



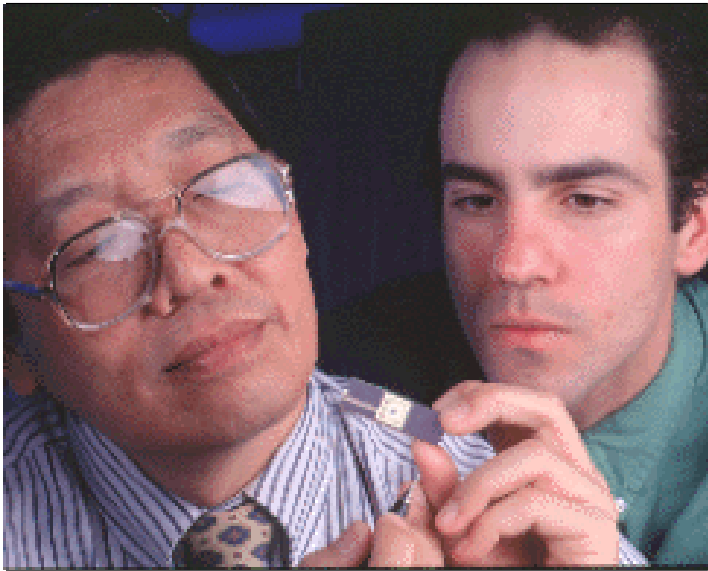
# NC STATE UNIVERSITY

## College of Engineering News

For our engineering alumni

Summer 1997

## Engineer's work on artificial retina could help the blind to see



Dr. Wentai Liu, associate professor of electrical engineering, holds the artificial retina chip embedded in a test strip. UNC-CH graduate student Elliot McGucken developed the photoreceptors used in the chip.

Restoring sight to the blind may sound like a miracle to some, but not to a team of researchers from North Carolina State University, UNC-Chapel Hill and Johns Hopkins University. Dr. Wentai Liu, professor of electrical engineering at NC State, Elliot McGucken, a doctoral student at UNC-CH, and Drs. Mark Humayun and Eugene de Juan of Johns Hopkins University are working on the design of a microchip that could restore sight to people with retinal pigmentosa.

The idea for the project began in 1988 when Humayun demonstrated that a blind person could be made to see

points of light by stimulating the nerve ganglia behind the retina with electrical current. The demonstration proved that the nerves behind the retina still functioned even though the retina had degenerated. Scientists reasoned that if the retina could be replaced with a device that could translate images to electrical impulses, then vision could conceivably be restored.

An implantable artificial retina device could enable many of the 10 million people afflicted with retinal diseases such as retinal pigmentosa and age-related macular degeneration to regain a sense of sight. In these diseases, the rods and cones that work much like pixels on a video screen become inoperative, but the ganglion cells lining the retina remain intact. Unfortunately, many of the devices developed thus far have been impractical for implantation.

"The problem was that the devices being developed were too intrusive or had unstable power supply," said McGucken. "We had to design a device that wouldn't damage the tissues, was small enough to fit in the eye and still have a means for providing power."

"There are very many complex engineering problems in this project," explained Liu.

(See **Workplace**, page 5)

(See **Retina**, page 2)

## Industrial Engineers target safer workplace in furniture industry

Bending, lifting, twisting—these are simple movements many of us perform every day without mishap. In furniture factories, however, workers who make these motions time and time again throughout the day can end up injured, costing themselves their jobs and their employers tens of thousands of dollars.

Dr. Gary Mirka and Dr. Carolyn Sommerich, assistant professors of industrial engineering at North Caroli-

na State University, are conducting research that will ultimately help furniture companies identify jobs with a high risk for injury and provide suggested improvements.

Their ergonomic analysis of furniture manufacturing, funded by the Furniture Manufacturing and Management Center at NC State, is at the halfway point of its two years. During the first year, Mirka studied factories for jobs that could produce low back inju-

ries. For the next year, Sommerich will look for jobs that lead to wrist, hand and shoulder problems. Together they aim to develop a checklist of hazards and create a handbook of guidelines that will make working in a furniture factory safer.

One of their goals is to help companies identify real problem jobs and then prioritize the steps to take to eliminate these problems.

## Retina - Continued from front page

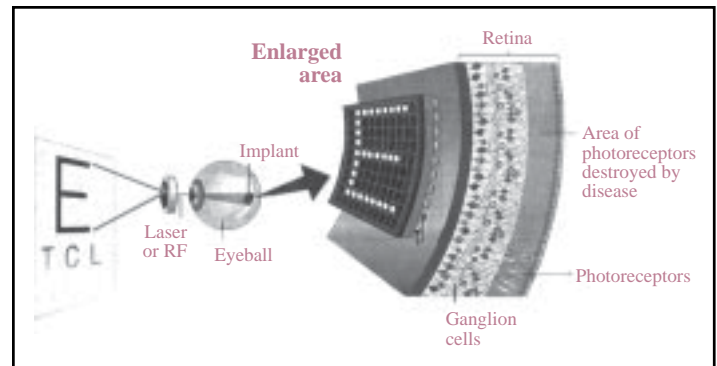
"We had to consider biocompatibility of the device and how to provide a reliable power supply. We also had to design an electrical circuit that conforms to the biological specifications."

With research funding from the National Science Foundation and the Fight for Sight Foundation, Liu and McGucken have developed an artificial retina component chip (ARCC) that seems to fit those specifications. Just two millimeters square, the wafer-thin silicon microchip is imbedded with photosensor cells and electrodes. At that size, the ARCC can be implanted in the blind person's eye near the vision center of the retina. Powered by an exterior laser aimed at a photovoltaic cell,

the photosensor cells in the microchip receive light and images through the pupil. The photosensor cells convert the light and images into electrical impulses that stimulate the nerve ganglia behind the retina. By stimulating the retina with a pattern of electrodes, the device partially recreates the visual information.

Using specifications sent by Humayun and de Juan, Liu and McGucken have created a prototype chip that is being polished to less than .02 millimeter thickness that will enable light and images to pass through the chip to the photosensors located at the back of the chip.

"While the current design of the ARCC will not restore clear vision, it can produce



vision compatible with limited mobility such as the ability to see forms or direction of movement," said McGucken.

Liu and McGucken have designed the chip to be as noninvasive to the eye tissues as possible. By using an external laser to power the chip, they have eliminated the need for future surgeries to replace the power source and eliminated the

problem of how to keep a battery viable in the wet, salty environment of the eye. The laser and photovoltaic cell is the power source of choice because the laser beam can pass through the cornea without damaging the corneal tissue. Also, the laser, powered by a small battery pack, can be fitted to a pair of regular eyeglasses and aimed at the ARCC's photovoltaic cell without clumsy or obtrusive headgear.

To further protect the eye tissues, the ARCC is designed so that the electrodes do not pass current to stimulate the ganglia. Instead the electrodes charge a plate that stimulates the ganglia. By charging a plate instead of passing current, the ARCC protects the retinal tissues from damage from the electrical current.

Once tested in Liu's lab at NC State, the chips will be sent to Johns Hopkins for biocompatibility testing by Humayun and de Juan. Then, FDA approval will be necessary for testing in humans.

"It's too early to tell if the chip could actually work in a human eye," said Liu. "The question of biocompatibility of the silicon being implanted in the body has to be answered first. But we are very optimistic."

The prototype chips are expected to be ready for shipment to Johns Hopkins for testing later this year. □

## Alumni needed for student recruiting

The COE has identified new student recruitment as a top priority. As the pool of qualified high school students has been shrinking over the past several years, engineering schools across the country have begun taking a more aggressive approach to identifying, recruiting and enrolling the best and the brightest.

Surveys have shown that students view the quality of the academic programs in engineering at NC State as a major strength. Some of them have concerns about the size of the university and their ability to perform in a competitive environment. They need to have more personal contact with staff, faculty and alumni during the college decision process to get a better perspective on the challenges and opportunities that we have to offer.

We need help from any of our engineering alumni who would be willing to call a few students in their area who have already been accepted to the College of Engineering. Students are always happy to hear from our students and alumni; they are eager to ask questions about your experiences both as a student and as a professional. These are bright young people whom you would probably enjoy getting to know. Over the past few years in the freshman engineering class, the range of high school grade point averages has been 3.64 to 4.19 and the average SAT score range has been 1130 to 1300.

The admission process for next fall is pretty well complete by early spring, but we need your help as we begin a new recruiting cycle in the fall for the 1998 class. If you would like to call some students from your area starting in October, please let us know. We will provide you with names, addresses and phone numbers of students who have been offered admission. We can also give you other pertinent information such as response deadlines, housing, financial aid and other topics that students have questions about so that you can be current on those issues as well.

We would also encourage you to invite these students to your place of business for some "real world" perspectives. We hope that this experience will be mutually beneficial and enjoyable for you and the students.

For more information contact: Kay Leager, Director of Recruiting, NC State College of Engineering, Box 7904, Raleigh, NC 27695-7904, (919) 515-9669, fax: (919) 515-8702, e-mail: leager@ncsu.edu. □

# Virtual classroom a reality at NC State

For what is believed to be a first in North Carolina, students at UNC-Asheville signed up for an engineering class at NC State University this past fall, came to class, and sat not in front of a professor, but in front of a computer and logged on to a live, on-line classroom.

In an effort to make distance education both cost effective and as close as possible to sitting in an actual classroom, NC State University's College of Engineering has been testing ways to use the Internet to deliver distance education classes. Dr. Tom Miller, assistant dean for information technology in the College of Engineering, and Kathy Hewitt, a graduate student in computer engineering, have developed a way to use Internet conferencing technology to conduct classes on-line with live video and real-time interaction between the professor and the students. As a result, Dr. Gary Mirka, assistant professor of industrial engineering, taught a class on-line to students in the fall.

"We have been experimenting in the use of Internet conferencing technology for some time," said Miller. "Basically, what we have done is applied this technology to teaching."

Miller has been searching for alternatives to videotaping classes for remote students. The Internet multimedia technology was an obvious choice because of the quality and availability of the North Carolina Research and Education Network (NCREN) data network, which provides Internet connectivity among the UNC system campuses.

The pilot project, supported by the Southern University and College Coalition for Engineering Education (SUCCEED),

conducted in Mirka's class used the Virtual Multicast Backbone on the Internet (MBONE) and did not require expensive video cameras or production personnel. The equipment required is minimal.

Unlike the videotaped version of the class, where students only see what the cameraman decides to show them, the on-line classroom is controlled by the students. By manipulating several windows on their computer screens, the UNC-Asheville students can see the professor, his notes, the "whiteboard" (an on-screen version of the chalk board) and other students in the class. Homework is e-mailed to the professor.

"I believe that the students present in the classroom still have a slight advantage over the on-line students," said Mirka, "but early indications from the on-line students show that they enjoy the interaction made possible by this technology. They can see me, hear me, ask me questions, and I can see them and ask them questions. And we can use the on-screen white board to work out problems. In most ways, I treat them as if they were physically sitting in my classroom."

According to Miller, the success of the UNC-Asheville test class has led to planning for two more on-line classes at other UNC system schools. The Legislature has provided funding for two additional sites in the state to begin operation next fall. While on-line classrooms will not replace the traditional model where students attend classes with live professors, the on-line classes are a viable means of providing unique educational programming to students across the state," Miller said. □

## ***Make plans now for football, food, and fun at Tailgate '97!***



The College of Engineering's annual tailgate party has been planned for the Clemson game on Saturday, September 13. Look for registration materials and more information to arrive this summer. Last year, in spite of Hurricane Fran just one day before, alumni joined faculty, students, family, and friends for barbecue and all the fixin's on the Carter-Finley Stadium grounds. Special thanks go to MCI Corp. and Mel Kemp of MCI for their exclusive sponsorship of last year's event and their willingness to do the same for this fall's event. We hope we'll see all of you this year for Tailgate '97!



# A familiar face takes the helm in Minority Programs

A familiar face has returned to the College of Engineering. Dr. Tony L. Mitchell, an alumnus and former associate professor of computer engineering, is the new director of minority engineering programs for the College.

As the new director, Mitchell has lofty goals. He wants to increase the graduation rate of minorities, increase the number of scholarships available to attract minorities, and implement



**Mitchell**

programs to help minorities succeed during their tenure at the university.

Mitchell has a strong base to build on since the College has the second largest African-American enrollment nationally among majority engineering institutions. Mitchell sees the focus of his office shifting from one of quantity to one of quality.

“I don’t see us significantly increasing the minority presence on campus,” says Mitchell. “What I see as my role is increasing the quality of the entering class.”

Top students, whether minority or majority, are recruited with scholarship offers. “Without scholarship money,” says Mitchell, “we cannot compete with the other engineering colleges for those top students.” Last summer, he was able to obtain funding for 15 new minority scholarships, doubling the number of scholarships available for recruiting minority freshman.

The new scholarship money came from a grant from the National Science Foundation through the North Carolina Alliance for Minority Participation (NCAMP), an alliance of eight state-supported institutions set on doubling in five years the rate at which minorities earn undergraduate degrees in science, engineering and mathematics.

While he is working diligently for scholarships for entering freshmen, Mitchell has not forgotten the students already enrolled in the College. To encourage those students, Mitchell has implemented an incentives plan that pays a limited number of one-time scholarships of \$500, funded by NCAMP, for significant improvements in grade point averages.

“We want to encourage students in the College to bring their averages up to a level that would qualify them for one of our regular NCAMP scholarships,” says Mitchell. “These one-time incentive scholarships help them see that hard work really does pay off.”

Mitchell is also working to improve the minority perception of the University. He wants minority students to see the University as an inviting place to go to school. To achieve that goal, Mitchell oversees a program in which entering minority freshmen are assigned upper-class mentors from the College in addition to the adviser and the university-level mentor assigned to the student.

“We try to pair the freshman and the mentor so they have the same major,” says Mitchell. “This gives the student a big brother or sister to go to if they have a problem they don’t feel comfortable discussing with our regular staff or with an adviser.”

In addition to mentoring, Mitchell’s office administers a summer bridge program called the Summer Transition Program (STP). Specifically geared to bridge high school and college, the program allows minority engineering students who will be entering freshmen in the fall to attend the second summer session to take courses and get to know the campus before the overwhelming 27,000-plus students arrive for the fall semester. STP gives the minority students an opportunity to bond with each other and familiarize themselves with the expectations of college. Funding in the past covered expenses for only 50 minority students to participate in STP, but with NCAMP funding, Mitchell has expanded that number to 75.

Mitchell also helps the College attract companies to recruit graduating students. One example of success in attracting major companies is the recent developments with Hewlett Packard, who is expected to announce that the College will be added to the national recruitment list.

In addition to administering the various minority programs, Mitchell represents the College as a member of the National Association for Minority Engineering Program Administrators (NAMEPA). He also holds teaching and research faculty status with the Department of Electrical and Computer Engineering, teaching the graduate class ECE 571, Introduction to Data Networks, this spring.

As if his primary College job isn’t enough, Mitchell also continues to advise students conducting graduate research in telecommunications and data networks.

Of his new job, Mitchell says “It is a challenge. I want to come in and do it all today, but much of what we are doing takes time to show results. I have to remind myself to be patient. I know we can accomplish our goals.” □

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## Appointments

- Nino A. Masnari — Dean of Engineering.
- John G. Gilligan — Associate Dean for Research and Graduate Programs.
- Sarah A. Rajala — Associate Dean for Academic Affairs (first woman to serve in a dean-level position in the College).
- William Isler — Special Assistant to the Dean.
- Kay P. Leager — Director of Recruiting.
- John R. Hauser (EE ’60) — Director, Center for Advanced Electronic Materials Processing.
- William J. Stewart — Director, Operations Research. □

## Workplace - Continued from front page

"We don't want our checklist to identify every job as hazardous when we know that's not true," said Sommerich.

Most current checklists are too sensitive and thus not very useful in determining truly high-risk jobs. Many are derived from automobile industry data, but no one has yet based one on the furniture industry's specific needs. Mirka and Sommerich's will be the first. Ideally, a safety specialist would use the checklist to identify a problem and consult the handbook for help. In many cases, however, nurses, supervisors and others will use these tools.

According to Jon Parish, director of loss control and environment for Lane Furniture in Alta Vista, Va., most furniture companies are small and do not have employees who focus only on safety in their jobs so they often do not have access to the kind of knowledge they need to make informed safety decisions. He believes the checklists and handbooks will help employees stay alert to the potential for injury.

"In the furniture industry we've done quite a bit to address the obvious unsafe conditions. We're moving to the more sophisticated plane of the not-so-obvious unsafe conditions, and that's where the research of Drs. Mirka and Sommerich comes in," Parish said.

The researchers believe the tools will yield other benefits as well. Low back injuries alone cost employers in the United States some \$30 billion annually in medical, re-training and other expenses; the checklist and handbook could help reduce those losses.

"Educating industry personnel about good workstation design principles as well as proper lifting mechanics will help head-off back injuries down the road," Mirka said. "Simple solutions to these problems such as keeping objects to be lifted between the height of the knee and the height of the shoulder can have a long-term impact on the incidence of low back injury. This is what we hope to provide to the furniture industry—simple, inexpensive solutions that can have a great impact."

To construct the tools, the researchers visit furniture factories to observe and even videotape workers doing their jobs. They recruit workers to wear equipment such as a Lumbar Motion Monitor, a device that gathers data about upper body movements.

They examine the company's injury and illness logs required by the Occupational Safety and Health Act (OSHA) and look for trends in the data that point to jobs producing specific recurring injuries.

Mirka and Sommerich use this information to compile their checklist, which they take back to furniture plants and apply to selected jobs. To test accuracy, the researchers match their results against the OSHA logs. After making any necessary adjustments, they give the checklist to furniture personnel to gauge user friendliness.

Currently, Mirka and Sommerich are looking for companies to participate in the project. Interested furniture industry personnel can call the researchers for details: Gary Mirka (919) 515-6399; Carolyn Sommerich (919) 515-8614. □

## Bayer Corp. plans facility on Centennial Campus

Bayer Corporation (formerly Miles Inc.) has announced that its Pharmaceutical Division will house a new biological products laboratory on the Centennial Campus at NC State University.

According to NC State officials, enhancement of a three-year research relationship with Dr. Ruben Carbonell, head of NC State's Department of Chemical Engineering, was a key factor in Bayer's decision to locate the laboratory facility on Centennial Campus.

The company plans to expand its research and development programs, and the close proximity to research faculty and students at the Centennial Campus location will facilitate those research and development plans.

The new Bayer laboratory will occupy 6,000 square feet of lab and office space in the Centennial Campus Partners Building I, currently under construction.

The lab, which will employ about 18 people, will focus on new drug discovery and development of protein manufacturing technologies. □

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## Dinner pairs donors and scholars for the first time

The NC Engineering Foundation held its first scholarship dinner April 17 at the Brownstone Hotel in Raleigh. The event brought together scholarship donors and student recipients for the first time. Foundation board members Glenn Futrell and Fred Gant spoke about the importance of scholarships to attracting top students to the College of Engineering. The Foundation plans to make the scholarship dinner an annual event. □

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## Awards and honors (selected)

- A number of prestigious NSF Faculty Early Career Development (CAREER) Awards have gone to faculty since spring 1996: Thomas M. Conte, electrical and computer engineering; Gregory N. Parsons, chemical engineering; Munindar Singh, computer science; William L. Roberts IV, mechanical and aerospace engineering; and James C. Lester, computer science.
- Two engineering professors received the prestigious Alexander Quarles Holladay Medal for Excellence in October, Franklin D. Hart (ME PhD '64) and Harold B. Hopfenberg.
- NC State Nuclear Reactor operations received high praise from the Nuclear Regulatory Commission in September, specifically the cooling system upgrade. The reactor was called one of the best non-power reactors in the country.
- Dr. Shu-Cherng Fang was named the Walter Clark Professor of Industrial Engineering.
- K. Linga Murty was elected fellow of the American Society for Materials International.
- Dr. Richard Felder, Hoechst Celanese Professor of Chemical Engineering, was the NC State University recipient of the Award for Excellence in Teaching from the University of North Carolina Board of Governors.
- Richard R. Johnson received the Faculty Advisor Award of ASME International in November. □

# Foundation News

## Futrell named president

Glenn Futrell (MSCE '65) of Raleigh and Manteo has succeeded Larry Nixon (EE '64) of Raleigh as President of the NC Engineering Foundation, Inc. We offer our thanks to Larry for his fine work on behalf of the College, and we welcome Glenn to his new position and wish him well during his tenure.

Two new working subcommittees have been formed in the Engineering Foundation, and they are headed by two of our most active alumni. A. Fred Gant (IE '55), of Raleigh, has been named chairman of the new Development Subcommittee, which will play an active role in the Campaign for NC State Students and in general fund-raising activities among the Foundation Board's membership. Steve Arthur (CE '60) of Greensboro is serving as the chairman of the new Marketing and External Relations Subcommittee, which focuses on better communicating the strengths of the College of Engineering to prospective students, alumni, and corporations. We thank the chairmen for their leadership and the members for their willingness and time. □

## Outstanding Alumni Named

The College of Engineering named Dr. Joseph P. Archie Jr. of Raleigh, Darrell V. Menscer of Myrtle Beach, S.C., and Claude A. Verbal of Flint, Mich., as the 1997 Distinguished Engineering Alumnus Award winners at a banquet April 3 at the Capital City Club in Raleigh.

A native of Nashville, Tenn., who grew up in Kinston, Archie (BSME '60, MSES '62, PhD ESM '68) (UNC-CH MD '68) is a vascular surgeon in Raleigh and an adjunct professor of mechanical and aerospace engineering. Menscer (BSEE '60), a native of Statesville, is retired as president and chief operating officer of PSI Energy Inc. of Plainfield, Ind. Verbal (ME '64), a native of Durham and plant manager of the Lansing Service Parts Operations for General Motors Corp. in Michigan, is the third African-American to graduate from NC State. □

## Meet-the-Dean events held

Over the past year, Dean Nino A. Masnari has been crossing the state to speak about his vision for the College with numerous groups of engineering alumni and friends.

These "Meet-the-Dean" events have been held in Greensboro/High Point, hosted by Norman Samet (CE '59) and Bob Rhodes (IE '60); Raleigh, hosted by Ed Vick (CE '56, MSCE '60), Smedes York (CE '63), Keith Harrod (CE '60), and Travis Tomlinson (CE '68); Goldsboro, hosted by Ray Bryan (CE '53); Charlotte, hosted by Ed Weisiger Jr. (IE '82), Ed Rose (CE '82), John Norris (NE '71), and Spiro Hondros (CE '56); Hickory, hosted by Larry Bowman (IE '73), Phil Null (FMM '67), Andy Wells (FMM '76); Winston-Salem, hosted by Ed Welch (Parent), Ed Scott (MAE '65), and Barry Gardner (CE '75); and Asheville, hosted by Gary Gibson (ME '62), Emory Pitts (IE '56), and Tom Finger (EO '73).

The College again sends its thanks to those who graciously agreed to serve as hosts and to those alumni and friends who took time from their busy schedules to attend. □

## Angelos endow full scholarship for engineering



William E. Angelo (left) and Dr. E. James Angelo Jr.

Dr. E. James Angelo Jr. and his brother, William E. Angelo, have established the Ernest James and Ethel Hudgins Angelo Memorial Scholarship in memory of their late parents. The scholarship will support students enrolled in the College of Engineering at North Carolina State University.

James Angelo, a 1939 electrical engineering graduate of NC State, and William Angelo, a 1942 chemical engineering graduate of NC State, were raised in Winston-Salem, North Carolina, and attended Reynolds High School.

In an effort to give back to the community of their youth, they have specified that the scholarship be awarded to students from Forsyth County, North

Carolina. The scholarship, which will provide full tuition, fees, room and board for one year beginning in 1997, will be the single largest merit scholarship awarded in the College of Engineering. The Angelos have stated their desire to make additional awards available in the future.

Scholarship recipients must demonstrate an interest in the environment and pursue an appropriate course of study within the College of Engineering that will give them the opportunity to pursue a position with a company or agency that works to protect the environment. The recipients will be chosen by a committee within the College of Engineering. The endowment will be held by the College in the North Carolina Engineering Foundation Inc.

Chancellor Larry K. Monteith said of the scholarship, "This commitment by the Angelo brothers is an investment in tomorrow's environmental leaders. This scholarship will allow the College of Engineering at NC State to continue to attract top scholars." □

## Nortel Supports Scholarships

Nortel recently renewed its annual support of scholarships for the third year. The \$50,000 gift supports 25 scholarships of \$2,000 each for students enrolled in the Computer Science Department and Electrical and Computer Engineering Department. The merit-based scholarships are renewable and can supplement other awards to top scholars. The scholarships aid in recruiting top students to the College of Engineering. □



## Gala celebrates new campaign



NC State University held its third annual lifetime giving gala at the Carolina Theater in Durham to celebrate donors committed to supporting NC State. The April 18 gala coincided with the formal launching of the multimillion dollar Campaign for NC State Students. Ed Woolard (IE '56) (left) and "H." Clark (IE '56) (right), shown here with Dean of Engineering Nino A. Masnari (center), both serve on the Campaign Executive Committee.

## Goal set in Campaign for NC State Students

April 18 the University announced the beginning of the "public phase" of the Campaign for NC State Students, the single largest campaign for endowed scholarships in the history of NC State. The College of Engineering has set \$13 million for its goal. Alumni Ed Hood (NE '52 and '53) and Darrell Menscer (EE '60) are co-chairs of the university campaign. College campaign chairmen Worley "H." Clark (IE '56) and Ed Vick (CE '56, MSCE '60) developed a committee of alumni and parents across the state. These 13 individuals have already pledged \$2.95 million toward the campaign and have helped secure a significant portion of the \$9.4 million already committed to the College. For more information, contact Ben Hughes or Ed Hand, NC Engineering Foundation, Inc., Box 7901, Room 231 Page Hall, NC State University, Raleigh, NC 27695, (919) 515-7458. □

## Davis endows scholarship

James M. Davis Jr. (ME '58) of Cary has established the J. Minor Davis scholarship endowment in the College of Engineering at NC State University. The \$50,000 pledge will support students in the Benjamin Franklin Scholars Program. Davis is senior vp of power operations at CP&L. Davis also serves on the Board of Directors of the NC Engineering Foundation Inc. □

## Other gifts, grants, and scholarships

- DARPA has granted \$1.395 million to Dr. Michael Steer, electrical and computer engineering, and \$1.1 million to Dr. Paul Franzon, computer engineering.

- Hoechst Celanese has given \$325,000 for renovations in the Department of Chemical Engineering. The gift consists of funds from Hoechst Celanese and NC State chemical engineering alumni who work for the corporation and is the largest pledged so far in the Riddick Laboratories fund drive, which aims to raise \$3 million to improve analytical facilities, add computers and telecommunications equipment to classrooms, and renovate conference rooms, lecture halls and laboratories.

- C.E. "Ed" Vick Jr. (BSCE '56, MSCE '60), chairman of Kimley-Horn & Associates of Cary, has pledged \$60,000 to endow the C.E. Vick/Caldwell Scholarship, bringing the total Vick/Caldwell Scholarship endowment to \$100,000. The gift was established in honor of his father, C.E. Vick Sr. Vick is chairman of the advocacy committee of the NC Engineering Foundation and previously served as the foundation's president and vice president.

- H.B. "Sonny" Aldridge of High Point has established the William F. Aldridge (ME '48) Sr. Endowment in memory of his father. The endowment will support a scholarship with preference to students in mechanical engineering. Sonny Aldridge attended NC State from 1968 to 1971.

- Worley "H." Clark Jr. of Chicago (IE '56), a 1993 Distinguished Engineering Alumnus, has established the Worley H. and Callie Anne Clark Scholarship Endowment in Sales Engi-

neering in the NC Engineering Foundation. The innovative scholarship will encourage engineering students to pursue courses offered in the College of Management and enable them to present their product or service more effectively.

- Norman G. Samet (CE '59) has pledged \$25,000 to endow the Norman Gilbert Samet Scholarship for studies in civil engineering. Samet recently completed his second term as president of the NC Engineering Foundation.

- Larry Allen Bowman (IE '73) has made a donation supporting the Benjamin Franklin Scholars Program. He is president of Prodelin Corporation.

- The College received a check for \$10,000 donated by BASF and presented by Mr. Gary Gibson, manager of mechanical design at BASF. The generous annual gift will be divided equally between chemical engineering and mechanical engineering.

- Exxon USA is contributing \$9,000 to the College. Exxon makes grants to schools that offer degrees in educational fields from which the company recruits the type of well qualified graduates Exxon needs as employees. □

**Did you know** only 74 engineering students attend NC State on an endowed scholarship or fellowship? Competition for top students is fierce: our public peers, on average, offer twice as many endowed scholarships. To meet this challenge, the Dean has set a goal of increasing our endowed scholarships and fellowships by 132 percent. For information on how you can help, please contact Ben Hughes or Ed Hand at (919) 515-7458. □

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## **Engineers' invention reduces power consumed by computers**

Out of context, a 90 percent efficiency rating might sound pretty good to most people. To a couple of NC State University researchers, however, that figure meant 10 percent of the energy used by personal computers is being wasted—quite a lot considering the number of computers in homes and offices the world over.

Several years ago, Dr. B. Jayant Baliga, professor of electrical engineering and director of the Power Semiconductor Research Center at NC State, and his student Manoj Mehrotra, who recently received his doctoral degree, set out to solve the problem. In late 1994, the two received a patent on their Trench MOS Barrier Schottky Rectifier (TMBS), a semiconductor component that can significantly increase the efficiency of power supplies.

Computers and other electronic appliances use integrated circuits such as microprocessors and memory chips to process information. The efficiency of the power supply that converts power from a 120V AC socket to the lower DC voltage required by the circuits determines the efficiency of the appliance. While converting the 120V line to the power supply, a loss of efficiency occurs in a device called a Schottky rectifier, which drops voltage as it carries current.

The TMBS rectifier is more efficient because less voltage is dropped as it carries a current. Approximately 60 percent

less heat—and therefore wasted energy—will be generated with this device. The reduction in electricity requirements will result in lower bills for consumers and a lower energy demand on utility companies. The device will also yield a smaller power supply in the computer itself, which will make the computer smaller and lighter.

The device could also extend the life of batteries in portable or cellular phones, and it has potential use in automotive electronics.

The invention is scientifically important as well, Baliga said, because it demonstrates a breakthrough in fundamental physics by supporting voltages about three times larger than predicted on the basis of accepted theoretical analyses. These standards indicate that a semiconductor requires a certain doping concentration (adding impurities to achieve a desired quality) to support voltage.

“When we invented this device we found a way to support the same voltage at a doping concentration tenfold higher,” Baliga said. “With a higher doping, the conductivity of the semiconductor materials goes up proportionately and the resistance goes down proportionately, and that allows us to attain the very low voltage drop.”

The patent for the TMBS device is one of 32 for NC State in Baliga's name. □