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President's Report to Board of Trustees, 2007

Clemson University

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CU-ICAR campus design fosters collaboration

A new model for economic development in South Carolina — matching Clemson’s strengths in automotive engineering with the state’s strong automotive industry cluster — called for a new model for collaboration.

The Clemson University International Center for Automotive Research (CU-ICAR) is a 250-acre “technopolis” where BMW, Michelin, Timken, Sun Microsystems and other corporate partners have joined Clemson to focus on automotive and motorsports research and other transportation issues. Mazda, the first Asian original equipment manufacturer associated with CU-ICAR, is the most recently announced. The campus master plan features five pedestrian-oriented “technology neighborhoods,” each to be anchored by a research facility to attract private companies related to the research focus.

The nerve center of Technology Neighborhood One, the first to be developed, is Clemson’s Carroll A. Campbell Jr. Graduate Engineering Center, home to unique M.S. and Ph.D. degree programs in automotive engineering. BMW and Timken corporate research facilities are nearby, with others anticipated. Buildings are clustered around a common plaza, with a fitness center and a restaurant offering additional opportunities for interaction.

The role that common space plays in collaboration is prized by an institution whose president is an architect. The proximity that enables people to share a meal or exercise together leads to sharing ideas. The intimacy of the CU-ICAR campus is intentional; Clemson and its partners look forward to reaping the benefits.
Clemson University is not large, compared to most of our peers among the nation's top-30 public universities. The main campus sits in a close-knit community in a relatively small state. I can drive to each of our off-campus research and education centers in a few hours.

We enroll about 17,000 students in five colleges. We have no law school or medical school.

I begin with a description of what Clemson is not, in order to explain to you what Clemson is: a research powerhouse in specific fields, with a rapidly growing graduate program and thoroughly engaged undergraduates who participate in real research and Creative Inquiry across the curriculum.

Each of Clemson’s five colleges pairs an applied, professional program with its partner academic discipline. For example: engineering with basic math and science, architecture with arts and humanities, agriculture with life sciences. We have identified eight emphasis areas where we are working to build globally competitive programs — and none is housed in a college or department. Instead, leadership is emerging from the faculty themselves, who are finding niches where their strengths align with state economic needs.

Because of all of these factors — location, size, community, academic organization and tradition — we believe Clemson University offers an unmatched culture of collaboration.

People don’t just get up in the morning and say, “Today I’m going to collaborate.” Institutions must provide the environment and the structure for creative people to bump into one another and begin conversations that lead to collaborations that lead to innovations that lead to better mousetraps, better cars, better health-care facilities, a better life.

In this report, you will see concrete examples of the ways Clemson University’s unmatched climate of collaboration is delivering on this promise every day.

James F. Barker, FAIA
President
Clemson University
Clemson, EPA join forces to support watershed management

Imagine having real-time data to monitor environmental health — water quality, storm-water runoff, even tree growth rate — from any Internet access point to improve watershed management.

Clemson's Center for Watershed Excellence, established in collaboration with the U.S. Environmental Protection Agency to foster cost-effective watershed management programs for S.C. communities, is developing the model for remote environmental sensing. The technology will be shared with the other watershed centers in EPA Region 4.

A system of sensors has been installed in a coastal forest to track environmental impact of commercial and residential development. The sensors connect to a University-operated network for data acquisition, archiving and real-time display.

Using monitoring equipment on a sophisticated network, researchers gather information on groundwater, surface water quality and quantity, weather conditions and other ecological measurements across a 3,500-acre tract. Environmental conditions will be monitored at specific sites during the development phases.

Observation data is moved from a variety of sources to members of an interdisciplinary research team. Scientists can specify the portions of the data stream that they need, while also placing security constraints on the data transfer.

The remote sensing project is one example of how the center is providing hands-on, practical products and services to promote the growth of local stakeholder associations committed to improving the natural and economic resources of watersheds.

But watershed management isn’t the only possible application of the remote sensing technology. Future projects could involve research in innovative materials, construction methods and communications techniques aimed at providing safer and more efficient infrastructure within communities. This could improve disaster planning and allow for earlier detection (and mitigation) of material degradation.
Clemson model to increase African American male teachers expands to universities across the country

A project to increase the number of African American men teaching in South Carolina elementary schools has grown well beyond its original aspirations.

Once an idea to place 200 African American men in the classroom, Call Me MISTER® (Mentors Instructing Students Toward Effective Role Models) is up and running in Pennsylvania and Virginia, while Georgia, Florida and Missouri are deep into talks about licensing the program.

In Pennsylvania, Call Me MISTER is based at Cheney University. In Virginia, Longwood University is the program’s home. Roy Jones, executive director of Call Me MISTER, is working to establish Call Me MISTER at Albany State University in Georgia, among a consortium of colleges in Missouri and with the Florida Minority Fund.

Even in South Carolina, the program has outgrown its original vision. While Call Me MISTER was based at Clemson from the beginning, the students were at three of the state’s historically black colleges/universities. But Misters are now enrolled at Clemson, too, as well as at nine other institutions across the state.

Thirty are already in the classroom, including six master’s candidates, and 150 are in the program statewide. When all of them graduate and accept teaching positions, half the African American men teaching elementary school in South Carolina will be Call Me MISTER alumni.

“In South Carolina, we’re seeing the impact of the first Misters as children experience these men as teachers and role models,” Jones says. “Across the country, we’re planting the same seeds we put in South Carolina soil several years ago. For kids across the state — and now the country — more positive male role models will be an important part of their elementary education experience.”
International team develops new conservation technology

A Confederate submarine that spent 131 years at the bottom of the Atlantic Ocean is the source of innovative technologies in materials science and conservation. An international team of archaeologists, conservators and materials scientists, led by Clemson professor of materials science and engineering Michael J. Drews, is conserving the H.L. Hunley submarine and its artifacts at the Clemson Conservation Center in North Charleston. Team members have worked on the Titanic and on major projects in Australia, Canada and throughout Europe. Members hail from Chile, Denmark, France and Uruguay.

The team has developed a prototype engineering design that “could change the world of conservation as we know it,” according to Drews. To date, the team members have applied the new technology to conserve small items such as the nut from the bolt that attached the Hunley's torpedo spar to the bow. In 2008, they plan to apply it to larger items such as cannonballs and multicomponent specimens. In conjunction with partners in France, they also hope to establish a laboratory employing the technology in Europe.

Using advanced engineering techniques and design to remove and prevent corrosion on metal surfaces exposed to saltwater, the center's research may lead to discoveries that could be applied to the maritime industry, offshore oil rigs and other structures like steel bridges that are exposed to saltwater.
Creative Inquiry team tackles challenge of the sphinxes

Clemson students are helping to preserve humanity’s distant past in Luxor, Egypt, through a trailblazing Creative Inquiry research project.

As part of an ambitious push to restore and rejuvenate the Luxor and Karnak temples, as well as the Avenue of Sphinxes and the surrounding city of Luxor, government officials in 2006 invited Clemson students to join students from Ain Shams University in Cairo to collaborate on a master plan for the city of Luxor.

Organized around the idea of “parallel studios,” the Egyptian architecture students and the interdisciplinary team of Clemson students in landscape architecture, planning, and environmental design and planning worked together over the course of a year to develop the plan. Between visits abroad, the students shared ideas and critiques “virtually,” through email attachments and Web site postings. In July 2007, representatives from both studios presented their joint recommendations and master plan to the governor of Luxor. The plan will be presented to Egypt’s prime minister and scrutinized by UNESCO and other interested parties around the world.

Aside from the tremendous honor to be invited to participate in the plan itself, the Luxor project is important in that it represents a unique Creative Inquiry studio — engaging undergraduate students along with graduate students and faculty in an intensive, discovery-oriented approach to learning. Students had to research historical, social and political influences before suggesting design strategies.
Partnerships place Clemson on electron-imaging map

The highly detailed nanoworld of electron microscopy is the vehicle for exploring surprising relationships that both drive and inform interdisciplinary research. Thanks to Clemson’s state-of-the-art Electron Microscopy facility, more and more researchers are using the lab to facilitate the understanding of materials, their properties and how they function in different applications.

One recent collaboration between biophysics faculty member Pu-Chun Ke and mechanical engineering faculty member Rui Qiao involved research into the behavior of lipid-coated carbon nanotubes. The researchers say this unique study offers exciting promise for integrating nanomaterials and biological systems to benefit such fields as the synthesis or self-assembly of materials, drug delivery systems and nanodevices for biosensing and imaging. Our advanced electron microscopy facilities have enabled Dr. Ke’s research to claim a finalist spot at the 2006 International Science & Engineering Visualization Challenge organized by the National Science Foundation and Science magazine and a top-10 most accessed article in the prestigious Journal of Physics Chemistry B.

As unique as this study is, most projects in the EM facility are collaborative, given the nature of nanotechnology research. Director JoAn Hudson says even the facility itself is a collaboration: Clemson’s partnership with Hitachi High Technologies America Inc. and the state of South Carolina’s Research University Infrastructure Act generated a $3.3 million investment in equipment that has put Clemson on the electron-imaging map with one of the best university electron microscopy laboratories in the United States for viewing objects at the atomic and molecular level.

The facility is housed in the University’s $21 million Advanced Materials Research Laboratory. In addition to Clemson faculty, it serves clients from other universities along with automotive, pharmaceutical, textile, electronics, environmental and medical industries.

Hitachi High Technologies and Clemson have also featured nanotechnology seminars for government and corporate users from across the country.
Clemson Computing and Information Technology is playing a leading role in creating an environment in which great things can happen, on campus and around the world, by expanding and strengthening the University's cyberinfrastructure. Rebuilding Clemson's computer network, connecting it to national and international networks, providing a world-class data center and a state-of-the-art network operations center, developing experienced support staff and fostering partnerships are all part of a comprehensive plan for collaboration and innovation.

Clemson also is providing leadership for the South Carolina Computing Consortium (SC3), a coalition of five major research institutions in the state including USC, MUSC, Hollings Marine Laboratory and Savannah River National Laboratory.

In 2007, the consortium created South Carolina's first presence at SC07, the International Conference for High Performance Computing, Networking and Storage. The 19-year-old conference is the premier venue in supercomputing with more than 10,000 attendees from academia, industry and government agencies.

Arden Bement, director of the National Science Foundation, has stated, "Leadership in cyberinfrastructure may well become the major determinant in measuring pre-eminence in higher education among nations." Clemson is responding rapidly to that charge and is leading the way for our state and the region.