Carolina Coal

Turning wood into a renewable energy source
The mound of woodchips piled up behind an old barn in Raleigh, N.C., could fuel a pretty spectacular bonfire. But as Chris Hopkins surveys the mound, he has a better idea. Hopkins, a doctoral student in forestry at NC State University, is part of a team of researchers working to turn woodchips into a substitute for coal.

Nearby the team members have set up a tall metal machine called a torrefier that performs modern-day alchemy. Woodchips go into a large funnel at the top of the machine and come out as hard, dry, black pellets at the bottom. In the process, they've changed more than just their appearance. They've been physically and chemically altered — through heat and pressure — to make them denser, drier and easier to crush.

The pellets — called bio-coal — are lighter than woodchips but retain 90 percent of their original energy content. That makes them an ideal feedstock for electric power plants that traditionally use coal to generate energy for businesses and residential neighborhoods.

“This process could help us build a bridge to more energy independence,” Hopkins says.

Woodchips are more abundant in North Carolina than coal and easier to collect. And, more importantly, they’re a carbon neutral source of energy. For a state that spends more than $4 billion a year importing coal, torrefied wood could be an economic windfall as well.

Hopkins explains that nearly half of the state’s forests are not adequately thinned because landowners lack a market for small diameter trees, rotten or unusable trees and logging residue. That land could be producing more valuable wood products if it was managed more effectively, he says.

If woodchips were collected and sold to help fire North Carolina’s energy generating plants, the state’s tax base could be increased by nearly $400 million a year, he estimates. Since the torrefier machine is small enough to transport on the back of...
a flatbed truck, it could be set up close to forest-clearing operations, making the process even more efficient.

Hopkins and his NC State colleagues are working with Progress Energy to test bio-coal wood in some of the company’s coal-powered generating stations this year. NC State’s Office of Technology Transfer (OTT) recently announced an exclusive license agreement with AgriTech Producers, LLC of Columbia, S.C., to commercialize this technology, called “Carolina Coal.”

Benefits of Carolina Coal

> It takes up less space and is cheaper to transport. It can be shipped longer distances, making exporting biomass a more realistic and profitable venture. One study in the Netherlands found that the long-distance trade and logistics of torrefied biomass were 30 to 70 percent more economical than raw biomass.

> Unlike regular pellets, which reabsorb water during shipping and storage, torrefied biomass resists water. Like coal, it can be stored without cover.

> It is extremely stable and resistant to crushing.

> It can be co-fired with coal. Because it can be pulverized with existing coal pulverizers, the capital costs necessary for co-firing are reduced.

> Torrefaction produces consistent and uniform feedstock. These qualities reduce the risk of damage and inefficiency in wood-to-energy processes.

> Most of the volatile organic compounds, like pinene and turpene, are burned off during torrefaction. As a result, less smoke is produced when the bio-coal is burned and there is less danger of slagging a boiler.

> The thermal efficiency of the torrefaction process is 96 percent. The treated biomass has a heating value of 11,000 Btu/lb, which is similar to that of coal at 12,000 Btu/lb.

Source: Kent D. Wooten, Sampson County Extension Director
Bulletin Board

Civil Rights: Then and Now
Angela Davis will give a talk titled “Civil Rights: Then and Now,” at 7 p.m. tonight in Stewart Theatre.

Davis is a professor emerita of history of consciousness at the University of California – Santa Cruz. Her appearance was organized by the Issues and Ideas Committee and is free and open to the public. For more information, call Rick Gardner, associate director of campus activities, at 515-5161.

International Affairs Seminar Series
The Globalization Strategies and International Services series continues with dual presentations from 1 to 2 p.m. on Friday, Sept. 18, in the Talley Student Center, Room 3118. Dr. Frema Arasu, associate vice provost with the Office of International Affairs, will speak about the global health initiative at NC State. David Dixon, program coordinator with the Office of International Affairs, will discuss the university’s process for developing an international memorandum of understanding.

Stargazing at Astronomy Open House
See Jupiter and the Andromeda galaxy during the fall astronomy open house beginning at 8 p.m. on Friday, Sept. 18, at the Reedy Creek Observatory.

The evening’s fun includes stargazing, constellation finding, telescope viewing of deep sky objects and refreshments. School-age children and their families are encouraged to attend. Astronomy experts from the physics department will be on hand to answer your questions.

Regulating Islam in Pakistan
Dr. Khalid Masud, chairman of the Council of Islamic Ideology in Pakistan, will give a talk titled “Regulating Islam in Pakistan: The Role of the Council of Islamic Ideology,” at 4 p.m. on Monday, Sept. 21, in Withers Hall, Room 331.

Hispanic Heritage Month Events
The Department of Multicultural Student Affairs invites faculty, students and staff to join in celebrating Hispanic Heritage Month.

• First Cary Caribbean Festival: Saturday, Sept. 19, 2–7 p.m., Herbert C. Young Community Center
• Coming to America!: Wednesday, Sept. 23, 7 p.m., Riddick Hall, Room 315
• Annual Futbol/Soccer Tournament: Saturday, Sept. 26, 9 a.m. to 5 p.m., upper intramural fields
• U.S. Census 2010 - It’s In Our Hands (Esta en Nuestras Manos): Monday, Sept. 28, 5:30 to 7 p.m., Walnut Room, Talley Student Center
• CNN “Latino in America,” Interactive Watch Party: Wednesday, Oct. 21, 8:30 p.m., Washington Sankofa Room, Witherspoon Student Center

Evolution of the Conflict in Iraq
Hear a military expert’s perspective on how the conflict in Iraq evolved from 2003 to 2009. On Monday, Sept. 21, Brig. Gen. H.R. McMaster, director of concept development and experimentation at the Army Capabilities Integration Center in Fort Monroe, Va., will speak from 1:30 to 3 p.m. in Stewart Theatre.

An Evening with Michele Bowen
Author Michele Bowen will speak about her latest book, Up at the College, at 7 p.m. on Tuesday, Sept. 22, on the first floor of the African American Cultural Center. A book signing and reception will follow her presentation.

Cultural Center Book Club
The African American Cultural Center Book Club will discuss Steve Harvey’s Act Like a Lady, Think Like a Man: What Men Really Think About Love, Relationships, Intimacy and Commitment, when it meets from noon to 1:30 p.m. Tuesday, Sept. 22, on the third floor of the African American Cultural Center. NC State’s Catalyst Bookstore will offer a 10 percent discount for those who mention the book club.

Wachovia Executive Lecture Series
Students, faculty, staff and business leaders interested in hearing insights from corporate executives can attend a free event featuring Susan Ivey, CEO of Reynolds American, from 4:30 to 5:30 on Wednesday, Sept. 23, in the Nelson Hall auditorium. The event is part of the Wachovia Executive Lecture Series.

Pulitzer Prize Winner’s Reading
Pulitzer Prize-winning author Tracy Kidder will read from his latest book, Strength in What Remains, on Wednesday, Sept. 30, at the McKimmon Center. NC State’s Friends of the Library and Quail Ridge Books and Music are sponsoring the reading, which is supported by the NC State Foundation. Admission is $5 or free with purchase of Strength in What Remains from Quail Ridge Books and Music. Contact the group at 515-2841 to purchase a ticket and reserve a seat.

Entrepreneurship Lecture Series
Meet a man who’s been named Ernst & Young’s “Master Entrepreneur” and one of Advertising Age’s “Digital Media Masters.” Christopher Evans, an entrepreneur and philanthropist with offices in Raleigh, will open the fall Entrepreneurship Lecture Series from 5:30 to 7 p.m. on Thursday, Oct. 1, at the McKimmon Center.

Faculty and Staff Notes

Chancellor Job Description Posted
Search committee members have posted a job description for the university’s next chancellor, incorporating suggestions from online submissions and open forum comments. You may still submit comments for the committee using the online feedback form, and input is welcome, said Bob Jordan, search committee chair. Jordan said that nominations for chancellor may be submitted to:

Jerry H. Baker
Baker and Associates LLC
10 Glenlake Parkway, South Tower, Suite 140
Atlanta, GA 30328
E-mail: jbaker@baasearch.com
Phone: 770-395-2761

Save Money at Wellness Expo
Attention, NC State shoppers: Here’s your chance to find deals galore during the Wellness Expo from 11 a.m. to 3 p.m. on Tuesday, Sept. 29 in the McKimmon Center. Want to save up to 20 percent on your cell phone bill? Check out the Wolfperks deals for faculty and staff. Plus, you’ll find faculty and staff discounts on a wide array of items, including sub sandwiches, shoes and sports memorabilia.

To help you save on your biggest purchase – a home – attend the seminar for first-time homebuyers at 12:15 p.m. To reserve a spot, register online. You can even catch a free shuttle from Centennial Campus or the College of Veterinary Medicine.

And, as the name implies, the expo will feature wellness screenings, a blood drive, free seasonal flu shots for State Health Plan members and benefits seminars on flex spending accounts.

Latino Student Success Grant
NC State received one of 20 national SEMILLAS grants to increase retention and graduation rates among Latino students. The $50,000 grant, supported by the Walmart Foundation, is part of nonprofit organization Excelencia in
Education's "Growing What Works" initiative, designed to accelerate student success with model educational programs proven to advance Latino achievement in college.

**Mitchell Awarded Research Grant**
Dr. Gary Mitchell, professor of physics, received an $800,000 grant from the National Nuclear Security Administration (NNSA) to explore ways to reuse or otherwise safely dispose of waste from nuclear power plants. He will serve as lead investigator for the project, "Cross Sections, Level Densities and Strength Functions."

**Artificial Retina Research Honored**
Dr. Gianluca Lazzi, professor of electrical and computer engineering, is part of a group of researchers recently honored with an R&D 100 Award for their work on an artificial retina that could one day restore sight to the blind. The awards, sponsored by R&D Magazine, recognize significant new technologies that exemplify the most innovative ideas of the year. Five national laboratories, four universities, and a private company have contributed to the research.

**Cyclists Make 100-Mile Charity Trek**
Two faculty members in the Department of Marine, Earth and Atmospheric Sciences will make a 100-mile bike trek this Saturday to raise money for United Cerebral Palsy. Professor David Genereux and Assistant Professor Karl Wegmann will take part in Ride Without Limits.

**Book on Location-Based Reality Games**
Dr. Adriana de Souza e Silva, assistant professor of communication and director of the Mobile Gaming Research Lab, has a new book of essays titled *Digital Cityscapes: Merging Digital and Urban Playspaces*. Her book examines how the convergence of smartphones, GPS, the Internet and social networks has given rise to playful, educational and social media games.

**Miller Named McPherson Professor**
Dr. Thomas K. Miller III has been named the McPherson Family Distinguished Professor in Engineering Entrepreneurship. Miller also serves as professor of electrical and computer engineering, vice provost for Distance Education and Learning Technology Applications (DELTA), director of the Engineering Entrepreneurs Program and associate dean of engineering. As vice provost for DELTA, Miller is responsible for the university’s learning technologies and distance education programs.

Miller is a member of the university’s Academy of Outstanding Teachers and recipient of the 1995 Joseph M. Biedenbach Outstanding Engineering Educator award from IEEE, formerly the Institute of Electrical and Electronics Engineers. The U.S. Distance Learning Association recently honored Miller for outstanding individual leadership in distance learning.

Alumnus Thomas R. McPherson established the endowed professorship. McPherson, who earned bachelor’s and master’s degrees in electrical engineering at NC State, founded and led several successful high-tech companies, resulting in one IPO and two mergers. The companies that he helped establish include Picture Element Limited, Network Equipment Technologies, Rapid City Communications, Hatteras Networks Inc., and recently Cognio Inc., which was sold to Cisco Systems. McPherson serves on the university advisory board for the Engineering Entrepreneurs Program and the Engineering Foundation Board of Directors.

**Nominees Sought for Service to Environment and Society Award**
Nominations are being sought for the annual College of Natural Resources and College of Agriculture and Life Sciences Joint Award for Service to Environment and Society. The award, which recognizes scholarly work to improve human and natural world conditions, is presented each year to a tenure-track faculty member from any of the colleges.

The award will be presented Oct. 5 at the Nobel Laureate Dr. Norman E. Borlaug Distinguished Lecture on Global Service to Society and Environment. Award nominations can originate from individual faculty members on their own behalf or on behalf of colleagues or from any level of university administration.

For more information, contact Paul Mueller, paul.mueller@ncsu.edu or 515-2665, or Dan Robison, dan.robison@ncsu.edu or 515-2690.

**Find an online preview of the Hunt Library**
Get an online preview of the Hunt Library, scheduled to be completed in 2012 on Centennial Campus. Renderings, plans, timelines and more are online at http://www.lib.ncsu.edu/huntlibrary. The Board of Trustees reviewed and released the design plans last week.

**Dr. Thomas K. Miller III has been named the McPherson Family Distinguished Professor in Engineering Entrepreneurship.**

**Enjoy a tale of genius, jealousy and revenge that has nothing to do with promotion and tenure.**

University Theatre opens its season with "Amadeus," the Tony Award-winning story of unsung composer Antonio Salieri’s rivalry with the brilliant Wolfgang Amadeus Mozart. Reserve a seat in the newly renovated Titmus Theatre in Thompson Hall.

Performances run from Friday, Sept. 18, to Sunday, Sept. 20, and from Wednesday, Sept. 23, to Sunday, Sept. 27. For tickets, call 919-515-1100 or visit http://ncsu.edu/arts.
Energizing Physics Classes
AN INNOVATIVE TEACHING PROJECT REDUCES TIME IN LECTURE HALLS.

Physicist Bob Beichner is no stranger to mixing things up in the lab or in the classroom. His innovative teaching methods have been fine tuned over the past decade into a system called SCALE UP – Student Centered Activities for Large Enrollment Undergraduate Programs – and adopted in one form or another at more than 50 universities across the United States, including Clemson, the University of Alabama and MIT.

Beichner’s philosophy is that students learn better through hands-on activities – a philosophy that’s been borne out by research and in practice.

His latest work takes that philosophy further, freeing hundreds of students from spending up to three hours a week in large lecture halls. The MILLIE project, short for “Methods of Incorporating the Latest Learning Innovations in Education,” provides smaller seminar-like experiences for students in Beichner’s introductory physics courses.

The key? downloadable videos of the course material that students watch before taking part in weekly classroom discussions.

“Faculty repeat the same 75 percent of their material each semester,” Beichner says. “And for the most part, lectures are simply a guide to the textbook. By preparing this guide for students to see before the lecture, we are able to spend class time answering specific questions about the material, rather than just rehashing the book in class.”

Beichner launched MILLIE during the spring semester with volunteers from one of the main introductory physics courses for science and engineering majors. Each class of about 100 students is divided into thirds. Students still get three hours of lecture per week, but only one hour is spent in the classroom. The other two lecture hours are available via iTunes podcasts.

Beichner made 40 videos for the course – each about 20 minutes long – incorporating both textbook problems and real-world demonstrations from external sources, such as YouTube. The videos provide a visual guide to the textbook and help students learn to read technical material.

“There is less work in preparation for this style of teaching than for three separate lectures,” Beichner says. “Once the video is made, it’s done.”

Results from the pilot program are promising. Test performance didn’t differ between students who took the regular lecture course and those enrolled in MILLIE, indicating that perhaps the amount of time spent in a classroom isn’t the best indicator of student performance. In addition, class attendance for students in the pilot program reached 70 percent, a fairly high rate.

Student reviews were mixed. They weren’t enthusiastic that Beicher’s videos largely follow the textbook material, although the videos are designed to do just that.

“Students would rather watch teenage boys doing stupid things on YouTube that deal with a lot of physics rather than going over dry textbook material, so that’s an understandable criticism,” Beichner says. “Still, this is very much a work in progress, and the results so far give me a lot of confidence in the future of the MILLIE program as an efficient alternative to straight lectures.”