CLEMSON UNIVERSITY

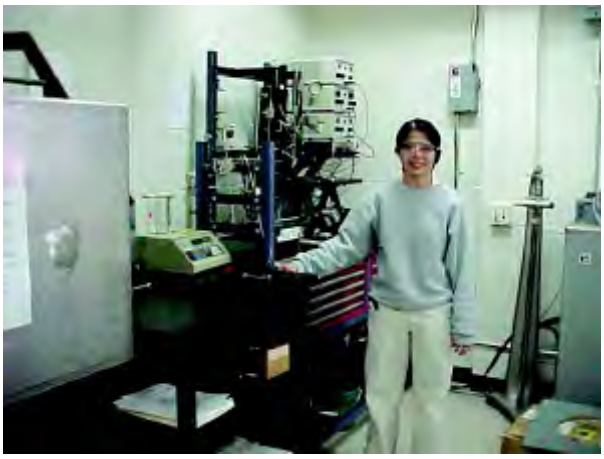
CHEMICAL ENGINEERING

Fall 2001

EARLE HALL RENOVATIONS COMPLETED (ALMOST)

Earle Hall has undergone a major facelift over the past few months, with renovations and relocation of a number of labs; addition of a graduate student lounge and improvement of the undergraduate lounge; and relocation of the library, seminar room and main office space.

"It is important to keep our lab space not only up to date but eminently functional and, to the extent possible, a pleasant working environment," said Department Chair Jim Goodwin. "We also relocated some lab spaces for the convenience of the faculty, so be sure to check the name on the door when you come by to see what we've done."



A space on the basement floor formerly devoted to storage has been subdivided, with one half devoted to rheology, and the other a 'space in waiting" for a new faculty member the department expects to hire this year.

Student facilities have been upgraded and expanded. Adding a bank of study carrels with computers has made the undergraduate lounge more inviting and more functional. The library has been relocated so that it is closer to the undergraduate lounge. Computers for student use, as well as periodicals and other materials are available -- and well-used. Our graduate students seem very pleased to have their own lounge, a facility that is long overdue.

The main office is now in the space previously occupied by the library. A newly furnished seminar room now occupies the former office space and is kept busy with research group meetings, graduate student presentations, and other uses.

Many of these changes have been made possible only through private contributions to the department through the Clemson University Foundation. If you have made a donation to the department, you can be assured the students, faculty and staff are very grateful for your contribution. Regardless of whether you are a contributor or not, we cordially invite you to come by and see the changes. Also, stay tuned for future developments. Much work is needed to bring our facilities into the 21st century. The Unit Ops lab is in need of additional upgrades, including desperately needed heating and air conditioning, and additional lab space will be needed as the national stature of the department continues to increase.

CAEFF FUNDING EXTENDED

The National Science Foundation has approved funding for the Center for Advanced Engineering Fibers and Films (CAEFF) for an additional five years, based on a successful third-year NSF site visit in April. Dr. Dan Edie, Dow Professor of Chemical Engineering, serves as director of CAEFF.

In its review, NSF described the CAEFF's vision, leadership, interaction between faculty across the research thrusts, and rapport with industry as "excellent." The review also praised CAEFF's research outreach, collaborations and educational component.

CAEFF also completed the design and specification for configurations of its new "Beowulf" parallel computer system. This 260-node, four-cluster system will greatly enhance the Center's computational power and, coupled with the new Keck visualization system, will give CAEFF unprecedented capability for the coming years.

Faculty/Staff News

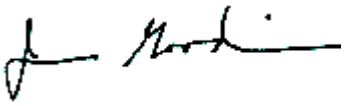
A NOTE FROM THE CHAIR

Preparing students for careers in chemical engineering means providing an environment that offers state-of-the-art equipment and learning experiences that are not only pertinent to but similar to what they will encounter in the work environment once they leave us. That's why it's crucial that we continually upgrade our lab equipment and facilities, as we have been able to do over the past few months, thanks in large part to private contributions of our alumni and friends. The recent gift from the Instrumentation, Systems, and Automation Society, noted elsewhere in this publication, is also greatly appreciated because it will provide the equipment for a new chemical kinetics experiment in the Unit Ops Lab, giving our students the opportunity to work on a project directly related to current practices.

Today's chemical engineers have many new and exciting career paths (as well as the traditional, also exciting ones.) It will be the faculty's challenge to think 'outside the box" of what our own education, professional experience and research interests have been in order to prepare our students for new opportunities. We enthusiastically seek the involvement of alumni and other professionals who can provide an outside perspective to both students and faculty. We are grateful for the participation we have had from alumni willing to come and talk to our senior seminars this semester and we look forward to a visit in February by our Professional Advisory Board, a group we depend on for recommendations about all aspects of our program. Curriculum development -- how best to provide instruction to our students -- is of continual interest. There may be few changes in the basic information, but delivery of information can take many forms, and we noted with interest -- and pride -- that one of our graduates, Dr. William M. Clark (B.S. '79) has received recognition for his work on a new approach to teaching chemical engineering.

It is also important to recruit new faculty who can to move us into new areas of research, and we expect to hire a faculty member with experience and interest in biochemical engineering this year. Again, funding from private sources will enable us to equip the laboratory that will provide a new focus for our students.

We appreciate your support, your suggestions, and your involvement in the department. We look forward to hearing from you and hope you will come by whenever you are on campus.



GOODING RETURNS FROM SABBATICAL YEAR AT DOW

Professor Charles Gooding has returned to the department after spending a year with The Dow Chemical Company in Freeport, TX, as Sabbatical Professor. Dr. Gooding's work was sponsored by Dow Global Chlorinated Organics and he was housed with the Separation Processes Group of Engineering Science and Market Development, a division of corporate research and development.

Dr. Gooding's work at Dow was divided into three parts: The first segment was devoted to developing simulation strategies for divided wall columns, a new distillation technology that Dow is exploring. During the second phase, he worked with a Six Sigma team to improve operation and control of a five-column distillation train. The last three months were spent working on advanced control of batch reactors for the polyurethane business.

During his year in Texas, Dr. Gooding also established contact with nationally known process control specialists on the chemical engineering faculties at Texas Tech University and the University of Connecticut, reviewed several process control texts and one separations text for use here at Clemson, and completed two manuscripts on prior work in membrane separations.

"Since returning in August, I have been able to put many of the experiences I had with Dow to good use in our senior separations course and in our introductory sophomore course," Dr. Gooding said. "In the spring I will be teaching the sophomore course again, in addition to our undergraduate process control course and part of our capstone design course. All of these involve simulation software and other engineering tools I used extensively during the sabbatical. In addition to these benefits, I have initiated talks on research collaboration with colleagues at Dow and at Milliken and Company. The opportunity to spend this year immersed in the Dow environment has certainly expanded my own personal knowledge base and also has given me a renewed enthusiasm for the profession and an even stronger commitment to making sure our students are prepared to meet the challenges and opportunities awaiting them when they graduate."

Faculty	Research Emphasis
Charles H. Barron, Jr., D.Sc.	Polymer Reaction Engineering
David A. Bruce, Ph.D.	Catalysis, Kinetics, Molecular Sieve Synthesis, and Molecular Modeling
Dan D. Edie, Ph.D. Director, Center for Advanced Engineering Fibers & Films	Composite Materials, High-performance Fibers, Polymer Processing & Rheology
Charles H. Gooding, Ph.D.	Membrane Separation Processes
James G. Goodwin, Ph.D. Department Chair	Heterogeneous Catalysis, Kinetic Analysis of Surface Reactions Characterization of Catalysts
Graham M. Harrison, Ph.D.	Fluid Mechanics & Non-Newtonian Flow
Douglas E. Hirt, Ph.D.	Polymer Films
Scott M. Husson, Ph.D.	Bioseparations and Separation Materials Synthesis
S. Michael Kilbey, Ph.D.	Polymer Science; Surface Modification via Self-Assembly
Stephen S. Melsheimer, Ph.D. Associate Dean, Engineering & Sciences	Automatic Control of Process Systems
Amod A. Ogale, Ph.D.	Experimental & Modeling Issues Related to Fibers, Films & Composites
Richard W. Rice, Ph.D.	Catalysis, Kinetics, & Chemical Reactors
Mark C. Thies, Ph.D.	Thermodynamic and Supercritical Fluids

FACULTY FACTOIDS*

- Associate Professor Bud Rice has missed ONLY ONE Clemson home football game in 23 years.
- Professor/department chair Jim Goodwin once played the role of "an American engineer" in a made-for-TV miniseries . . . in China.

**Little-known tidbits of TOTALLY USELESS information about the Chem E Faculty. More to come in future issues!*

WORKSHOP TEAMS FACULTY/INDUSTRY

Assistant Professor Graham Harrison, along with representatives from Cryovac and Rheometric Scientific, offered a short course in rheology for North Carolina- , South Carolina-, and Georgia-based companies that would benefit from a thorough understanding of the flow behavior of materials in designing and optimizing their processes. Fifteen companies were represented during the two-day event that was co-sponsored by the Center for Advanced Engineering Fibers and Films (CAEFF) and Rheometric Scientific (a CAEFF partner.) The rheology laboratory in Earle Hall features state-of-the-art capillary, rotational, and elongational rheometers.

CU, NC STATE, PORVAIR PARTNER ON DOE STUDY

CU Chemical Engineering faculty members Jim Goodwin and Bud Rice and Professors Jerry Spivey and George Roberts of the North Carolina State University Chemical Engineering faculty are collaborating with Porvair Advanced Materials of Hendersonville, NC, through a grant from the U.S. Department of Energy that focuses on reducing the concentration of carbon monoxide to less than 100 ppm in a flow of hydrogen to automotive fuel cells. The group will develop, characterize, and evaluate a series of metal catalysts supported on reticulated metallic foams. Using conventional steady-state microreactor tests and isotopic switching experiments, the research team will study the selective oxidation of carbon monoxide at conditions of practical interest, focusing on the effect of steam, which has not been included in most of the published studies on this reaction. Steam is a major component of the feed to the selective oxidation step, and is known to kinetically inhibit the reaction and to deactivate the catalyst.

Student News

AIChE OFFERS SOCIAL, LEARNING OPPORTUNITIES

The AIChE Student Chapter has gotten the year off to a busy start with a round of social activities, most of which are designed to offer more than merely getting to know each other.

A welcome back barbecue introduced new students into the Chem E "family" and was well-attended by faculty, giving the undergraduates an opportunity to get to know their professors better. The ever-popular Louisiana Shrimp Boil followed not long after, with Chem E Professor and Associate Dean of Engineering/Chef Steve Melsheimer serving up the classic combination of shrimp, corn, potatoes and onions in a fragrant Cajun brew. *C'est magnifique!*

AIChE students also welcomed back Chem E alumni with a reception in Earle Hall following the UNC game. Attendance was less than what the students had hoped, perhaps due to the fact that the 1:30 kickoff prevented a pre-game drop-in, which may be easier than a post-game event, when people are ready to head home. **We welcome any suggestions for ways to make this an event you can attend.**

While food seems to be a major theme of student gatherings, at least one meal had an ulterior motive: career success. AIChE sponsored a dinner designed to help students determine whether their "meal manners" were up to interview standards. A consultant was on hand to (tactfully) watch how the students behaved at a seated dinner similar to one they might have in an interview setting, then gave them suggestions to correct some of the gaffes she observed.

AIChE officers this year include Matthew Studney, president; John Perry, vice president; George Hendrix, secretary; and Gerald Murphy, treasurer.

GRADUATE STUDENTS STRENGTHEN TIES

The Graduate Student Organization has been instrumental in setting up the new graduate student lounge and in planning a number of outings. The new lounge, which occupies space that was formerly a storage room, features comfortable seating, the grad student mailboxes, and both a refrigerator and a microwave oven.

A "welcome back" dinner, a Sunday afternoon hike to Whitewater Falls to savor the spectacular fall color display of the Blue Ridge Mountains, and an after-work mixer so far this semester have provided opportunities for graduate students and faculty to enjoy some social time together.

"It's difficult in the course of the regular academic schedule to find the time to get to know each other," said GSO officer Jared Tatum. "We want to have fun but also it's important to get to know our faculty away from classes and grades. When potential graduate students visit, we want them to see that Clemson Chem E is an environment where graduate students are made to feel welcome and where faculty and graduate students share mutual interests both academically and beyond the classroom."

In addition to Tatum, other members of the GSO committee are Heather Shore, Sonia Hammache and Chris O'Brien.

UNIT OPS LAB RECEIVES GRANT

Dr. Richard W. Rice, Associate Professor of Chemical Engineering, accepted a $5,000 grant from the Instrumentation, Systems, and Automation Society, Western Carolinas Section, to upgrade instrumentation in the Unit Operations Laboratory.

The grant will be used to purchase equipment for a new chemical kinetics experiment. This is the second grant to the department by ISA, a worldwide organization of professionals involved in a variety of industries and processes involving measurement and control applications.

"The Unit Ops Lab is a crucial part of our students' hands-on experience, and it needs to be the very best ," said Department Chair Jim Goodwin. "We are constantly in need of improvements, new experiments, and other ways to maximize the Unit Ops experience. For example, we badly need air conditioning for the entire space, not just for the comfort of students and faculty but primarily for humidity control to protect equipment. This is a costly proposition and one for which we will have to find a creative solution."

Bookmark our website for updates: http://www.ces.clemson.edu/chemeng

Chem E Family Album

Whitewater Falls

Homecoming Drop-In

Shrimp Boil

WILLIAM M. CLARK (B.S. '79) RECOGNIZED FOR DEVELOPING NEW CHEM E INTRODUCTORY CURRICULUM

The American Society for Engineering Education has recognized Clemson Chem E graduate William McDonald Clark with the 2001 William H. Corcoran Award for the best paper published last year in the journal *Chemical Engineering Education.*

Clark, Associate Professor of Chemical engineering at Worcester Polytechnic Institute in Worcester, Mass., was recognized along with two of his colleagues, Associate Professor David DiBiasio and Professor Anthony Dixon, for "A Project-based Spiral Curriculum for Introductory Courses in Chemical Engineering," their paper outlining a new curriculum for sophomores at WPI. The award is sponsored by Eastman Chemicals Corp. and was presented at the ASEE annual meeting in Albuquerque.

The paper describes a comprehensive overhaul of WPI's Chem E sophomore curriculum supported by a U.S. Department of Education grant. The three termed their approach "spiral" because basic concepts are not assumed to be fully learned on their first presentation but are revisited during the year in different contexts and in an increasingly sophisticated way. Students work on open-ended design projects, tailored to their level, throughout the sophomore year. A key feature of the new curriculum is integration of topics traditionally taught in a way that compartmentalized them.

The curriculum is now in use by the entire Chemical Engineering department at WPI and has been well received by most students who find the project approach helped them relate course material to real-world applications and helped them develop critical thinking skills useful in subsequent classes and eventually in their careers.

In the traditional course-based curriculum, we teach students isolated information, but they don't really put it together until they get to the Unit Ops lab in the senior year, whereas with this approach, they work in teams on group projects throughout the curriculum.

"At first, some students are a little bit in shock, because this approach involves three books, with three professors coming at things from three different angles. But by the end of the first term, they begin to see the value of working in teams on specific projects," Clark said.

"I use the analogy of baseball to explain the difference," he said. "The traditional curriculum is like teaching someone to play baseball by teaching them to only hit the ball, or to only run the bases, without explaining the game or giving them a chance to play until they've learned all the separate skills. This provides an opportunity for students to apply their knowledge along the way."

STILL WANTED
Your Memories

You are cordially invited to drop by and check out the new displays in the Earle Hall lobby.

So far we've only gotten 'artifacts" from faculty and students, so we still would like to have any old photographs of the interior or exterior of the building, student and/or faculty activities, or any anecdotes or items you have to share.

We will copy and return all original photographs and will credit all materials to the individuals who provide them.

Please contact Sandy Woodward by phone (864-656-2055) or email (woodwas@clemson.edu) to discuss arrangements for sharing items.

ALUMNI BRIEF SENIORS

We are always pleased to have alumni visit for any formal or informal reason, but having graduates come back and talk to our seniors about employment and career issues is of special value. This semester we have been pleased to have the following guests speakers for Senior Seminar.

Richard A. Coats (B.S. '86; M.S. '90)
Albemarle, Inc.
"Chemical Engineering in the Pharmaceutical Industry"

Tim Williams (B.S. '89)
Dority & Manning Law Firm
"Chemical Engineering in Law"

Titus Gibbs (B.S. '96) and Kimiaki Miyamoto
Fuji Photographic Film, Inc.
"Chemical Engineering in the Photographic Film Industry"

Ken Birchfield (B.S. '90)
BASF
"Career Development"

We appreciate their support and their timely and helpful information!

Check out the new Alumni page on our website, www.ces.clemson.edu/chemeng

Thank You for Your Support.

As the year draws to a close, we want you to know that we are deeply grateful for your support of this department, our students, faculty and programs. At this critical time in our nation's history, our country needs bright, creative, inventive chemical engineers. We are especially proud that our graduates play an important role in national defense, in the development of new materials and technology, in medicine and pharmaceuticals, and in countless other areas.

We appreciate more than ever that YOUR contribution makes it possible for us to graduate top-caliber students who in turn make invaluable contributions to our society. *If your name has been left off this list in error, we apologize in advance and ask that you let us know so that we can correct the oversight.*

Honor Roll of Contributors, Jan. 1-Nov. 30, 2001

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A Final Note

TIME MAGAZINE'S PUBLIC COLLEGE OF THE YEAR

CLEMSON

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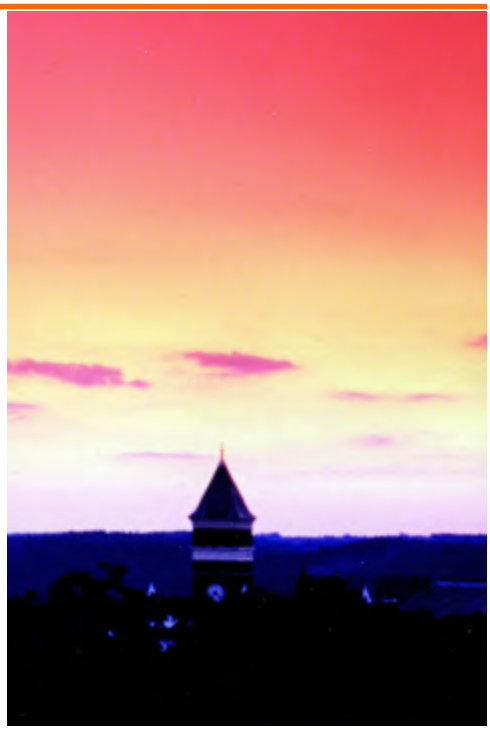
Check out the "new" Chem E website. Over the past few months, we have made some changes to existing pages and added some new features that we hope will be helpful.

The **What's New** page is where we highlight anything new, even if you're directed to another page. Keep up with classmates on the **Alumni Page** (now that we've made it easy to send us your news.). The **Calendar** page lists department events, and the **Photo Album** is a visual record of our latest news.

Please let us know any suggestions you have for making the site useful and interesting to you. We appreciate your comments.



Tillman at Twilight. *This image conveys the beauty and spirit of Clemson so well that we decided to use it on our graduate student recruitment materials.*

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