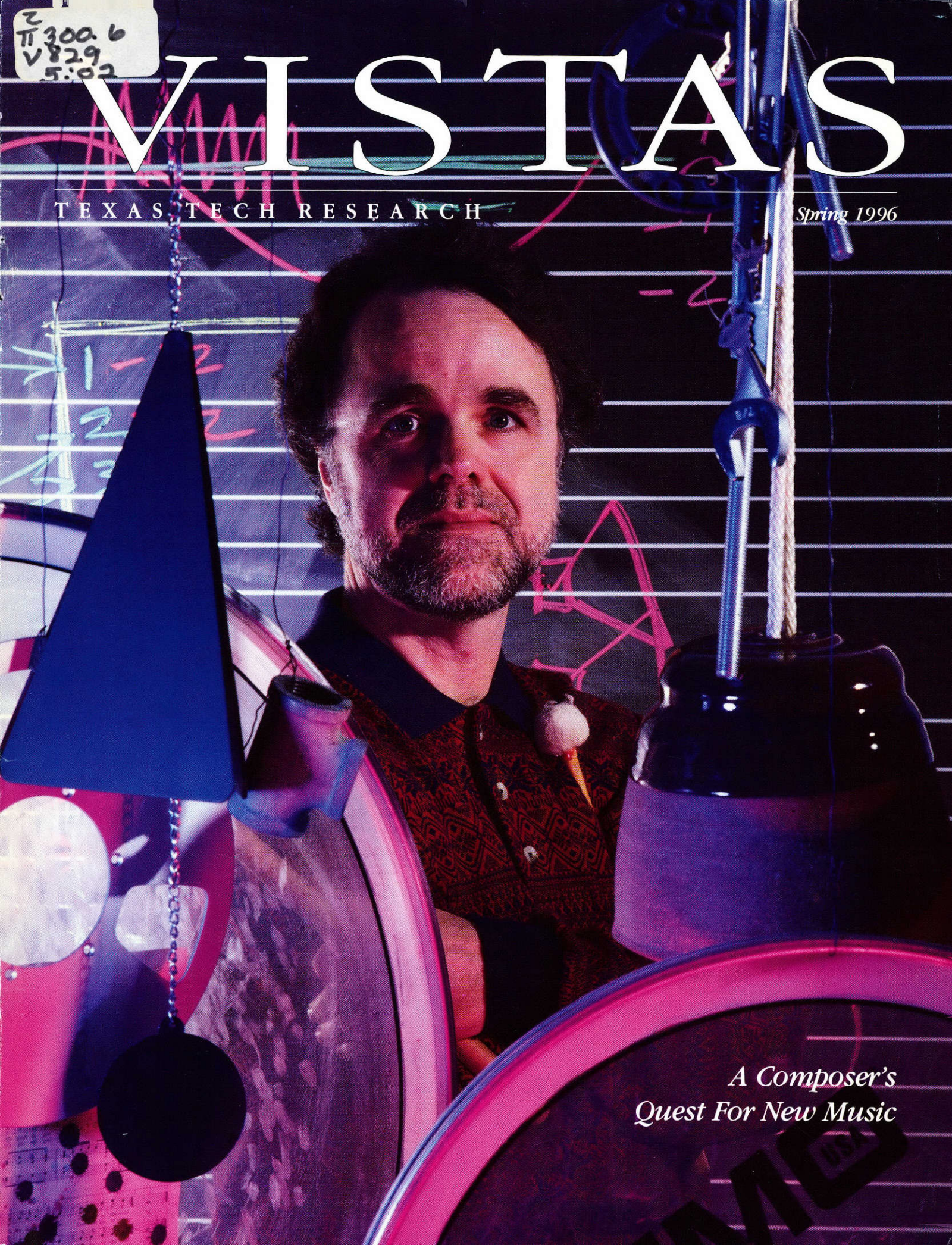


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TEXAS TECH RESEARCH

Spring 1996



*A Composer's
Quest For New Music*



VISTAS

TEXAS TECH RESEARCH

Spring 1996

Vol. 5 No. 2

Each issue of *Vistas: Texas Tech Research* (Library of Congress ISSN 1055-9159) reflects the goals, techniques, results and drama of research and creativity at Texas Tech. The magazine describes only a few of the many scholarly activities conducted at Texas Tech University and at Texas Tech University Health Sciences Center.

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ABOUT THE COVERS

Front—Texas Tech University composer Steven Paxton utilizes a hand-constructed “junk rack” comprised of items for percussion for improvisation in creating sounds as he attempts to invent alternative music. The structure is in his Studio for Experimental/Electronic Music at Texas Tech where Paxton, other artists and students can explore music based on their own individual contemporary musical voices rather than on traditional ones, he explains. The studio also has an electronic work station for composing. Paxton further incorporates the studio into his own interarts collaborations. (Photo by Artie Limmer)

Inside Front—A drop of water collects on the leaf of a *Chlorophytum comosum* in the Texas Tech Greenhouse. The photograph illustrates a feature article about Horn Professor Purnendu Dasgupta, Ph.D., who researches in chemistry using liquid drops as collectors for atmospheric gases. He has discovered that drops can be used to determine and measure the content of the air surrounding the droplet. Among other advantages, this drop system has brought the ability to perform a complete chemical analysis on a particle that is 1/100th of the diameter of a single strand of hair. (Photo by Artie Limmer)



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A Glance at Research and Creativity

The Gleaners

They are the gleaners, those who gather what is left after the harvest. They are by nature innovative conservationists, thus they demonstrate the solution to feeding the world's hungry, now and in the future.

At Lubbock's Breedlove Dehydration Plant, people turn improbable tasks into possible achievements, and Texas Tech University faculty, staff and students have enlisted in those efforts from the beginning inceptions of the facility, a division of the South Plains Food Bank.

Last fall, Texas Tech's Community Action Network organized almost 400 faculty, staff and students to produce 1 million servings of dehydrated soup mix to feed the hungry in inner-city Los Angeles in an effort called "SOUPer Solution."

For one 24-hour period in October, 12 shifts of about 30 volunteers each worked to put dried potatoes, carrots, onions, turnips, green beans and celery together in bags, sealed them and labeled them with the words "Texas Tech University volunteers prepared this soup mix over a 24-hour period on Make a Difference Day, Oct. 28, 1995."

The annual "Make A Difference Day," the largest national day of doing good, is sponsored by the Points of Light Foundation and USA Weekend magazine. Communities that organize special projects in celebration of "Make a Difference Day" can enter their projects in the annual challenge, in hopes of being awarded \$2,000 for the charity of their choice, according to Michael Genovese, Texas Tech University Center Pro-

grams assistant coordinator.

Volunteers at the Breedlove plant were needed to hand mix the vegetables in an assembly line arrangement because no blender equipment is in operation for combining the contents of the soup, explained Howard M. Mercer, marketing director for the Breedlove plant.

The soup mix packages were distributed through LIFE Outreach International, an organization active in humanitarian relief programs, which purchased the first million servings of dehydrated soup that the Texas Tech group packaged.

UC Programs President Ben Hamilton, a junior marketing major from Bowie, stayed throughout the entire 24 hours of the project.

"Sometimes as college students we get wrapped up in everything about our college lives, and we tend to forget how lucky we are to be going to college and getting an education. I think this is one way of giving back to those who aren't as fortunate as we are. This is a way of giving back to the community," he said. "SOUPer Solution has great potential of gaining national recognition for Texas Tech as well as Breedlove."

Karla Jensen, a new assistant professor of communication studies, said she volunteered for the effort in order to be a part of the university and of the Lubbock community. "It feels great to know that I'm helping somebody a thousand miles away. It's a good reminder of how bountiful our society is and how little others have. With every scoop of carrots, I wonder who this is going to feed," she said.



Joey Hernandez

"I know it sounds like a cliché, but really I'm trying to make a big influence on a lot of people's lives at one time by donating a few short hours of my time," commented Eric Winston, a junior pre-veterinary medicine major from Weslaco.

Administrators at the South Plains Food Bank say that dehydrated food, because of its long shelf-life and nutritional value, increasingly will become important in feeding the hungry. Also, the shipment and production of dehydrated foods has proven to be more cost efficient than that of canned or frozen foods because the weight of moisture is not being transported.

"Based on a cost of 60 cents per pound of soup mix, one 8-ounce serving could be produced and shipped to a needy family for less than 2 cents," Mercer said.

The Breedlove Dehydration Plant went on-line in October 1994. The conception for the use of a dehydration plant to mass produce food for the hungry resonated from the receipt of surplus dehydrated rations issued to soldiers in the 1991 Persian Gulf War.

Farmers report that for var-

Two Texas Tech volunteers fill bags with dehydrated vegetables to feed the hungry in Los Angeles.

ious reasons, 20 percent of the produce crops in Texas are never even harvested. If not harvested and sold during the right window of opportunity, excess vegetable crops are plowed under, dumped in landfills or fed to cattle. Often vegetables or fruit are shipped to an area and turned down by processors or supermarkets. Most of this produce is good, edible food that is either irregular in size, shape or color or still has field dirt on it. The produce is wasted simply because it does not meet cosmetic standards. In other cases, food is wasted because not enough storage room or refrigerated storage space is available to keep the produce from spoiling.

"When it comes to food banking and fresh produce, such as carrots or potatoes, it seems it's always feast or famine. Either you do not have any product or you have more than you can possibly distribute before it begins to spoil," Mercer said.

"Dehydration is the future of surplus foods because when we take the water out

of foods, we don't have the problem of spoilage. We have less weight to transfer. We don't have a storage problem, meaning it doesn't have to be refrigerated. So our costs keep going down. For example, the potatoes and carrots can last in excess of a year," Mercer said. "So we do have a solution to feeding the hungry of the world."

Recently, members of Breedlove were notified that the dehydration plant would appear in the "Guinness Book of Records" as being the largest non-profit factory in the world drying surplus crops to feed the poor. The \$7 million plant operates with no federal assistance or aid from the United Way.

As the plant was being designed, the facility received ample expertise from Texas Tech, notes Mercer, and that proficiency has continued during its first year of operation, says South Plains Food Bank Executive Director Carolyn Lanier.

"Texas Tech and Breedlove have always been closely affiliated since the plant's conception. I had hoped that students would get involved and would continue to work with Breedlove. The support of Texas Tech volunteers was essential to the production of the soup. I wanted students to understand that without them the soup mix could not be produced and that 1 million people would go hungry," said Cheryl Shubert, the University Center coordinator of student activities and a main organizer of the "SOUPer Solution" event.

At the recent International Hunger Summit and Harvest Fare, the South Plains Food Bank and the Breedlove Dehydration Plant honored Shubert for her work on the soup project.

Several other Texas Tech faculty members were honored for their recent contributions to the Breedlove facility.

Jean Kavanaugh, M.L.A., assistant professor of landscape architecture, was noted for her landscape design around the facility. Michael A. Jones, Ph.D., associate dean for graduate studies and research in the College of Architecture, was credited for his aide in architectural design. Mario Beruvides, Ph.D., assistant professor of industrial engineering, was honored for developing and improving management structure and methods at the plant. Ernst W. Kiesling, Ph.D., professor of civil engineering, was credited for conducting an energy audit at Breedlove and for developing plans for improved energy usage at the plant.

With the assistance of these and other faculty members and students over the years, the South Plains Food Bank

and the Breedlove plant operate optimally. By itself, the South Plains Food Bank serves 33 counties and feeds 16,000 people a day on average. With the Breedlove Dehydration Plant, the regional facility has exhibited that the two organizations can feed the hungry on a worldwide scale.

For the beginning of the "SOUPer Solution" effort, Shubert handed out thank you cards that gave participants a thought to keep in mind throughout the rest of the project. The card quoted anthropologist Margaret Mead who once said, "Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever has."

Those gleaners from Breedlove and Texas Tech must continue to believe Mead's words because, at the bottom line, that's exactly what they're doing.

— Kippira D. Hopper
and Charles Griffin

A volunteer weighs a bag of dehydrated soup mix marked with a label indicating that Texas Tech University volunteers prepared the soup mix during a 24-hour period on "Make a Difference Day" on Oct. 28, 1995.



Joey Hernandez

Doomed to Credit Card Jail?



Joey Hernandez / Jerry Kelly

The old-fashioned “buy now — pay later” way of handling finances has landed many consumers in credit card jeopardy. Finding ways to eliminate debt is the first step to solving financial problems. The solution begins with a telephone call.

Last summer, Texas Tech University opened the doors to the new Center for Financial Responsibility. Under the guidance of researcher A. William Gustafson, Ph.D., the center will assist consumers and professionals through specialized programs in addressing issues from individual finances to planning for retirement.

“We’ve recognized for the past few years that the living standards of many consumers will go down drastically if they’re thinking about retiring and living on social security,” Gustafson said. “Unless consumers start

thinking about ways to cut their living expenses so they can save for retirement while they’re still working, they’re going to be in for a rude awakening when they reach retirement age.”

Housed in the College of Human Sciences, the center will use existing facilities, faculty and staff to provide consumers and professionals with information on how to plan successfully for the future. The center will sponsor workshops, guest speakers and seminars ranging in cost from no charge to a set fee depending on which program is provided.

“Texas Tech is drawing an increasing number of students who want to study in the area of family financial planning, and I’m glad we have such a good working relationship between our college and the College of Busi-

ness Administration,” Gustafson said.

Students enrolled in the family financial planning major are required to follow the courses outlined for a business administration degree plan. Gustafson said by using the same criteria as a regular business administration student, the program is guaranteed to attract top students.

Texas Tech’s family financial planning program is one of more than 70 in the United States that is registered by the Certified Financial Planners Board of Standards.

“Through the center, we’ll be able to sponsor events that will bring the business community together with the families that need these kinds of services,” he said.

Family financial planners are responsible for assisting consumers achieve their financial goals. In this capac-

ity, Gustafson said, the financial planner serves as the quarterback on a team of professionals including an attorney, an accountant or a stock broker.

“Our job is to clarify the goals and resources of a family or an individual by integrating areas, such as insurance, investments, taxes, retirement, employee benefits and estate planning, so that the family or individual can meet his or her financial goal,” Gustafson said.

Eliminating credit card debt is the first step toward financial independence. For example, if a person owes \$2,000 on a credit card with a 19.8 percent interest rate and he or she pays a minimum monthly balance of about 2 percent, or about \$40, the customer would take more than 31 years to settle the debt. This type of payment procedure also would cost the consumer more than \$8,000.

The staff of the center will help consumers analyze their financial lives by reviewing the various lifecycles most consumers face. According to Gustafson, the staff will examine how a couple’s lives will change monetarily during changes such as buying a home, the birth of children, saving for a child’s college education, planning for retirement and caring for aging parents.

Gustafson and fellow researchers in the department of merchandising, environmental design and consumer economics began studying demographic changes that influence how well an individual will live in retirement based upon

factors such as indebtedness, earnings, savings, retirement benefits, health, cost of living and inflation. Their findings indicated that most people either will have to increase their savings during their working years or expect to survive at a lower standard of living.

"The saddest thing to me is how some people look forward to retirement only to be forced back into the workforce or postpone retirement," Gustafson said.

Numerous employers are moving toward consulting with financial planners in order to assist employees with their own personal finances and maximize the employee benefits provided by the organizations. By planning ahead, Gustafson said, consumers can protect themselves against large tax liabilities as well as build a nest egg for the future.

"There are some people who would rather go out and get a second job just to buy extra things like a boat or jet skis because it's the trendy thing to do. What that person should be asking himself or herself is whether those extra things are worth the trouble they're causing. Maybe spending more time with the family is more important than working a second job. Consumers should not make big ticket purchases until they have figured out their own financial picture."

Gustafson said the key to survival in the '90s is not to try to "keep up with the Joneses next door," but to determine one's own personal financial goal. By being realistic and sticking to that goal, an individual will be able to enjoy the golden years without money problems.

— Myrna Whitehead

A Purpose for Polyhedrons

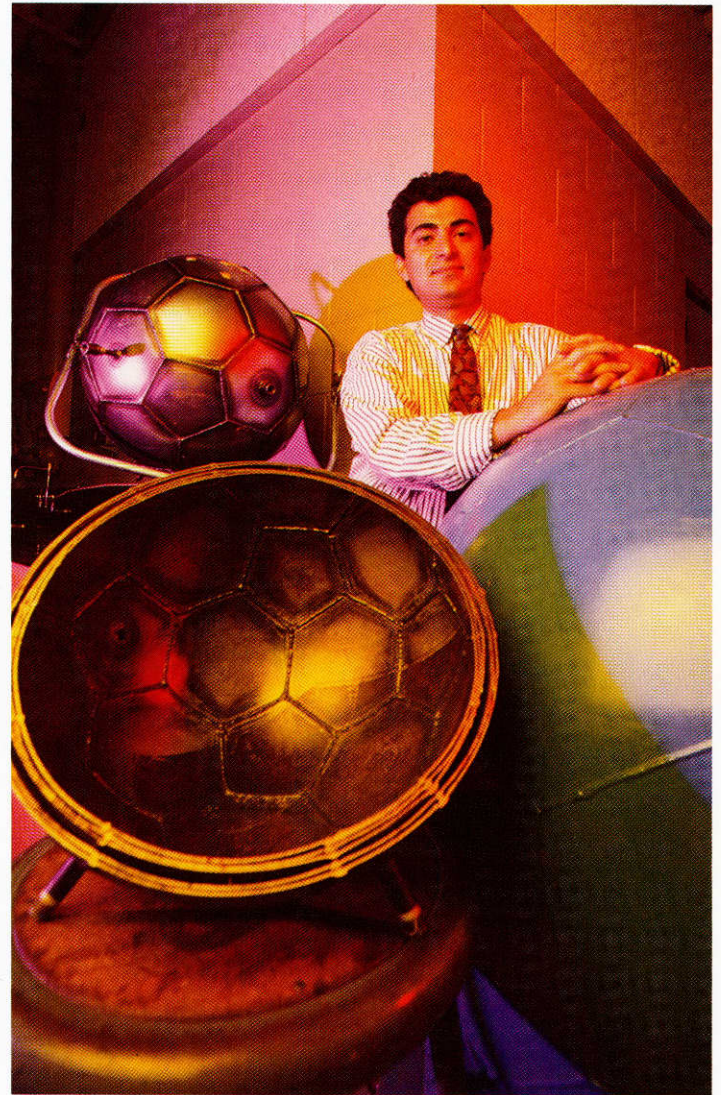
Texas Tech University researcher Javad Hashemi, Ph.D., is welding together flat pentagonal and hexagonal sheets of steel to form polyhedrons. While that sounds rather uneventful, the next step should prove interesting.

Once he's got his polyhedron shape, Hashemi, an associate professor of mechanical engineering, then forces water and air into the flat-sided metal ball to form a round metal cylinder. The process takes many hours, but it is much like blowing up a vinyl balloon. The only difference is these metal balloons can be used for storing high pressured gases, such as propane or natural gas. Pressure vessels are used at refineries to contain pressurized gases.

Hashemi's process, called "Integral Hydrabulge Forming," has been heralded by manufacturers as a way to make pressure vessels more economical and easier to assemble. Currently, pressure vessel manufacturing requires large presses and dies, complex tooling geometry, welding across curved surfaces, wrapping machines and precision fitting.

Hashemi said the biggest problem with the conventional method of manufacture is the welding process. "Welding across a curved path is a complex process that can result in unacceptable density of voids and gaps in the weld seam."

Hashemi's process of welding flat pieces of metal is significantly less complex than the conventional vessel manufacturing techniques.



Mark Mamawal

He said metal forging equipment or complex cutting and welding procedures are not needed. Using Hashemi's method, vessels can be manufactured in any machine shop with a modest equipment set. Hashemi said this will cut the cost of manufacturing plus allow for better pressure vessels.

"Because there is no need for forming presses, complex welding across curved sur-

Surrounded by polyhedron forms, Javad Hashemi contemplates the uses of the pressure vessels that resemble metal balloons.

faces or complex cutting techniques, the cost of capital and specialized labor will be reduced.”

The process involves welding together flat pentagonal and hexagonal sheets of steel to form a polyhedron, a container shaped like a cube. The polyhedron is then internally pressurized to “bulge” out the flat surfaces until the polyhedron forms a sphere. Multi-layers of metal are pressurized together to form a thick-walled vessel. This aspect of Hashemi’s process allows manufacturers to develop pressure vessels with multiple, concentric, thin-walled polyhedrons that can be bulged together to form the final pressure vessel.

“The new method controls to a certain extent the weld integrity,” said Hashemi. “Considering the magnitude of production of pressure vessels, it is clear any contributions to the enhancement of the manufacturing process could create a significant impact on the industry.”

After the polyhedron is formed, it is pressured until small bulges begin to form in the metal. The pressurization takes place in small increments and after every pressurization cycle, the metal is allowed to rest for 15 minutes. This pressurization-relaxation cycle continues until a spherical form is achieved. The bulging pressure, when the polyhedron becomes fully spherical, can reach more than 4,700 pounds per square inch (psi).

Each layer jacket is filled with water creating an effective “atmospheric” pressure to the preceding shell. For instance, in a five-layered vessel, the outer shell is formed at a pressure of 980 psi, but the inner shell pressure reaches about 4,700 psi. This

effect allows the manufacture of vessels with large pressure-bearing capacity in a relatively easy process. Also, Hashemi said only the inner layer must be corrosion resistant, reducing the need for making the entire pressure vessel out of a non-corrosive material.

The multi-layered manufacturing process gives Hashemi’s pressure vessels an advantage over conventional vessels because they have the potential to improve plant safety. He said die cast pressure vessels fracture and explode during failure, sending flying metal through the air. However, when a multi-layered vessel fails, the layers fail independently and peel off like an onion, leaving the vessel intact.

“The multi-layered pressure vessel is safer because after years of stress, when a layer ruptures it pulls away at the weld, yet there are still other layers to keep the vessel in check. So, unlike conventional pressure vessels, the multi-layered vessel doesn’t explode like a bomb.”

Hashemi’s process was featured at the Winter Meeting of the American Society of Mechanical Engineers and in the October 1994 issue of *The Fabricator*, the official publication of the Fabricators and Manufacturers Association. The research has been supported by the State of Texas Line Item Research Fund, under the Research Enhancement Program.

Hashemi has proven that sometimes the most basic of research, like welding metal together and forcing the finished pieces into a ball, can lead to very useful applications that not only save time but improve safety as well.

— Michael Sommermeier

An Expansion of Library Resources

The Libraries at Texas Tech University recently expanded journal holdings by about 1,000 journals, saving \$50,000 in the process.

Thanks to an expansion in computerized access, patrons now may find more periodical indexes, abstracts and other databases through reciprocal, electronic access via Texas Tech’s computerized Library Information System (LIS).

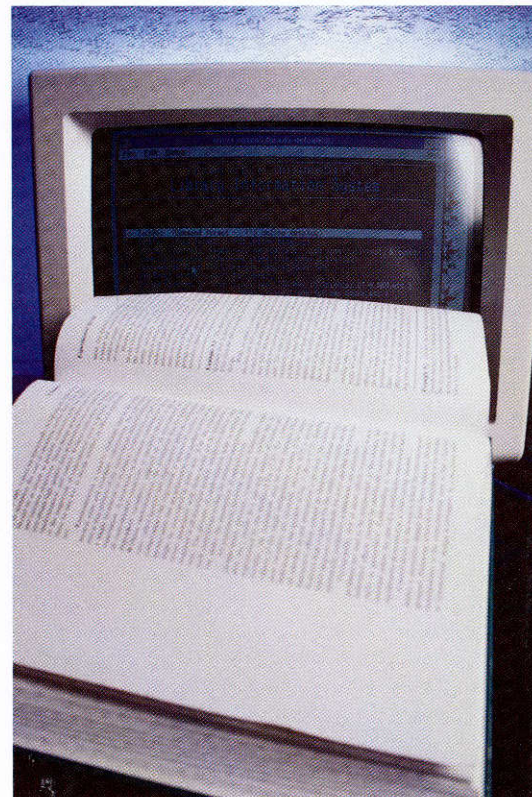
In order to have expanded access, the University Library — a member of the Llano Estacado Information Access Network (LEIAN) libraries — joined with the New Mexico Consortium of Academic Libraries (NMCAL) in a special agreement only to provide access to the FirstSearch indexes and databases.

According to Virginia Andrews, head of library automation at the Texas Tech University Libraries, “A LEIAN committee decided to access FirstSearch through a special plan that involved combining the interests of LEIAN group members and the New Mexico Consortium of Academic Libraries because we received a cheaper rate by joining together than if Texas Tech had to pay the access fee independently.

“It’s important to note,” said Andrews, “that the

NMCAL group has not joined the LEIAN Consortium — the merging of the two is only for purchasing the new database ‘LEIAN/NMCAL FirstSearch.’”

If the Texas Tech Libraries had independently accessed FirstSearch and 20 ports, the fee would have been \$141,000. Instead, the LEIAN consortium libraries, of which Texas Tech is a member, merged with NMCAL so Texas Tech’s purchasing fee to access FirstSearch and 30 ports would be \$90,000 — an approximate savings of \$50,000 for the Texas Tech libraries. Each consortium member school paid a portion of the total \$351,000 fee, which is based on the full-time enrollments (FTE) figures for students.



Joey Hernandez

A major advantage of the merge, says Andrews, is that the libraries purchased the databases collectively as opposed to subscribing to the databases individually in other formats, thus a great deal of duplication was eliminated.

Of the 25 databases and indexes available through FirstSearch, some of the more popular ones are WorldCat, ArticleFirst, ContentsFirst, ERIC and PsycFIRST.

WorldCat, the world's most comprehensive bibliography, contains more than 33 million bibliographic records. ArticleFirst consists of bibliographic citations that describe items listed on the table of contents pages; and ContentsFirst contains the complete table of contents pages and holdings information from more than 11,000 journals covering science, technology, medicine, social science, business, humanities and popular culture.

The new information on FirstSearch also includes access to American Business Information, Applied Science and Technology Index, Biography Index, Book Review Digest, Education Index, Environmental Sciences and Pollution Management, PAIS Decade, International Repertory of Music Literature, Sociological Abstracts, USA Select Telephone Directory and Worldscope GLOBAL.

ERIC contains more than 700,000 annotated references to non-journal material published in *Resources in Education* and to journal articles in the monthly edition of *Current Index to Journals in Education*. Psychology resources and related fields may be found in PsycFirst, which offers patrons journal articles, technical reports, monographic series and

dissertations.

The usage of FirstSearch has increased remarkably, according to E. Dale Cluff, Ph.D, director of the libraries at Texas Tech, especially considering the brief period of time that the search system has been available at Texas Tech. Records for April 1995, which highlighted data during the first nine months of availability of FirstSearch, indicate more than 370,000 searches were conducted. Cluff noted that the only library that ranked above Texas Tech in national FirstSearch usage was the University of Minnesota.

The reasons for the high usage, Cluff said, may be attributed to the system's user-friendly format; the visual appeal and location of FirstSearch on the Library Information System's menu; electronic access marketing through seminars with academic departments and short courses; and the receptiveness of Texas Tech students, faculty and staff regarding electronic research methods.

According to Linda Bixler, director of the Alliance of Higher Education (AHE), which collectively purchased FirstSearch, Texas Tech students, faculty, staff and patrons did more FirstSearch research in one month's time than all association members. Bixler noted that academic libraries in the Dallas/Fort Worth area, such as those at Southern Methodist University, Baylor University and Southwestern Medical Center, are included among AHE library members.

Additionally, of all the LEIAN consortium member schools, Texas Tech students and faculty members were responsible for 76.4 percent of all the searches on FirstSearch conducted between

Oct. 1, 1994, through Sept. 30, 1995. The LEIAN members include libraries in the Texas Panhandle, South Plains and Eastern New Mexico. The NMCAL libraries include 12 campuses in New Mexico.

The expansion of computerized access means that instead of locating a standard international database of information, additional journals may be found via the Library Information System to provide patrons with full-text articles as well as abstracts. The library has expanded the number of indexes and databases for use through FirstSearch, an online Library Information System menu item that provides easy access to a variety of databases and indexes.

The usage of FirstSearch has increased remarkably, according to E. Dale Cluff, Ph.D, director of the libraries at Texas Tech, especially considering the brief period of time that the search system has been available at Texas Tech.

Andrews was one of nine individuals who served on a statewide Commercial Indexing Committee that decided what specific indexes that TexShare would access. As a group, members of the committee eventually decided to establish statewide access to two, full-text databases.

"With further funding

from the Legislature, we will be able to add more specialized databases in the future," she said.

Cluff, who serves on the statewide Texshare Advisory Board, said that after monitoring patron activity on TexShare during the month of July 1995, he and his staff determined that a total of 27 percent of the searches at state-supported institutions in Texas were performed at Texas Tech.

TexShare is available in 52 libraries at 39 public colleges and universities throughout the state of Texas. The Texas Legislature pays 75 percent of the service's fee and participating libraries pay 25 percent. Additionally, the TexShare Gopher may be used to access the *Federal Register* and *Commerce Business Daily*.

To allow more individuals database access, Andrews says that database information may be downloaded onto individual diskettes at personal computers. If Texas Tech does not have a specific holding, articles may be ordered through interlibrary loan at no cost to patrons. Additional special delivery services also are available and are charged to the individuals.

For more information about the computerized Library Information System as well as TexShare and FirstSearch indexes and databases, patrons may call the University Library's Reference Desk at (806) 742-2236.

"By working together, the libraries are able to jointly provide access to these databases. We are able to provide our patrons with more information that is easily available at a reduced cost to our libraries," said Cluff.

— Jennifer LeNoir

(Editor's Note: The following opinion piece was written by Jorge I. Auñón, who holds a doctorate of science degree with a specialty in biomedical engineering, specifically in neurological studies. He is the dean of the Texas Tech University College of Engineering.)

Exporting Education to Refineries Across the Bering Strait

By Jorge I. Auñón, D.Sc.

Perestroika — the national revival of political, economic and social life in the former Soviet Union — opened Komsomolsk, a city that struggles to compete in today's capitalist world. Inside the city of 300,000 residents, Khabarovskij Oil Refinery is now 49 percent privately owned. When the government cash flow stopped, so did the oil flow in a pipeline connecting the oil refinery with the Sakhalin Islands, east of Komsomolsk and north of Japan.

Still flowing in Komsomolsk, the Amur River equates to America's Mississippi River. Komsomolsk-on-Amur State

Technical University educates the refinery's workers, and now Texas Tech University has become a part of that process.

Looking for a first-class chemical engineering program, the university and the oil refinery selected Texas Tech as the institution to educate their students. Once basic classes are mastered at Komsomolsk-on-Amur, the refinery pays Texas Tech for a three-year program to educate Far-East Russian students.

Ten students came to Texas Tech in 1994 from Komsomolsk. This year eight more students crossed the Bering Strait for their education. More than

a technical education, however, these students, and all international students, experience American history, culture and society. In essence, they become global citizens.

Understanding other cultures, perhaps an altruistic concept that is hard to measure and define, is, nevertheless, just as valid an objective, in terms of educational value, as is learning technical skills. At the Komsomolsk-on-Amur's and the oil refinery's invitation, Jacque Behrens, director of the Texas Tech Division of International Education of the Office of International Affairs, and I traveled to Komsomolsk in August 1995. Along the way, we began to better understand our Russian counterparts.

Gifts are an essential part of Russian business. Gifts presented and received varied according to the rank of the persons with whom we met. At a formal dinner, where toasts took the place of gifts, the vice director of the aircraft factory in Komsomolsk said he never imagined he would be toasting Americans. I, in turn, toasted Russians as a native of Cuba, something I never dreamt I would ever do.

Meeting our students' parents at the dinner demonstrated the importance of sharing our cultures through such programs. Parents valued meeting us as much as we valued learning about them. Many parents had never seen Americans before, had never thought their children would study in America and had never thought they would toast Americans at their dinner tables. Some of those we visited knew nothing about Americans except what they had heard through the dogma from Moscow. Through trips such as the one to Komsomolsk, we exchange knowledge, export the American culture and expe-



Artie Limmer

rience the common bonds of humanity.

Bonds such as those with children of either gender or any ethnic origin, for example, touch our lives. At a summer camp, where more than 500 children attended for one month at a time, the kids were delighted to see us despite our foreign appearance. They greeted us with small gifts. Then, we played the international sport, soccer.

Beyond children, other similarities, such as a knowledge base, bring adults together. Case in point: expertise in engineering helped overcome the language and cultural barriers between Americans and Russians. No matter the language, we all were engineers. So, to some degree, we spoke the same language.

Despite our similarities, we realized the differences between American life and Far-East Russian life instantaneously. Workers in the aircraft factory, mines, oil refinery and university labored without air conditioning and essentially had no ice or refrigeration. The children's camp was no different.

The most disturbing story from the Komsomolsk trip was from an interpreter who worked at the university there. She is a single mother of a 9-year-old daughter. She must live with her mother because she earns only \$60 per month, a very poor living, even by Russian standards.

With their low standard of living, Far-East Russian students will find it difficult to return to the oil refinery. The refinery pays Texas Tech for each student's education. In return, the students must work for the refinery, otherwise their parents are obligated to repay their tuition.

With much more than financial compensation, Texas Tech benefits greatly from the exposure to Far-East Russian students. American students gain knowledge about a culture that had long been closed. Most students would never encounter Far-East Russia in any other way. Without the invitation to go to Komsomolsk, I never would have seen their land.

Knowing the value of international experiences, the College of Engineering at Texas Tech will improve its partnership with Komsomolsk by interna-

tionally training future teachers. Tomorrow's engineers, Russian and American, will have a greater depth of knowledge to share with their students.

To gain the most from their American experience at Texas Tech, Russian students must be prepared to communicate in English upon their arrival in the states. If students come to Texas Tech without speaking English, then language barriers build even higher communication and cultural barriers because Americans and Russians cannot interface immediately. Therefore, the Russians' perception of America and American students' views of Far-East Russians are skewed because of a lack of initial understanding.

Once settled at Texas Tech, with a strong English background, each exchange student is placed in engineering and pre-engineering classes based upon his or her current skills. For some, a complete background in mathematics and science courses is needed to handle engineering courses. For others, engineering classes will suffice. A more structured academic program designed specifically for Russian students would decrease variances in the program's length. Although the College of Engineering is primarily responsible for the academic program, the Office of International Affairs provides each student with the support needed to survive in an American university environment.

Knowing the success of Texas Tech's Russian program, the Far-East Oil Company has expressed an initial interest in a similar program with other engineering disciplines and more students. Expansion, however, depends on the performance of our Russian graduates once working in the oil refinery. Other programs will especially benefit students. Companies desire such graduates because of their language fluency, cultural understanding and technical expertise.

Despite some altruistic concepts with no hard definitions, international programs not only affect students' lives and education, but also directly impact Texas Tech's academic reputation. We are extending what we do best — education — to the rest of the world. □

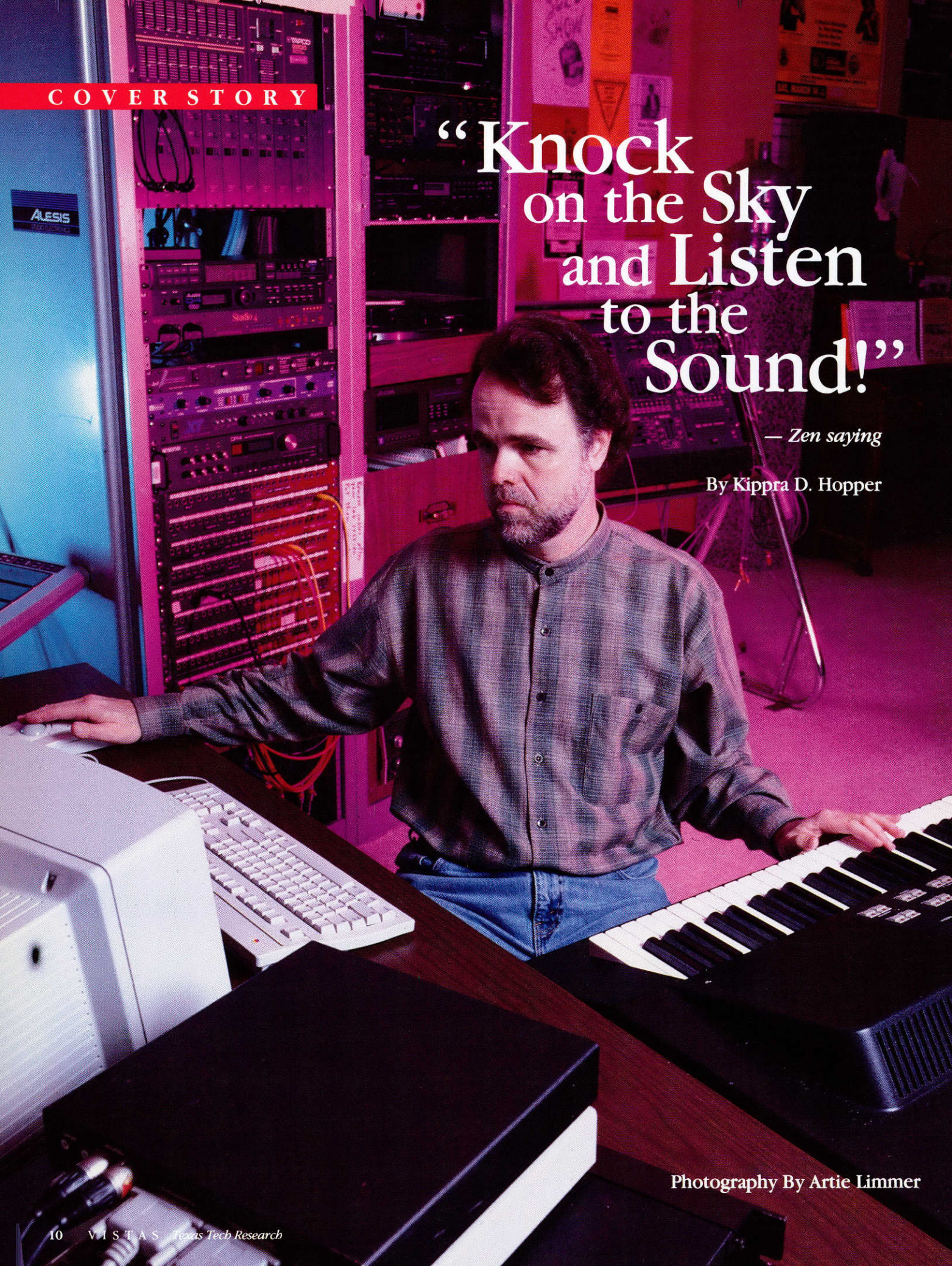
Despite some altruistic concepts with no hard definitions, international programs not only affect students' lives and education, but also directly impact Texas Tech's academic reputation.

COVER STORY

“Knock on the Sky and Listen to the Sound!”

— Zen saying

By Kippra D. Hopper



Photography By Artie Limmer

"Sound is a much more generalized, even abstract, entity than a composition or song."

Capturing, manipulating and liberating sounds, composer Steven Paxton is on a quest to explore new music.

From the music of traditional styles, and the diverse tenors of the world's cultures, to the creative reality of his own imagination, Paxton dwells in the expanse of an "alternative" music.

While a seemingly simple statement, the common element in Paxton's music is sound, a complex effect. "Sound belongs to all of us, and we all know something about sound and have experienced a huge variety of sound through our lives. Sound is a much more generalized, even abstract, entity than a composition or song. These are refined, focused, subcategories of sound," Paxton says.

As director of the Studio for Experimental/Electronic Music at Texas Tech University, Steven Paxton, Ph.D., supervises a teaching, research and creative projects facility involving Musical Instrument Digital Interface (computers and synthesizers working together), digital audio, sound design, direct synthesis, live performance, improvisation, world music resources and interarts collaborations.

"The approach that I take to teaching music is exploratory and based on people finding their own musical voice as a result of their own experiences rather than learning about other people's experiences of the 18th century and deriving their musical voice from those," he explains. "I see this as an alternative to more traditional teaching methods, and the music that results is sometimes an alternative sort of music."

Thinking of himself as an explorer, Paxton explains that sound, a natural phenomenon, is manifest and musicians simply venture, make choices about which way to turn, what to attend to and what to ignore — the way Lewis and Clark explored new land.

The classification of "alternative" music is a nomenclature pondered much in musical circles, and Paxton spends a great deal of energy clarifying what alternative music is and where the genre fits within the total realm of

music itself.

"The mainstream musical establishment is so entrenched in baroque music, classical music and romantic music, that to them anything modern or from their own generation is an alternative, as amazing as that may sound. Today, there are composers who create traditional music, and I would say they're contemporary composers, but they compose, sometimes exceptionally well, in a historical style with an imitative approach. It's not exploring any new ground," he said.

As a composer and teacher, Paxton prefers to present his audiences and his students with alternatives, experimenting directly with sound and with the act of performance.

"Presenting people with alternatives to tradition doesn't exclude or negate the past. It studies it, and then choices are made. Students can take the past and they can work in a historical style and then hear some alternatives that they could use maybe to add to that, or maybe they could turn away from the past altogether.

"The word 'alternative' is a little less heavy-handed and anarchistic than 'experimental' I suppose," Paxton said. "The alternatives I provide people might be just fairly inconsequential things. It might just be a different instrument, or combination of instruments. That's what an electronic music studio is."

A more accurate, though no less ambiguous, term for the kind of music that Paxton composes is "new music," according to Susan Schoenfeld, associate professor of music, who was active as a performer of new music in the 1960s and early '70s. "The term 'alternative' is something that's only been coined recently. Alternative implies to me that this isn't music; it's an alternative to music. And all composers are experimental. So, I disclaim alternative as a legitimate title. Music is music, and it's either new or not. Historically, every composer's music has been new at one time or another."

Another performer, Willie Strieder, associate professor of music, said his definition for alternative or experimen-

tal music would be writing that explores not only thematic content but also developmental content as well as various ensemble ideas.

For Paxton, the elements that constitute alternative music are compositions that are outside the mainstream of entertainment music, classical or concert music. "I guess it would be musical material that people wouldn't ordinarily expect to hear. For example, the nature of rock'n'roll is that there are always people exploring alternatives really aggressively because that's what young people do. So, alternative rock is thriving. It's not so common in classical music. I guess the only thing that's sometimes a little suspect about alternative rock is that there still is often a commercial priority."

The actual music that Paxton composes presents something of a paradox, he notes; most of the music is for acoustic, traditional instruments. He says, however, that his compositions all are influenced by the alternatives he has explored in electronic music, world music and musical experimentation.

Paxton says he is interested in making his music accessible to the listener. "By that, I mean that someone can understand what's happening as they're hearing it, or at least they have something to latch on to and are not just left in the dark like it's some kind of inside procedural trick that only the composer or musicians know."

He explains that he currently uses some sort of repetitive rhythmic or melodic pattern to achieve his desired results. "I want any audience member to be a part of the piece as it unfolds, almost as if they were reading a novel or a mystery story, and they're able to keep track of the characters and maybe anticipate the outcome. That gives you a positive concept of your listening experience rather than just being totally baffled. There have to be enough complications, twists of plots, ambiguities, etc., to keep things interesting, though, and a little bit on the edge."

Many of the performers and conduc-

"I just compose music. It's not that I want to be well-known or well-liked in and of itself, but I do want people to share some things with me."

tors who have worked with Paxton's pieces believe he is meeting his mark of being accessible to both audiences and performers, while still creating fresh, new sounds.

Schoenfeld, a viola player, has performed Paxton's "Elegy for Lady Macbeth" and agrees that the music is accessible. "For performers that's fairly important. With this particular piece, I found that it wasn't that difficult to play, but it was also very evocative, and it exploited colors of the instrument, which is something I appreciate as a performer."

A trumpet player, Strieder depicts Paxton's music as accessible and minimalistic. Strieder played with organ and percussion on a Paxton chamber music piece titled "I will sing to the Lord."

"You usually don't find in traditional music that sort of combination of instruments. The piece we did, compared to traditional music, was designed in a minimalistic way thematically, but what was neat was that I kept stating an idea, but then when I changed the idea, it made a really big impact," Strieder said.

Director of Orchestral Studies at Texas Tech Eric Fried conducted the orchestral premiere of Paxton's work "A Hamlet Overture" and noted the elements of minimalism in the composition. "The piece makes use of short rhythmic motives in various contexts, and they're both transfigured and displaced within the piece. He uses these motives to display diverse characters, from nervous to intense, to slow and sensual. His work also employs elements of tonality and chromaticism. This variety makes the work very interesting and accessible to the listener."

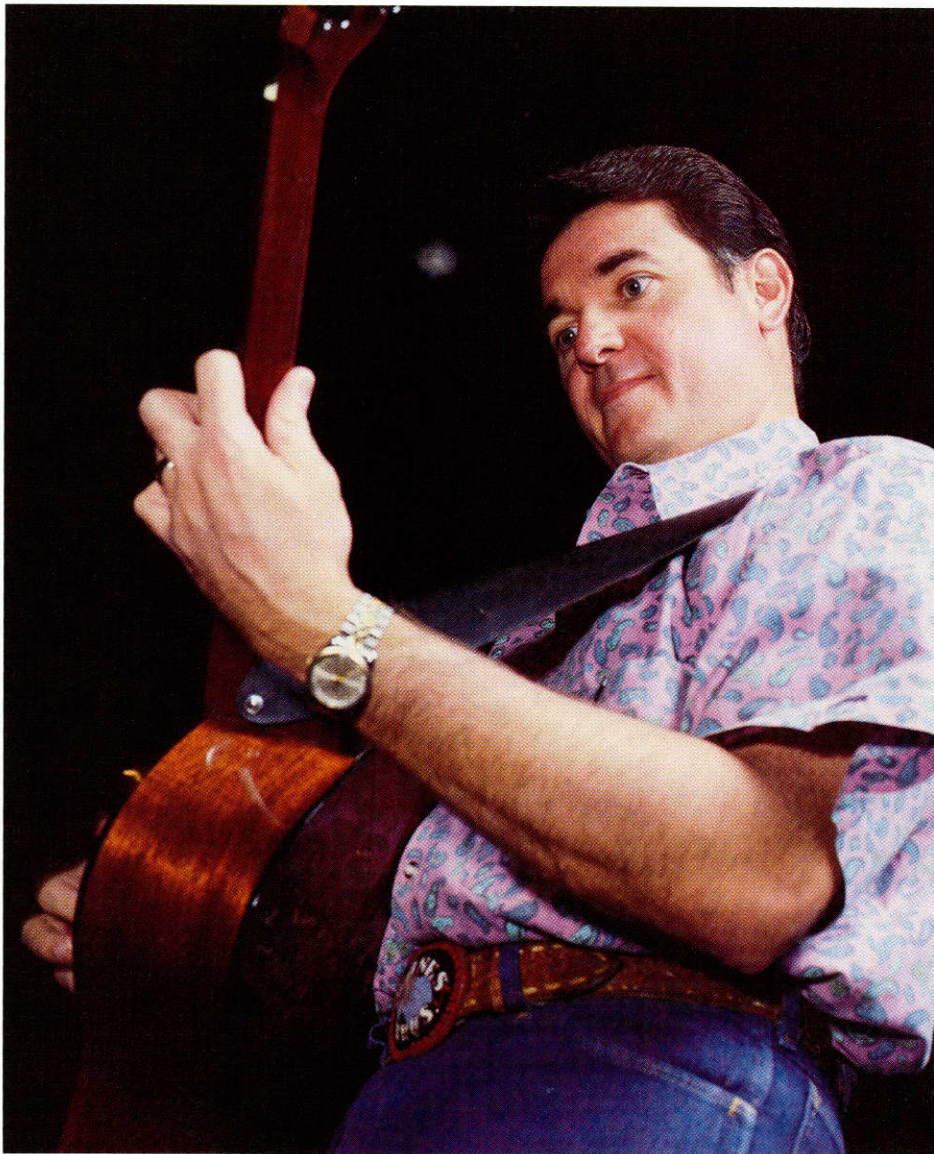
Alan Shinn, associate professor of music, worked on Paxton's "Chorale with Alleluias" with a percussion ensemble, and commented, "All of Paxton's music is refreshing. It is good emotional music. It is tonal and has

elements of minimalism. He draws upon elements familiar to him, such as percussion and choral components. He uses interesting poems as a text."

Schoenfeld also characterized Paxton's works as being minimalist, with concise material repeated almost incessantly with occasional minor changes. "It's not music that involves great contrast. But the beauty is that as it repeats, there's these wonderful tone colors that are created to the ear and overtones from the instrument. And it's fun to play. It takes a lot of talent as a composer to understand, especially in string

instruments, how to get this kind of effect."

The difficulty of Paxton's music, at least for a conductor dealing with young players, rests in the rhythmic aspects, according to Fried. "The individual musicians must be extremely independent and accurate in counting within their own parts. Yet they also have to be mindful of watching the conductor at all times in order to achieve a good rhythmic ensemble. The rhythmic meters, which are sometimes asymmetrical, often change with every bar, requiring the utmost



Kenny Maines performs his folk music for the Lubbock International Music Festival in September 1995.

*"I like to work with other artists.
In fact, if there's anything that I focus on, it's collaboration."*



The Beledi Ensemble plays Middle East music including using an Arabic lute.

concentration."

Paxton says his music is a way to communicate with others — to develop a dialogue — in an attempt to become connected with them.

He compares his craving to compose music to the desire to make new friends, similar to the actions of Willy Loman, the main character in "Death of a Salesman."

"He was always talking about how he was well-liked; he was well-known. He really wasn't, but he just ached to be," Paxton said. "He thought tramping around all over the eastern seaboard, selling whatever he sold, was the way to become well-known. And he did it as best as he could.

"I just compose music. It's not that I want to be well-known or well-liked in and of itself, but I do want people to share some things with me," he said.

One title Paxton takes quite seriously in applying to himself is that of an interarts collaborator. In this domain, Paxton has worked directly with private

and government funding agencies, receiving support from the National Endowment for the Arts, the British Arts Council, the New Music Alliance, the Goethe Institute, Meet the Composer, the Society for Composers Inc., Texas Composers Forum, the Texas Commission on the Arts and the Lubbock Arts Council.

"I like to work with other artists. In fact, if there's anything that I focus on, it's collaboration. That may be another aspect of this wanting to share things with friends," he said. "I usually work with dancers, visual artists or theatrical directors."

With an early background in theater, choir and band, Paxton said he began to focus on collaborative projects while working in 1980 on his doctorate at Texas Tech. A student of Horn Professor Mary Jeanne Van Appledorn, he composed an electro-acoustic sound score for a production of Arthur L. Kopit's play "Wings," which is about a woman who suffers a stroke.

"That was really a perfect vehicle because the whole play is about what's going on in the woman's mind and her

world after having the stroke," he said. "In ways it's a scientific, kind of clinical, sort of play because of what we've learned about people who've had strokes. They just short-circuit, and it's almost like the imagination goes wild and gets all mixed up with reality. So I could follow this character through the play and create collages of music and sound that corresponded to whatever mental state she happened to be in."

Since then, Paxton has created more than 40 compositions and worked on dozens of collaborative projects, in the process receiving commanding honors.

He was a featured composer at the 1991 International Computer Music Conference in Montreal and at new music festivals at colleges, cultural centers and art galleries in Texas, New Mexico, Nebraska, Ohio, Tennessee, Massachusetts, Connecticut and Florida.

He has received several awards from the American College Theater Festival, and in 1990, Paxton was awarded a \$16,000 Composers Fellowship from the National Endowment for the Arts (NEA). Paxton was given the funds to support the composition of several works, including a work for piano solo, a work for 10 percussionists and incidental music for a play by Shakespeare. Paxton was among 16 American composers from nine states who received fellowships from a pool of 309 applications.

His latest NEA project was composing "Wake-up and Dance," a work for solo piano. Steven Glaser, a former Texas Tech faculty member and now an associate professor of music at Ohio State University, performed the premiere of the composition at Texas Tech in 1994. Glaser since has performed "Wake-up and Dance" on dozens of recitals throughout the United States.

Paxton notes that his largest projects often have involved theatrical and dance productions, consequently he has written the sound scores and incidental music for more than 24 productions.

For several years each summer Pax-

“Songwriting is storytelling, and it’s usually fairly traditional and based on some musical materials that are the common property of everybody.”

ton has traveled to the outdoor Nebraska Shakespeare Festival in Omaha, where he has been composer-in-residence, writing music for Shakespeare plays — some collaborations which have been part of his NEA grant.

Paxton frequently has worked at Texas Tech with George Sorenson, Ph.D., professor of theater, on interarts collaborations. Such creative endeavors, according to Sorenson, give artists the chance to learn from and to interact with each other.

“With Steve the process is so exciting. First of all, he is willing to take incredible risks with his ideas. He’s able to challenge both me, the work and certainly the students who are involved in the work through the possibilities created by his expertise,” Sorenson said. “I have always found that his work, as in this collaborative area that we have, stands on its own terms and yet still supports what we’re about.”

Sorenson and Paxton have collaborated on three major productions, “Spring Awakening,” “On the Verge” and “A Christmas Carol.” Paxton’s work for the play “Spring Awakening,” by German expressionist playwright Frank Wedekind, especially impressed Sorenson.

“For ‘Spring Awakening’ Steve took sound, and in some instances, actors’ voices saying lines from the script, and he developed an incredible sound score. It was almost like a piece of poetry,” Sorenson said. “One could almost have a feeling that you could still appreciate the message of the play, the purpose of the play and, hopefully, the artistry of the play without seeing the play. That was something that was so phenomenal about his work.”

The music in the presentation of a play can provide a means for audiences to understand the structure as well as the themes of the production, Sorenson said.

“Audiences have an opportunity to see a whole different facet of the play. In my association with people in education and the arts, I have never worked with anyone more creative and



more exciting than Steve Paxton,” Sorenson emphasized.

Paxton’s publications include a composition titled “Prophecy,” for unaccompanied mixed chorus, and “Three Spring Songs,” for three-part women’s chorus and piano. His work also has been included on the Leonardo Music Journal’s recorded “Anthology of Music for the 21st Century.”

“The Dundee Telegrams and Other Communications” is a CD recording the Paxton Group released in 1989 with Paula Claire, an English sound poet who is involved with alternative and experimental approaches to poetry. The title originates from a found poem based on the coded telegrams sent by Matador Land and Cattle Co. from Dundee, Scotland, to its agents in North America early this century. The code

Ching-Liang Lee (left) performs on the er-hu while Jeffrey Parsons plays the harp.

book is in the Texas Tech Southwest Collection, where Claire did research in 1985.

“I hadn’t really thought that much about poets being performing artists, although I knew in the back of my mind that poetry is something that one hears,” Paxton said. “Paula Claire is definitely a performer, though, and her poems are performance pieces. We worked as an ensemble. It was very unusual. Some of the work we did is not superficially attractive nor accessible. Some of it is pretty aggressive. It’s not a commercial product in any sense. It’s just art.”

Collaborating with visual artists, Paxton often has created sounds for visual

“Composers have often found music from other cultures very attractive and even have tried to integrate it into their work.”

images. “I would develop sound structures, sound sculptures or performance pieces that would occur in the gallery along with the exhibit. That was a little more integrated than just doing a performance at an opening,” he said.

Paxton also was a part of the large collaboration among songwriters and artists at the Lubbock Fine Arts Center in 1990 called “Stories From A Storm Cellar.”

That experience makes Paxton yearn to do further work with songwriters, such as Lubbock musician Andy Wilkinson, who also participated in the Storm Cellar Project. “Songwriting is storytelling, and it’s usually fairly traditional and based on some musical materials that are the common property of everybody. To have a songwriter who is working with this kind of subcategory of sound and then for me to collaborate with that person by working with just the raw material of sound itself, that seems like

a collaboration that has a lot of potential because it’s like a foreground-background relationship where things are probably never going to get into each other’s way even though they’re both dealing with sound. They’re conceptually so much different,” he said.

Paxton’s interest in songwriters and musicians from the local community, as well as the world community, was reflected in his two-day Lubbock International Music Festival in September 1995. Musicians from India, China and the Middle East joined bluegrass, Tejano and country western musicians from the Lubbock area for two concerts.

Paxton sees such projects as consistent with the exploration of alternative music, and he points out the historical importance of similar experiences for composers. “Composers have often found music from other cultures very attractive and even have tried to integrate it into their work. I guess we just

have to rediscover alternatives sometimes.”

He exposes the students who enroll in his composition classes to world music and other alternatives as well. “My students are surprised that there are so many people who do art music. All over the country, all over the world, there are composers who are making music in the same way that painters and sculptors are making pieces of visual art that are not necessarily commercial products.”

Paxton offers performance artist Laurie Anderson as an example of someone who has approached her music from an angle of making art. “She’s not being expressive necessarily, like you would think a folk singer would want to express themselves. And she’s not just trying to make a buck; she’s making an art piece. The material that she’s using to make that art piece happens to be vernacular musical material, sometimes the same material from which pop music is made. And the tools she uses are those of new music technology and performance practice.”

Providing electronic instruments and computers as musical tools, Paxton teaches his student composers how to deal with the raw material of music, which is sound. With electronic instruments, the student composers can work directly with sound and associated musical materials. They can work alone, if preferred, without going through the intermediary of a performer.

In the same vein, Paxton believes that composers and musicians have the potential to work directly with their audiences, lessening the distance between creator and observer. “The audience for music has a particular personality, regardless of cultural, social or economic background, and there’s a way for us to interface with their interests.”

Perhaps in his quest, Paxton is seeking what Henry David Thoreau called “a vibration of the universal lyre.” His search for alternative music may lead him to another observation by Thoreau, “The echo is, to some extent, an original sound, and therein is the magic and charm of it.” □

Alan Munde (left) and Joe Carr (with banjo) join with other bluegrass musicians.







A Lock-and-Key Arrangement

Examining the relationship between insulin and particular receptors on cells, researchers struggle against diabetes

By Preston Lewis

Charles W. Garner, Ph.D., is attempting to break a code that affects thousands of lives. If he succeeds, Garner stands to change the way those people live and eat.

The code Garner is cracking is an intracellular one involving the biochemical mechanism that allows insulin to regulate cell metabolism. Garner and his associates in the Texas Tech University Health Sciences Center's department of cell biology and biochemistry are delineating this mechanism which is critical to understanding — and eventually to preventing or possibly curing — diabetes.

"Diabetes mellitus is somewhat of an orphan disease," Garner said, "because it doesn't receive the significant research funding that AIDS, cancer and heart disease do. Like those diseases, diabetes affects large numbers of people and can be just as devastating to the quality of life of those it affects."

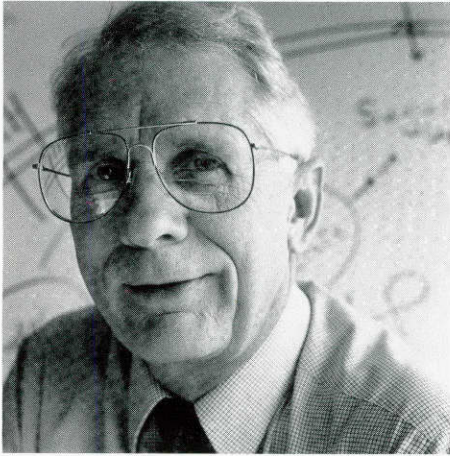
Diabetes comes in two forms: Type I or juvenile onset diabetes and Type II or adult onset diabetes. Type I diabetes occurs primarily in young people when

the pancreas produces little if any insulin. Type II usually affects people over age 40 and results from a breakdown in the intracellular codes.

"The most common form of diabetes," Garner said, "is Type II diabetes. This disorder is one involving a defect in the ability of insulin to stimulate absorption of glucose from the blood."

Insulin is a critical hormone produced by the pancreas to metabolize glucose and to maintain proper blood sugar levels in the body. Three types of cells — liver, muscle and fat cells — are particularly responsive to insulin. Glucose is a form of sugar that serves as the primary energy source for most of the body's cells. However, glucose is stored in significant amounts in only two places: in the liver as glycogen and in the muscles. Other cells get their supply from glucose circulating in the blood.

When cells cannot absorb glucose, symptoms of diabetes appear. These can include physical weakness and mental apathy as well as a persistent thirst, frequent urination, blurred



Artie Limmer

Charles W. Garner is trying to break a code that eventually could prevent diabetes.

“The problem with a Type II diabetic is that they may have insulin but the target cells — the ones with the receptors — don’t respond appropriately or they respond in some diminished degree. That’s where the severity lies.”

vision, tingling sensations in the hands and feet, greater susceptibility to infection, impotence in men and absence of menstrual periods in women.

“The problem with Type II diabetics is that while they may have adequate insulin, the target cells don’t always respond appropriately, or they respond in some diminished degree,” he said.

Insulin turns on glucose uptake and fat synthesis, one of the major areas of metabolism the hormone regulates. But for insulin to do its job, it has to bind to so-called receptors on the surface of the appropriate cells as a sort of lock-and-key arrangement. These receptors are biochemicals known as enzymes, complex proteins capable of inducing chemical changes in other substances.

Proteins are long molecular chains made from various combinations of 20 diverse chemical building blocks called amino acids. The order and the number of the amino acids in a particular chain determine a protein’s electrical charge and its physical shape, which is important in the binding process. In its simplest analogy, the receptor is a lock and the insulin is a key to the cell.

Because of the complexity of the interactions once insulin binds to the cell, a more fitting analogy would be the electronic “key” systems now used at many hotels and businesses. Those systems use a plastic card with an electromagnetic strip on the back. When the card is inserted in a slot on the door handle, an electronic scanner reads the key “code” on the electromagnetic strip. If the code matches that assigned to that door, the handle will open. If not, the door remains locked.

It’s much the same way with the interaction between the cell, the enzymes and insulin. Garner is trying to identify why insulin, or the cellular equivalent of the key card, is not always read properly by the enzymes, the cellular equivalent of the scanner, when seeking access to the cell.

“We’re trying to understand the sequence of events in the cell after the insulin binds to its receptor protein,” Garner said. “The receptor traverses the cell’s plasma membrane and through a shape change inside the cell transmits the information that an insulin molecule is bound to the outside.”

The change of the receptor’s shape on the inside of the cell is important

because — using the door analogy — it chemically re-codes the cellular “magnetic strip,” in this case an enzyme called a kinase. The re-coded kinase then provides the cellular key necessary to turn on what is known as the insulin receptor substrate-1 or IRS-1.

A substrate is any substance, in this case a protein, acted upon and changed by an enzyme in a chemical reaction. Once IRS-1 is turned on, it starts a cascade of chemical interactions which allow the cell to absorb glucose from the blood and then to utilize it as the raw material for a host of intracellular activities.


“We have demonstrated the importance of the insulin receptor substrate as crucial to glucose transport,” Garner said. “We know the first chemical change inside the cell is a chemical modification of the insulin receptor substrate. What we are trying to determine now is how chemical modifications on IRS-1 lead to change in glucose transport and other insulin responses.”

Understanding this first chemical process with IRS-1 is crucial because it activates other proteins which propagate the intracellular chain of events leading to metabolism within the cell. Those processes, however, fail when a malfunction occurs in that first step.

“The problem with a Type II diabetic,” Garner said, “is that they may have insulin but the target cells — the ones with the receptors — don’t respond appropriately or they respond in some diminished degree. That’s where the severity lies. If there’s not enough insulin or if cells don’t respond when there is adequate insulin, then glucose is not taken out of the blood fast enough and it accumulates, creating a variety of problems.”

With a fuller understanding of these processes, medical scientists hope for better treatments and even cures for Type II diabetes, which currently can be managed only by diet, exercise and a handful of drugs.

“When your car won’t run you don’t have much hope of getting it going unless you know what’s wrong,” he said. “But to understand what’s wrong, you’ve got to know how the car works. There’s no doubt what causes diabetes in general, we’re just trying to learn the specifics so we can fix it.” □



*Within
a Single
Drop*

By Charles Griffin

Purnendu Dasgupta marveled as raindrops fell from a grey sky into the upwardly turned mouth of his little boy playing in a rare West Texas shower. Perhaps if rain were more common in Lubbock, Dasgupta as well as other residents would be more blasé about a cloudburst, but because the showers are so infrequent, he and others pause and relish in the spectacle of nature.

"Everyone knows that the air seems fresher after it has rained. Air smells cleaner. It's obvious that raindrops wash-out some of the things, presumably things that we do not want," Dasgupta said.

Through his observations, Purnendu Dasgupta, Ph.D., Horn professor in the department of chemistry and biochemistry at Texas Tech University, came to realize that perhaps liquid drops could be used as collectors for atmospheric gases. Specifically, he began thinking that drops could be used to determine and measure the content of the air surrounding the droplet.

"I have been thinking about it for some time. What if you could do everything you wanted to do, all of the chemistry that you wanted to carry out, and all of the measurements you wanted to do, in a single drop? This was my motivation," he said.

Dasgupta began his research on a basic level. Initially he studied what is known about general formation of a drop and its reproducibility. He looked at the changing shape of a drop as a function of time — a drop forms as a slight bulge and then becomes spherical, followed by the formation of a pear-shaped neck that eventually becomes tear-shaped. Through observation, he said evidence shows that drops are completely superimposable. In other words, if one were to conduct an experiment and form one drop at a time, and then measure and weigh the drops, the drops would be identical.

"The indefinite renewability of the drop is what makes the process great," he said.

The renewability of the drop also makes the process more economical than other measuring procedures. Typically, researchers often use membranes to conduct similar measurements. However, the disadvantage in using membranes is that, just like most surfaces, over a period of time membranes can be altered by deposited dust particles or other airborne nuisance, Dasgupta said. Thus, the system must be recalibrated frequently or changed, costing both time and money. The drop system does not require such maintenance: When a drop becomes unusable or contaminated, one may simply form another.

In addition, the drop procedure is more environmentally conscientious,

requiring smaller amounts of chemicals to conduct analyses, thus generating less waste than other comparable measuring systems. Using another system, Dasgupta said, would require sample sizes 1,000 to 10,000 times larger than that required by the drop system.

In a practical application, for example, the drop system could be beneficial to patients from whom it is somewhat difficult to draw blood. "I'm one of those people you have to stick five times to find a vein. So, I personally would be very happy with methods of drawing blood that require a smaller sample, such as a pin prick as opposed to conventional amounts," Dasgupta said.

"However, reducing the sample size is only important up to a certain point. An obvious advantage is apparent when you think not so much of the sample size but think in terms of mass sensitivity. In other words, what is the absolute smallest detectible amount that we can measure in the system," Dasgupta said.

With current laboratory equipment, the drop system can provide a major component analysis for a single one-micron particle. In perspective, the finest human hair is approximately 100 microns in diameter, thus the drop system has the ability to perform a complete chemical analysis on a particle that is 1/100th of the diameter of a single strand of hair.

Dow Chemical recently sought to patent a chlorine sensor based on Dasgupta's drop technology. Dow, a funding agency of the study, expressed an interest in the development of an instrument which would measure chlorine levels for industrial hygiene purposes, he said.

"Dow wanted a device that would sound an alarm when chlorine concentrations exceeded one part per million. The drop based device surpassed their expectations, detecting concentrations as small as three parts per billion," Dasgupta said.

However, the shape of a spherical drop restricts detection capabilities because of surface-to-volume ratios. Specifically, most competing analytical techniques determine the concentration of various elements based upon the distribution of the material of interest after it passes through the surface of a membrane. A spherical drop has a smaller surface area than most flat sur-

faces and is not as advantageous.

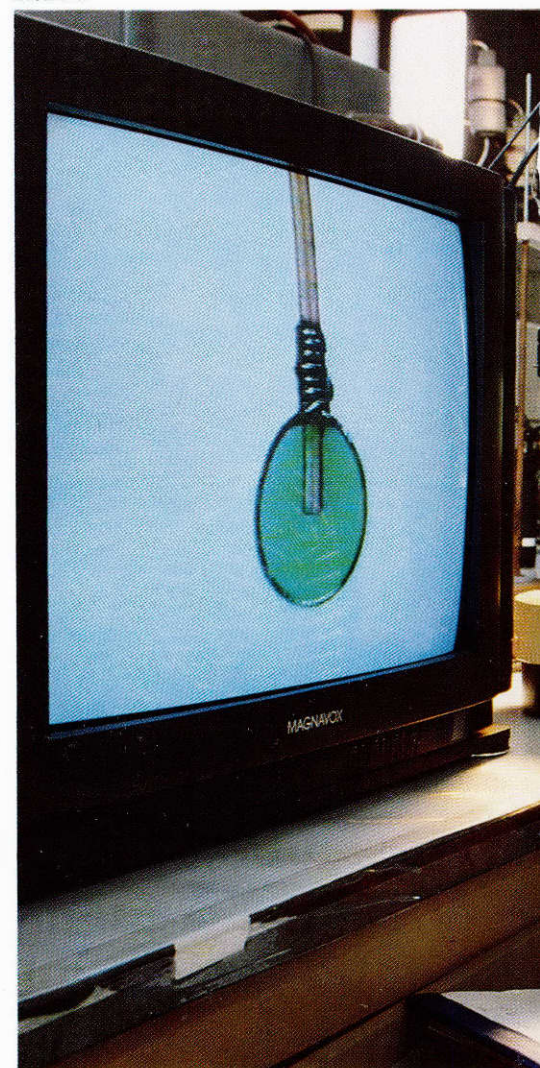
"A very thin film (a flattened drop) has a greater surface area and less volume, thus generating a better surface-to-volume ratio," Dasgupta said.

Just as children make bubbles from soap by using a tiny wire loop, researchers can produce a thin film with virtually any liquid, he said.

"To give some perspective of scale, if one were to take a darning needle and put it in water, eye first, the eye would contain a drop, about 50 microliters. The largest loops that we make are two millimeters in diameter and hold roughly 1/60th of such a drop," Dasgupta said. He added that the smallest loop used has a capacity of 10 nanoliters or 1/5000th of a single drop.

Dionex Corp. recently applied for a patent on the film-based analysis technique. Dionex plans to use the technology to detect trace gases, Dasgupta said.

Artie Limmer



Dasgupta has developed a number of different systems in conjunction with doctoral and post-doctoral students, who use the drop or film-based sensing technique. The different techniques can be very simplistic or quite complex, he said.

The most rudimentary system developed by Dasgupta consists of a couple of optical fibers bracketing the drop, one to bring light in and one to take light out, he said. "It is a very inexpensive set-up. Typically a light emitting diode is connected to the light-transmitting fiber, and a light detector is connected to the other fiber. This allows us to look at the attenuation, or depletion, of light as it passes through the drop which has developed a color due to the analytical reaction," Dasgupta said.

Another equally simple system examines fluorescence. Through this system,

researchers examine light emitted from a drop. In this case the drop is formed around the tip of an optical fiber and gas is sampled around it. The optical fiber directs a certain wavelength of light into the drop, exciting the drop from within. A reagent in the drop then reacts with the gas forming a fluorescent compound which emits a different wavelength of light. Light-detectors are placed at right-angles to measure the light emitted from the drop.

"This device is sensitive to very low parts per billion of hydrogen sulfide, an agent which is of considerable interest to us because of the geographical region we live in," Dasgupta said. Hydrogen sulfide is a poisonous gas commonly produced in oil fields. In high concentrations, the gas can be lethal.

With single drops, Purnendu Dasgupta is collecting atmospheric gases.

Dasgupta's dynamic drop system, is a third and somewhat more complex system. This system uses a pump to create a continuous flow of drops. A computer manipulates factors that control physical aspects of drops. This particular system is similar to the chlorine sensor developed for Dow Chemical.

More intricate systems created by Dasgupta involve film-based technology. The most complex is completely automated and is capable of measuring most gases in the low parts per billion, Dasgupta said. In addition, with assistance from Texas Tech students, Dasgupta is developing additional technologically advanced experiments.

Electro-spray, an experimental process, generates a stream of small drops by applying a high-voltage current between a metallic needle containing liquid and another metallic surface. This method actually will afford researchers the opportunity to examine drops with a fluorescence microscope as the drops pass through the air. This particular procedure will eliminate the need for containers or wire loops to confine the liquid and thus will reduce stray light, he said.


In the same vein, Dasgupta also is studying a new technique which he calls a multiple liquid droplet system. In the process, researchers use a tube containing multiple channels within its body. By using the tube, Dasgupta said, one could form a primary drop in the center and use other channels to add various reagents at the same time or in intervals.

Dasgupta has received noteworthy recognition among his peers for his research, which has been published in a number of academic publications. His efforts culminated in a prominent placement of an article in the Dec. 1, 1995, issue of *Analytical Chemistry*.

"There are numerous applications for the drop and film-based techniques. Because the technology is new, still a week does not go by without another idea of how to explore droplets," Dasgupta said.

Exhibiting the same enamored fascination as his little boy did while playing in a cool West Texas rain, Dasgupta said that only time and economics would tell how many of his drop systems would become practical and how many of them would remain a researcher's academic curiosity. □





*The
Secret
Relief
of Chili
Peppers*

By Josh Ben Allen

Photography By Artie Limmer



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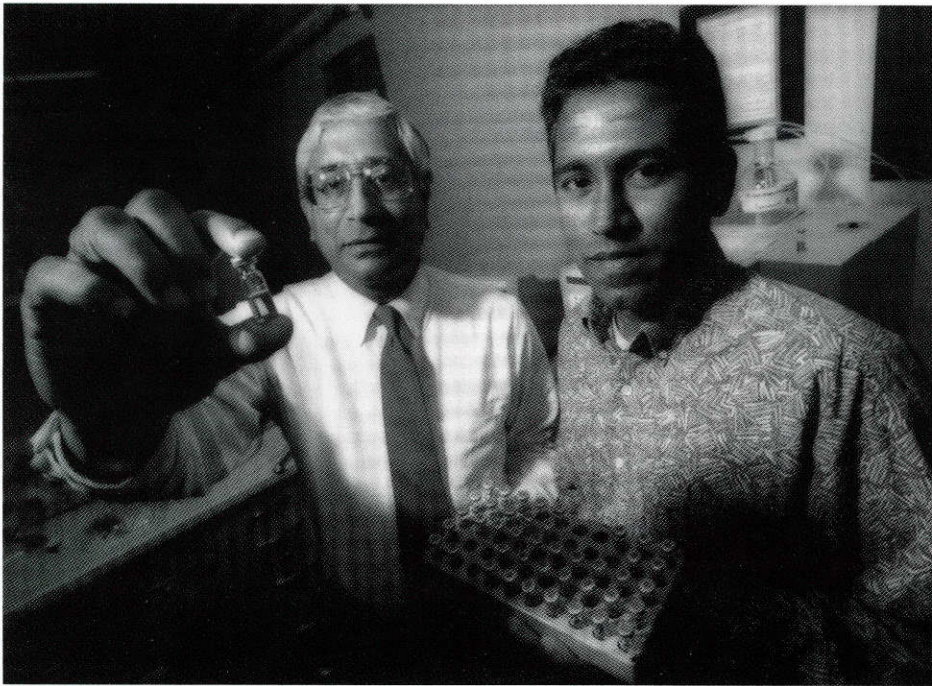
ohn Griswold's garden of chili peppers eventually might relieve the itching that burn victims feel while their injuries heal. The substance that makes peppers hot, capsaicin, is believed to be an anti-inflammatory agent, according to John A. Griswold, M.D., director of the Timothy J. Harnar

Burn Center at University Medical Center and associate professor of surgery at Texas Tech University Health Sciences Center.

"Capsaicin seems to inhibit Substance P, the chemical that makes us feel itch," Griswold said. "In burn victims, the frustrating part for doctors is the amount of itching patients experience in the first stages of healing after a skin graft. Itching leads to scratching, which leads to new wounds or tissue damage."

Creams currently on the market do not contain enough capsaicin to relieve burn victims' pain, but they do stop itching caused by shingles, a herpes virus similar to chicken pox, Griswold explained. Moreover, capsaicin relieves the pain for patients with rheumatoid arthritis, osteoarthritis and various peripheral neuropathic conditions. When a burn victim applies one of those creams to the skin, however, a burning sensation replaces the itching.

"The solution might be as simple as mixing an anti-itch medication, such as Lanocane, with capsaicin," Griswold said. "We just don't know if we can use a high enough potency of capsaicin and still hold down the burning factor."



Raghu S. Narayan (left) and his doctoral student Ravi Sethuraman are using a new technology to extract higher levels of capsaicin from peppers.

“We can use supercritical fluid extraction to remove 90 to 95 percent of the capsaicin contained in peppers.”

Working to extract higher levels of capsaicin from peppers, Raghu S. Narayan, Ph.D., professor and chairperson of the Texas Tech chemical engineering department, uses a new technology that could reduce the cost of pure capsaicin.

“By traditional methods,” Narayan explained, “you boil the pepper in water and leave it overnight. Then, you take that pepper soup through a 10- to 15-step extraction process. Using a variety of organic solvents, such as hexane, the long extraction process yields maybe 20 percent of the capsaicin contained in the pepper. The current process is very involved and leaves you with a lot of pots and pans.”

Narayan and his students use a fluid that is neither a liquid nor a gas in a two-step process, called supercritical fluid extraction.

“We can use supercritical fluid extraction to remove 90 to 95 percent of the capsaicin contained in peppers,” Narayan said. “This is a safe and reliable technology.”

First, a solvent must be selected. Narayan initially chose propane because of its non-toxic nature and its cost.

“Propane has a very interesting property. It is strictly a gas above 97 degrees Celsius and above 630 pounds of pressure per square inch. Below that, it can be a liquid,” Narayan said.

In between those two states, how-

ever, a critical point exists. As propane approaches the critical point, it becomes denser. Beyond the critical point, propane becomes a supercritical fluid, sharing the properties of a liquid and a gas.

“In looking at the thermodynamics, we can make propane or any usable solvent switch from a liquid to a dense phase,” Narayan said. “Under those conditions, it has very good solvent properties.”

Because of propane’s flammable nature, however, the safety precautions required for handling it indoors are too cumbersome for the experimentation process.

Carbon dioxide also works as an excellent solvent in the supercritical state, but it is more expensive because a higher pressure is needed to reach the critical point.

“We ran enough experiments with propane to know that it will work,” Narayan said. “But, in terms of mapping the supercritical fluid extraction process, we chose to use carbon dioxide. With the initial experiments completed, we will be able to use any solvent, such as propane, for extraction, as long as we know that substance’s critical point.”

During the first stage of extraction, Narayan and his doctoral student, Ravi Sethuraman, separate capsaicin from chili peppers, much the same way one makes coffee.

“Chop up the pepper just like grinding coffee grounds,” Sethuraman explained. “Then remove the excess moisture in the pepper by blending the pepper with moisture absorbing agents. Pack the chopped pepper into a tube and run carbon dioxide through it.”

Specifically, Sethuraman packs 8 grams of washed sand inside a tube, places 0.5 grams of crushed pepper wrapped in filter paper inside the tube and caps the tube with 2 more grams of sand. Once the tube is tightly packed, Sethuraman runs carbon dioxide supercritical fluid through the tube in the same manner water runs through coffee

grounds. The carbon dioxide fluid passes through the pepper and picks up the capsaicin, carrying it to a trap.

By varying the pressure and temperature of carbon dioxide, as well as the extraction time, Sethuraman tries to produce the highest concentration of capsaicin which eventually should minimize the overall cost of producing capsaicin.

"Liquid carbon dioxide is pumped through the tube at pressures above the critical point," Narayan said. "When carbon dioxide comes into contact with the chili pepper, the capsaicin is dissolved. Then, reduce the pressure, and the carbon dioxide escapes as a gas at room conditions. Capsaicin and anything else that has been extracted is trapped."

The trap must be rinsed to remove the capsaicin and colorants. Sethuraman chose alcohol, a non-toxic liquid, because capsaicin is highly soluble in alcohol.

"Rinsing with alcohol dissolves the contents of the trap," Narayan said. "The solution of capsaicin, colorant and alcohol, which you now have, makes it convenient to separate the capsaicin. Colorants have no medicinal value, but they don't do any harm. It's a matter of how pure you want the capsaicin."

"Capsaicin is a cough suppressant as well as an anti-irritant medication. So, we could formulate a nighttime cough medicine with the capsaicin and alcohol solution. If needed for other products, the solution must be purified to pure capsaicin. This is the second stage of the overall supercritical fluid extraction process."

Griswold, along with other medical researchers, study the practical application of capsaicin. Narayan simply extracts capsaicin from the pepper. To do that in the most economical and reliable way, Narayan and Sethuraman, run multiple extraction tests changing the extraction time, temperature and/or pressure based on a statistical research design. In all, 85 extractions must be analyzed.

"Based on preliminary studies, supercritical fluid extraction looks very promising," Sethuraman said. "The darker the color of extracted solution, the more capsaicin that is present."

For those preliminary results, Sethuraman bought 1 gram of the purest capsaicin available for \$185. He analyzed the capsaicin solution in a machine called a gas chromatography/mass spectrometer (GC/MS). That spectrometer enables him to chart accurate amounts of capsaicin present in each extract.

"When all the extractions are analyzed, it's simply a matter of comparing the results of the extraction to the known properties of the capsaicin we purchased," Sethuraman said. "Then we will know the exact temperature, pressure and time it takes to extract the most capsaicin for the least cost."

Soon Sethuraman may have to repeat his research method for a new development in supercritical fluid extraction, a development he is unwilling to discuss because it has the potential of being patented. Narayan said the new development could increase the effectiveness and reduce the cost of supercritical fluid extraction.

With or without the new technology, Sethuraman maps the extraction process of capsaicin with carbon dioxide. Once completed, that map will serve as a template for all other supercritical fluid extractions, regardless of the solvent used or substance extracted. With the guidelines written for supercritical fluid extraction, all one needs to know is what solvent will extract the substance desired and the critical point of that solvent.

"Right now, I am very interested in supercritical fluid extraction because it has helped me to understand different analytical techniques," Sethuraman said. "Quantifying the amount of capsaicin separated by each extraction will allow me to model the supercritical fluid extraction process for not only different solvents, but also for agricultural substances other than peppers."



"Capsaicin is a cough suppressant as well as an anti-irritant medication. If needed for other products, the solution must be purified to pure capsaicin."

"In other words, you will be able to give me another substance similar to capsaicin, and I will give you the guidelines to start using supercritical fluid extraction. Modeling the whole system is the most exciting part to me."

The supercritical fluid extraction system did not originate with peppers and capsaicin. Narayan strategically targets areas with local interests and benefits. In fact, cottonseed oil prompted Narayan to think about supercritical fluid extraction.

"The South Plains needs to be more diversified in what we have to offer from an economic stand point," Narayan said, "rather than simply growing agricultural products and selling them for their raw value.

"It's like mining iron ore, shipping it to Japan, having them make steel and shipping it back to us for five times the price. Adding value to cotton means producing products such as cottonseed

John Griswold, M.D., is optimistic about the relief that capsaicin, the substance that makes chili peppers hot, can bring to burn victims who often feel intense itching.

meal, but only cattle can digest the gossypol, a toxin found in cottonseed."

Choosing supercritical fluid technology, Narayan and Sethuraman used carbon dioxide to determine if gossypol can be extracted without using toxic solvents.

"If the Environmental Protection Agency bans hexane and other toxins from the extraction process, supercritical fluid extraction could be an alternative," Narayan said.

Supercritical fluid extraction leaves no trace of gossypol or carbon dioxide in the cottonseed meal, according to Narayan.

"After experimenting with cottonseed, we were asked by a small company: 'Can we apply this technology to remove fats, triglycerides and cholesterol from foods like gravy,'" Narayan said.

"We got the gravy down to 2.9 percent fat from 55 percent fat," Sethuraman said. "We were not able to reach 1 percent fat because we were limited by the pressures that the pumping units produced. Most likely, we will have to use our new development to achieve

this low level of fat content."

Narayan became interested in extracting capsaicin from chili peppers through his conversations with John Griswold. Peppers are not only of local interest and benefit, but they also integrate the research efforts of faculty and staff members at both Texas Tech campuses and neighboring universities.

"This is not just the chemical engineering department's project. Horticulturists have the opportunity to come up with various types of peppers and other agricultural products that will lend themselves to this type of extraction. As a matter of fact, New Mexico State University in Las Cruces is the chili pepper capital of the world."

At New Mexico State, horticulturists grow many different varieties of peppers that range from hot to mild. Narayan wonders if extracting an exact amount of capsaicin from one type of pepper might leave a precise level of hotness in that pepper. Although the pepper is crushed to extract capsaicin, a food company, for example, might use the crushed pepper with a controlled capsaicin level for mild salsa.

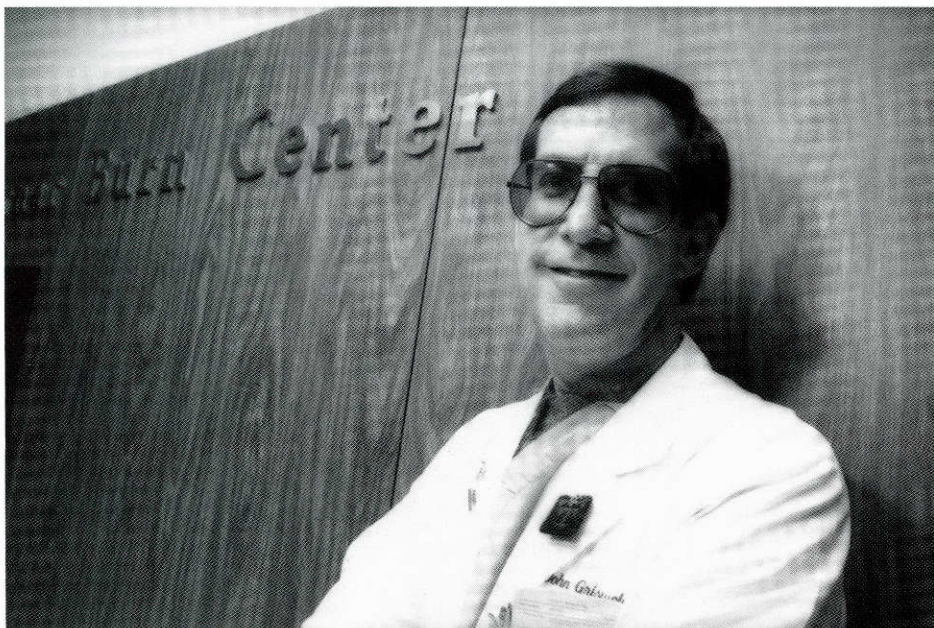
"I am simply speculating the practical uses here. I had no idea about capsaicin three years ago. But, as a result of our work, I know that we now have the ability to do difficult separations such as this. That's the exciting part," Narayan said.

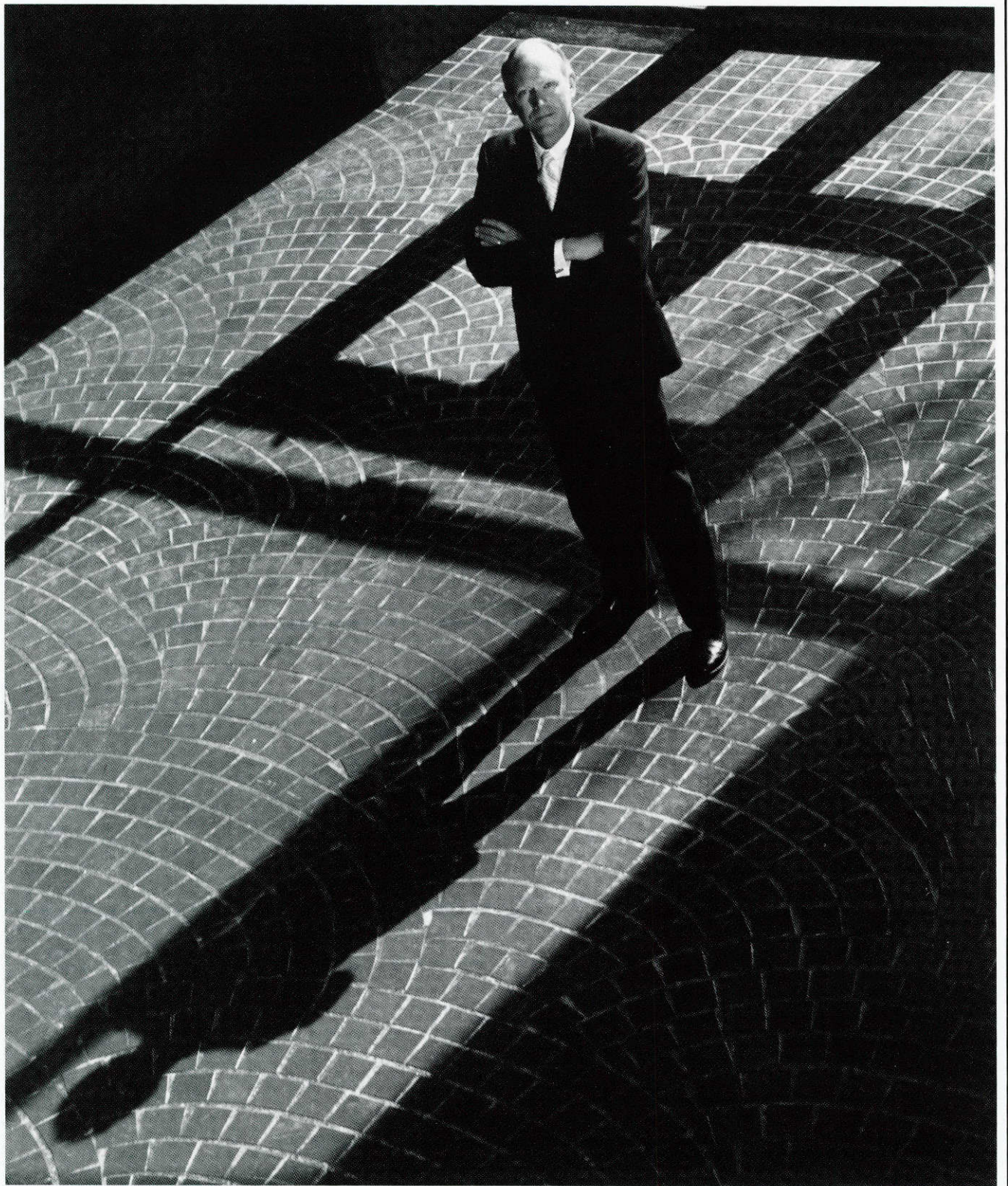
Once Narayan and Sethuraman complete the specifications for capsaicin extraction, Griswold takes over.

"We have the research prototype and system in place to develop and evaluate a capsaicin cream," Griswold said. "We would know its effectiveness within six months.

"We have a research number on file with the Food and Drug Administration. We can have government approval fairly quickly after the evaluation period."

With government approval and a little help from modern technology, John Griswold might harvest one of Mother Nature's medical secrets in his own garden. □





The Pro Bono Proponents

By Jennifer LeNoir

Photography By Artie Limmer

The ultimate test for lawyers — who generally work in an adversarial system — is measured when they make personal commitments to serve underrepresented clients through free or “pro bono” work.

While an attorney’s goal is to win the client’s legal case, representatives of the law should be equally concerned about the moral and ethical implications of the legal profession on society, according to W. Frank Newton, dean of the Texas Tech University School of Law.

The extent of free legal services that are available to the poor currently is the focus of a national debate in Congress that began during the spring of 1995. At issue is the future funding of the Legal Services Corp., a federal program established in 1974 during the Nixon Administration to provide money to states for free legal services for the poor, Newton explained.

“Pro bono services for the poor are important because low-income children are maimed, raped and sexually abused more often than any population of young people. If society can’t protect its children, then it cannot function socially or morally. This scenario is not much different than an ancient society that might have sold children into slavery,” Newton said.

Research concerning low-income people, says Newton, indicates that this socioeconomic group statistically suffers more stress and abuse than any other segment of society.

The national Legal Services Corp. assists low-income individuals with serious matters by providing pro bono legal services, such as the granting of divorces, the arrangement of adoptions and the resolution of child custody issues as well as other services related to additional civil matters.

“It’s time that the United States Congress and the legal profession realize that people are not simply important because of their level of education or the size of their bank account. Individuals should be valued intrinsically by society and the legal profession,” Newton said.

The state of Texas is almost totally reliant on federal funding for pro bono legal services because the state Legislature does not provide money for indi-

W. Frank Newton has been greatly instrumental in leading the state’s pro bono policy.

gent legal services. If Legal Services Corp. funding is cut by Congress, one solution being considered by the Texas Supreme Court would require the state’s lawyers to provide free legal services to the poor. Already, guidelines established by the Texas Bar suggest that lawyers donate 50 hours a year to helping the poor.

When a class of poor people has no access to the legal system in the United States, the nation could one day separate further into a society of “haves” and “have nots,” threatening the security and wealth of the “haves,” Newton said.

“Morally, we ought not exclude the

nationwide, Texas has the largest percentage of its population classified as living at or below the poverty level. About 4 million of the 17 million people living in Texas exist at or below poverty guidelines, which are set by Legal Services Corp. Newton commented that to be eligible for assistance from the Legal Services Corp., individuals must meet federal poverty guidelines established according to the most recent census data. Only 20 to 30 percent of the poor’s legal needs currently are being met, he said.

The current debate, to be ongoing during this electoral year, involves



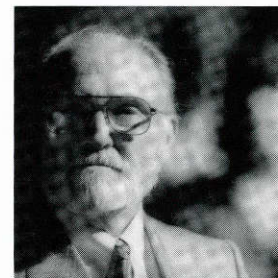
poor from our legal system. Churches have been extremely helpful in assisting the needs of the poor. However, if 4 million Texans have no realistic hope of receiving adequate legal assistance when they need it, will the poor segments of society continue to abide by the laws of the land?” Newton questions.

The State Bar of Texas considers the role of the Legal Services Corp. to be extremely important, Newton explains. “Many attorneys are working to ensure that the Legal Services Corp., which organizes and conducts most of the pro bono work done in the United States, is not dismantled.”

Newton says Texas attorneys have been forced to become leaders in pro bono legal work. Populations of Hispanic Texans living in the Lower Valley area and African-Americans living in the Fifth Ward of Houston, particularly, have extremely low incomes. Without Legal Services Corp., Newton said, these individuals would not have access to the legal system of this country.

Of the 10 most populous states

whether the budget of Legal Services Corp. would be cut from the 1995 budgeted amount of \$415 million down to a 1996 proposed budget of \$271 million. If a current proposal before the



David Cummins

leading the State Bar of Texas to adopt its voluntary pro bono policy. Dean Newton chaired a statewide task force established by the State Bar of Texas in response to a directive of the Texas Legislature to review and report on a Texas pro bono policy. He also won approval for a survey to help determine where legal services money is most needed.

U.S. Congress passes, the legislation will have a devastating impact on pro bono work, said Newton.

The Texas Tech dean was instrumental in

Newton chairs the Texas Equal Access to Justice Foundation, which administers a program called Interest on Lawyers' Trust Accounts (IOLTA) in which funds are distributed to legal services programs. To date, \$43 million dollars have been distributed in Texas.

In accordance with state law, lawyers must establish an IOLTA account for client monies which are incapable of generating interest for the client. The account earns collective interest that is paid into the state's IOLTA fund and is used for pro bono activities.

Although Newton did not create the IOLTA program single-handedly, "He

providing entitlement legal services, was the first award recipient.

Even if Congress decides to severely cut or abolish the Legal Services Corp., many generous and charitable organizations will continue to help the poor, Newton said.

However, Newton is concerned about ethical implications of legal decisions on society. His concerns led him to become a key member and founder of the Texas Center for Legal Ethics and Professionalism, an organization concerned about evaluating the level of professionalism among attorneys. He served on the committee that put

County Bar Association, and from individuals in private practice who donate their expertise to poor individuals.

To receive legal help, however, clients must meet the classification of "poor," which are the same income guidelines designated by West Texas Legal Services. Also, the clinic attorneys do not represent anyone involved in a criminal dispute.

"What's unique about the legal clinic at St. John's United Methodist Church is the learning opportunity it provides for Texas Tech law students," said Floyd, who serves as an internship supervisor for law students volunteering at the clinic and in the Internship Program at Texas Tech.

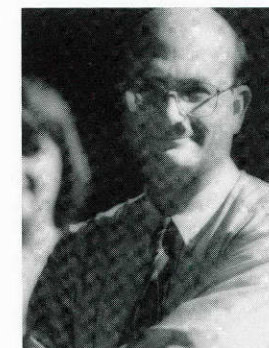
Through the clinic, law students work with Lubbock law firms on pro bono cases and are supervised by attorneys at those firms. Numerous clerkship opportunities exist at private firms in Lubbock, and students are regularly placed at West Texas Legal Services through the Internship Program at Texas Tech, Floyd said.

Students also have opportunities to be trained as dispute mediators through the South Plains Alternative Dispute Resolution Center in Lubbock. Learning mediating skills through the center's workshops is important in legal education because students learn about the financial benefits of conflict resolution, Floyd said.

According to Pierre Woods, a third-year law student from Wichita Falls and president of the Volunteer Law Students Association at Texas Tech, "The law clinic offered through St. John's Methodist Church is beneficial because it allows students to gain important interpersonal skills that are crucial to the

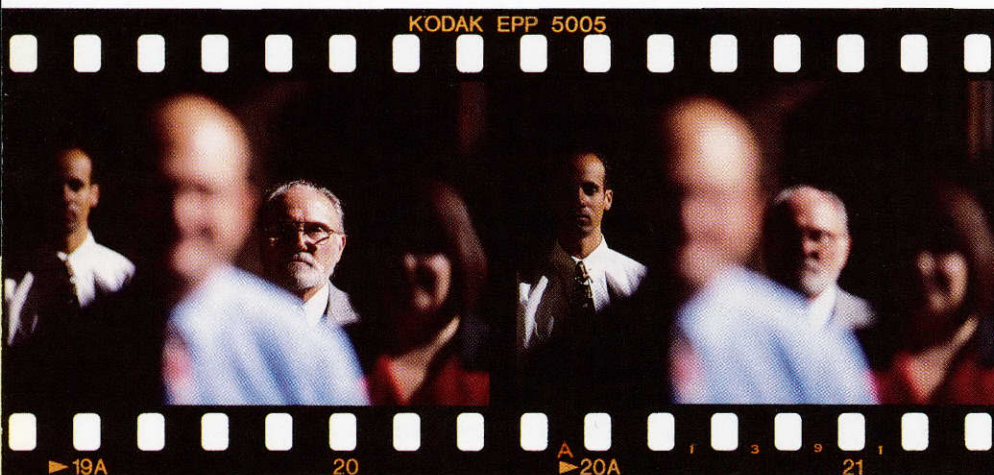
client interview process. This process, which usually is assigned to a practicing associate at most law firms, is given to student interns at the clinic."

Interns at the St. John's United Methodist



Tim Floyd

Church legal clinic prepare motions and pleadings on behalf of clients, said Woods, who commented that many of



Law faculty and students alike — such as Tim Floyd, Brandi Truelove, David Cummins and Pierre Woods — participate in pro bono work.

has been the most important force in its development from a voluntary program in 1985 to a mandatory safety net for legal services groups," according to *Texas Lawyer* (April 3, 1995). Because of Newton's efforts, thousands of low-income Texans have received legal help that they otherwise would not have obtained.

Texas Lawyer says Newton "has been legal services' most effective voice. Legislators, judges and Bar leaders respect him, and he's the rare advocate whose words can change minds on pro bono policy and legal services funding."

As a result of Newton's commitment to pro bono activities, members of the board of directors of the State Bar of Texas created an award in 1994 called the "W. Frank Newton Pro Bono Award." The Austin law firm of Hilgers & Watkins, which served as pioneers in

together the Texas Lawyers Creed, a broad concept impacting how lawyers deal with each other and the judiciary, which was adopted by the Supreme Court of the State of Texas and the Texas Court of Criminal Appeals.

"One obligation of every lawyer is to make sure the legal system works for all and not some. It's always been a problem with respect to how the poor have access to the legal system," Newton said. "The standard used when serving the poor should be the same as when an attorney serves a Fortune 500 company."

He noted that Texas Tech faculty members and students have a well-established history of pro bono legal endeavors.

In one example, Tim Floyd, professor of law at Texas Tech, helped in 1991 to initiate a free legal clinic at St. John's United Methodist Church. Meeting on the second and fourth Tuesday evening of every month, the clinic involves free legal advice from attorneys, who are members of the Lubbock

the clinic's volunteer attorneys also serve as mentors for student interns.

Brandi Truelove, a third-year law student from San Angelo, agrees that her legal clinic experiences gave her practical experiences that regular clerkships do not provide. Truelove has volunteered at the St. John's clinic since her first semester in law school and in subsequent voluntary roles at West Texas Legal Services and at the Legal Aid Society of Lubbock. Truelove says she initially decided to attend law school to help people.

"Students often get bogged down with tunnel vision in the study of the law, and they never really learn how to apply what they've learned to the real world. I've learned a great deal about client counseling skills, about what questions to ask, and I have become more familiar with the elements of the law and how to apply the law," she said.

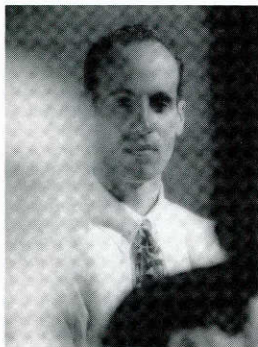
Truelove says that without Legal Services Corp., members of the general public and the legal profession probably would see more confusion in the court systems.

When individuals cannot afford legal representation, she said, "The situation is like an economic deprivation of justice." As a result, people often resort to acting as "pro se" litigants, or persons who choose to represent themselves in court. Too many complex, legal procedures exist in our court systems today, said Truelove, who believes that "pro se" litigants tend to slow down the already heavily burdened courtroom dockets.

The only resolution to the impending budget cuts faced by the Legal Services Corp. and other agencies that provide free legal services is for more

attorneys to donate their services. "We must see more community spirit among the legal profession," she said.

Numerous attorneys already contribute their legal expertise to the



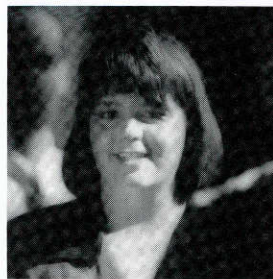
Pierre Woods

poor. They typically believe they are paying back society for the privilege of

being an officer of the court and a citizen in American society, according to David Cummins, professor of law at Texas Tech.

"But the main reason I like to do pro bono work is because of the fact that if our legal system is only available to the wealthy, who can purchase the services they need and want, then we're going to have a very demarcated society of 'haves' and 'have nots' where access to legal services becomes a barrier," said Cummins.

At some point, the United States may have a majority of people without access to legal services because they cannot afford them. If a segment of society is barred from pursuing their legal rights under the Constitution, and a minority of people continue to have access to the world's finest legal services, society eventually will experience a



Brandi Truelove

rebellion. The American Bar Association has published statistics about the inadequate distribution of legal services nationwide, said Cummins. "Whatever contribution I make by providing pro bono legal services isn't going to make any difference in the great scheme of things. But when lawyers in all parts of the nation start participating in pro bono work, together our efforts can really make a difference," he said.

Cummins and his wife, Louise, who serves as the executive director of the Volunteer Center of Lubbock, both received the George Mahon Award for Extraordinary Public Service in May 1995 at the 11th Annual Celebrity Luncheon of the Women in Communications Inc., Lubbock Chapter.

As a professor of law for the past 25 years, Cummins has taught taxation, estate planning and professional responsibility. Despite teaching full-time, Cummins continues to offer his legal assistance to a variety of organizations. One group is Project Help, a utility assistance charity; another is the South Plains Food Bank. In November 1994, Cummins was named "Citizen of the Year" for his volunteer work in West Texas by the Texas Department of

Human Services. In 1991 he won the George Woods Award for Outstanding Service in Law from the Lubbock branch of the National Association for the Advancement of Colored People (NAACP).

Additionally, Cummins has been responsible for incorporating more than 10 non-profit organizations and charities in Lubbock. He has been on the board of directors for West Texas Legal Services for 14 years. He was president of the Legal Aid Society of Lubbock County, a non-profit society that provides legal assistance to poor people concerning divorce, child support and the termination of parental rights.

Cummins says he is concerned about the future of some individuals' access to the legal system, especially when expenditures are reduced as part of the United States Congress' attempt to balance the national budget. That action will be felt by more than 300 Legal Services Corp. grantees around the United States — including 12 Legal Services offices in Texas. The 12 Legal Services Corp. agencies in Texas — Gulf Coast Legal Foundation in Houston and West Texas Legal Services in our own area — will be forced to provide fewer services to the poor.

"As a result of the budget cuts to Legal Services Corp., the rights of many poor people will not be addressed. When these individuals are eligible for benefits and entitlements by a government agency — and they are denied — they will not have access to legal redress because traditional attorneys' fees range between \$150 to \$400 per hour. Additionally, instead of people seeking divorces, poor people will simply move out and take what they want from their spouses," he said.

"While there remain plenty of good people in the world with charity in their hearts, a society without equal access to our legal system will become a more primitive society," Cummins said.

Newton acknowledges that Congress must make difficult decisions about cutting expenditures. But the effects on human lives will have devastating repercussions for society. In the meantime he is continuing his fight to keep the Legal Services Corp. alive and well, avoiding a society that is divided in even harsher terms. □

Awaiting the 'Third Wave' in Higher Education

By Michael Mezack, D.Ed.



Artie Limmer

(Editor's Note: The following opinion piece was written by Michael Mezack, D.Ed., executive director of the Division of Continuing Education at Texas Tech University and an associate professor of educational psychology and leadership. After 19 years at Texas Tech, he will retire in June. He holds a doctoral degree in higher education with a minor in psychology from The Pennsylvania State University. In addition to distance learning, his research focuses on the areas of adult learning, adult learning styles and continuing education.)

Educational institutions must help society deal with the rapid changes that are occurring in technology, the workplace and in a multitude of demographic trends. These changes have given higher education an excellent opportunity to use new means of technology to reach potential students and positively influence the effective uses of new communications technology by communities.

Researchers at Washington State University's Social and Economic Sciences

Research Center recently learned about a growing demand among adult learners for continuing education (outreach). The same study discovered that universities should explore making such education more affordable and convenient. The survey supports the need for an expansion of distance learning and reports that homes are rather well-equipped, to receive such programs, i.e., 87 percent have VCRs, 67 percent have cable television, 35 percent have personal computers, 17 percent have modems and 10 percent

have fax machines. Thus, the need for lifelong learning and the accessibility of technology to the majority of learners will expand the way universities do business.

Peter Magrath, president of the National Association of State Universities and Land Grant Colleges (NASULGC) has said, "The survey shows both that the public considers higher education more important than ever and that we have our work cut out for us to meet the growing demand for continuing education." (*NASULGC NEWSLINE*, October, 1995. p.7).

In the last year or so distance education has been one of the most discussed topics in higher education. During recent months, articles have covered topics such as how to counsel distance education students; how the State University of New York (SUNY) system has attempted to capture a leading role in distance education; how one institution is building a "virtual college" on the cyber-frontier; and how the Internet is "an ocean of unedited data." In addition, announcements of conferences, workshops and seminars on a variety of distance education topics, issues and problems are increasing daily. Numerous invitations encourage learners to participate in a variety of consortia dealing with regional, national and international efforts aimed at expanding and monitoring distance education initiatives.

During the course of American higher education, two megachanges have become manifest. The first involved the transformation from the classical curriculum of the "Colonial College" to the elective system and to an expanded curriculum resulting in the "Yale Report of 1828," which unsuccessfully defended the classical curriculum. The second focused on the introduction of the Land Grant and State Colleges (The Morrill Land-Grant Acts of 1862 and 1890), which opened higher education to the sons and daughters of the working class and to African-Americans, expanded public education and spread utilitarian higher education.

Now we are on the verge of a third megachange or wave — movement toward the Virtual University (VU). Perhaps the intermediate step in such a movement was the introduction of education at a distance, which has existed for somewhat more than 100 years in

the form of print-based correspondence study initiated by William Rainey Harper at the University of Chicago. Additional forms of distance education, such as the use of radio (at the University of Wisconsin) has been around for about 50 years, and video has existed for a somewhat shorter time. In more recent years we have utilized computer-based instruction. However, in the last decade, new and/or improved technologies have exploded, making it possible for universities to deliver their offerings to virtually all who want them. Universities have not arrived yet at this place of higher technology, but the dynamic forces occurring not only in the United States but worldwide are forcing them into the era of the virtual university.

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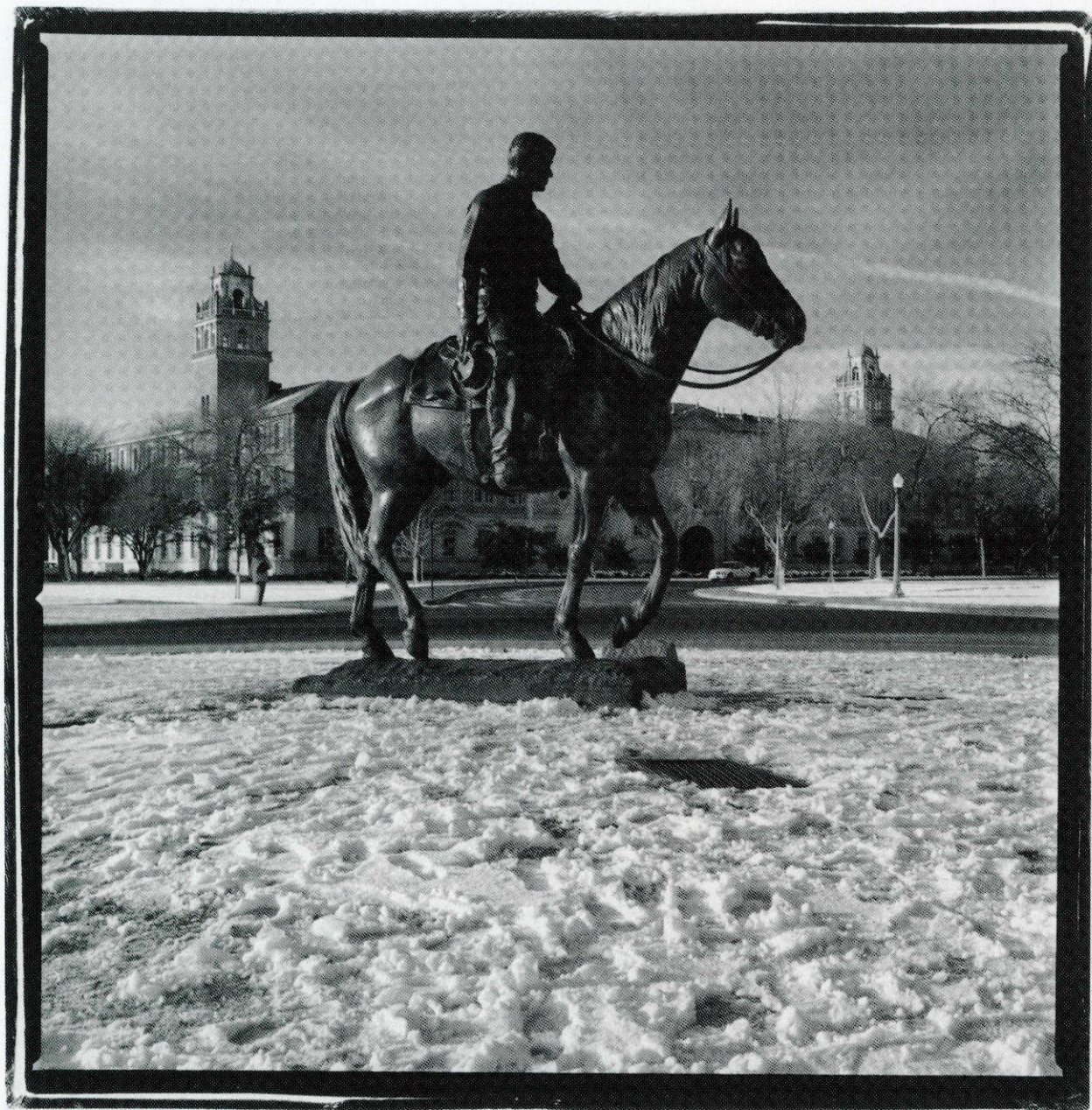
The exponential rate of change that is occurring in nearly all aspects of society is prompting the need for persons to be lifelong learners. Such is the reality of the late 20th century. One can only imagine what changes will occur in the 21st century.

At this juncture, we should ask what is a virtual university? It is a university where teaching, learning and support services are delivered through a variety of means to allow students and other learners expanded access to a universi-

ty's offerings without regard to a learner's situation in time and space. While we're not there yet — we are talking about and, in some cases, doing distance education. However, distance education offers a limited view of what a university should be doing because it's attempting to deliver both credit and credit-free courses and programs in much the same way universities have been delivering their on-campus offerings. In many ways distance education efforts have paved the way for the development of a better "education source," i.e., an improved teacher-learner interaction. Furthermore, distance education initiatives have opened up universities to the idea that reaching out beyond the campus is needed and can be done effectively. Such initiatives have prompted research into the teaching/learning process, which in turn have resulted in an increased awareness of what that process entails, and ultimately in improvements in the teaching/learning process both in distance education as well as in campus-based teaching. Nevertheless the time has come to move on to the next phase in the evolution of the teaching/learning process — how to utilize the array of technologies and the findings of brain and learning research to improve what we do and to be able to provide it to "all who would benefit."

There, of course, will be those who fear, resist and/or belittle movement toward the Virtual University, just as there were those in defense of the classical curriculum and those who resisted the state university-land grant movement.

I would conclude with a quote that captures the essence of resistance to change. "But change in education is difficult. It means doing things differently, not just working longer or harder at what we already do. Change is difficult because we tend to confuse what is familiar with that which is natural. Change is inhibited more by tradition and inertia than by mandates and regulations. 'Letting go' of some practices is proving to be more difficult than 'adding' new ones. And since most of us were schooled in the very type of institutions that we are trying to change, too many of us hold suspect any school that does not resemble the school that we remember." — Adam Urbanski, president, Rochester Teachers' Association. □



Inside Back Cover — An early Spring snow covers the Texas Tech University campus. Footprints mark the ground near the statue of Will Rogers in front of the Administration Building. (Photo by Artie Limmer)

Back Cover — Fashion design major Theresa Alexander exhibits several of her originally designed and handmade articles of clothing in the apparel production laboratory in the Human Sciences Building. Alexander was selected as one of eight students nationwide in 1995 for an all-

expense paid internship with Textile Clothing Technology Corp., (TC)², a conglomerate of manufacturers. During her internship, she learned the latest technology in the apparel production industry and mass production. (TC)² is trying to change the methods of sewing, cutting and inspecting clothing to be more competitive with foreign markets and to create less trauma for its workers, according to Alexander. The Lockhart native will graduate in May. (Photo by Artie Limmer)

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