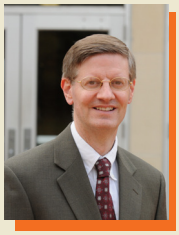
FALL 2011

CLEMSON
CHEMICAL AND BIOMOLECULAR ENGINEERING

Message from the Chair:



Dear Alumni and Friends of the Department:

Hello from Clemson and we hope you are doing well. In the last newsletter I summarized the key features of the University's Plan 2020 in which one of the strategic areas is providing engagement and leadership opportunities for all students. The plan broadly defines "engagement" opportunities, but focuses mostly on co-op jobs, internships, study abroad, and research opportunities. With that in mind, here are relevant numbers from last year's graduating class in Chemical & Biomolecular Engineering:

- The senior class was 50 students
- 19 participated in the co-op program and 24 did an internship (6 did both)
- 17 had a research experience
- 7 studied abroad

Many students had multiple types of experiences. Overall, 43 out of the 50 seniors had at least one engagement experience. To support CU Plan 2020, our goal is 100% participation.

We are extremely pleased to welcome Dr. Rachel Getman to the faculty. Dr. Getman joined the Department in August after completing a post-doctoral appointment at Northwestern University. This semester she has been teaching Advanced Kinetics to our new contingent of graduate students, and next semester she will teach ChE 130 – Chemical Engineering Tools – to a larger-than-normal group of freshmen. Dr. Getman's research expertise is in the area of computational modeling of catalytic systems, and is an excellent addition to the Departmental focus area on reaction engineering.

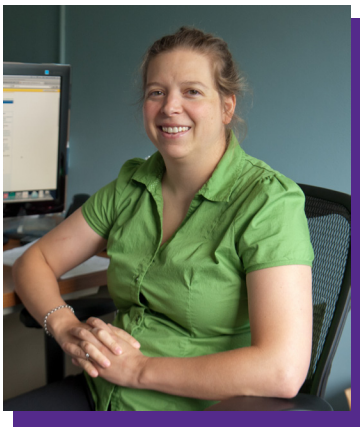
This semester has also brought significant recognition for teaching. Dr. Scott Husson received the Phil Prince Award for Innovation in Teaching, which goes to the University's outstanding teacher who demonstrates creative teaching methods in the classroom. This award is on top of two other teaching awards that Dr. Husson has received during his tenure at Clemson.

Additionally, we highlight one of our graduates, Dr. Liaros Nikos from the Class of 1987, and his journey from studying in the U.S. to wine-making in Greece. Please enjoy all of the features in this newsletter.

Best regards,
Doug Hirt
Professor and Chair

P.S. Thinking of organizing a reunion of your ChE classmates? We would be more than happy to help you arrange a class reunion using Earle Hall as your home base, like we did for the Class of 1963 this past May.

New Faculty Member
Dr. Rachel Getman



We are pleased to announce that Dr. Rachel B. Getman has joined the Department of Chemical & Biomolecular Engineering this fall as an Assistant Professor.

Dr. Getman received her B.S. degree from Michigan Tech and her Ph.D. degree from the University of Notre Dame, both degrees in Chemical Engineering. Before coming to Clemson, she was a Postdoctoral Research Fellow at Northwestern University.

Dr. Getman's research interests are in the areas of molecular simulations, computational catalysis, and rational catalyst design. Her current research involves designing biologically inspired catalysts for alkane and alcohol powered fuel cells, designing bimetallic catalysts for biofuel hydrodeoxygenation, and designing environmentally benign catalysts to remove nitrates and phosphates from stream headwaters.

Dr. Getman's teaching interests are chemical engineering kinetics, reactor design, and computer methods. She is currently teaching our Advanced Kinetics class. Her teaching philosophy and "key belief" is getting students to think critically about problems, solve problems independently, and solve any problem related to chemical engineering using the fundamentals they've learned in class.

We welcome Dr. Rachel Getman to Clemson University! Her teaching and research interests and expertise will be a valuable asset to our Department and to the College of Engineering and Science.

FOCUS ON TEACHING

Teaching Philosophy, Strategies, and Development

by Dr. Scott M. Husson

My teaching style is based largely on Edgar Dale's Cone of Learning, which shows that active modes of learning improve retention. Over the years, I have used a number of 'non-traditional' teaching methods. All of the methods that I use are developed, assessed and revised based on my teaching philosophy, which has six parts: 1) Students should be informed of lesson objectives. 2) Teachers must show enthusiasm for the course material. 3) Students want to see specific examples of how the course material can be applied. 4) Students need practice and guidance to improve their technical writing skills. 5) Students need practice and guidance to improve their critical thinking skills. 6) Teachers should show compassion.

I espouse the philosophy that students have different learning styles, and I use a number of different modes to disseminate knowledge so that all learners are engaged. Here are a few examples of teaching methods beyond standard pedagogy among many that I use in the classroom:

- Hangman game – each day begins with an empty hangman game on the board. Students are asked to pay close attention to work I do on the board or things that I say and to alert me if I make a mistake. Each error that they catch generates a hangman part (head, torso, arm, etc). If the students complete the hangman, then a mysterious 'reward' is given. My students are obsessed with learning what will be the reward – they are engaged learners looking for a 'win'.
- Pictures of famous people – my course notes are littered with photos of the most influential figures in science and engineering. When we hit an important science or engineering milestone, I like to show a photo or portrait of the person(s) who is responsible for inventing/developing the concept or technique to be discussed and give a brief biographical history of that person. My students seem to appreciate seeing the face and knowing something about the person behind what we learn.
- Thermo 'art' – in thermodynamics, the relationships among pressure, temperature, and molar volume are important to understand how materials behave under processing conditions. In my class, we make 3-dimensional models of pressure-temperature-molar volume surfaces using self-hardening clay. Students really get a feel for how these variables are related in ways not possible by looking at 2-D images on the page of a book. The models can be used to answer questions on homework assignments and exams.
- Presentation skits – in the laboratory course that I teach, students deliver skits designed to draw attention to good practices and poor practices in delivering oral presentations. Students are handed note cards (and in some cases props) that tell them what to say and do. In pairs, the students develop a short skit based on the note cards. Topics deal with issues such as eye contact, cell phones, vocalization, fillers (um, uh), knowing your audience, among many others. Having the students learn about presentation dos and don'ts using skits is far more effective and entertaining than any standard lecture could hope to be. Skit day is one of the funniest (and informative) of the semester.

Integrating research and classroom teaching is vitally important. Students must learn that research is our tool to generate new knowledge. I like to infuse lectures with current research initiatives, as well as historical ones that provide the foundation for classroom discussions. For example, when introducing the concept of the first law of thermodynamics, I have found that students appreciate the simple but profoundly insightful experiments conducted by James Prescott Joule. Showing them the experimental setup and explaining the methodology used by Joule gives a real sense of how research generates new knowledge.

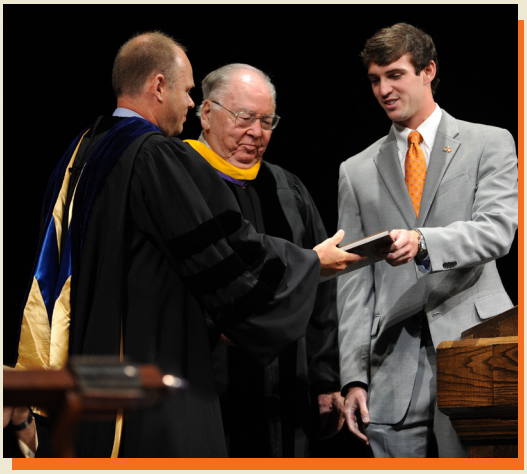
As with all professions, becoming an effective teacher requires practice, assessment, refinement, and professional development. I have had the good fortune to participate in two national workshops: The National Effective Teaching Institute and the New Century Scholars Workshop, which were facilitated by thought leaders in engineering education. In return, I am dedicated to the education of all members of the Clemson community. My new role as workshop instructor for the Effective Teaching Workshop taught annually in the College of Engineering and Science provides a venue for me to share my ideas and experiences with new faculty on the elements of effective teaching-lecturing, active and cooperative learning, course planning, testing and grading, and dealing with a variety of problems that commonly arise in the life of a faculty member. And what a good life it is!

HAYDEN-O'CONNELL EQUATION

George Hayden, M.E.Ch.E, (pictured left) is a Consultant who specializes in advising clients on separation processes, including purification of lignin. Mr. Hayden was in our department recently collaborating with John Blackburn and Michael Lake of Techfish LLC and Drs. Mark Thies and David Bruce on our lignin research project. During those meetings, it was noted that Mr. Hayden is the co-creator (with John P. O'Connell) of the **Hayden-O'Connell** equation. While obtaining his Masters Degree from the University of Florida, he authored the publication **"A Generalized Method for Predicting Second Virial Coefficients"** which was published in July 1975. In order to accurately predict phase equilibria involving the vapor phase at pressures above atmospheric, deviations from the perfect-gas law usually need to be taken into account. His equation developed an accurate method for predicting **second virial coefficients** using only critical properties and molecular parameters, which is used in our departmental research today. It is always nice to put a face to a name!

$$B = \sum_{i=1}^{N} \sum_{j=1}^{N} y_i y_j B_{ij}(T)$$

PHIL PRINCE AWARD



Professor Scott Husson received the prestigious **Phil Prince Award for Innovation in Teaching for 2011.** He was presented the award and recognized at Clemson University's Academic Convocation in August. Dr. Husson received an $1,000 award and a donation to the Clemson University Library will be made in his name. The allocation to the library will be solely for educational material in the area and manner to be determined by Dr. Husson

The Prince Award, named for Clemson President Emeritus Philip Prince, recognizes outstanding teachers who demonstrate creative and novel teaching methods in the classroom. Carlisle Kennedy, president of the undergraduate student body, said Husson has had a "profound impact on his students' lives." Dr. Husson engages his students in critical-thinking activities and emphasizes written communication in all of his classes. He is able to communicate his ideas very effectively, and he merges his research experiences into the teaching arena.

Our alumni repeatedly say that the most important course in our curriculum is the unit operations laboratory. Dr. Husson has recently introduced innovations into that lab course to enhance the educational experience for the students. Another area that he emphasizes in all his classes is written communication. He distributes a list of "Daily Tips on Writing" and gives exercises for the students to work on so they can improve their writing skills. This summer he also designed and offered a special topics course on "Mentoring" with the primary objective to guide graduate student mentors so they could understand "scientific teaching" and apply those skills in order to become more effective and reflective mentors to undergraduates. This is just another way that Dr. Husson goes above and beyond the call of duty to provide value-added experiences and innovations for the benefit of Clemson students.

FACULTY HIGHLIGHTS

Prof. Anthony Guiseppi-Elie, was a speaker at West Virginia University in September. He presented, "Frontiers of more than Moore in molecular bioelectronics, biosensors, and bionics" as part of the **WVNano Distinguished Colloquium Series** in collaboration with the WVU Physics Colloquium.

Prof. Christopher Kitchens, along with Prof. Thompson Mefford (Materials Science and Engineering) and Prof. Brian Powell (Environmental Engineering and Earth Science), were recently awarded a four year, **$600,000 grant from the National Science Foundation to study the "Fate of Engineered Nanomaterials in the Environment".** The number of commercial applications and consumer products that contain nanomaterials are growing exponentially. Currently there are no metrics available to assess the fate of these nanomaterials once they have entered the environment. The goal of this work is to investigate the competitive binding of natural and anthropogenic ligands on a nanoparticle surface, as well as, the impact of nanoparticle size and chemistry on nanoparticle transport in natural systems. Results from this work will aid in the development of new universal metrics that are capable of predicting the environmental fate of various nanomaterials. • Profs Kitchens and Mefford were also awarded the **2011 College of Engineering and Science Faculty Collaboration Award**. This award was in recognition of their collaborative research efforts in the field of plasmonic and magnetic nanoparticles. • Professor Kitchens was also invited to present his research at the **6th Sino-US Joint Conference of Chemical Engineering** in Beijing. The focus of the November 2011 meeting was "Chemical Engineering for Clean Energy" with conference goals of promoting US – China collaborations in the development of clean and sustainable processes, products, and services that meet the ever-growing demand on energy, while reducing emissions and improving the human condition.

Prof. Amod Ogale has been awarded the **Graffin Lecturership 2013 by the American Carbon Society.** The lecturership is in honor of George D. Graffin, a pioneer in natural graphite, and is awarded each year to an individual who has made distinguished contributions to the field of carbon science and engineering. • Prof. Ogale presented a keynote lecture on carbon fibers derived from low-cost mesophase pitch precursors at the **World Carbon Conference 2011, Shanghai, China.** • Prof. Ogale was also awarded an **NSF** grant worth $200,000 to conduct research on extrusion of films in micropatterned dies in collaboration with Hoowaki, LLC; and another research grant worth $150,000 by the **United Soybean Board** to develop soy-based fibers that use bio-renewable precursors and also offer cost-competiveness.

Prof. Mark Roberts was awarded a competitive **Non-Tenured Faculty Grant from 3M.** This award is administered by 3M's Research and Development in partnership with the Corporate Giving Program. It recognizes outstanding new faculty for the quality and pertinence of research and is intended to help the recipient achieve tenure, and remain in their teaching position and conduct research.

STUDENT HIGHLIGHTS

Vienna Unit Ops Program - Since 2002, Clemson University has partnered with the University of Wisconsin and Technische Universitat Wien (TU Vienna), both members of Global E3, to offer a summer Unit Ops lab that provides an international experience for U.S. ChE students. The summer Unit Ops program in Vienna is an approved substitute for one of our Clemson UO labs (ChE 407) and helps "off-load" the demanding senior lab from the fall senior schedule for those undergrad students who participate. This summer ChBE undergrads **Spencer Mason, Brent Klapthor, Jeremy Kearns, Grant Robertson, and Malvika Ogale** (pictured left) took advantage of this opportunity and traveled to Austria for the summer. Because TU Vienna is recognized as a top European ChE program, our students were able to develop valuable communication skills while experiencing an academically rigorous laboratory program with excellent facilities. Not only did our chemical engineering students gain a high quality lab experience in Vienna, but they also had a positive and valuable international experience, which many companies are seeking in new hires.

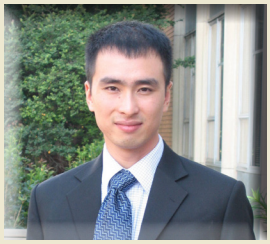
Eastman Chemical Company in Kingsport, Tennessee, recently donated funds to the Department of Chemical & Biomolecular Engineering for our collaboration in Eastman's internship program. Each year Eastman selects top students to participate in a summer internship program at their plant. **This past summer, Scott Tryggestad, ChBE senior, participated in the program and was the recipient of the Eastman Award for Excellence in Chemical Engineering.** The funds donated will be used to help with lab renovations and programs that support our undergraduates. Jennifer Moffitt, Chemical Engineer, and Luke Guthrie, Tech Staff Engineer, of Eastman Chemical Company, both graduates of Clemson University, presented the check to Dr. Doug Hirt (center). We are thankful and proud to have this ongoing relationship with Eastman Chemical.

Even though Chemical Engineering has a very demanding curriculum, several of our students make time to enjoy other endeavors. **Brian Orr**, a sophomore (pictured right) played with his orchestra quartet at the recent Legacy Day on November 11th, which celebrated Clemson's history on the grounds of Fort Hill, the historic home of John C. Calhoun, Thomas Green Clemson and Anna Calhoun Clemson. **Scott Kwarsick**, a Senior, (you can see a glimpse of his profile on the very left) plays trombone with the Clemson Tiger Marching band and is enjoying this exciting football season as a band member. The band and orchestra are just two of the 400 clubs and organizations that students on campus can join.

Two of our PhD students received travel awards to present their research at the SACNAS National Conference in San Jose, California, in October. The award recipients and their presentations were: **Milagro Marroquin, "Location of Biological Foulants Within a Wet Membrane Structure" (Poster) (Prof Scott Husson, advisor); and Jose Luis Orellana, "Liquid and Supercritical Extraction of Fat from Rendered Materials" (Oral) (Prof. Chris Kitchens, advisor).** Jose received the Award for Outstanding Research Presentation at this conference. The Clemson SACNAS chapter also won the Role Model Chapter Award (Outstanding Use of Social Media to Further the SACNAS Mission) for the third consecutive year. SACNAS is a society of scientists dedicated to fostering the success of Hispanic/Chicano and Native American scientists—from college students to professionals—in attaining advanced degrees, careers, and positions of leadership.

PhD GRADUATES

Dr. Sourabh Kulkarni
Dissertation: **"Quantitative Analysis and Structural Characterization of Carbonaceous Pitches"**
Advisor: Dr. Mark Thies
Current Position:
Technology Development Process Engineer
Intel Corporation
Hillsboro, Oregon



Dr. Ha Nguyen
Dissertation: **"Modeling and Synthesis of Functionalized Meta-Poly(Phenylene Ethynylene) Helical Structures"**
Advisor: Dr. David Bruce
Current Position:
Assistant Research Scientist
Texas A&M University
College Station, Texas

Dr. Halil Tekinalp
Dissertation: **"Pitch-Based Activated Carbon Fibers: The Effect of Precursor Composition on Pore Structure"**
Advisor: Dr. Mark Thies

Dr. Yu-Tung Tsai
Dissertation: **"Oxygenate Synthesis During CO Hydrogenation on CoCuZnO Based Catalysts"**
Advisor: Dr. James Goodwin
Current Position:
Postdoctoral Research Associate
Oak Ridge National Laboratory
Oak Ridge, Tennessee

Dr. Jack Zhang
Dissertation: **"Effects on Hydrogen Adsorption and Activation on Platinum in a Fuel Cell Catalyst"**
Advisor: Dr. James Goodwin
Current Position:
Staff Scientist
Rennovia, Inc.
Menlo Park, California

Dr. Liaros Nikos - ChE B.S. Class of 1987

as told to Dr. Mark & Evanne Thies

Over the past three years Dr. Thies has been traveling to Greece to collaborate with Dr. Doros Theodorou at the National Technical University of Athens on a research project. It has been during these visits he has had the pleasure of getting to know a former chemical engineering student Nikos Liaros (BS ChemE '87) a little better. Dr. Thies is proud of Nikos' success as a chemical engineer from Clemson in spite of the "F" Nikos received in his thermodynamics class...but more on that story later.

How did Nikos decide to come to the U.S. to go to college? Nikos says that his godfather Vangelis Theodorou, a famous surgeon in Greece, was the one who "polluted" him at a very early age to go to school in America. Dr. Theodorou was educated himself in the States and practiced medicine there for 10 years before returning to Greece. When it was time for Nikos to go to the University, Dr. Theodorou contacted a friend and his former classmate Dr. Gus Papadopolous, who remained in the States and was practicing medicine in Houston, Texas, for advice on where Nikos should attend college. Dr. Papadopolous was an alumnus of Wofford College in Spartanburg, SC, so the two doctors decided Nikos would attend Wofford and major in Chemistry. Nikos packed up, got on a plane with little information about what to do when he arrived. He was told there "might" be someone at the Greenville/Spartanburg airport to greet him. Nikos did arrive safely at Wofford on July 14, 1982, and started taking classes that summer. Comfortable with his grades, Nikos applied for a scholarship given to students of Greek descent and received the scholarship in the spring of 1983.

When Nikos arrived at Wofford, he also had in mind playing soccer. Unfortunately, when he arrived and was busy taking classes that summer, the Wofford team was away for training Nikos started practicing while the team was away and when the team returned, he asked for a tryout. He made the team as a walk-on and started for 2 years. After the first semester, Nikos realized that chemistry was not what he wanted to pursue, but he was more interested in Chemical Engineering. He started doing some research into what school to attend, keeping in mind he wanted to stay in the area and continue to play soccer. He even went to talk to Coach Ibrahim before he transferred, but the coach could not speak to him until he was a student at Clemson. So in the summer of 1984, Nikos became a Clemson Tiger.

Nikos attended Clemson for 3 years as a student in the Department of Chemical Engineering. Unfortunately, he was not able to play soccer because Coach Ibrahim made him realize that he could not be in such a rigorous major and play soccer at the same time. As a student at Clemson, he was doing so well he thought he was a "God" (After all, Nikos is Greek) – until he flunked Dr. Thies' thermodynamics class. It was the first and only "F" Nikos ever received. He was so rattled by the grade that he even called Dr. Thies' at his home to argue about the grade. Nikos doesn't remember that detail, but Dr. Thies does with great trepidation, because Nikos is a big guy at 6'4". That "F" was the wake-up call Nikos needed. He buckled down and graduated from the department in 1987. Nikos returned to Greece immediately to fulfill his military obligation and also to go through the process of validating his degree from a university outside of Greece. The Chemical Engineering degree in Greece is a 5-year program, so he had to take 2 classes and perform a research project.

When Nikos was applying for a job after the army, he had three offers in a very good market for chemical engineers. He decided to take a position with Heineken in Patras, Greece, because Heineken was one of the top 10 companies in Greece, and the offer was too good to pass up. He started as a shift brewer for 2½ years and then moved to quality control. Next, he was relocated to Thessaloniki to be head of brewing and malting. In 2003, he was moved to Athens by Heineken to be head of their human resource team for the 2004 Summer Olympics. It was a wonderful opportunity for a technical guy, to work on a high profile project that allowed him to be exposed to other avenues in the company. It was after the Olympics project that Nikos joined the central organization of the company in Athens as a Planning Production Expert. For the past 2 years, Nikos has been in central quality control, dealing with ISO (International Organization for Standardization) certifications and as a liaison to the Greek government. Nikos attributes his success at Heineken first with the decision to attend a university in the U.S., and second the decision to attend Clemson to become a chemical engineer.

Although Nikos has worked in the beer-producing industry for a long time, he has always had an interest in wine. Wine making is an honored Greek tradition, and many Greeks still make their own wine. Nikos's introduction to the wine industry started out very innocently enough. In 2002, he decided to plant a small amount of grapes (just a quarter of an acre on the 12 acres he owns) on the land he owns in Adam, which is located southeast of his hometown, Thessaloniki. After much research, he selected an Italian variety called Refosco. A good friend and dairy farmer from Adam, Demetri, saw what Nikos was doing and asked if he would allow him to plant some vines on Nikos's land too. Nikos said of course to his good friend. Upon Nikos's return to Adam a month later, he was stunned to find that Demetri had planted vines on 2.5 acres of his land, far more than he had anticipated. When Nikos went to Demetri to discuss the situation, Demetri's response was "what do we do next?" At this point Nikos knew they were in way over their heads, so he decided to hire an expert for direction. After 3 years, they produced 500 bottles of wine. The two friends were greatly encouraged by their product – and Adam Vineyard was born (www.adam-oinos.gr). Nowadays, Nikos's production has climbed to 10,000 bottles in four varieties, two whites and two reds. By 2015, he anticipates producing 50,000 bottles. In 2010, Nikos started to investigate the possibility of importing to the U.S. He has discovered that the process is very difficult because FDA approval is required, and is done through an importer. At this point, Nikos is still searching for that connection. So you'll have to come to Athens to sample his wine. In conclusion, Nikos's career has become the envy of many of our undergrads – working with beer and wine and getting paid for it. Nikos and his wife, Eleni Stefanopolou who is a lawyer and poet, live just outside of Athens on the beach, where they have the pleasure of swimming year-round.

Department of Chemical and Biomolecular Engineering
127 Earle Hall, Box 340909
Clemson, SC 29634-0909

www.clemson.edu/ces/chbe

Advanced Materials
Biosensors and Biochips
Chemical & Biomolecular Separations
Energy
Kinetics and Catalysis
Molecular Modeling and Simulation

DONORS - FISCAL YEAR 2011

The Department of Chemical and Biomolecular Engineering would like to honor the following donors to our department from FY2011 (07/01/10- 06/30/11). Financial support is always critical to the operation of the department - without it we would not be able to fund our initiatives that help us attract the best students and faculty. Thank you so much to the donors listed below and to all those thinking of donating in the future. Your generosity is sincerely appreciated!

Corporations, Foundations, and Trusts

3M Foundation
BASF Corporation
Bechtel Foundation
Cardinal Health Foundation
Citgo Petroleum Corporation
Dow Chemical Company Foundation
ExxonMobil Foundation
Fluor Corporation
Ingersoll-Rand Company
Kraft, Inc.
Mansfield Oil Company
Pfizer, Incorporated
R E and M Solutions Inc.
Triangle Community Foundation
Verizon Foundation

Individuals

Joe M. Alexander
Susan G. Bailey
Jay B. Barber
Charles H. Barron
Donald W. Baxter
Harry E. Beasley
Celia J. Beauchamp
Linda H. Bergeron
Patricia A. Bernat
Matthew E. Blackstone
Paula Blanchard
Trent A. Bolling
James W. Bracken
Williams S. Brant
Gayle S. Bumgarner
Louis A. Chaddick
Cindy P. Chapman
Richard A. Coats
Charles D. Cooper
John W. Coyle
Trent D. Crawford
John B. Crostic
Jill S. D'Amato
George M. Daugherty
Charles D. Dukes
Patricia L. Dunham
Carrie E. Dunton
James L. Edwards
Matthew T. Eggerding
Roy N. Eissmann
Claude D. Epting
Stephen Q. Ferguson
Mark R. Fisk
Edward E. Ford
Larry B. Fore
John B. Frazer
Bradley W. Gantt
Jonathan G. Garrick
Dean C. Gaskins
Matthew W. Gissendanner
Larry N. Goff
Tracy L. Greene
David B. Grubbs
Jeffrey J. Gude
Susan M. Hamm
M. N. Hanano
Jeffrey S. Harding
Edward W. Hardwicke
Edward C. Henne
Paul A. Hernley
Linda K. Hicklin
Priscilla J. Hill
Lyman L. Holland
Thomas J. Holstein
Karin M. Hudson
Mark D. Ingram
Tim J. Iori
Sean P. Israel
William L. Jackson
James K. Jennings
Latisha M. Johnson
Samuel T. Johnson
James R. Jones
Jamie L. Keller
Scott S. Kendrick
Doreen C. Keptner
Russ Kiekhaefer
David J. Kistner
Kris W. Knudsen
Roy A. Kosin
Elizabeth L. Kruger
Frank L. Lambert
Frank H. Lamson-Scribner
Bryon E. Leggett
Clifton J. Lewis
William C. Lewis
Robert M. Lindler
Jessie W. Little
Anne O. Littlejohn
Doris M. Littlejohn
Jerome F. Marra
Ellen P. Martin
Emmy V. Matson
Robert M. Mattison
Thomas D. McClure
Jeffrey L. Meece
Stephen S. Melsheimer
Marcia Mia
Gary N. Mock
C. V. Moore
David W. Morison
Jacklyn D. Moxham
Daniel W. Mullin
George W. Newcomb
Michael D. Newman
Noelle R. Norfolk
Mary C. Norris
David A. Owen
Bonnie W. Pattie
Carol A. Perez
Albert H. Peters
Jasmeen M. Pharr
William T. Pool
John W. Prather
James W. Price
Ralph S. Radford
Deborah A. Reeves
Walter S. Rieker
David B. Robbins
Susan M. Roberts
Richard C. Rogers
Robert A. Sawtelle
William B. Scherler
Brandon T. Scruggs
Joe E. Shaw
Kara S. Shealy
Ronald B. Sheppard
Charles M. Shuler
Frank H. Shuler
Robin L. Smith
Dyan M. Spinnato
William H. Spitzer
John R. Stamey
Joseph C. Stanfill
William D. Stephens
Amanda M. Stevenson
Morgan M. Stokely
Carmen C. Sutheimer
Mark A. Todd
Alfred D. Tolson
Thomas P. Turnbull
Erick S. Vasquez
Richard D. Vernon
Jason R. Vitali
Winston E. Wallace
Keisha A. Walters
Robert M. Ward
Laura B. Weaver
Mark E. Weining
Andreas Westergaard
Gloria J. Williams
Larry W. Wyatt
James A. Yanacek
James C. Young