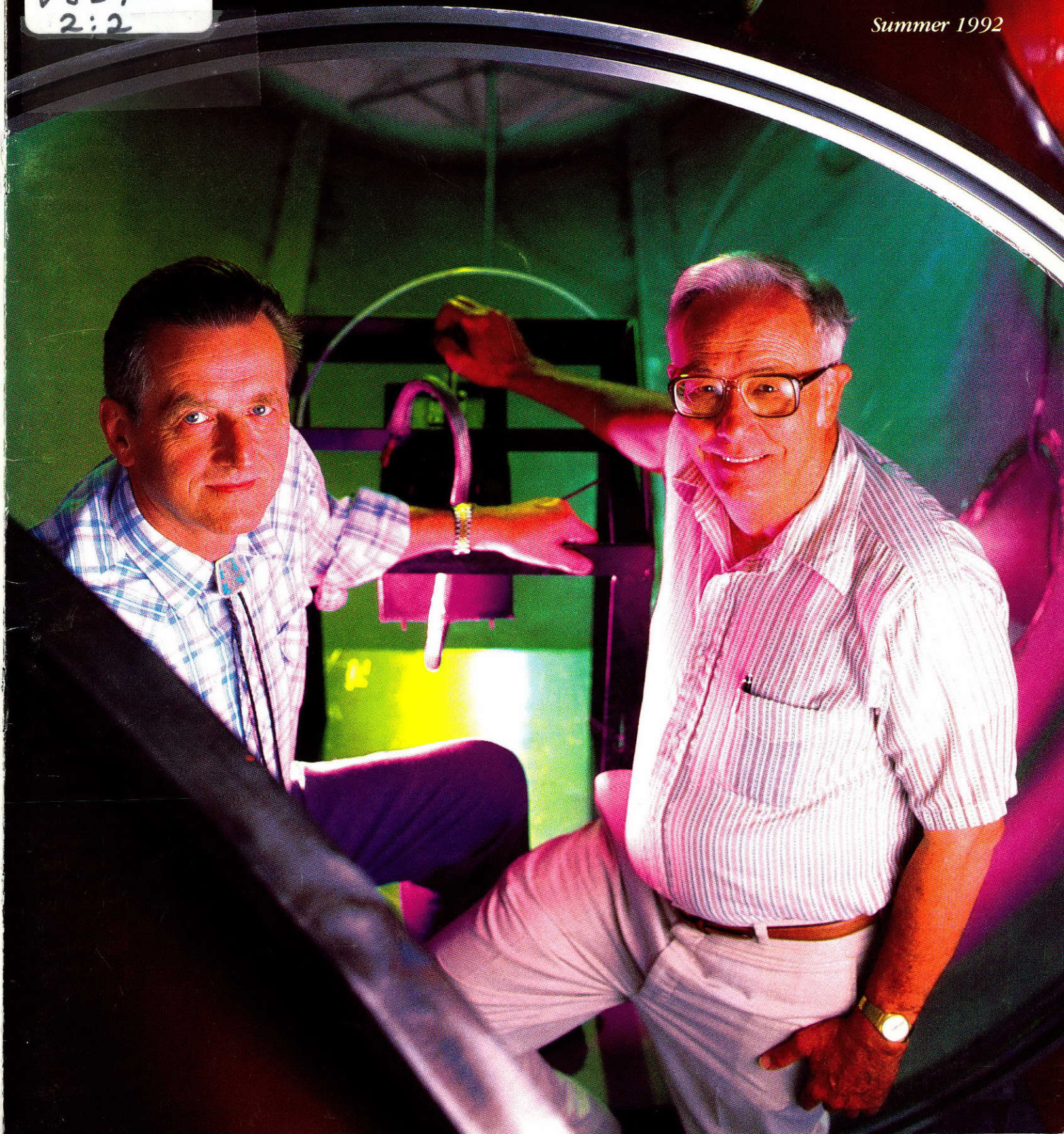


VISTAS

TEXAS TECH RESEARCH

Summer 1992

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VISTAS

TEXAS TECH RESEARCH

Summer 1992

Vol. 2 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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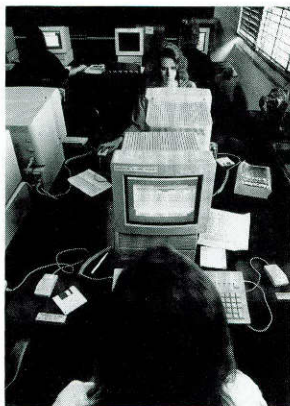
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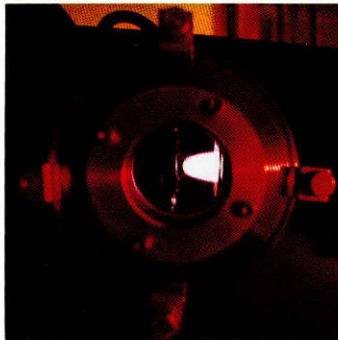
ABOUT THE COVERS

Front—Magne Kristiansen (left), a Horn professor of electrical engineering and physics, and Edgar O'Hair, an associate professor of electrical engineering, stand in an arc-jet vacuum chamber being readied for new research using hydrogen to fuel slow propulsion in the low Earth orbit of 200-300 miles. Researchers in the Pulsed Power and Plasma Laboratory are pursuing a quest for more power for space vehicles. (Photo by Artie Limmer)

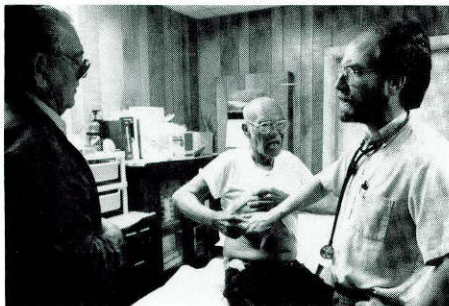
Back—Texas Tech University presented its second annual International Week in February. The theme of the week, "Harmony Amidst Diversity," focused on the variety of the 83 countries represented by the 1,092 foreign students on campus. A flag procession was conducted from the north end of the Engineering Key to the University Center. (Photo by Mark Mamawal)



Page 5



Page 8



Page 16



Page 30

OBSERVATIONS

A Glance at Research and Creativity

Latin America; Information access; Writing collaboration; Gin trash

2

VIEWPOINT

Political Blame in 1992, by Mark D. Harmon, Ph.D.

A mass communications faculty member analyzes the mass media and modern politics.

6

COVER STORY

The Beyond: Forging Power to Stretch Farther Than Our Moon, by Jim Barlow

Researchers in the Pulsed Power and Plasma Laboratory search for more power for space vehicles.

8

FEATURES

Giving Children an Advantage, by Myrna Whitehead

An early childhood educator concentrates on beginnings.

13

MEDNET: Technology Links Rural Doctors with Urban Specialists,

by Preston Lewis

New ways of communicating decrease rural isolation for health care workers.

16

Amarillo Center — Care for the Masses, by Kim Davis

Regional center meets medical needs for residents of the Texas Panhandle.

22

Images: Photography Faculty Establish Visual Language

Art and mass communications educators reveal personal works.

25

The Sound of Music, by Kippira D. Hopper

Musical rhythm and rhyme assist children in learning how to read.

30

PERSPECTIVES

Deciding Health Care Priorities, by Darryl M. Williams, M.D.

Americans must come to terms with paying for medical care demands.

32

Government Publications
Texas State Documents

OCT 05 1992

Depository
Dallas Public Library

A Glance at Research and Creativity

Scenes of Latin America

"Why am I referred to as a Colombian, but you and everybody else in the United States are called Americans? I am an American, too." Those words spoken during a casual conversation hit home poignantly in this 500th anniversary year of Christopher Columbus' first journey to the New World.

South of the United States lie more than 25 countries or territories — Latin America, a long-exploited, economically troubled and culturally diverse region marked by political divisiveness, vast physical diversity, rapid population growth and, perhaps more than anything else, misunderstanding by outsiders.

Columbus and his legacy have been the targets of unending scrutiny as the Americas try to measure what good and what evil were begot by the European conquest. The future, however, is the target of Texas Tech University's Latin American Area Studies program.

"Lots of times, Americans and American students have this stereotype image of Latin Americans as all living in grass huts, sleeping under cactus plants and being marginally literate," says Gary Elbow, Ph.D., director of the program, which has no faculty positions but is supported by departmental donations of time for more than 30 faculty members to teach courses.

"I think that it is important to understand that there is a very, very active and extremely vital intelligentsia in Latin America. The people are functioning not just in a Latin American ambience but worldwide," Elbow says. The future, he says, likely will see

North America and Latin America drawing closer together.

"As the Europeans progress through their 1992 economic unification program, and they become a huge unified trading block, Japan will become a part of an East Asia trading block with Taiwan, Singapore, Malaysia, Thailand, Korea and eventually China," Elbow says. "It leaves the United States and Latin America in a position of a shotgun marriage. Who else are we going to tie ourselves to? We've already hooked in with Canada. The next logical place is to look south to Latin America."

LAAS is not just history and political science. Hanging on the office wall next to Elbow's desk is a self-portrait by Mexican artist Frida Kahlo, whose work recently has gained renewed interest, especially among feminists, and helps Elbow nail down a point on how the fine arts play a vital role in LAAS, the oldest interdisciplinary program in the College of Arts and Sciences.

"It's a liberal arts program. The concept behind it is to provide students with a broad-based background with respect to Latin American culture and society," Elbow says. "If there is a focus, it is on foreign language skills. We feel pretty strongly that you just don't function without the language skills. That's really fundamental. Beyond that, we want our students to understand as much as possible about Latin America through the history, politics, social conditions and cultural traditions, not just in an anthropological sense but also in the fine arts — writ-



Photos by Gary Elbow



Top: Imbabura Peak rises from the Andes in Ecuador. Above: Otabalo Indians peddle their goods.

ings, musical traditions, art, drama, cinema."

LAAS offers two undergraduate- and one graduate-level courses. The undergraduate courses satisfy the university's general humanities requirement; one also is an alternative for a multi-cultural course in elementary education. To round out a bachelor's degree, students must draw from Latin American-based courses in the other disciplines. Graduate students can pursue minors to complement their master's or doctoral degrees.

Two courses with Columbus' first journey in mind recently were designed. Allen Kuethe, Ph.D., in the spring taught a colonial Latin American history course concentrating on Columbus. This fall, Elbow will teach "Caribbean in Fact and Fiction," using James Michener's popular "Caribbean" with non-fiction history books to study the impact of the European

conquest.

Elbow says the growing Hispanic population in North America and the potential emergence of many Latin American countries in the coming years will require educated workers, especially in banking, law, business and international trade and relations.

Those workers will need a background in the language — Spanish in all but Portuguese-speaking Brazil — and in the cultures of Latin America. One recent graduate, a native Peruvian, landed a job with a Dallas-based insurance company that sells travel insurance to Latin Americans, Elbow notes.

"Mexico is the largest Spanish-speaking country in the world," Elbow says. "By the end of the century, more than 100 million people will live there. It's got what's arguably the largest city in the world, Mexico City. Brazil is the largest Latin American

country in population and area, and it has the eighth-largest economy in the world. Brazil also is becoming a major exporter, especially of arms, airplanes and resources.

"There is going to be a lot going on in the near future. It doesn't matter whether the United States has free trade with Mexico. Mexico already is our third-largest trading partner, and trade with the rest of Latin America can only go up. That's our natural trading area. I think it is inevitable that the United States and Latin America are going to become ever more closely tied economically, culturally, politically and in every other sense. The more we understand about the region, the easier and more successful those relationships are going to be."

IAAS can help students overcome their misconceptions, Elbow says. The courses, taught by professors who have lived and/or studied in Latin America, come from a wide variety of disciplines, such as foreign language, geography, history, anthropology, political science, music, biology, museum science and economics.

"By becoming familiar with Latin America and breaking down the stereotypes, students become representatives of a more accurate image that they can pass on to others," says Elbow, who has lived in Guatemala and has had Fulbright grants in Ecuador and Costa Rica. "If you are able to realize the inaccuracies of stereotypes about one part of the world, then pretty soon, you begin to apply your understanding to other parts of the world."

— Jim Barlow

Expanding Information Access

The advent of the computer may have revolutionized the gathering, categorizing and storage of vast amounts of information onto floppy or hard disk drives. However, the key to a good computer program is accessibility and whether it is user friendly.

The Texas Tech University Library has introduced its own version of an on-line access catalog, TECHPAC, to the community. Texas Tech became the third Texas university to offer this service which is similar to information exchange programs at the University of Texas and at Texas A&M University.

TEHPAC provides users with a multiple-approach access to more than 90 percent of the university library's monographs, 95 percent of the Law School library's holdings and 20 percent of the Southwest Collection documents. In addition, various government materials also are accessible through the on-line card catalog system.

According to E. Dale Cluff, director of libraries, preparations for the new system took more than three years to complete. TECHPAC is based on the Data Research Associates Library software system which offers users the on-line catalogues of more than 100 libraries in the nation.

"The Texas Tech libraries are part of an affiliation with AMIGOS Bibliographic Council Inc., which provides network services to more than 300 member libraries in the Southwest," Cluff said.

Nationwide, public, corpo-



Photo by Arie Linnert

E. Dale Cluff
with new
computer system

rate and school libraries also are members of the cooperative network which allows access to centralized databases for cataloging, inter-library loan and acquisitions, he said.

The on-line catalog system also is accessible to all terminals on the university and Texas Tech University Health Sciences Center networks, as well as to dial-in users who have the proper modem equipment. This allows access to the libraries' records from offices or homes.

User friendliness was a key characteristic for acceptability at Texas Tech. Karen Ruddy, coordinator of user instruction, wanted to be sure that students, faculty and staff could use the system with minimal training.

"Because so many students who come to college are unfamiliar with a research library and the searching techniques that are needed to access the tremendous amounts of information available today, we developed an 11-minute video to provide personal orientation," Ruddy said.

The video explains the features of the library including the card catalog, how to locate books and periodicals and information on how to electronically access the databases.

Access can be achieved by the same traditional searches in the card catalog system such as finding publications according to the author's name, book title or subject. In addition, the database can be accessed by entering key word combinations. The system will retrieve a group of words located anywhere in the record, including the subtitles and content notes and in any order such as the author, title, subject and series fields.

Computer sorting, such as combining terms or search fields, will make it possible to search for a word in the title of a work and the author's last name at the same time. Qualifying or limiting searches through language manipulation and publication dates can enhance the results of the search.

Texas Tech's CD-ROMs resources is divided into 18 academic categories including disciplines such as agriculture, economics, literature and sciences. Most of the materials that are available on this system date from late 1983 to the present.

The advantages of TECHPAC and other forms of electronic access systems will make obtaining information within libraries easier, more complete and less time consuming.

— Myrna Whitehead

Trash in the Trough

One person's trash is another person's fortune. This isn't a tale of a junkyard scavenger selling car parts to pay for a child's education. This is about how West Texas cotton field waste has been turned to gold. As roughage, or cattle feed, that is.

Since C. Reed Richardson, Ph.D., came to Texas Tech in 1976, he has hunted for a magical laboratory combination that would turn the region's overabundant annual supply of virtually worthless gin trash into an economical alternative for roughage.

This spring, Richardson's work reached the stage that researchers and their paying sponsors dream about: Turning experimental research into a commercial product. In this case, the product is SP-2000, as Richardson's chemical oxidant is known on the patents of Lubbock's Swetech Corp., Richardson's research sponsor for the last three years. The conversion process provides a fiber food that is less costly to most feedlot operations.

Two major chemical companies came and went as research sponsors because early successes were too expensive for everyday farmers and ranchers. Then came Charles Sweeney, a Texas entrepreneur. He was so excited about the potential of Richardson's work that he moved to Lubbock, opened an office in Texas Tech's Pyramid Plaza and rented a manufacturing site for SP-2000 at the airport industrial park.

Next came a group of investors and Texas Tech graduates Tim Teske (finance, 1989), Dusty Morrison (animal business, 1978)

and Charlie Pentruf (animal business, 1978), who formed BioEnerTech to market the product.

"We're happy to announce that the process for field application has begun," said Richardson, professor and interim chairperson of the department of animal science. "This is potentially a big step forward for the Panhandle region, for the cotton and cattle industries, as well as for helping solve the ecological problem of gin trash."

How important is SP-2000? "This breakthrough can effectively take a waste product and turn it into a viable and much needed feedstuff," said Pentruf, who studied under Richardson. "The economic impact of that is tremendous. We are in a roughage deficit area, and this can provide a feedstuff that compares with alfalfa hay or other roughage."

Gin trash is the burrs, stems and other waste products that remain after cotton processing. The waste has been a problem measured in

tons since the Clean Air Act of 1974 banned its burning. West Texas cotton producers supply one-fourth of the nation's annual cotton crop, and they create 1.5 million tons of gin trash, 60 percent of the national total, each year.

Since burning was halted, 42.5 percent of the gin trash each year has been used as a soil conditioner. The process, however, has been a financial liability, averaging about \$6 per ton of gin trash for ginners to remove from their facilities, Richardson said. There are 629 gins in Texas, and average-sized gins end each season with about 10,000 tons of the waste material.

For the region's 5 million head of cattle and the growing dairy production business in New Mexico, Richardson's success may translate into major savings for both roughage and the trucking costs to import feed.

Untreated gin trash is 35 percent digestible. Using SP-

2000, the gin trash becomes 56 percent digestible, putting it in the same realm as alfalfa, corn silage and many other roughages.

The biolytic procedure uses a mixed oxidant produced in a special electrolytic cell, for which Sweeney has obtained patents worldwide. The finished product breaks the bonding between the indigestible lignin groups, thereby increasing the cellulose or energy availability.

The chemical also works on sorghum stubble, sorghum, corn stalks, wheat straw and other hay grazing forages. Tests on grain sorghum showed a 56 percent increase in the rate of ruminal digestion within 16 hours, and an application on corn resulted in a 38 percent increase in digestion within 12 hours.

In a field test of a commercial operation monitored by Texas Tech and Swetech Corp., treated gin trash was used as 62 percent of the total diet of feeder cattle for 75 days at the Springlake Feedyard near Earth, Texas. Consumption of the gin trash, which replaced all other roughage, was termed excellent, and the cattle showed an average daily gain of 2.25 pounds per day.

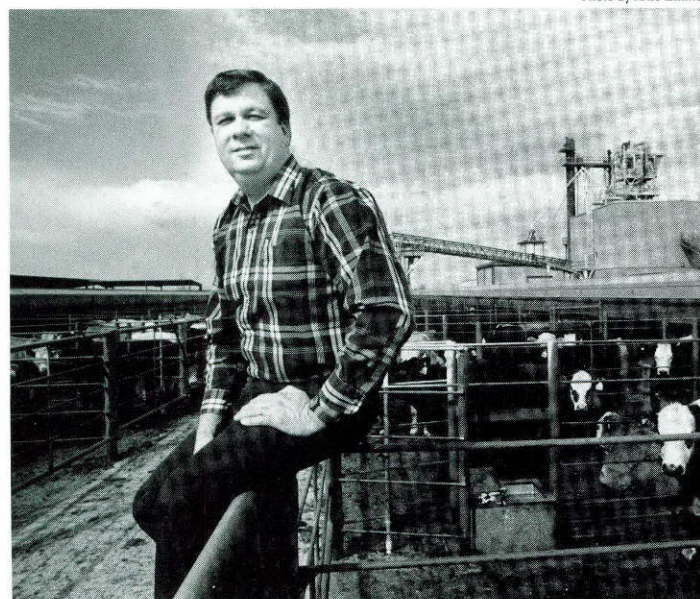
In another field test, treated gin trash completely replaced alfalfa hay as the roughage for steers, resulting in a cost reduction of 2 cents per pound of gain. The steers averaged a daily gain of 3.23 pounds.

But do cattle like the stuff? Richardson says, "Yes, they've shown no hesitancy at all to eat it." And the processed roughage has produced zero residual problems in the cattle. It's environmentally friendly.

—Jim Barlow

C. Reed Richardson has found a way to turn gin trash into cattle feed.

Photo by Artie Limmer



Writing As a Joint Venture

In 27 sections of English classes, Texas Tech University students are learning that effective writing is not done in a vacuum, and, with some coaxing, they are learning that collaboration among themselves is appropriate and functional.

Facilitated by a unique and advanced computer program — the Daedalus Instructional System — the students become readers and editors for each other's writing assignments.

The students enter their individual essays, step by step, into computers, which are linked or networked. Along with class instructors who offer comments about the documents and enter those suggestions into the computer, each student views every other student's work and offers a written critique. The students use the written feedback to revise their work until they have an acceptable final draft.

"We've got all this criticism going on, or this exchange of ideas, all of which are then saved as a file. This becomes the students' text. This is what they study. They get into the computer and look at other people's theses, seeing how other people are writing. They take the critiques and apply those to their own documents, but also they see everybody else's suggestions to each student. So what we've got is a collaborative environment where there's an awful lot of ideas and suggestions knocking around about specific pieces of writing, and it all ends up in text, just like a classroom transcript," explained Fred Kemp, Ph.D., assistant professor of English.

Kemp, who is the director of English composition, has overseen the Computer-Based Writing Instruction and Research Project since he introduced the program to Texas Tech four years ago. The DOS version of the program was designed by Kemp and other graduate students in rhetoric and composition at the University of Texas in Austin. The program has been adopted by about 72 universities across the United States, including the University of Texas, Texas A&M University and the University of Michigan.

"At Texas Tech we have 27 sections and 16 instructors that are working on this system. This is probably the largest project in the country that is handling full-time writing instruction in computer-based classes to this extent," Kemp noted.

Apple computers has given about \$160,000 worth of computer equipment to Texas Tech to encourage the Daedalus company to write a Macintosh version of the system, which was completed last year. The instructional system is available in both IBM and Apple labs within the Texas Tech English department.

"The thing that is radical and different about this approach to teaching writing is that students help one another. In about the third grade, students are told that they are cheating if they ask somebody to help them with something. That doesn't make sense, does it? There's no professional who would ever send something off to someone without having a peer look it over," said Mary Hatfield, a lecturer in English

who has used the system.

"Not only do the students work together, but the faculty works together also. The students become informed editors kind of."

The classrooms are very active because the teaching is conducted from a problem-solving approach. The teacher becomes a facilitator or coach rather than a boss, Kemp said.

"The students are writing constantly. This class privileges the writing process much more than any traditional classroom ever could. The students write easily five times as much in this class than they could ever write in any other class because it's so easy to revise, to change documents and to produce subsequent drafts," he said. "These students are people who have been trained for 10 or 12 years in traditional classrooms where they produce very sterile writing with very little purpose and point."

In a position paper about computer support for cooperative learning, Kemp wrote:

With computers, peers collaborate in writing.

"In the networked classroom, there is not time-consuming reading aloud, no flashing of transparencies on overhead screens, no multiple Xeroxes of printed text. Because all classroom text is in electronic form, any piece of writing, major or minor, can be immediately distributed to individuals or to the entire class. Students are constantly engaged in moving drafts to peer readers, to groups, to everyone, and are constantly writing and reading responses to drafts and original ideas in the form of brief critiques or e-mail messages. Classroom discussions are held in electronic form with a great many advantages over traditional classroom discussion."

Kemp believes that in traditional writing classes, the individual writer is isolated and the classroom teacher is a professional reader.

"In this classroom, they begin to depend upon other readers. So they learn how to share their text. They learn how to write their text for a real audience, rather than just for the teacher who's a professional reader, and they learn how to read very closely in a very practical way," Kemp said.

— Kippira D. Hopper

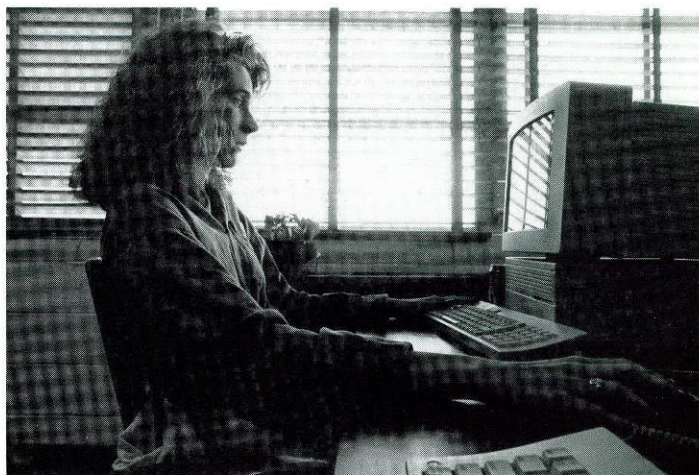


Photo by Artie Limmer

Political blame in 1992

By Mark D. Harmon, Ph.D.

(Editor's Note: The following opinion piece was written by Mark Harmon, Ph.D., an assistant professor in the School of Mass Communications. He is a former radio and television journalist as well as a newspaper columnist.)



Photo by Mark Mamawal

This year has been an introspective one in American politics. Candidates, voters and news reporters have had to answer hard questions about themselves and their role in the process. The universally cited problems are fairly well documented: declining voter turnout, voter frustration regarding candidate choices, and a campaign dominated by superficial and peripheral issues — some with little or no connection to public policy.

There certainly is enough blame to go around. Voters claim to want news organizations to stick to serious issues, but programs devoted to serious issues draw very poor ratings. Furthermore, when voters are asked about candidate choices, specific candidate positions rarely figure in the answers. Voters seem to like non-traditional candidates only in the abstract. The longer Paul Tsongas, Jerry Brown and Pat Buchanan stayed in the race, contended with others and revealed their positions, the more voters abandoned them. Look for a similar pattern with H. Ross Perot.

The congressional races have been no better. Certainly the check overdraft scandal says something about Congress, but while public attention fixes on this development — a more frightening financial crisis goes virtually unreported. Remember how the savings and loan crisis disappeared during the 1988 campaign and reappeared in a massive bailout in 1989? Now a very similar crisis is brewing in banking, and we probably won't hear much about it until 1993.

So pick your favorite group to blame: politicians who reduce their message to "sound bites" on a series of "hot button" issues identified by pollsters, journalists who take their lead from the pollsters and the politicians (by default failing to force more serious concerns into debate), or the voting public for failing to demand more from the politicians and the reporters.

For better or worse, here are nine

new developments at that curious intersection of news, candidates and voters known as Campaign 1992:

1. The Shrinking Sound Bite. The evidence for this phenomenon comes from a widely quoted study by Kiku Adatto. The Adatto study, quoted in *New Republic* and elsewhere, compared more than 280 network evening newscasts from 1968 and 1988, finding that the average campaign sound bite (bloc of uninterrupted speech) fell from 42.3 seconds to 9.8 seconds.

Of course, as David Brinkley has pointed out, one can say a lot in 9 seconds ("I think therefore I am.") or precious little in 42 seconds. The value to the voter can't be measured exclusively in length of sound bite, but certainly such brief clips make elaborate discussions of policy alternatives highly unlikely.

Broadcast journalists now use such sound bites as "punctuation" or stress points to news reports. Bill Smith of Northeastern University has looked at the 1968-1988 numbers again. He noted that while the length had shrunk, the number of bites tripled.

Office seekers, in fact, quickly learn to speak in 10-second bursts. This is the course-of-least-resistance for most candidates. These 10-second bursts are easy to edit into local TV news packages. The pre-planned bursts typically are designed in advance so it's unlikely the candidate will commit a gaffe. The bursts also nicely fit the frenetic pace of bopping from airport to airport to deliver them to the assembled local camera crews and newspaper reporters.

It may say something about the lack of initiative and aggressiveness among local reporters that campaign directors generally do not worry about such appearances. The local press and broadcast reporters are merely "free media," nicely complementing the planned message of campaign ads.

2. Horserace Journalism. Even among the more experienced and

resourceful reporters in larger markets, the natural tendency is to spend a good deal of time and ink on the horserace aspect of the campaign: who is ahead, who is behind, who has "momentum," etc. This approach treats voters as gamblers at the \$2 window looking for a sure thing.

3. Arbitrary Decisions on Range of Candidates. The horserace concentration inevitably leads to two camps of candidates, "serious" and "non-serious." This has nothing to do with a jocular demeanor, but with the perceived chance of winning. Some coverage decisions clearly must be made; 65 candidates were on the presidential ballot in New Hampshire.

Nevertheless, party leaders and news organizations were quick and arbitrary in excluding certain candidates from debates and frequent coverage, especially in the early stages of the campaign.

News organizations could not keep a consistent standard in this matter. For example, Larry Agran, the former mayor of Irvine, Calif., mounted a national campaign and was on the Democratic ballot in most states. He was nearly invisible in coverage.

His campaign workers first were told he was excluded from debates/coverage because he has not ever won a high elective federal or state office — a stance at odds with extensive coverage of Pat Buchanan and H. Ross Perot (or in past campaigns Pat Robertson or Jesse Jackson). Furthermore, former U.S. Sen. Eugene McCarthy was running but nearly invisible in 1992.

Later some debate sponsors changed the standard to candidates receiving Federal Elections Commission matching funds. That will come as quite a surprise to Lenora Fulani, cross-listed on Democratic and New Alliance Parties and receiving matching funds. She regularly was excluded from forums or coverage.

4. Institutionalized Debates. Presidential debates have become an institution, and debates for other elective office are much more common than in past years. Clearly the public is served well by candidates meeting face to face. Unfortunately most of these candidate forums are not true debates, but just joint press conferences. Rarely do candidates clash or challenge each other directly.

There may be some improvement forthcoming in a plan advanced by CBS, NBC, ABC and CNN. If the campaigns agree, there will be four simulcast debates, three presidential and one vice presidential — and just a moderator for each, no panel of questioners and no studio audience. The proposal is a variation on a plan advanced by former NBC political producer John Ellis. He, while on fellowship at Harvard, proposed "Nine Sundays" of hour-long candidate debates and conversations the autumn of the election.

5. Long-Form Opportunities. Candidate debates are one of a growing number of opportunities for voters to evaluate candidates. C-SPAN's effort has been the most ambitious, a planned 1,000 hours of coverage. The "Road to the White House" consists of 90-minute programs aired twice. It is a behind-the-scenes look at campaigns, including unedited speeches, rallies, appearances and planning sessions.

Public broadcasting's "MacNeil/Lehrer Newshour" and National Public Radio's "Morning Edition" and "All Things Considered" both have offered extensive candidate profiles, stump speeches and analyses of public policy positions. PBS also will chip in "Listening to America" specials with Bill Moyers and guest experts outlining issues.

Cable News Network expects to offer 500 to 700 hours of coverage, including in-depth candidate profiles dubbed "Democracy in America." The three traditional over-the-air networks, CBS, NBC and ABC, will offer about 100 hours of special long-form reporting on the campaign.

6. Truth Boxes. One clearly encouraging trend is that several of the nation's largest-circulation newspapers and CNN regularly dissect the dubious claims of televised campaign ads. These analyses have been dubbed "truth boxes" and are very much needed. This year the Democratic and Republican nominees likely will spend about \$30 million each of public money on television, mostly on quick-hitting commercials.

Other newspapers and some broadcast news teams also have adopted the "truth box" technique, though on a more sporadic basis. One also hopes these news organizations look more closely at radio claims.

7. Radio Attacks. Radio has become

the "scud zone" of attack ads. Jerry Brown did not hesitate to use on black radio stations a Bill Clinton outburst about Jesse Jackson. (Clinton erroneously had been informed Jackson had endorsed Tom Harkin. Clinton's comment was overheard at the end of an interview.) Clinton, in turn, slammed Paul Tsongas on radio. President Bush and Pat Buchanan also traded barbs in radio spots. Radio has become a place to test run an attack, or to target an attack designed to appeal to a specific demographic group.

8. Satellite video feeds represent a serious challenge to the integrity of broadcast political reporting. Congressional incumbents can campaign directly from Capitol Hill by offering convenient and timely sound bites for local TV newscasts. If done as genuine two-way news interviews these satellite links present no problems. Frequently, however, these reports take the form of a video press release — a congressional aide asking pre-arranged easy questions and the incumbent responding with pat answers. Well-financed opponents can do the same with rented or purchased satellite up-link units.

No print journalist should be satisfied to print a press release without rewrite, fact checking and additional sources. No broadcast journalist should be satisfied with a video handout.

9. Excessive reliance on television. The latest Roper polls reveal that two out of every three Americans report getting most of their news from television, and half say they rely on television exclusively. Television news, even when done well, is not meant as a stand-alone information source. Voters who skip news magazines, radio and newspapers may learn only enough to cast negative votes against certain candidates. Worse still, such persons may become so frustrated by negative ads or non-issues that they choose not to vote.

So we find ourselves in 1992 in the midst of substantial change in U.S. electoral politics and how it is covered. By far the most pervasive change is the overwhelming pessimism about the process making daily life much better. That trend can be turned around only by enlightened leadership and angry voters. The best reporters can do is nudge it along by sticking to serious topics and demanding better answers to penetrating questions. □

THE BEYOND

Forging power to stretch farther than our moon

By Jim Barlow

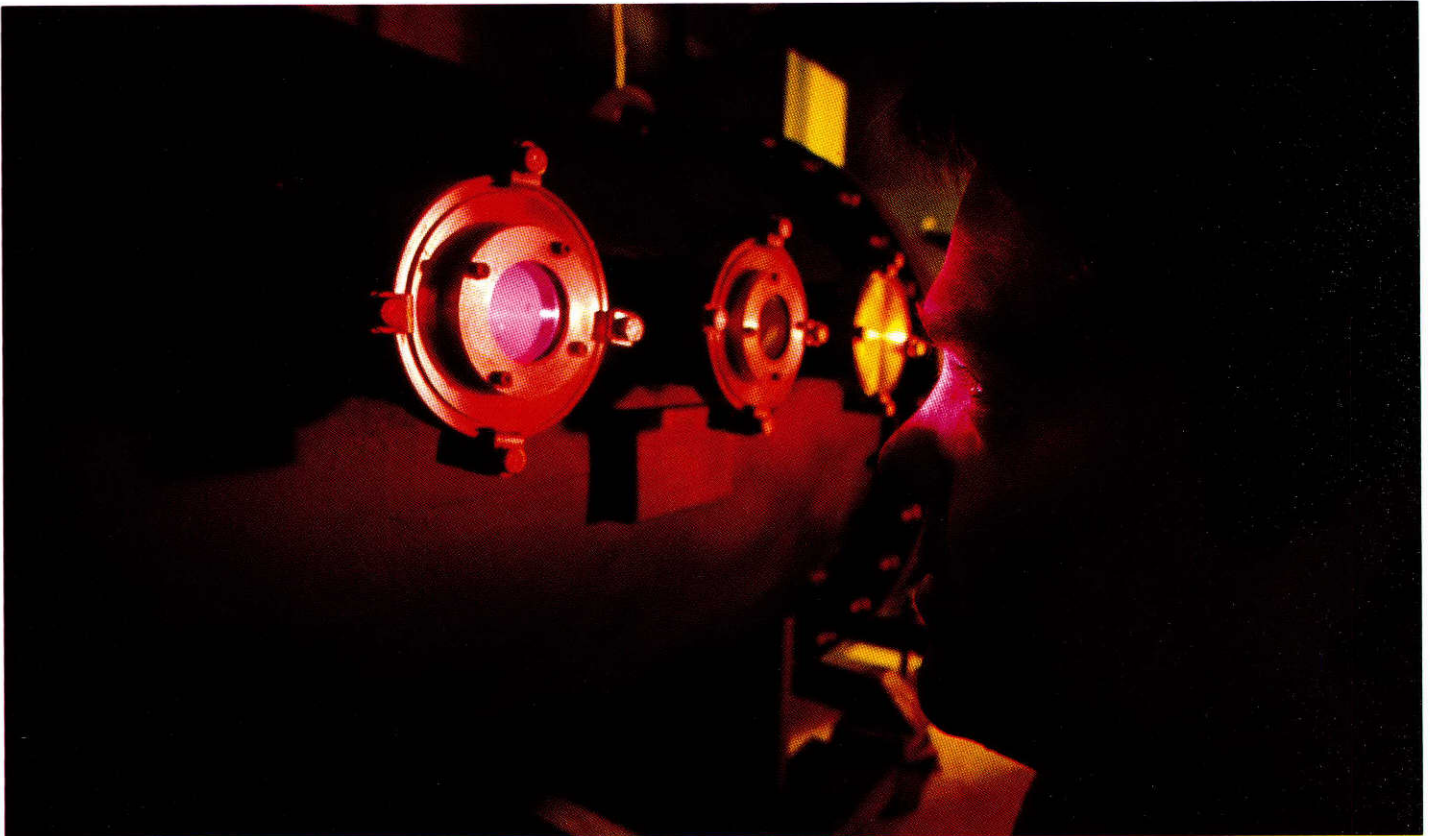


Photo by Artie Limmer

Scott Harris, NASA fellow and Texas Tech graduate student, observes a bright, nitrogen-fueled arc-jet through a port-hole of a vacuum chamber.

Somewhere out there, deep in space, two newly discovered planets are said to be orbiting a pulsar in the constellation Virgo. An exploratory mission, however, must be left to the science fiction writers because, so far, technology has allowed us round-trip manned flights only as far as our own moon.

Researchers melding their interdisciplinary minds inside Texas Tech University's Electrical Engineering Building are looking skyward. They won't be confused as characters on "Star Trek:

The Next Generation," nor are they planning a trip to Virgo. But their work is on the vanguard of the Strategic Defense Initiative Organization (SDIO) and the National Aeronautics and Space Administration (NASA).

Work in the Pulsed Power and Plasma Laboratory can be viewed as a quest for more power for space vehicles. Researchers are raising voltage to unprecedented levels, studying and improving the insulation that contains the power and creating more efficient and longer-lasting propulsion.

"Up to now, we have not needed lots of power in space," said Magne Kristiansen, Ph.D., a C.B. Thornton and Paul Whitfield Horn professor of electrical engineering and physics. "With the eventual coming of a space station and some of its military applications, and with potential planetary missions, we will need a lot more power."

While long-term space missions may seem to be the goal, the Kristiansen-coordinated program, for now, is an orbital affair. Much of the work is directed toward improving the power and thrust in the treacherous low Earth orbit of 200-300 miles, where ionized gases, or space plasma, eat away at the insulators that are vital to keeping equipment functioning.

The program — located primarily within the department of electrical engineering — utilizes researchers and graduate students from physics, chemistry, mechanical engineering, industrial engineering, chemical engineering and mathematics. Research is conducted in four locations, including the off-campus Texas Tech Research Foundation facility.

In addition to Kristiansen, the key faculty researchers from electrical engineering are Hermann Krompholz, Edgar O'Hair, Mary Baker and Michael Giesselmann. Others are Lynn Hatfield and Roland Menzel from physics; Jahan Rasty from mechanical engineering; John N. Marx from chemistry and biochemistry; and William Kolarik from industrial engineering. Senior research associates are Thomas Gregory Engel, Gary Leiker, Gene Igel, Kim Zinsmeyer and Ellis L. Loree.

"This group is not a formal organized institute or center of any form," said Kristiansen, a Norway native who joined the Texas Tech faculty in 1966. "We form the largest research group on campus, but we have no official status. We are a group of people who decided to work together. While I nominally head it up, I have no power. I don't set any faculty member's pay scale. I don't set faculty promotions. If faculty members get mad at me, they can take their marbles and go home."

Kristiansen served as an electronics technician and instructor for the Royal Norwegian Air Force from 1950 to 1958 before entering the University of Texas at Austin, where he earned his bache-

lor's and doctoral degrees in electrical engineering in 1961 and 1967, respectively. He initiated plasma research with Marion O. Hagler, Ph.D., Horn professor and current chairperson of electrical engineering, after his arrival on the Texas Tech campus in 1966. Pulsed power research began in the early 1970s.

The program, as of March, was operating with \$4.4 million in grants, including almost \$3.27 million from the SDIO and Defense Nuclear Agency (DNA), for 12 research areas. The DNA and SDIO have earmarked \$2.5 million alone for high-voltage space power research through April 1, 1996. Another \$317,969 in two grants come from the Texas Higher Education Coordinating Board's Advanced Research Program, and two grants by the Air Force Office of Scientific Research total \$166,469. The \$4.4 million also includes \$100,845 for the first year of a three-year grant awarded by the U.S. Department of Education to fund graduate research assistants working in areas of national need. Another \$2.29 million in proposals were pending in March.

Twenty years ago, grants totaled approximately \$46,000. Since then, about 60 researchers, faculty assistants, undergraduate and graduate students, staff members, secretaries and engineers have been involved in the program. "It really takes the mixing of the people to do the job," said Hatfield, Ph.D., a professor of physics who came to Texas Tech in 1968 and is the program's co-director.

"Many universities have what they call interdisciplinary programs, but they are really just on paper. Some work over here, some work over there. They know each other's names, but that's it. Here, we work on the same problems. We sit down with each other once a week to talk, and we go to each other when something won't work," said Hatfield, who earned a bachelor's degree in 1960 from Arkansas Polytechnic and his master's and doctoral degrees in 1964 and 1966, respectively, from the University of Arkansas.

The various projects are intertwined in applied plasma physics, involving ionized gases in arcs, and pulsed power, in which the arcs and sparks are used to manipulate high-current voltages and power, often in very short time scales, Kristiansen said.

"We operate, in some cases, on time

scales shorter than one thousandth of a millionth of a second at power levels that go in excess of one thousand million watts," he said. "The high voltages, the currents and the time scales are extreme."

Understanding and protecting electrical and solar power systems against the hostile ionized gases and ultraviolet radiation in low Earth orbit will be vital to future space exploration. "The main thing you have in space, when you get above the Earth some 300 miles or so, is a lot of ionized gas," Kristiansen said. "Most of that is oxygen, either ionized or atomic. In either case, it is bad because oxygen is chemically very reactive. It attacks almost any metal, any insulators, and it does harm.

"If you look at any of the Apollo equipment, which went to the moon and back, it looked like someone had poured a bucket of acid over it. As the spaceships came back toward Earth, the chemical reactions on the ships were incredible. When scientists saw the damage, they initially had no idea what had happened," he said. "There are positive and negative charges, ions and electrons, and strong ultra-violet radiation from the sun that is not blocked by the atmosphere as it is on Earth. There are extreme variations of hot and cold temperatures based on exposure to sunlight. All of this does some damage to the materials."

The challenge, he said, is building a better insulator — what shape, what material, how to place the wires, what coating surface works best. "The conditions of low Earth orbit are bad news for most insulators," Kristiansen said. "They tend to arc and flash over and short out the electrical system."

If the space plasma's charged particles strike a conducting surface, they are conducted as a current, Hatfield said. If a charged particle like an electron hits an insulator, it sticks and produces a negative charge or it creates an electrical charge. Eventually there will be a spark, or arc, that crosses a gap in a circuit or between electrodes, which could shut down both the electrical equipment used to communicate with Earth and that which operates the vehicle.

"The kinds of tests we are doing are very important," Hatfield said. "For a

long-term mission, like to Mars, you can't go out there halfway and have your radio or computer fail."

Texas Tech has participated with other universities and private companies in the Space Power Experiments Aboard Rockets, or SPEAR. In SPEAR 1, sounding rockets were sent up into a brief low Earth orbit for high-voltage experiments. SPEAR 2 veered off course after lift-off from a New Mexico launching pad and had to be destroyed. Hatfield is working with other researchers on a book for the SDIO about what was learned in the failed launch. The next SPEAR step will be insulator experiments on satellites.

In preparation for those experiments, Hatfield and Rasty, Ph.D., associate professor of mechanical engineering, are looking at the aging mechanisms of insulators through accelerated aging tests. "They are looking at synergistic relationships, if they exist, and how to speed up the effect of the space environment," Kristiansen said.

As Hatfield sees it, a whole new world awaits up there. "Experiments are difficult because all of our long-term experience with insulators is on the surface of the Earth," he said. "Most of the technology has been done by the power companies, who are distributing electrical power using insulators that have to withstand things like rain and dust and snow and sunlight. In space,

it's different."

For example, Kristiansen said, a piece of plastic left out in the summer sun on Earth will change colors and become brittle. "It must endure temperature cycles as well as possible mechanical stresses, bending and ultraviolet radiation from the sun. What does all that do when they all act together? Is it a synergistic reaction? Did it get worse acting together, or did the stresses cancel each other? Can you study them one-by-one, or do you have to study them all together?"

The testing started from scratch four years ago, when no one else was involved in the research, Hatfield said. Even the laboratory equipment was specially built for the project. In a vacuum chamber that simulates the space environment, insulation material is sent through a three-minute thermal cycle, in which the temperatures go from 100 degrees Celsius to -40 Celsius and back to 100 degrees Celsius. A satellite has a 90-minute cycle of warming and cooling as it circles the Earth.

"Right now, we are looking at how to relate the accelerated cycle to the real cycle," Hatfield said. "One year in a 90-minute orbit would be two weeks in our chamber. But we know it's not linear like that. We don't know what it is. Maybe it's exponential so that when we speed it up, the aging is really accelerated. Maybe we don't have to use two

weeks to simulate one year in a 90-minute orbit."

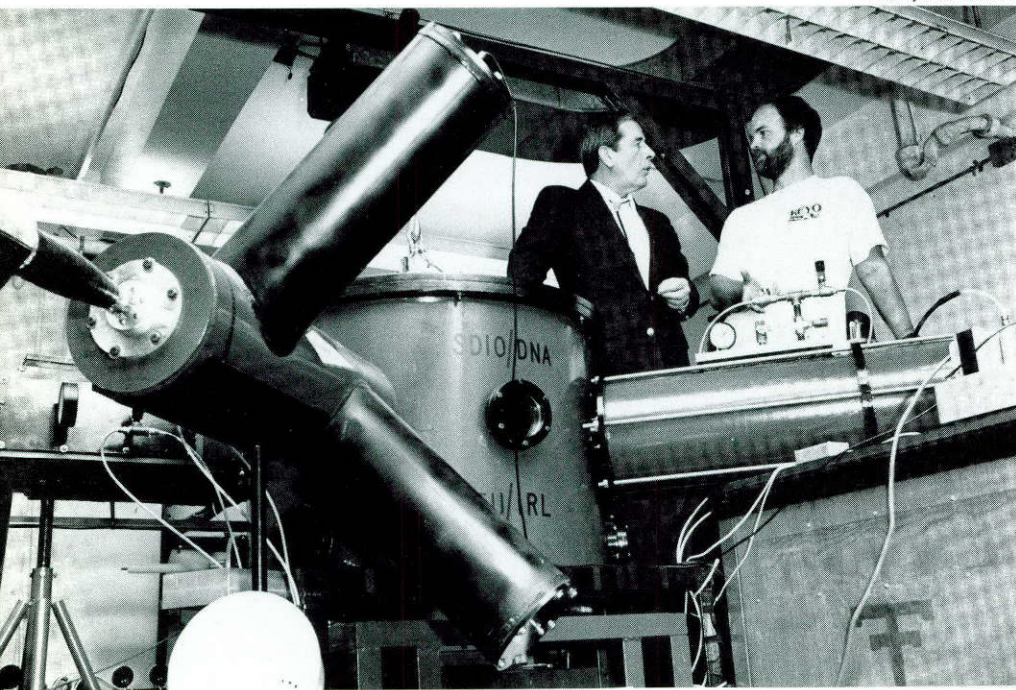
After going through the aging cycle, the insulation material is examined for any changes. Mechanical engineering researchers, led by Rasty, look at tensile strength, shear strength, hardness and susceptibility to fracture, hoping to be able to predict how long the material will last in real-life applications. The examination has used the pioneering work of Roland Menzel, Ph.D., a professor of physics, whose laser fluorescence technique has attracted a \$287,187 grant from the Electric Power Research Institute for the testing of underground electrical power cables.

A laser light is directed onto dye-covered insulation, and the glow of the fluorescence, or radiation emitted, is measured with a spectroscope. "We can see things happening to the insulation at applied voltages that are far less than the breakdown voltages. If you were to take a microscope and take a look at the surface of the insulation, you wouldn't see anything," Menzel said. "The dye attacks defects so they can be seen. We're interested in seeing what happens on the way to breakdown. We don't want to do autopsies on failed specimens. The idea is to reach an understanding of the failure mechanisms in order to be able eventually to make a better insulation."

It is hoped that better insulation will allow increased power levels during space missions. "There was a common belief that you couldn't hold off more than 300 volts in space. That is wrong," Kristiansen said. "We've done experiments using 40,000 volts. The question is: Can we do it not only once but over long periods of time? And can we still do it after the machinery has been out there two or three years? Nobody really knows. This ground testing and accelerated aging to find the right materials will allow full-scale experiments in space."

Ground testing does have a drawback. Vehicles that have been sent on long-term missions, such as Voyager, are gone, Hatfield said. "We don't get to

Photo by Mark Mamawal



Professor Lynn Hatfield (left) and physics graduate student Brian T. McCuistian discuss ongoing research near specially constructed machinery designed to test insulation in space equipment.

look at them. What we try to do is use the insulation material that will withstand the space environment. Typically, these are materials that have been invented in the last 10 or 20 years, and those old measurements really don't mean anything."

In the satellite recoveries that have occurred, Hatfield said, the insulation, which has been made out of smooth, slick polymers like kapton, had been eroded away significantly. The NASA Lewis Research Center in Cleveland, he said, determined that the change resulted from chemically active oxygen atoms hitting the surface and grabbing some of the material.

"We decided to take some of the materials and roughen them artificially with sand paper and polishing compounds. We used lucite, lexan and celcon, all polymers with different chemical makeup," he said. "A doctoral student chose 10 different surface roughnesses, randomly roughened the surfaces and measured the voltage necessary to make a spark across the surface." The higher the voltage required before a spark occurs determines an insulator's strength.

Tests in the 1950s on very rough and very smooth surfaces had found that smoother ones were best for insulating high voltages. Texas Tech's experiments have confirmed those results for celcon and lucite. "But for the lexan, we found that too rough was bad and too smooth was bad," Hatfield said. "There is a certain roughness right in the middle that was twice as good. We understand why rough is bad, but we still don't understand why smooth is bad. We are looking for an experiment to tell us why."

Pulsed power researchers also are worried about the equipment deterioration in space. They are trying to conquer the erosion occurring in electrical system cathodes, the terminals that deliver currents to arc-jet propulsion engines. They also are seeking more efficient and cheaper alternatives to conventional and extremely heavy chemical fuel.

"If NASA is going to go to the planets, under present technology, you can't afford to take enough fuel with you to get home," Kristiansen said. "So what you have to do is use your fuel more efficiently. And you use it more efficiently by ejecting it faster by electrical discharge and using the lightest

possible fuel that you can find. A combination of light fuel and electrical discharge gives you very high exhaust velocity."

The arc jet research has added knowledge to the low-level tests performed by NASA, Hatfield said. With funding awarded three years ago by the Advanced Technology Program of the Texas Higher Education Coordinating Board, researchers have used nitrogen in their study of how to extend the running life of arc-jet machinery, which uses gas heated by an electric-generated plasma rather than chemicals to provide thrust. "The Jet Propulsion Lab had made some 500-hour tests," Hatfield said. "What we need for real missions is 1,000 hours or 1,500 hours." NASA has asked Texas Tech to convert from nitrogen to hydrogen, the lightest gas possible, in future experiments in an effort to obtain even higher chemical velocities.

The chief investigator on the arc-jet research is O'Hair, Ph.D., a retired Air Force colonel and associate professor of electrical engineering. He once worked in the laser weapons program at Kirtland Air Force Base at Albuquerque, N.M., and he previously taught at West Point, where he earned a bachelor's degree in 1953, and at the Air Force Academy. He holds master's and doctoral degrees from Purdue University.

O'Hair and a graduate assistant, NASA Fellow Scott Harris, utilize a 440-volt electrical power supply that sends currents into a test rocket's nozzle region, where the electrical power creates a plasma with temperatures of some 30,000 degrees Kelvin (29,727 degrees Celsius or 53,541 degrees Fahrenheit). The gas enters at room temperature, swirls around the plasma and is heated by the electric arc. "The electric source creates the plasma," O'Hair said. "The plasma heats the wall and the injected gas. These gas products then expand through the nozzle, creating rocket thrust."

The concept is not new. Conventional chemical rockets since the 1930s have used the same process, but at lower temperatures and with solid or liquid propellant. The problem has been that the propellants are pushed out quickly, meaning that after launch, there is little or no fuel left for in-space orbit changes.

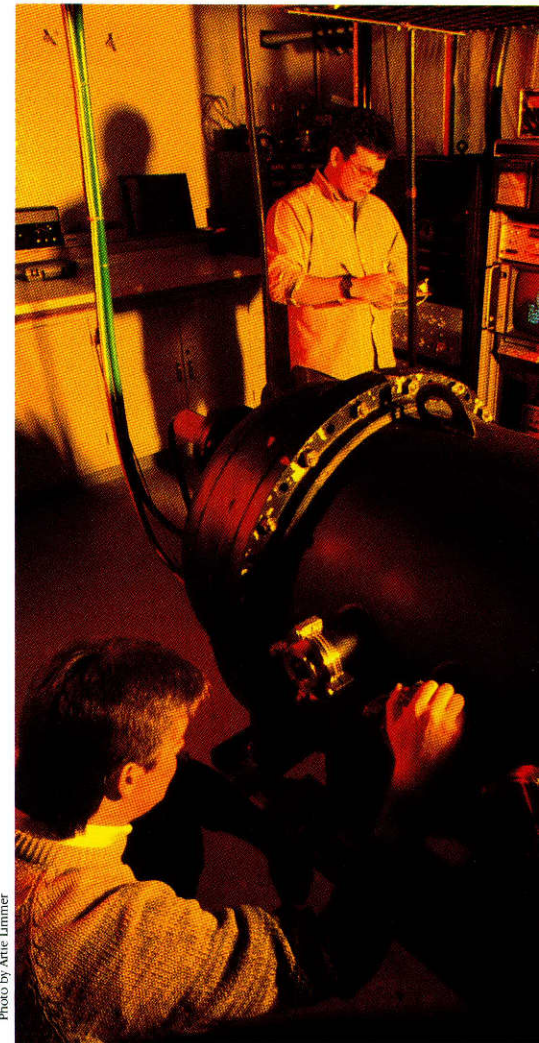


Photo by Arrie Limmer

Electrical engineering technician Christopher Hatfield (standing) and graduate student Scott Harris examine a nitrogen arc-jet chamber.

"Chemical rockets give huge thrusts. You can lift tons of things into orbit, but you will throw away 80 percent of your payload in fuel," Hatfield said. "And then, if you try to go to Mars, you're washed up. You can't get there. So with these electric arc jets, on a long-term mission where you can use very little force and a small amount of gas for a long time, you can take more equipment there. Less of the payload is fuel."

Electrical systems using gas and higher temperatures can create longer lasting thrust capabilities. The trade-off of increased velocity and less fuel is called specific impulse. The goal is to have a specific impulse of 1,000 or greater, O'Hair said. "The specific impulse for chemical rockets using liq-

uid hydrogen plus liquid oxygen is about 400, as good as you can do with a chemical system. Solid propellant's specific impulse is 300 or less." Researchers hope that hydrogen will bring better results.

An electrical system may be able to utilize fuel more efficiently, moving a spacecraft from one orbit to another slowly, O'Hair said. Increased efficiency could save millions of dollars in fuel and extend the life of space vehicles, he said. "If I started out with a 1,000 pound satellite, and I have a very high specific-impulse rocket system, I might need only 10 pounds of fuel for an orbit transfer," O'Hair said. "Everything is a dollar trade off."

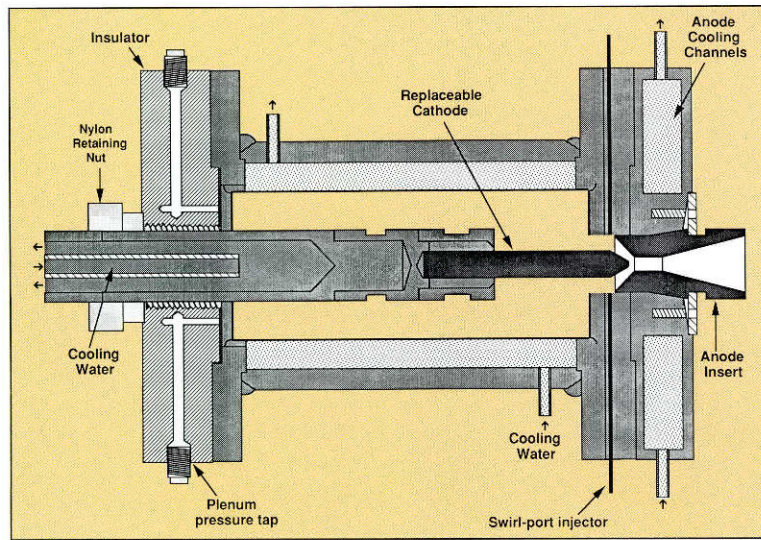
There are satellites using 1.5 kilowatt arc-jet rocket systems, but future needs call for 10 kilowatt systems. O'Hair is gearing up for 10 kilowatt testing, a reduction from 30 kilowatts initially sought by NASA. The technology of taking 1.5 kilowatt systems to 10 kilowatts will not be easy because the erosion rate on the cathodes is not linear in space, he said. The deterioration may occur much faster.

Another project has Baker, Ph.D., assistant professor of electrical engineering, experimenting with electromagnetic launchers that use electrical forces for hyper-velocity propulsion of projectiles. Baker and two graduate assistants are trying to boost propulsion levels in a 6-foot-long railgun to speeds exceeding 6 kilometers per second. Inside a vacuum chamber, an electrical power source generating millions of amperes is used to fire projectiles the size of a .22 caliber rifle bullet at a speed equivalent to a car's traveling 20 miles in 2 seconds.

The problem is that the speed is too slow as an alternative for currently used systems in military or space systems, said Baker, who earned her bachelor's and master's degrees in 1983 and 1985, respectively, from Texas Tech and her doctorate in 1988 from the University of Texas at Arlington. Since 1979, when the first railgun was tested in Australia, researchers have tried unsuccessfully to increase the velocity. It's believed that

energy saturation is occurring on the metal lining of the walls within railgun systems, negating efforts to increase power, Baker said. She is studying the railgun's plasma armature, which triggers the propulsion, and will try placing metal on the back of projectiles in an effort to increase the conductivity of the electrically generated plasma, therefore increasing the velocity.

Most weapons use chemical or pressure-oriented propellants, she said. "The desired advantages of electromagnetic launchers are that they can launch projectiles with higher velocities than



TTU 30 kW DC ARC-JET ENGINE TEST MODEL

current systems, in theory approaching the speed of light, and that they don't require fuel or dangerous propellants to be carried with them," she said.

The potential application of her work, and that of four similar projects in the United States, could be in space-based kinetic energy weapons, rocket or weapon launches from Earth into space and in ground-based weapon systems.

Researchers also are studying high-powered switching, looking for mechanisms that will allow very rapid changes in voltage levels. While the work has obvious space and military applications, one of the best uses may be here on Earth, Kristiansen said, referring to efforts to remove nitrous and sulfur oxides from the gases emitted by the smokestacks of fossil fuel plants. "Europe has inherited a terrible problem. All the marble statues get eaten up by the sulfur oxide. Coal is a very, very, very polluting fuel," he said.

Researchers hope to use a high-powered switching technique. "We need something that can pulse at 200,000 volts 300 times per second and last for years," Kristiansen said. "To switch that on and off for a year, you're talking something like a thousand million switch operations. There's nothing today that will do that."

Another major project is designed to extend the life and improve the efficiency of amorphous hydrogenated silicon cells, or solar cells. Researchers also are trying to increase the power density of high-voltage systems with magnetic insulation principles. The latter effort may help operations within space stations and with high-powered radar, lasers and particle beams.

The research programs have resulted in more than 30 theses and dissertations in the last five years. Five of the last eight winners of the Outstanding Pulsed Power Graduate Student Awards at the Institute of Electrical Engineering International Pulsed Power Conference were Texas Tech students.

"I think it is highly unusual that such a group of students and faculty work as well together as we do," Kristiansen said. "A lot of people from other places have commented on the cooperation. We have clearly, in the area of pulsed power, the leading position of any university, probably in the world."

Kristiansen follows his students' successes with an employment roster that includes Teledyne Brown Engineering, Maxwell Laboratories, Superconducting Super Collider Laboratory, Lawrence Livermore National Laboratory, Lockheed Missiles & Space Co. Inc., Sandia National Laboratories, Naval Surface Warfare Center, Los Alamos National Laboratory and LTV Aerospace & Defense Co.

Perhaps, someday, space explorers from Earth will travel the 1,300-light-year journey to the constellation Virgo to explore those two planets. And, maybe, it will be reported that Texas Tech's research helped spawn the technology that got them there. □

Giving Children an Advantage

By Myrna Whitehead

"It is extremely important that a child's environment is enriched as rapidly as possible during the formative years."

"Children are our future. If society fails to take care of today's children, the children of tomorrow will suffer greatly," says Texas Tech University's Mary Tom Riley. As an educator, Riley is motivated to ensure that all children receive the best start possible.

During her 20-year career at Texas Tech, Riley, professor of human development and family studies in the College of Home Economics, has received about \$30 million from federal grants and contracts. She has earned a national reputation as a researcher, educator and grant-writer extraordinaire based on contracts to the university from the Administration of Children, Youth and Family.

At Texas Tech, Riley serves as director of the Institute for Child and Family Studies. The institute focuses on the

needs of young children and their families, from daycare to early education. Funded by two large federal contracts, Riley and her staff operate a regional resource center where training is provided for teachers and administrators of Head Start programs. Another funded project focuses on training teachers in Head Start programs for working with disabled children.

In the 1980s, Riley and her staff wrote a proposal and were awarded a \$1.2 million grant to form a consortium for the federally funded Head Start program. Riley and her staff provided training for a five-state federal region of

Mary Tom Riley visits the Carver Early Learning Center, a Head Start school in Levelland, where children are mimicking rabbits.



Photo by Artie Limmer



Photo by Artie Limmer

Riley watches young students in the Head Start Program as they explore colors with fingerpaints.

Head Start programs that comprise Texas, New Mexico, Arkansas, Oklahoma and Louisiana.

The results of a study of federally funded Head Start programs in the five-state region influenced the government's national policies regarding Head Start. By evaluating those programs in the region, the study measured performance indicators which determined whether the program was giving children needed skills for performing well in life.

"I became convinced early on that childhood education makes a difference," Riley said. "The entire concept of early childhood in America is based on research conducted by Benjamin Bloom which states that half of all intelligence is gained by age 4.

"The Bloom research really inspired me to see that all children receive the best start," Riley said. "Therefore, it is extremely important that a child's environment is enriched as rapidly as possible during the formative years."

The Head Start program offers preschool children immunization, medical and dental care, speech and hearing screening, educational assistance and other social services designed to better prepare children for school. The goal of the program is to give disadvantaged youngsters a more equal opportunity to excel in the classroom. In 1980, Riley was one of 10 researchers and educa-

tors invited to Washington, D.C., to address governmental policy makers on the benefits of the program.

Riley's success on a national level has allowed her an opportunity to pursue other interests on a statewide level. One of Riley's newest pursuits has been in the area of creating new curricula for state programs such as the Child Care Management System. Her newest publication, "SHAPES," is a five-book curriculum to train teachers in developmentally appropriate practices with preschool children. This project was funded by a grant from the Texas Department of Human Services. Her curriculum is being used throughout various parts of the state.

"This is not one of my big money projects, but it has been one of the most rewarding," Riley said, adding that the benefits of the programs often overshadow the financial facet. "With this program, we can teach basic child care skills to the people who need them the most."

Riley's interest in education was instilled at a young age. As the oldest of three children, she said her parents emphasized education as a means for obtaining individual goals and objectives.

"My parents were hard working Americans who encouraged us to set goals for ourselves," Riley said. "My dad owned a manufacturing company, and

my mother worked with him. Together, they provided a warm, loving and supportive environment."

Riley began her undergraduate work at the University of the Ozarks in Clarksville, Ark., and she later attended the University of Colorado at Boulder and the University of Tampa. Riley completed her undergraduate work and received a bachelor's degree in business administration in 1954. She earned a master's in business administration with an emphasis in education/counseling in 1959 from West Texas State University and a doctorate in early childhood/special education in 1974 from Texas Tech. She did post-doctoral work at Harvard University. During her career, Riley has presented professional papers in several European and Asian countries.

As a researcher, Riley has been able to implement innovative programs that have since become part of the educational curriculum. While working for the McLean Independent School District, Riley introduced a pilot academic counseling program and a summer abroad study course through a humanities class. Later while employed at the Region XVI Education Service Center in Amarillo, she hosted an educational talk show at one of the Amarillo television stations where new programs for public school were discussed.

"I really enjoyed being able to take a

concept from the idea phase and to develop it into something that is beneficial for students," she said.

Among Riley's favorite projects was a three-year training school in Arlington, Texas, called the Master Executive Training School. Funded by a \$150,000 grant from the U.S. Department of Health and Human Services, Administration for Children, Youth and Families division, Riley offered a two-week graduate program focusing on management skills.

Fifty fellows, many of whom were child care administrators at Head Start facilities, were chosen to represent their home states and were taught management skills through teaching techniques such as a business-oriented curriculum. Lectures presented by executives of some of the nation's largest corporations contributed to the curriculum written by Riley. Participants were urged to read numerous professional publications. The training also included a daily workout session which blended physical fitness into the academic program.

Another of Riley's favorite projects involved working with children with disabilities. In 1980 Riley created the film "Head Start, It Really Works" based upon a study conducted by Cornell University. The film started a new interest in Head Start across America. It was shown over and over to lawmakers and citizen groups. After its release, Head Start tripled in size.

Riley later created another film, "Fortunate Few," with funding from the U.S. Office of Education. The film focused on the problems of severely disabled children.

She also produced an additional film series, "LATON: A Handicapped Child in Need." LATON stands for Louisiana, Arkansas, Texas, Oklahoma and New Mexico. The films were based on a longitudinal study concerning the effects of training parents of handicapped children. The films depict the life story of a handicapped youth and his family. Its message is that intervention can make a difference in a child's performance.

Although much of the success of these ventures lies with Riley, she said the success is shared by a great staff of supporters.

According to James Mitchell, associate director of the Institute for Child

and Family Studies, working with Riley for the past 14 years has been the most challenging and rewarding experience of his career.

"I've never known anyone who has been more innovative or creative in designing programs for young children as Mary Tom," he said. "Not only does she have a real love and compassion for children, but she has been an ambassador for Texas Tech. She has traveled throughout our five-state region and the rest of the nation selling Texas Tech to people who otherwise may not have heard of Texas Tech."

"I believe I've been very lucky to be in on a project at just the right time with just the right people."

Merron Teague, former program administrator for the Institute for Child and Family Studies and now assistant superintendent for secondary education with North Forest Independent School District in Houston, said Riley always strives for excellence.

"Everything our office did, whether through a workshop or through individual instruction, we always worked as a unit and we tried to do our best," he said. "I enjoyed working with Mary Tom because I felt she was very dedicated to the education of young children. She also was a good friend who you could talk to about your problems or your concerns."

"If I had to say who has been the most influential on my abilities to write proposals, it would definitely be George Meenahan and J. Knox Jones," Riley said. "They encouraged me to keep on writing." Meenahan, vice president of research services at Texas Tech during the early 1970s, and Jones, a Horn professor of biology and museum science, former vice president for research and graduate dean, were mentors for Riley.

Riley also credits the Office of Research Services and Robert Sweazy, vice provost for research services, for help in obtaining funding.

"I believe I've been very lucky to be in on a project at just the right time

with just the right people," she said. "Most people are as nice to you as you are to them. And that's the key to what I do. A track record, visibility and name recognition are essential when competing for funding."

Riley's contributions have not been overlooked by her peers. She was named Outstanding Educator in 1982 by the West Texas State University College of Education and a similar honor was bestowed by the alumni association of the University of the Ozarks.

Riley said she has remained at Texas Tech for two reasons — Home Economics Dean Elizabeth G. Haley's support and enthusiasm, and Riley's own staff.

"I don't think I could have done the things I've done if I didn't have the kind of loving and supportive staff who works with me. I couldn't have asked for a better bunch of people to work with."

"I have stayed at Texas Tech because of the support I have received from my dean. Bess Haley has a way of making a person feel a part of the larger picture. She truly has been an asset for Texas Tech and the College of Home Economics," Riley said.

The admiration is mutual as Haley calls Riley the most dynamic individual she has ever met.

"Mary Tom Riley is recognized by local, state and national leaders in the field of early childhood education. Her work with Head Start directors and other individuals with providing child care is exemplary.

"She has provided a national database of statistics which have been used in documenting the great success story that Head Start represents," Haley said. "Mary Tom is an enthusiastic person who is excellent at networking colleagues across universities, agencies and states for the good of young children. I'm very pleased that I've had the opportunity to serve as her colleague. She is the leader in acquiring external sponsored project funding for both the college and the university."

As Riley eyes her next objective, she said the ground work that she and others have done in the institute will benefit the future. While her staff is studying new academic challenges, Riley is setting her sights on accepting some new opportunities in the rapidly growing early childhood profession. □



MEDNET

Technology

links

rural doctors

with

urban specialists

By Preston Lewis

Photography by Artie Limmer

As the only physician in the Big Bend community of Fort Davis, James D. Luecke is a celebrity around town. Everywhere he goes, folks call him “Doc,” though at 34 he’s too young to fit the stereotypical image of the elderly country doctor of the horse-and-buggy days.

But like that country doctor of old, Luecke regularly makes house calls. On this Monday night, it is past seven o’clock when he finishes seeing patients at his office and dark by the time he turns down the hardpacked dirt road leading to the modest home of Concepcion and Julia Granada. Both are in their 90s and both are in declining health. Concepcion, or “Chon” as he is called, uses a crutch to get around because of a bad hip from being kicked by a horse years ago. Julia is infirm and wheelchair bound. Luecke wants to check on both of them.

“It’s just easier for me to see them at home than for them to come into the office,” Luecke says. “We visit a little, I examine them and then Chon insists I share a drink of whiskey with him before I go. It’s a ritual, but by the time I leave, I think they feel better even though I may not have done much

medically for them.”

Greeted at the door by the Granada’s daughter and granddaughter, Luecke walks into the kitchen past the wood-burning stove, aglow with a fire in its belly. The smiles of Chon and Julia are as warm as the stove and as bright as the naked light bulb over the table.

The ritual begins again, Luecke examining them both, Chon unlocking a cabinet to get the whiskey bottle Julia does not approve of and Julia offering him his fill of the pork rinds made fresh that morning. Doctor and patients converse in Spanish and all laugh freely. Then after a half hour of more visiting than doctoring, Luecke says his goodbyes and departs at the end of a long day.

Like the medicine of old, rural medicine is still close and personal where physicians don’t just know their patients, they know their families and their problems, many of them not related to health issues at all. That is the side of rural medicine that is beginning to draw young family practitioners like Luecke and Clifton Pearce in Alpine and Sheri J. Talley in Fort Stockton back to the rural areas to establish practices and lives.

But there is another side to rural



medicine, a side that not all doctors can handle, the long hours and the isolation. Dr. Luecke on the night of the Granada house call, for instance, had had no supper except for the handful of pork rinds. And, he was still 26 miles from his home in Alpine where he lives to be close to Big Bend Regional Medical Center, the nearest hospital to Fort Davis.

The only hospital ever in Fort Davis

closed in 1891 when the military post that gave the town its name was abandoned. Today the partially restored hospital is part of a national monument that preserves a way of military life that has gone the way of the cavalry and the telegraph, which helped the U.S. Army close the gap between forts on the early West Texas frontier.

Today the Texas Tech University Health Sciences Center is using the

telegraph's progeny, the telephone system, to help close the gap between rural physicians and their urban counterparts. Through the Texas Tech MEDNET interactive video consultation system, a service of the health sciences center's newly established HealthNet, specialists at the health sciences center are helping family practitioners in Alpine and Fort Stockton receive subspecialty consultations without their patients having to leave the community hospital.

This consultation service and the health sciences center's innovative KARENET and Tech Link programs are being consolidated into HealthNet, a comprehensive department that will use technology to address a variety of rural health care needs. HealthNet's components will include the MEDNET continuing education service which is providing accredited on-the-job training by satellite for doctors, nurses and other health care professionals at some 50 hospitals in Texas and New Mexico.

Top: The only hospital in Fort Davis was abandoned in 1891 and is now part of a national historic site at the former Army post. Left: Dr. James D. Luecke visits with Julia Granada and her daughter during an after-dark house call.





Above: Dr. James D. Luecke finds it easier to check Julia Granada at home than for her to come to his office for an exam. Right: Concepcion "Chon" Granada is a patient as well as a friend for Dr. James D. Luecke.

"The longer you practice rural medicine," said Dr. Pearce, "the easier it is to get away from the science of medicine and to rely too much on the art of medicine. MEDNET helps you keep the science of medicine in balance with the art of medicine."

Pearce and Luecke have each done more than 50 video consultations with their patients and Texas Tech subspecialists in Lubbock and Odessa. Talley has just started using the video consultations in Fort Stockton. Additionally, all three regularly attend Texas Tech MEDNET's Wednesday satellite broadcasts of continuing medical education programs for physicians.

"MEDNET takes the loneliness out of patient care out here," Pearce said.

For Dr. Talley, MEDNET helped uncover a sexual abuse problem for one child and a neurological problem for a 47-year-old man.

"Both patients would have been difficult to diagnose without MEDNET," Talley said. "The information I received was new and the final diagnosis was different from what I had been thinking."

Most times, though, the consult confirms the rural practitioner's diagnosis. In well over 80 percent of the MEDNET consultations to date, the rural practitioner's original diagnosis has held, said Texas Tech MEDNET Director J. Ted Hartman, former dean of the School of Medicine.

"These are doctors you would do well to have as your own physicians because they are knowledgeable, dedi-



cated and good, no doubt about it,” Hartman said. “The problem is that the rural doctor is often the ‘Lone Ranger’ with no place to turn for subspecialty help.”

For instance, when William Henry Bedford Langham, or Willie as his parents called him, was born in the summer of 1990 with fingers only partially developed on his left hand, Dr. Luecke needed answers. First, what could be done for Willie? And second, was this a genetic problem that would affect Tom and Laura Langham’s future children? The first question could be answered by a pediatric orthopaedist and the second by a geneticist. While Alpine certainly lacked such subspecialists, the Texas Tech University Health Sciences Center did not and Dr. Luecke scheduled a video consult when Willie turned six-months old.

Dr. Mary Lynn Newport, a Texas Tech orthopaedist and hand surgeon, did a long-distance examination of the newborn as Dr. Luecke manipulated Willie’s hand before the video camera. Dr. Newport then studied the X-rays as the camera focused on them. Nubs of bones in the thumb, forefinger and middle finger showed up white on the X-ray. No white or calcium appeared in the ring finger or the little finger. With no bone in those fingers, there were likely no tendons. Nothing could be done for those two fingers, but for the thumb and two large fingers there was hope. However, it would require time to see how the fingers developed, Newport said, before deciding on the best corrective option. Newport would need to see Willie periodically to assess the options.

Next during the initial video consult, Dr. Terry L. Myers, a Texas Tech pediatrician and the only medical geneticist in West Texas, allayed the fears of Tom and Laura Langham. The problem was caused, not by genetics, but by amniotic band syndrome, a malady where fibrous bands develop in the uterus and entangle the growing fetus so a limb, or in this case fingers, cannot grow properly.

“Amniotic band syndrome has no recurrence risks,” Myers assured the Langhams. “If the parents are talking more kids, the chance of having another baby with this problem is no greater for them than for any other parents.”



Though the subspecialists were more than 275 miles away, the Langhams after the 20-minute consult had to drive only 26 miles from the Alpine hospital back to their Fort Davis home, a vast savings in time, distance and money compared to a trip to Lubbock.

Fourteen months later, Tom and Laura Langham made the trip to the hospital again for a follow-up exam with Dr. Luecke in Alpine and Dr. Newport in Lubbock. By then Willie was almost 2 and was a bright, bouncy boy exploring everything around him. Sitting in his mother’s lap, Willie took a pen from Dr. Luecke and began to play with it, alternately grasping it with his right hand and his left hand. In Lubbock Dr. Newport watched her monitor and Willie.

“Developmentally,” Newport said, “he’s doing really well with that hand, the best we can expect with what he’s got.”

Then Dr. Newport studied the latest X-rays transmitted from Alpine. She noted that Willie’s finger stubs had grown proportionately to the hand. That was a positive sign, at least for the thumb and the first two fingers which could ultimately be lengthened by a new technique that stretches bone, muscle and nerves with minimal surgery.

“We need to watch him once a year until he’s 4 or 5,” Dr. Newport told Luecke and the Langhams, “then we can consider lengthening his index finger and his thumb. My aim is to make

A video consult connects Dr. James D. Luecke and Willie Langham, seated with his parents in Alpine, with Texas Tech hand surgeon Mary Lynn Newport in Lubbock.

sure this hand is a good helping hand, as opposed to a normal hand, so it helps him pinch, helps him grab his pants to pull up his zipper, helps him button buttons, things like that. For that he needs his index finger and his thumb.”

Luecke concluded the Langham consult and moved into an unscheduled consult that he had piggy-backed onto the first. Almost two years before, another unscheduled consultation first showed Luecke the dramatic possibilities for MEDNET consultation. The very first MEDNET consultation was conducted June 29, 1990, as a surgical follow-up on one of Luecke’s patients who had had a colostomy in Lubbock.

At the end of that consult, Luecke asked Dr. Hartman, “Is there any way that I could show a chest X-ray to a neonatologist up there? We’ve got a pretty sick baby.”

With that request, the MEDNET staff immediately contacted Texas Tech’s chief neonatologist, Dr. Marian Myers, who was making rounds at University Medical Center. Within minutes, Myers reached the MEDNET studio and a life-and-death drama unfolded before the cameras in Alpine and Lubbock.

Luecke explained the baby’s breathing difficulty, then showed an X-ray



of the baby's chest. The sharp television image helped Dr. Myers make an immediate diagnosis: right upper lobe pneumonia. But, there was more. Dr. Luecke reviewed the lab reports on the blood tests and Dr. Myers identified another problem, metabolic acidosis, a condition created by excessive acids in body fluids. In a newborn, the condition can be critical because a baby's capacity to correct the problem by breathing is limited.

Dr. Myers informed Dr. Luecke of the proper medicines and dosages for the newborn. In return, Luecke gave her the thumbs up sign as he rushed off to treat the baby. With medication, the newborn was stabilized and then transferred more than 140 miles to Odessa, site of the nearest tertiary care center. Less than a week later, the fully recovered baby went home for the first time.

"This was an unforeseen situation," said Hartman, "which demonstrated conclusively how communications technology can help physicians and can save patients."

"Our biggest problem as rural physicians," said Luecke, "is that we are isolated. In big cities you certainly have some relief just down the street, but out here it's a long road to Odessa or El Paso. You can get on the phone to a specialist, but you can't show the problem like you can with MEDNET.

"With MEDNET I can offer my patients a lot of subspecialists without having to send them on the road," Luecke said. "A patient's problem

has to reach a certain threshold before you want to put them to the expense of sending them out of town. This way, we can get consulting faculty quickly, without a lot of travel and a lot of expense."

In fact, an independent evaluation by the Lubbock and Austin accounting firm of Durbin & Co. estimated that each MEDNET consultation saved an average of \$1,500, compared to the alternative of sending patients, in some cases by ambulance or helicopter, to a tertiary care hospital. The accounting firm determined that figure by selecting 11 MEDNET consultations at random and then matching the actual cost of the treatment with the projected cost for transportation and urban treatment.

The patients selected in the survey were treated for problems ranging from a rash to a broken hip to pneumonia to congestive heart failure due to a reaction to a prescription medication. For eight of the patients, their medical needs were handled in Big Bend Regional Medical Center after the interactive MEDNET consultations. Three patients had to be transferred to other hospitals. The MEDNET consultations resulted in projected cost savings as high as \$4,954 for six patients and in no direct change in projected costs for the other five.

In addition to saving the patients money, the consultations made money for Big Bend Regional Medical Center. Without the consults, all of the 11 patients in the random survey would likely have been transferred to larger

hospitals. But with eight of the patients, the MEDNET consults helped keep them and their revenue at the Alpine hospital.

Big Bend Regional Medical Center is licensed for 50 beds and certified for 34 beds with a realistic capacity of 25 patients, said hospital Administrator Richard D. Arnold. The hospital averages a daily census of just over 10 patients. For a hospital that survives on the margin, a handful of patients by urban standards can make a difference in rural areas.

"It makes it very difficult to pay the bills at 10 patients a day," said Arnold. "If we could average between 15 and 20 patients a day, then the economies of scale would kick in."

As a demonstration project, Texas Tech MEDNET has been funded by \$1.9 million in grants from the U.S. Department of Health and Human Services. The Texas Tech University Health Sciences Center, in line with its mission to address rural health needs, has provided additional funds and has received contributions of equipment and funds from AT&T and Southwestern Bell. As a result, the hospitals in Alpine and Fort Stockton have not had to pay the start-up costs or the telephone line charges for MEDNET's interactive video. The initial equipment costs, including digital encoding equipment, video equipment and computer hardware, were about \$65,000 per hospital.

Because of its remoteness, Alpine has limited telephone service which uses analog microwave and copper wire



instead of more versatile fiber optic lines. MEDNET's interactive video component must rent a fully dedicated T-1 telephone line from Alpine into Odessa where it can connect with the health sciences center's Tech Link system. The monthly line charge for the 127-mile Alpine line is \$3,750, a fee that is beyond the reach of most rural hospitals.

"Communications technology has exploded so fast," said MEDNET Director Hartman, "that government regulations and telephone line tariff issues have not kept pace. We have to rent that line 24 hours a day, every day, rather than access it on demand because that's what the regulations, based on old technology, require. Somehow we've got to get past those regulatory issues so we can provide economical service to the physicians who are on the frontline of medical care."

Alpine, for instance, has four physicians, all family practitioners. These four physicians, Drs. Luecke and Pearce among them, do everything from delivering babies to setting broken bones to performing appendectomies to treating colds.

"I like it," said Dr. Luecke who grew up around Wichita Falls, "because I do a little bit of everything. That's what medicine should be."

Dr. Pearce, who grew up in Bay City and Harlingen, said, "I came to Alpine because it's a good, small community off the freeway where doctors can do real family medicine instead of being a

traffic cop who directs patients to specialists down the street. Out here, it's a more patient intensive process. If you can do it, you do it."

Hospital Administrator Arnold said, "Our physicians are generalists, but sometimes they need a medical colleague's opinion. The consultative video gives them access to a more specialized level of care which can make them feel more comfortable in treating their patients.

"For small rural hospitals to survive, there has to be networks like this so our physicians have partners in providing the next level of care," Arnold said.

At Pecos County Memorial Hospital 67 miles away in Fort Stockton, Administrator William H. Maloy agreed. "It's building a bridge to Texas Tech faculty for our doctors. It's good for our local citizens to realize that we are not an isolated, free-standing unit, but that we have direct access to a major medical center."

Maloy administers a 37-bed hospital, with a daily in-patient census of just over 10 patients. Fort Stockton has five physicians, including three family practitioners, a surgeon and a pediatrician.

Dr. Talley, who grew up in Midland, is one of the family practitioners who, like her counterparts in Alpine, chose her specialty and a rural practice site because they fit her conception of what medicine should be.

"I like being able to do everything from obstetrics to surgery," she said. "I like being able to know my patients and their family situation. That's easier

MEDNET is helping overcome the isolation and vast distances which make rural health care delivery so difficult in West Texas.

to do in a small town and it helps me better treat them."

After her first video consult on a difficult child sexual abuse case, Dr. Talley teamed with Dr. Rafael Garcia, the consulting physician and Texas Tech's authority on child abuse, to give a satellite-broadcast program on the subject for physicians in the some 50 rural hospitals subscribing to MEDNET's continuing education service.

Said MEDNET Director Hartman, "When we have a consult that we think might be particularly appropriate for other rural physicians, we try to incorporate that physician into one of our regular Wednesday continuing medical education programs for doctors. Who better to address issues faced by the rural physician than a rural physician?"

Hartman and a MEDNET staff of a dozen have taken the concept from an idea just three years ago to a reality that today is drawing attention nationally from other states interested in addressing their rural health care needs and from the nation's capital.

"Sometimes I think we've amazed ourselves at how well the consults have worked," Hartman said. "We thought the consults would work and the doctors would accept them, but we didn't know for sure until we tried it."

Dr. Pearce, for another, is pleased with the result. "MEDNET," he said, "makes me a better doctor." □

Amarillo Center— Care for the Masses

By Kim Davis



Photo By Artie Limmer

With continuous support from surrounding hospitals, the Amarillo Regional Academic Health Center is contributing greatly to the welfare of West Texas residents.

Nestled in the center of the Texas Panhandle, the city of Amarillo understands the need for rural health care delivery. Because the city is surrounded by numerous small, West Texas towns — many of them without a single health care facility — Amarillo is charged with caring for the masses.

To the physicians of Texas Tech's Regional Academic Health Center in Amarillo, this charge is a welcome one.

"If there's one thing Amarillo is blessed with, it's talented doctors," said E. Lee Taylor, M.D., associate dean of the Amarillo health center. "It's important to us to be able to care for people who otherwise might be left out of health care services."

Surrounded by four major Amarillo hospitals, the Texas Tech branch is quite capable of providing the kind of quality service its patients demand. The regional center, Taylor explained, encompasses four specialties: obstetrics/gynecology, internal medicine, pediatrics and neurology, as well as a department of family medicine. The surrounding hospitals — particularly Northwest Texas Hospital, which provides the majority of financial support for Texas Tech faculty and residents — also provide educational opportunities to better prepare resident physicians for future practice.

"It's important that Texas Tech maintain physicians in this part of the state," Taylor said. "Since the institution's inception, our mission has been to provide quality care and education in hopes of maintaining qualified physicians in the West Texas rural communities. Amarillo is contributing to that mission. We've been quite successful in keeping a majority of our residents in this area after they have completed their training."

But not only are physicians caring for patients who are already sick. Amarillo doctors also are emphasizing preventive care for healthy patients. This focus of the regional center, Taylor said, is an ongoing effort to encourage patients to take charge of their own health and recognize healthy living behaviors. In just under three years, for example, the center's Maternal and Infant Health Improvement Act (MIHIA) Program has directly contributed to lowering the infant mortality rate in Amarillo and its surrounding areas.

The program — supported in large part by Northwest Texas Hospital — provides prenatal services to medically and financially eligible low-income women and their infants.

"In just the two years we've been in existence, we have noticed most of our high-risk pregnant moms are having healthy babies," said Shanna Assiter, director of Amarillo's MIHIA Program.

Under the umbrella of the department of pediatrics and jointly sponsored by the department of obstetrics and gynecology, the MIHIA Program has doubled its client numbers, now seeing a patient load of nearly 3,500 pregnant women annually.

"Northwest Texas Hospital is keeping busy," Taylor said, adding that the hospital provides obstetrical care and pediatric intensive care facilities for the MIHIA Program.

The MIHIA staff also has what Assiter termed "satellite people" tending to high-risk moms in rural towns such as Pampa and Borger, both several miles away from any adequate health care facilities.

"The essential goal of the program is not to weed people out of MIHIA, but to bring people in," Assiter explained. "A lot of our clientele are illegal aliens or low-income people who in the past have been shut out of the medical system."

"It's important that we welcome these people and help them back into the health care system that they've been so fearful of in the past."

By providing prenatal care to these high-risk patients — who range in age from 15 to 35 — physicians, nurses and social workers of the MIHIA Program not only are helping to ensure a healthier baby, but also are saving taxpayers thousands of dollars in health care costs.

It costs the health care system anywhere from \$30,000 to \$45,000 for every seven-day stay an infant spends in the neonatal intensive care unit, said Phyllis McLemore, former director of Amarillo's MIHIA Program. Taxpayers, she said, are left with that cost for every mother who cannot pay for her newborn's health care. But with proper prenatal care, fewer babies are born with the health problems that lead them down the path of expensive medical bills.

"From start to finish, the cost of hav-

ing a baby through the MIHIA Program is approximately \$264 per participant," McLemore said. "This counts for lab work, case management and prenatal care. You can see for yourself that this is a major savings for the health care industry."

Premature births are the No. 1 contributor to such high mortality rates in this country, said Rolf Habersang, M.D., associate chairperson for Amarillo's department of pediatrics.

"The goal of the program is to have prenatal care for all women, so that we don't have premature babies," he said. "In time, this would lower mortality rates that are already much too high in the United States."

Thanks to the MIHIA Program, Assiter said, Amarillo now has a lower mortality rate than the nation as a whole. Last year, Amarillo suffered 5.5 deaths per 1,000 births, while the United States overall is right at 10 deaths per 1,000 births.

"The MIHIA staff has a lot of ground to cover in the Panhandle area," Taylor said. "Part of the reason for their success is their dedication to rural health care delivery."

But pediatrics is not alone. The department of internal medicine also is striving to meet the health care needs of rural communities. Texas Tech regional physicians, for example, are a welcome addition to the under-served population of rural Claude.

Without on-site medical care, residents of the small community must travel several miles to find the health services they need. But for two years now, Margaret Thurmond-Anderle, M.D., has been saving residents that long drive. Thurmond-Anderle spends five half-days per week in Claude as an on-site physician for outpatient care.

As a board-certified internist, Thurmond-Anderle is able to see and treat the general population of these rural communities, and as a board-certified rheumatologist, she also is able to treat much of the elderly population for arthritis.

"Arthritis is a common problem in farmers and ranchers," said Steve Urban, former associate chairperson for the department of internal medicine. "There are a lot of these types of hard-working people in Claude. Without on-

site visits, patients would have to travel several miles to see a physician in Pampa, Panhandle or Amarillo.”

For the staff of both the MIHIA Program and internal medicine, Taylor said, travel is as much a part of their jobs as checking pulses. And, while Amarillo is home to most regional center employees, their offices encompass the entire Texas Panhandle.

Just 40 miles northwest of Amarillo in Tascosa, for example, sits one of the many offices of Charles Wright, M.D., associate chairperson for the department of family medicine. There, Wright and other staff members serve many functions as health care providers to the Cal Farley Boys Ranch.

Boys Ranch is home to 343 boys representing 22 states. Most of the boys — ranging in age from 5 to 18 — typically come from broken home situations and are in need of guidance, a wholesome environment and consistent encouragement in academic, vocational and religious training.

“Basically, the kids that come to Boys Ranch are a bunch of good kids in bad situations,” Wright said.

Wright and his staff serve as medical directors at the ranch every Tuesday afternoon in an on-site facility of two exam rooms, a dental office, an optometry office and 40 beds for over-night stays.

“I tell you, working with these kids is one of the true pleasures of practicing medicine,” Wright said, adding that he sees a variety of problems — from sports injuries to behavioral problems and from acne to strep throat.

The main goal at the ranch is for all boys to graduate from high school and go on to lead healthy, rewarding lives, Wright said. And for those who do well academically, Boys Ranch often is able to help fund a college education.

“A lot of people think these kids are delinquents,” Wright said. “But they’re not. As a matter of fact, they’re some of the most wholesome kids I’ve ever known. They’re one of the biggest reasons I love doing what I do.”

Fortunately for the mission of Texas Tech, most of Amarillo’s doctors, nurses and residents love doing what they do. After all, Taylor said, nearly 66 percent of Amarillo’s resident physicians remain in Texas after graduation. And of those staying in Texas, 63 percent choose to set up practice in the Panhandle and in

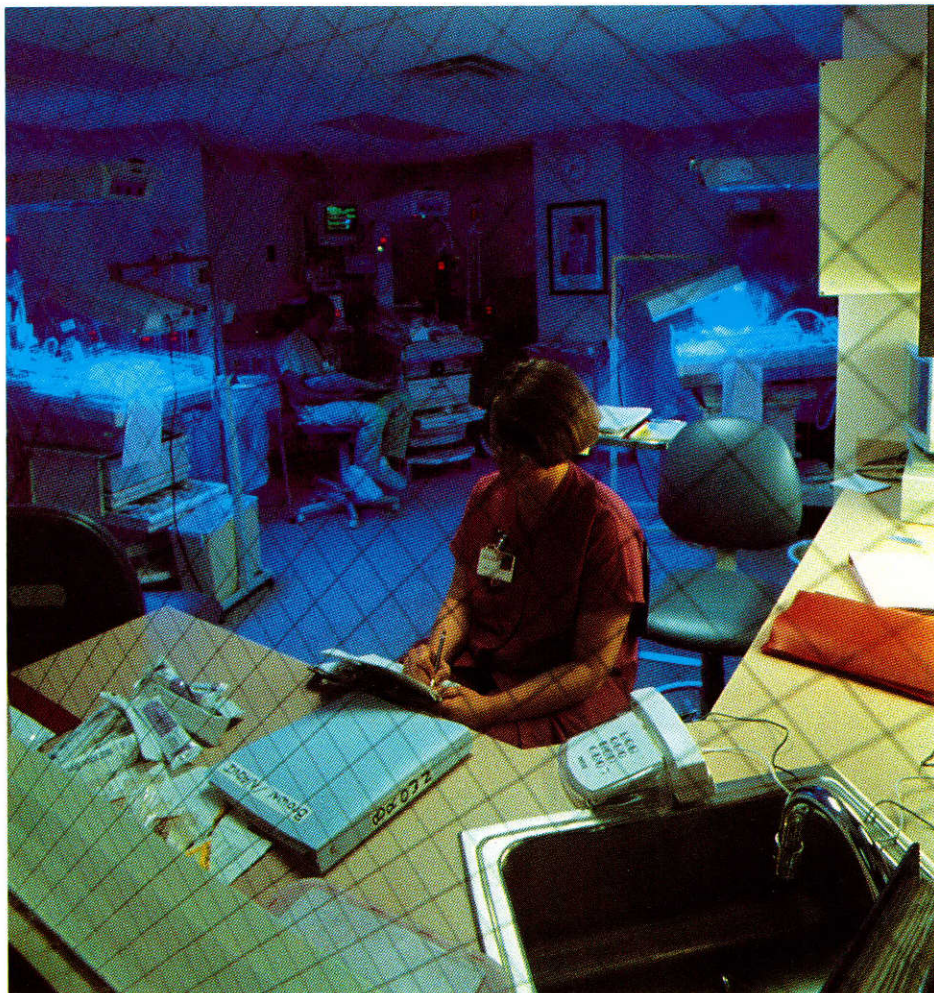


Photo by Arnie Limmer

other West Texas communities.

While the Amarillo center has not even been in existence for 20 years, its programs, staff and expertise is growing in leaps and bounds. From programs in infertility and intensive AIDS research to developments such as the recently established epilepsy clinic and the Bone Marrow Transplant Unit, the regional center is answering the needs of rural West Texas.

Before the Bone Marrow Transplant Unit’s inception in January 1991, Taylor explained, patients were forced to seek help as far away as Dallas or Denver. Under the direction of Panpit Klug, M.D., the new program utilizes the in-patient unit at High Plains Baptist Hospital and receives both clinical and research lab support from the Don and Sybil Harrington Cancer Center. Now patients with leukemia and lymphoma are able to find help at home in Amarillo.

“We have a unique situation,” Taylor said. “We’re fortunate to be able to turn

A Northwest Texas Hospital nurse watches over the Minimal Stimulation Room of the Neonatal Intensive Care Unit.

to the many hospitals we have here, from the Veterans Administration Medical Center to St. Anthony’s Hospital across town. We’re able to count on every one of them for support in one form or another.”

And, Texas Tech counts on the regional center in Amarillo. The health sciences center’s mission — from Lubbock to El Paso to Odessa and Amarillo — is to provide quality health care services to rural citizens who might otherwise be without adequate medical attention.

Amarillo health care providers have taken that charge seriously, Taylor said, and are continuously searching for more ways to provide outreach programs to the many rural citizens of the West Texas Panhandle. □

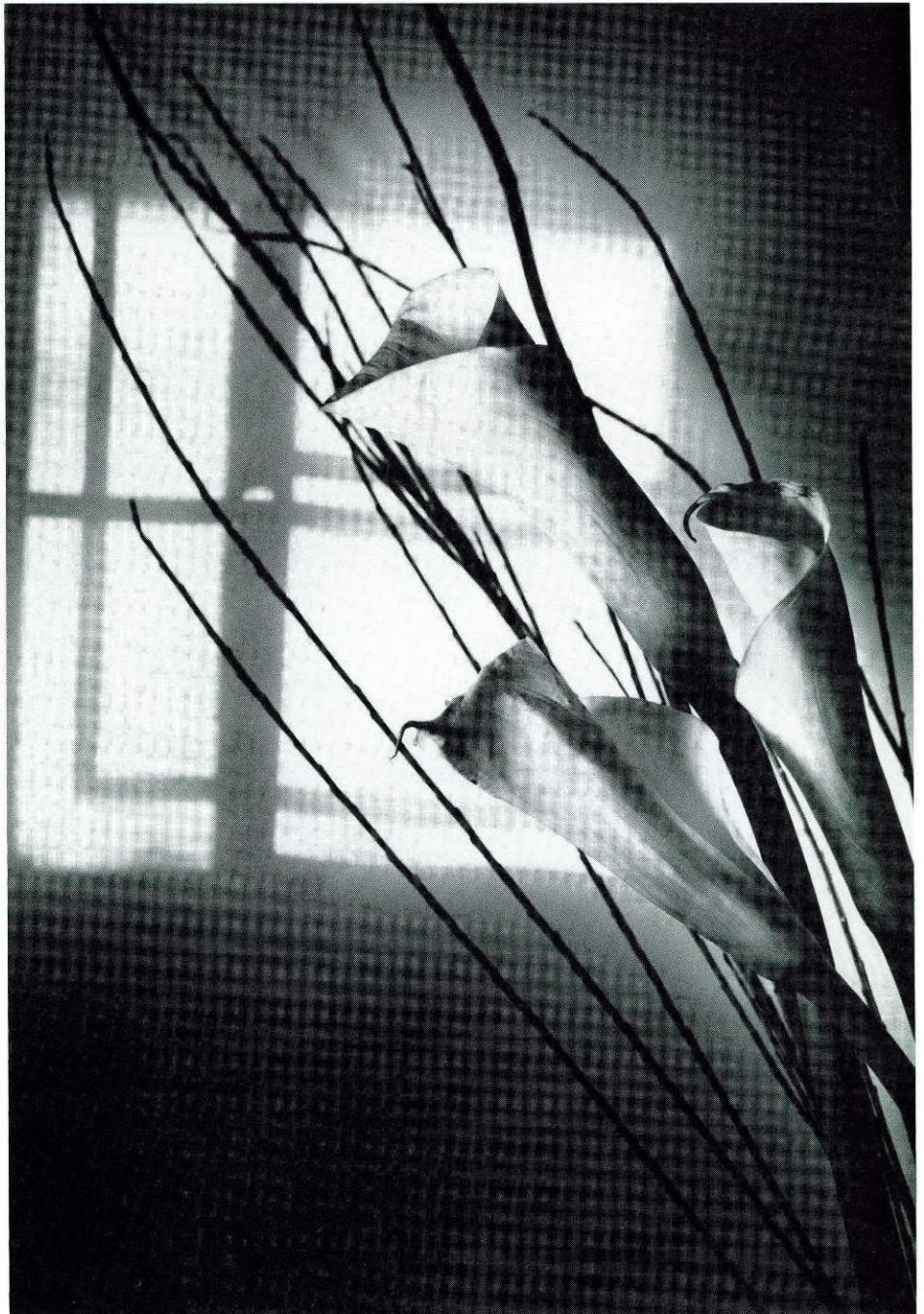
IMAGES

Photography faculty establish visual language

In graduate school I read the following quote by Lewis Hine: "I wanted to show the things that had to be corrected. I wanted to show the things that had to be appreciated." This quote is to the point and expresses my approach and appreciation of photography. My work and interest vary — I may be working in the more journalistic style of "street photography" and then switch to work that is more traditional, e.g., "landscape photography." Some photographs I find beautiful and significant simply because they offer us a fresh and challenging insight of vision. However, the photographic work I like best deals with visual and social contradictions where our understanding and perceptions of reality are altered, forcing us to think more seriously about what is significant. For me this approach to photography can help change our vision from one of simple sight, to a more intense way of seeing, insight.

— Hershel Womack
Assistant Professor
School of Mass Communications

Untitled
Hershel Womack



Generally speaking, one of the dichotomies of photography is its dependence on the physical. One is limited to “being there” in order to photograph. However, there are overwhelming possibilities on where to be. An extraordinary place “to be” is on the Llano Estacado or the staked plains of Texas. This north-west part of Texas is an incredibly flat and vast area. Most of the year it is without water. For the few trees that grow on the plains, wind is their constant companion. To visitors, the starkness of this landscape seems void and barren, but there is a real beauty to the land and a strength to the people who have lived here for generations.

Having spent more than 15 years here, the isolation of this area compels one to be contemplative, and the minimalistic qualities of the land tend to spark imagination. These photographs are part of my response to the land and its people.

— Ashton Thornhill
Associate Professor
School of Mass Communications



Cristo Rey celebration, a Catholic mass, outside El Paso
Ashton Thornhill



A nun walks the path during the Cristo Rey celebration.
Ashton Thornhill



View from the Driver's Seat
Purina Mills Inc., Lubbock
James Hanna

The question is often asked, "What is photographic art?" Meaning, how does it differ from other forms or types of photography?

Photography as an art medium has, since the end of World War II, become increasingly allied with the issues of the visual arts as a whole. It has moved away from the traditional photographic role of being a functional tool. It no longer need be considered literal or objective in its depiction of reality. This has opened new possibilities. We see and understand more now, we accept a photograph that is more overtly personal, experimental and ideational. The medium has become provocatively expressive.

The artist often places his photograph on the edge of acceptance — a dangerous position indeed. The artist accepts the fact that not everyone will understand the image. Each viewer is invited to form his or her own opinion as to the content of each picture. This is actually an amalgam of the descriptive information the artist places in the image; and the cultural, aesthetic and life-experience associations the viewers bring with them. Thus, photographic art tends to be a collaborative of the artist and the viewer.

— James W. Hanna
Associate Professor
Department of Art

From the caves, temples and samadbi shrines of saints in India to the sacred places of the Navajo in the American Southwest; from the two lane highways and back roads of rural America to the strange contrasts of urban metroplexes, the subjects that I photograph range from traditional places of pilgrimage to curious locations in the everyday world discovered by chance. My resulting photo-drawings are both descriptions of actual scenes and references to recurring themes from different times and places. While one aspect engages the present moment, another searches for an unseen larger pattern that includes past, present and future all at once. In the layering of hand drawn marks on photographs, and in the sometimes humorous incongruities visible in the places that I photograph, I'm interested in the dialogue between inner experiences and outer ones, old ways and new ways, the mythical and historical, the sacred and secular. All along I wonder: Where did we come from? And where are we going? The stillness and silence of each photograph provide a mirror for experience that reflects whatever each viewer is willing to see, even while it points to the illusions and mysteries inherent in our limited understanding.

— Rick Dingus
Associate Professor
Department of Art



County Fair Roper, Lubbock, Rick Dingus



Underground Stairway, Sonora Caverns, Texas, Rick Dingus



Photo by Artie Limmer

The Sound of Music

By Kippra D. Hopper

Many students learn to read music; other students listen to music while reading. Now, some Lubbock elementary school students are learning to read with the sound of music.

Donald Tanner, Ph.D., of the Texas Tech University School of Music faculty, for more than five years has been using a phonemic alphabet and elements of music to teach first through fourth grade students how to read and write.

Tanner has discovered that his approach toward literacy is especially helpful in teaching those children who are dyslexic or who have other learning disorders and those who come from bilingual homes with emphasis on English as a second language. Regular

classroom students also benefit.

For five years, Tanner's research has been funded by the Initial Teaching Alphabet (i.t.a.) Foundation of Roslyn Heights, N.Y. He has received \$182,000 in grant monies.

Tanner uses the Initial Teaching Alphabet which is comprised of 44 symbols representing the 44 sounds of the English language. The i.t.a. is simpler than the 26-letter conventional alphabet because it does not require knowledge of irregular spellings.

The i.t.a., perfected in 1960 by Sir James Pitman, offers beginning readers with an almost perfect one-to-one correspondence between sound and symbol. In the English language, a lack of correspondence exists between the sounds, or phonemes, and the printed or written representations, or graphemes. Words that have the same spelling patterns can have different sounds — as in “go” and “do.” And words that have different spelling patterns can have the same sound — as in “bed,” “head” and “said.”

Tanner notes that many kindergartners and first-graders come to school with extensive vocabularies.

“We start by using the words in their vocabulary and teach them to sound out the words. The emphasis is on sounds rather than spelling rules, which are more difficult to grasp,” Tanner said.

Tanner adds music to the instruction, and he has observed that children read with more fluency and thus have a greater comprehension of what they have read.

“I use music with i.t.a. because many children hesitate when they read and have no idea what the paragraph means. I have discovered that if children read rhythmically, it helps remove the hesitation, and they read much more fluently and tend not to stumble over words,” Tanner said.

He notes that several elements have parallel functions in both music and reading, including phrases, steady beat, rhythm of the words, meter, melodic contour and rhyme.

Tanner began thinking about using music to teach children to read when

North Ridge Elementary school teacher's aide Amy Pierce (left) and teacher Terri Highsmith lead first graders in the button game.

he had two graduate students who were excellent performers and were dyslexic.

"When the young woman, a pianist, would look at numbers, the numbers would invert for her. She learned to compensate for her difficulty, and she played beautifully. I asked her how she could read music. She said she was familiar with the styles of certain composers, especially Mozart and Chopin. If she were playing music by those composers, she could anticipate what the composers were going to do musically, and she could sight read. But, if she were given something in a style unfamiliar to her, she could not sight read nearly as quickly or accurately."

Tanner said the flutist had a problem distinguishing left from right, another common problem with dyslexics.

"He looked to see where he wore his watch to know which direction was left. He played well, but he also said he could not sight read quickly. I realized these problems may affect reading also," Tanner said.

Tanner — who has conducted his research in the Frenship Independent School District — began his work initially only with students who were dyslexic. He soon realized that his approach would be helpful to all students who have reading problems.

"A diagnosed dyslexic should have untimed examinations. If they know they are not timed, they do alright. But if they know they are timed, they become frustrated. Dyslexics are often above normal IQ. They are usually very creative and need an opportunity to take advantage of their talent," he said.

"Dyslexics do not all fit into one category. They have different kinds of problems. We often think a dyslexic reverses letters or words, but he or she may not. Actually, some of the leading neurologists say that only a small percentage of children who are dyslexic reverse words, such as 'was' and 'saw.'

"I work with some dyslexics whose eyes jump ahead in the line of print. Their eyes are scanning constantly to see what is coming. They are looking for something familiar. This causes them to get things out of order, and what they are reading does not make sense," Tanner said.

Tanner points out that dyslexia formally is a reading disorder. Most dyslexics can isolate sounds, he said, so

if instructors are sequential and go step by step, very slowly, students can learn to read and write.

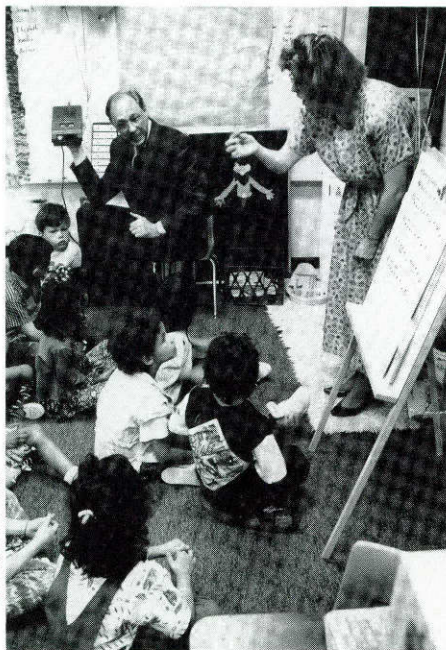
Tanner believes a three-dimensional approach is useful in teaching children to read. Learning is part visual, part auditory and part kinesthetic, or learning by doing, he said.

"We make learning tasks into games. We have them speak it, we have them write it, we have them recognize it and we have them perform musically. It is multisensory, using every sense," he said.

Tanner also promotes "sky writing." "If you sky write a letter with a stiff elbow, the process helps create an impasse to the brain and you are more nearly apt to remember what you are writing.

"First they keep a steady beat, and they put a sound to every syllable, and then we use rhythm instruments, which are instruments that are non-pitched. Two examples are rhythm sticks or tone blocks. We use rhythm instruments to develop coordination. I am discovering that physical coordination has a considerable effect on how one reads. If individuals are poorly coordinated, they are a little more halting in the way they read and in the fluency with which they read. Ultimately, if they stumble when reading, they do not comprehend as well," he said.

Tanner and his assistant, graduate



Dan Tanner (left) and Lari Young conduct a rhythmic chant of the button song.

student Lari Young, have used the i.t.a. musical approach with the Chapter I program, a federally funded reading program for students who are deficient in reading. They also have worked in special education classes and normal population classrooms.

"It seems that kids learn to read faster by using this method, with the music added to it, with the rhythm underlying the words. They read a sentence like 'The . . . cat . . . ran . . . fast,' and they will read it very choppy and slow. After we put rhythmic values over the words, students can read it with rhythm. We start with a steady beat, then we increase the tempo, and they can read and comprehend it. It's amazing," Young said.

Having taught elementary music in San Antonio for three years, Young said most children love the currently popular rap music, so she writes rhythmic raps for them. For example, the long vowel rap begins: "a . . . a . . . angel . . . e . . . e . . . eagle . . . i . . . i . . . ice cream . . . u . . . u . . . unicorn . . . o . . . o . . . old"

"We emphasize the music. We do rhythmic and melodic activities. We talk about accents. We are teaching them music, and a lot of the elements in music such as dynamics, loud and soft, and melody, high and low," Young said. "Music helps us remember things, so the students better understand what they read. Using music gives their reading a kind of shape."

Tanner and his assistant use bells, which are pitched, to teach about melody. "Bells are like a piano keyboard. We talk to the students about going up and down melodically. They can learn a song easily. Then we take it from the song with the rhythm and the meter and put it back into the reading."

The i.t.a. music program is organized so that in the first or second grade, the students can be transitioned out of i.t.a. and into the conventional alphabet at the end of a year.

"We do attempt to do that as standardized tests are given in the spring, and, of course, the standardized tests, which all students take, are in the conventional alphabet," Tanner said.

Something new and valuable still might be learned from the old musical verse: "Reading and 'riting and 'rithmatic taught to the tune of a hickory stick" □

(Editor's Note: The following opinion piece was written by Darryl M. Williams, M.D., who is the dean of the School of Medicine at the Texas Tech University Health Sciences Center.)

Deciding Health Care Priorities

By Darryl M. Williams, M.D.

The problem is obvious. We as a nation must come to terms with how we are going to pay for the medical care we all demand. Our wants are simply stated. We demand high quality care, which often translates into high tech care. We want low cost. We insist upon immediate access.

Those wants, however, do not compute. We as a nation cannot do all three, and we are approaching the day when we must make choices among them. Maybe we can do only one. Hopefully, we can do two. But even if we can manage two, the omission of one becomes a form of de facto health care rationing, much like cost and insurance coverage often dictate who gets treated.

Right now this country spends 12 percent of the gross domestic product on health care delivery. That averages out to more than \$2,000 a person. On top of that, health care costs nationally are rising two and a half times as fast as the consumer price index, the standard measure of inflation. Unless we change the current trend, we may well be spending more than 20 percent of our gross domestic product on health care by the end of the century.

Even with such a disproportionate expenditure, we as individuals may not be — and we as a nation economically certainly will not be — any healthier for it.

That paradox may be the ultimate

irony for a nation that without a doubt has the best health care system in the world. This is the medical system that has received 44 of the 74 Nobel Prizes awarded in medicine over the last 30 years. This is the health care system that continues to lead the world in innovation, even when other segments of our nation's economy have lost their technological advantage to foreign competitors.

Medical innovation, though, is of little value unless it reaches the people in need and this country's medical system has done that. For example, at the time Canada had only 12 magnetic resonance imaging units, or one per every 2.3 million people, the United States had 900 MRI units, the equivalent of one per every 266,000 people.

When Canada had 39 cardiac catheterization labs and Germany had 161, the United States had 1,234. When Canada had 39 open heart surgery units and Germany had 45, this country had almost 800. In both cases, the United States had not only the numerical advantage, but also the per capita advantage.

Our medical system has depth as well. In Lubbock, for instance, the telephone book lists 49 medical specialties. That is not uncommon for cities our size and larger. Medical problems that a decade ago could only be treated by a handful of subspecialists in metropolitan medical centers are now being handled routinely across the country. Depth means patient choice in physicians and in hospitals.

Even with such an innovative and accessible health care system, are we getting what we pay for from the \$2,000 we spend annually for every man, woman and child? The best indicators — life expectancy and infant mortality



Photo by Artie Limmer

rates — provide arguable results. For instance, average male life expectancy in this country is now more than 72 years, up from 66.6 years in 1960. The current figure is comparable to that in Germany which spends considerably less than we do for health care. However, our life expectancy is lower than most other European countries and such disparate nations as Cyprus, Costa Rica and Japan.

In 1960 we were a leader in infant mortality rates globally, recording deaths in 27 out of every thousand births. We've reduced our national infant mortality rate to 10 per thousand births in the three decades since then. Even so, countries such as Germany, Japan, France and Canada, which in 1960 had higher infant mortality rates than this country, now have lower infant death rates than the United States. Japan, with the world's lowest infant mortality rate today, dropped from almost 31 per thousand to five. Germany moved from 33 per thousand to eight.

In spite of our innovative and accessible medical system, we seem to be getting less for our money than some other countries. The reasons may be numerous, but seven are critical, in my view, and must be addressed.

First, we must devote more of our resources to prevention. Treating minor problems before they become major — which translates into expensive — medical problems is the most cost-effective method of dealing with our health care needs.

We spend 41 percent of our budget on preventive care but that's no more than Turkey spends. Admittedly 41 percent of \$2,000 is a lot of prevention, but Canada spends 75 percent, Japan spends 73 percent, Germany 77 percent and Norway an incredible 90-plus percent of their national health care budgets on prevention. It is clear that prevention is an issue that should be of higher priority on our national health care agenda.

Second, government regulation is adding to the cost of medicine without appreciably improving the delivery of health care to the patient. For example, an unfortunate young woman in New York died in a prominent New York hospital, likely because of mismanagement by a resident physician. As a

result, the state Commissioner of Health totally revised the number of hours resident physicians could work in a week. Because of the incredible me-too-ism in regulation, other states did likewise and then the federal government joined in. Certainly some modifications in resident hours may have been needed, but these were imposed without thought to the circumstances and without regard to their impact on the cost of health care and training requirements. Too many regulatory decisions today are based on isolated cases and without regard to their overall impact on the cost and quality of the health care we are supposed to receive.

Third, the wrong profit motive in modern medicine must be corrected. Certainly, all of those involved in health care delivery as individuals and as institutions deserve to be compensated for their work and dedication. The profit motive, though, becomes counterproductive when we provide the Cadillac model of treatment when the Honda version will suffice. In a medical system as large as ours, the Cadillac version has its place, but not at the expense of the Honda version.

Fourth, technology has certainly contributed to the excellence of our medical system, but we must control it before it breaks the financial system which pays for our care. We must look objectively at how much technology is really necessary and where. For instance, today in Lubbock we have three magnetic resonance imaging units, which is a quarter of the total for all of Canada just a few years ago. What is the right number for Lubbock? I do not know, but I know we need to look critically for the answer to that question, not just in Lubbock, but in cities across the country.

Additionally, technology has provided us a whole range of amazing drugs, but not without increasing costs. Unfortunately, we seldom look at drugs and drug treatments objectively to determine if their reasonable outcomes are worth their costs.

Fifth, medical education has to take responsibility for some of the trends in our health care system. Medical faculty have a tendency to replicate themselves and consequently we may be producing more specialists than we should

instead of the generalists that we need. Unfortunately, the prestige factor in academic medicine favors the specialist. If we are to place greater emphasis on preventive medicine, then we need more generalists. Medical educators must be more diligent in responding to society's needs.

Sixth, malpractice liability issues have got to be resolved so that the interests of the patients are protected without destroying the integrity of health care delivery. Liability issues create an ever-growing spiral of cost for the patient, the physician and the public. That cost spiral must be corrected.

And seventh, third-party funding of medical costs must be addressed comprehensively. Until we figure out a way to fund our insurance needs uniformly, we will never be able to spread the risk across society in a reasonable way. We must eliminate this patchwork of Medicare, Medicaid, private insurance and no insurance which no one, not even the Health Care Finance Administration, can figure out. Otherwise, we will face ever increasing costs.

While we must address these seven areas, we cannot change the system without being convinced collectively that it must be changed. Right now, however, all participants in the health care system — whether doctors, malpractice lawyers, insurance companies, regulators and even patients — seem more intent on preserving their self-interest rather than in saving the health care system we depend on. The result is that we as a nation have not made choices between high quality/high tech, low costs and instant availability. Until we make those choices, we will continue to see an increasing percentage of our domestic national product go to paying for our health care.

Our health care financing problems are so massive that we cannot solve them in the incremental way that Americans go about addressing political problems. We must tackle these health care issues all at once to resolve the problems satisfactorily and equitably. To do that will take commitment at the national level, commitment on the state level, commitment at the local level and, perhaps most importantly, commitment at the personal level. Unfortunately, we seem unwilling to make that commitment. □



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