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President's Report to Board of Trustees, 2005

Clemson University

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AT THE INTERSECTION OF SCIENCE AND IMAGINATION
At the intersection of science and imagination is "invention" — the result of knowledge creatively applied to generate a better quality of life. It's this inventive spirit that drives Clemson research. In this report, we picture key areas of invention at Clemson, many through the lens of one of our powerful electron microscopes housed in an imaging facility that epitomizes the best in both science and imagination. I'd like to share with you the latest on Clemson's wireless communications, advanced materials and biomedical breakthroughs — to show you how the University is working to sustain the environment, both in natural resources and man-built structures — and to highlight some exciting ways our students are impacting the future, from automotive technology to the entertainment industry.

James F. Barker, FAIA
President
Clemson is one of only five universities in the United States offering degrees in packaging science. The facilities of the new Center for Flexible Packaging put Clemson among leaders in teaching, research and service for the flexible packaging industry, the fastest growing segment in the packaging industry. Job placement for new graduates of Clemson's packaging science program ranks at greater than 95 percent, and they continue to gain employment at premier companies including Kraft Foods, Masterfoods, PrintPack, Sonoco, Campbell Soup, Smucker’s, Georgia-Pacific, Fuji and Cryovac.

Drop it, freeze it, heat it, fold it, shake it, tear it, soak it, print on it. That's what Clemson researchers and students do to ensure products show up at your door fresher, safer and in one piece.

Surface of a multilayer film, created by “smart blending” technology, that provides a novel barrier for protective packaging of food.
Clemson medical researchers are discovering ways to prevent and treat high blood pressure and diabetes using nutrients from plants, and ways to target and destroy cancers using cells from your own body.

A forerunner in biomaterials science and engineering education, Clemson has one of the nation's 50 best biomedical/bioengineering graduate programs according to U.S. News & World Report. The Clemson University Genomics Institute ranks as a leading research and training center for discovering and analyzing genes important to agriculture, human health and the environment. The institute offers more than 150 genetic libraries of plants, animals and insects for use by scientists all over the world. Clemson is collaborating with the Greenville Hospital System, the Greenwood Genetic Center, the Dolan DNA Learning Center and other research universities in the state on a number of initiatives focusing on a healthier life and more abundant economy.

Soybean floral buds at an early developmental stage. Research is conducted on chromosomal and molecular control of reproduction and shoot-root communication in response to stresses to improve plant performance.
Clemson and its partners are building an automotive technopolis in the South, where new processes in engineering lightweight materials and alternative fuel sources will reduce car pollution and support a smart, healthy environment.

The 250-acre Clemson University International Center for Automotive Research (CU-ICAR) campus in Greenville sits at the center of the Charlotte-to-Atlanta corridor. The campus is designed to foster integration of faculty, students and industry partners through technology neighborhoods and collaboration plazas. CU-ICAR has attracted more than $209 million in private and public funding from partners including BMW, IBM, Michelin, Microsoft, SAE International, Sun Microsystems, The Timken Company and the state of South Carolina. Tom Kurfess, BMW Chair of Manufacturing in Automotive Engineering and director of the Carroll A. Campbell Jr. Graduate Engineering Center, leads one of the nation’s most innovative automotive engineering graduate programs addressing industry’s pressing challenges in systems integration.
Clemson researchers have the power to visualize the future — a future that will be fashioned through innovations in advanced materials.

An SEM image of a "plasmonic flag" small enough that 50 would fit onto the tip of a human hair. Plasmonic materials have potential to revolutionize chemical sensing and optical computing as well as display technology.

Clemson’s Center for Optical Materials Science and Engineering Technologies (COMSET) has spun off two companies and accumulated more than $30 million in federal research funding. Clemson’s Center for Advanced Engineering Fibers and Films, one of only 20 NSF Engineering Research Centers, receives $5.5 million annually for research in designing new materials. The new Advanced Materials Research Lab, a $21 million complex at the Clemson Research Park, is anchored by the nation’s top optical materials and electron microscopy research laboratories.
Clemson University is at the forefront of a new way of thinking — restoring, rehabilitating and rejuvenating buildings, neighborhoods, civic infrastructures and urban ecologies to protect our resources and ensure our future.

The newly formed Clemson University Restoration Institute located in Charleston, the first formal academic organization focused on the restoration economy, will establish South Carolina as the international leader in restoration knowledge and expertise. Clemson is working on conservation research and restoration of the Civil War submarine H.L. Hunley and development of a 65-acre research campus that could contribute to significant economic development and job creation in North Charleston.

Clemson’s innovative graduate degree program in historic preservation, offered jointly with the College of Charleston, integrates history, policy and science as they relate to historic preservation.
Environmental stewardship is at the heart of Clemson education, research and outreach. Students, citizens, farmers, commercial developers and urban planners all benefit from the University's research on the environmental impact of changing land-use patterns.

The aquatic organism on the left, which hasn't been exposed to suspended clay, has algae in its intestinal tract. The one on the right, which has been exposed, has an intestinal tract blocked with clay that will cause it to starve.

Organic Style magazine (April 2005) named Clemson as one of four universities making extraordinary strides in helping the environment. Clemson's recycling efforts, especially those of Students for Environmental Awareness, earned recognition. Students from Clemson's environmental engineering and science department were winners at the international Annual Environmental Design Contest in 2005. The team won first place for developing a cost-effective, energy-efficient method to remove arsenic and nitrate from drinking water in rural, isolated communities. Clemson Public Service Activities' Changing Land Use and the Environment project (CLUE), funded by a USDA grant, educates municipal officials, designers, building contractors and the public in storm water management.
From hospital rooms to medical offices, Clemson students are "health conscious" when it comes to designing patient-centered facilities.

Images of urban analysis diagrams of Charleston, illustrating studies on the parallels between cities and hospitals and the need to consider hospitals as an extension of the city and regional fabric in which they exist.

Clemson's Architecture + Health program is one of only two health-care programs in the nation. It's widely recognized for the high caliber of its graduates and the extensive track record of public service projects. Clemson students earned first place in the 2004 Healthcare Environment Award Competition, sponsored by Contract magazine, The Center for Health Design, American Institute of Architecture Students and Medquest Communications. The collaborative project involved the design and construction of a full-scale inpatient-care room for a hospital.
DPA graduates are sought by the growing electronic arts industry, particularly companies engaged in special effects within the entertainment and commercial video, film and gaming industries. Clemson alumni are employed from Los Angeles-based Rhythm & Hues Studios to New York's Blue Sky Studios. Clemson's new computer science facility provides the DPA program with 4,000 square feet of studio space for major motion-picture quality animation and effects, including virtual reality equipment and laboratories for research in computer networks, eye tracking, Web applications and much more. DPA director John Kundert-Gibbs and graduate student Jerry Gardiner received the Best Independent Animation Award for the program's student-generated 3-D animation "Demons Within" at the international 2005 Eurographics conference in Dublin, Ireland.

Technically savvy, artistically talented students are shaping the silver screen in the entertainment world through Clemson's Digital Production Arts (DPA) program.
Clemson University researchers are sending pictures, information and sound across the globe at light speed using the same technology that makes your car lights brighter, more visible and safer.

Senior leadership includes three IEEE fellows and IEEE Third Millennium Medal recipients. Internationally renowned wireless research pioneer Michael Pursley, an IEEE Centennial Medal recipient, is one of the world's 10 most cited authors in the field. A team of Clemson engineers is revolutionizing battlefield communication networks, funded by a multimillion-dollar grant from the U.S. Department of Defense's Multidisciplinary University Research Initiative. NSF CAREER Award recipient Harlan Russell is investigating protocols that can automatically find routes among the ad hoc arrangement of radios, support different types of network traffic, such as voice or email, and save energy to extend battery lifetime.