

# Mining Engineering

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## UK Mining Engineering: Over a Century of History

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*Charles J. Norwood. Image courtesy of  
University of Kentucky Archives*

in the country. A brief review of the  
program's history follows.

The UK Department of Mining Engineering was originally established in 1901 under the direction of Professor Charles J. Norwood, who also served as the chief inspector of mines for the Commonwealth of Kentucky from 1884 to 1919 and the state geologist for the Kentucky Geological Survey (KGS) from 1904 to 1912. Our current SME student chapter is named in honor of C. J. Norwood for his importance in the history of our program and the state. The department's first bachelor of science graduate was Robert Hardgrove Barclay in 1904. Barclay served under Professor Norwood in the KGS as a mining aide.

In 1908 the department became the College of Mining Engineering and established a graduate program in 1912. Reorganization of the colleges resulted in the addition of a metallurgy program in 1916 and the college was renamed the College of Mining and Metallurgy. In 1918 all of the engineering colleges were combined into

During the fall of 2008, the UK Mining Engineering Foundation celebrated its 25<sup>th</sup> anniversary. During this event it was noted that the department has the unique distinction of being both one of the oldest and youngest mining engineering programs

a single college and the program converted to the Department of Mining and Metallurgy.

The separate mining department was closed in 1968, and the program became a specialty area in the Department of Civil Engineering. In the later part of the 1970s, a large national demand for mining engineers developed as a result of the energy crisis. In 1980 approximately 26 accredited mining engineering programs produced over 800 mining engineers nationwide. Under Professor Ted D. Haley's leadership, the UK mining engineering specialty area graduated 39 students in 1980, which remains the largest graduating class in the history of the program. Within a four-year period from 1979 to 1982, the program produced over 130 new mining engineering graduates.

In response to the demand and request of the Kentucky mining industry, the Department of Mining Engineering was reopened in 1981 under the direction of Professor Joseph W. Leonard III. In 1983 a group of mining industry corporations and individuals provided an endowment to establish the UK Mining Engineering Foundation which serves to provide financial, political and advisory support for the department. Gatesby Clay, former president of Kentucky River Coal, presented the initial pledge and challenge which resulted in the foundation endowment.

Since the initiation of the program in 1901, the UK Mining Engineering program has produced 665 graduates, including 66 M.S. graduates and 11 Ph.D. graduates. The first M.S. graduate was Samuel M. Cassidy in 1928. The first Ph.D. degree was awarded in 1992 to Arun J. Basu.

The purpose and goal of educating and producing outstanding students is the same in 2009 as it was in 1901. The department appreciates those who recognized the need for mining engineers and paved the way for today's Department of Mining Engineering.

see blue.

The University of Kentucky  
is an  
equal opportunity university

## Two Major Coal Producers Honored

Many mining companies and associated service organizations provide crucial financial, political and technical support to the UK Mining Engineering Department. Two of the largest coal producers in the United States were honored at the 2009 UK Mining Engineering Awards dinner for their contributions.

**CONSOL Energy Inc.**, founded in 1864 and currently the largest producer of high-BTU coal in the country, has provided annual financial contributions to the department for over 30 years. The total sum of the awards exceeds \$600,000. These annual contributions have been used to fund scholarships, student travel for field trips and national meetings, the UK mine design team's trips to national competitions, education and research equipment and other general needs. In recognition of their unwavering support, the department faculty dedicated the department's CONSOL Energy library in their honor. In the future, a portion of the funds provided by CONSOL Energy will also be used to provide a copy of the SME Mining Engineering handbook to every undergraduate who successfully achieves "engineering standing" status. Jack Richardson, vice president of CONSOL's central Appalachia operations, was present at the dinner to receive a declaration of the department's appreciation.

Undergraduate scholarships are a key requirement for recruiting the best and brightest students into the mining engineering program. In support of this need, **International Coal Group (ICG)** signed an agreement

with the University of Kentucky in September 2008 which will provide an annual \$15,000 gift for five years to be used for scholarships. A total of six scholarships will be awarded from the funds. A declaration of appreciation was presented to Neil Mosley (BSMNG '93), president of ICG's Powell Mountain Energy operation.

The department greatly appreciates all of the companies and individuals who provide annual gifts to the department. The companies and individuals who have contributed at the Platinum level (i.e, more than \$10,000 annually) include:

Alliance Coal;  
Alpha Natural Resources;  
CONSOL Energy Inc.;  
Kentucky River Coal Corporation;  
Massey Energy;  
Peabody Energy.

All donations have contributed significantly to the longevity and growth in the department as well as the quality of the educational environment.



*Dean Thomas Lester, Mr. Jack Richardson (VP CONSOL Energy), and Chair Rick Honaker.*



*Dean Thomas Lester, Mr. Neil Mosley (President of ICG's Powell Mountain Energy operation), and Chair Rick Honaker.*

## Chair Report



*Rick Honaker*

The 2008-09 academic year was both successful and exciting for the faculty, staff and students of the department. The year started with a boom in the mining industry and enthusiasm for the opportunities that existed both nationally and internationally. Human resource representatives from over 20 companies visited the department in fall 2008 to interview candidates for summer internships and permanent positions. The excitement was never more apparent than the

2008 MINExpo where a record number of attendees, including a group of about 25 faculty and students from our department, were treated to a vast array of new developments in mining and processing technologies.

The downturn in the global economy soon after MINExpo had an immediate negative impact on the demand for energy and natural sources. However, the department continues to receive requests concerning open mining engineering positions and our schedule for companies visiting is nearly full for the upcoming fall 2009 semester. Reasons for the continuing demand include the need to address demographic issues and the increasing demand on mining companies to address an ever increasing number of new federal and state regulatory statutes. After recovering from the global economic recession, the demand for new mining engineering graduates is expected to grow even further as the energy needs of developing countries continue to expand and the world population grows toward the 10 billion mark. The UK Department of Mining Engineering will play a key role in meeting the future mining engineering needs for the commonwealth and the country.

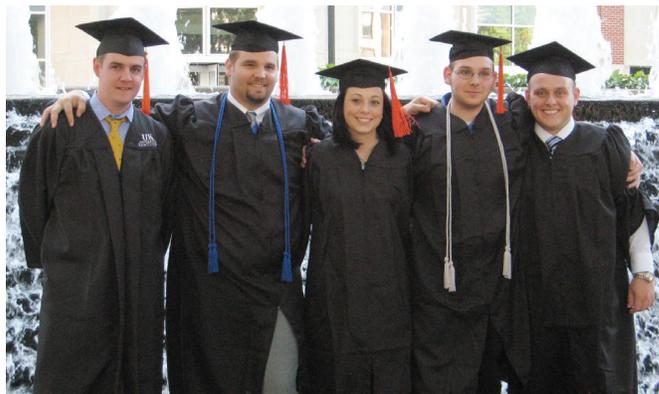
In response to the demand, our department launched a recruitment effort that resulted in the quadrupling of the undergraduate enrollment. Total enrollment reached 98 for spring 2009, of which 31 were classified seniors and 13 completed their B.S. degrees. All but one of the graduates are currently working in the coal industry with an average starting salary of \$62,455. Two individuals graduated with M.S. degrees and are working in the hard rock industry, while a Ph.D. graduate took a position with an equipment manufacturer. Undergraduate students were very successful in obtaining summer internship opportunities. In a freshman level class of 50, Over 60% of the students are working this summer for a mining company.

The quality of our incoming freshmen and graduates continues to improve. The average ACT scores earned by our freshman are comparable to those reported by the other engineering programs in our college. Our students are very competitive nationally as indicated by being awarded scholarships from various societies that exceeded \$30,000. Sixty-seven percent of our senior class successfully passed the fundamentals of engineering exam on the first try compared to a national average of 61%. Their efforts in educating the general public on the importance of mining and in general humanitarian activities resulted in two national awards being presented to the Norwood Student Chapter. We are very proud of their achievements.

Three of our faculty received national awards. New research funding was near an all-time high and ranked second among the engineering departments at UK. The 2009-10 academic year promises to be an even more successful year with nearly \$3 million in funding committed from federal agencies.

We are looking forward to the start of the 2009-10 academic year. Our recruiting efforts have resulted in an expected incoming freshman class of 64, which is one of the largest ever. Total enrollment will exceed 130 and enrollment in upper level courses will vary from 20-30.

In closing, the department greatly appreciates the financial support provided from our alumni and friends. Your support during the 2008-09 academic year provided many opportunities for the students and staff including several educational field trips with large student groups to regional mining and manufacturing operations and trips to the annual SME meeting and MINExpo. I look forward to working with each of you to ensure that we can offer the same educational value for our current and future students during this difficult economic period. GO BIG BLUE!



*2008-09 Mining Engineering Graduates (L to R: Joseph White, Philip Ellis, Monique DeSpain, Jack Griffin, Nathaniel Waters)*

## STUDENT REFLECTIONS



*Monique DeSpain*  
B.S.MNG '09

It's funny how one individual can step into your life and change it. In my case, that person was Ron Robinson. We were first introduced when he visited my high school to recruit students for the mining engineering program at UK. He explained to us what we could do with a mining engineering degree, and the opportunities in the industry. I had no idea about mining or mining engineering, but I wanted the scholarship and I wanted to attend

UK. So, I thought to myself, why not give it a try?

During my first semester, I joined the student chapter of the Society of Mining Metallurgy and Exploration (SME). SME gave me the opportunity to meet the other students in the mining program, to network, to find summer internships and to travel. Through SME, I realized that the mining department at UK was where I wanted to be.

I had the opportunity to participate in several summer internships. During my first summer, I worked for the Office of Mine Safety and Licensing in Frankfort. It was an opportunity to become familiar with permitting maps and permitting processes. During my second summer, I worked in Lexington for Engineering Consulting Services (ECSI) while taking summer courses. Working at ECSI allowed me to improve my AutoCAD abilities, as well as learn more about the permitting processes. During my third summer, I worked for Texas Utilities, in Mt. Pleasant, Texas. This internship exposed me to lignite surface mines and the engineering issues involved with them. For my last summer internship, I worked for Thunder Basin Coal Company, a subsidiary of Arch Coal, in the Powder River Basin of Wyoming. This internship exposed me to large sub-bituminous coal surface mining operations. Many of the activities I participated in included surveying, pit design and coal quality.

I accepted a full-time position at Thunder Basin Coal Company and will work at the Coal Creek Mine, a surface mining operation consisting of a dragline and truck/shovel operation. At Coal Creek, I will focus on coal recovery, pit design and dragline operations. I look forward to developing my career with this great company and contributing to its future success.

I would like to thank everyone who supported me through my college career, especially my parents. Their support and encouragement helped guide me through these past four years. I would also like to thank my colleagues, the faculty and staff of the department and ECSI.

*Monique DeSpain, Class of '09*

Graduating from a small high school in Eastern Kentucky and finding my niche in the large campus population of the University of Kentucky was an honest concern for me. It didn't take long, however, for me to realize that the mining engineering department in the College of Engineering would be the place for me not only to be challenged, but to be given the opportunity to gain experiences previously unimaginable.



*Logan Curry*  
B.S.MNG '09

The mining engineering curriculum is intense and challenging. While lab reports, projects and exams tended to become extremely strenuous and time consuming the proper management of time and resources allowed me to experience the true college atmosphere. Lifelong friends were made in the department with classmates and professors, and I strongly feel that this network has created a solid foundation to start my professional career in the industry.

While class work can become exhausting, the extracurricular activities offered through the department confirmed my professional career choice in mining. The numerous field trips ranged from the underground coal mines of Eastern Kentucky to the large-scale surface gold mines in Nevada and the surface phosphate mines in Florida. These priceless experiences gave me the opportunity to apply scientific theories and laws from the classroom to practical hands-on applications in the field.

I was also an active member of the Norwood Student Chapter of SME. Annual trips to the SME national meetings took me to Denver, Colorado and Salt Lake City, Utah. While there, I took advantage of the opportunity to further network with other schools and companies and even learn how to ski. Along with opportunities to travel were opportunities to participate within the organization as an executive officer and intramural participant. Being able to strengthen a growing student-based chapter through my secretary position as well as represent a respected program as a quarterback and shortstop of multiple intramural teams made my experience as a mining engineering student complete.

In closing, being able to interact with a program on all levels makes any department truly unique. The University of Kentucky mining engineering department has these characteristics, which is why I am honestly proud to say that I am a UK mining engineer.

*Logan Curry, Class of '09*

# SME NORWOOD STUDENT CHAPTER REPORT

*Nate Waters, 2008-09 Chapter President*

The 2008-09 academic year was a very active and rewarding year for the Norwood Student Chapter. Several opportunities were presented as a result of the hard work and momentum provided by the chapter officers and members from the previous year. Early in fall 2008, we were notified that the chapter was selected as the 2008 Outstanding Student Chapter which energized the student members and thus set the stage for another successful year.

Student activities continued to grow with the chapter fielding intramural football, soccer, basketball and golf teams throughout the year. While the competitiveness of the teams may sometimes be lacking, intramural sports have proven to be a successful way to build relationships between the students. Two sponsored football tailgates were held and the students helped cheer on the Cats to another successful season. Tailgating has become a student favorite and an event we look forward to having every season.

The chapter was very active in the SME Government, Education and Mining program especially in regards to explaining the importance of mining. Chapter members submitted two articles to the student led campus newspaper, *The Kentucky Kernel* which has published many negative mining articles in the past. This was a great opportunity for our students to educate the university community on the importance of mining in their everyday life. Following these two articles, the newspaper ran a special article entitled "Future of Coal" which covered the life experiences of mining engineering students within the Kentucky mining community and the university. The chapter worked closely with the newspaper to ensure accurate information was published. The result was a balanced article presenting both sides of several mining issues and perceptions about daily life within the coalfields.



*UK students visiting Arch Coal's Black Thunder coal operation in February 2009.*

Other educational activities included an elevated involvement in mining legislative issues through the development of online forums in which members voice their opinions and email elected officials. The chapter also held outreach programs at Picadome Elementary in Lexington and Wolfe County High School. The chapter members are committed to educating the public on the importance of mining and I look forward to seeing this effort grow in the years to come. As a result of our continued efforts, our chapter has been awarded the Government, Education, and Mining Award by the Society of Mining, Metallurgy and Exploration in consecutive years including the 2008 award.

As a result of the financial support provided by several companies, alumni and friends, the chapter members were provided the opportunity to participate in several field trips, which were very informative and educational. The students visited several mining operations in Kentucky from Pikeville to Madisonville. Mining operations visited included Massey's Taylor Fork Mine, Arch's Mingo Logan Complex (West Virginia) and Black Thunder Mine (Wyoming), and the Armstrong coal operation (western Kentucky). The students were also able to attend several conferences including MINExpo (Las Vegas), Kentucky's P.E.M. Seminar, KCA/CAS/SME Fall 2008 joint meeting, the 2009 Annual SME National Meeting (Denver), and the 2009 International Coal Preparation Conference (Lexington). These conferences provided the students with valuable opportunities to gain industry information and contacts as well as participate in a business atmosphere.

The most rewarding experience was the opportunity to accept the 2008 Outstanding Student Chapter Award and the 2008 Government, Education and Mining Award at the SME dinner held during the 2009 annual meeting, which are two out of three possible awards presented to student chapters of the national society. Seventeen students were in attendance to receive these two awards and be recognized throughout the conference. The last time the chapter received this award was in 1993 and we were pleased to bring this award back to the University of Kentucky. We would like to thank the companies and individuals who made this possible through their support of the Norwood Student Chapter.

This year has been a very successful year for the chapter which would not have been possible without the support of the mining industry. We hope that our supporters realize that, through their support, valuable educational experiences have been provided, lasting relationships were developed and heartfelt memories were generated. Your continued support for the Norwood Student Chapter is greatly appreciated.

# Extracting Thin-Seam Coal Resources

By Professor Joe Sottile

Coal mining has been, and continues to be, an important industry for the Commonwealth of Kentucky. For example, in 2006 the Kentucky coal industry had receipts of \$4.97 billion and paid a total of \$1.04 billion in direct wages to over 17,000 people. And in the 2007 financial year the industry paid \$221.4 million in severance taxes and a total of \$634 million in state taxes.

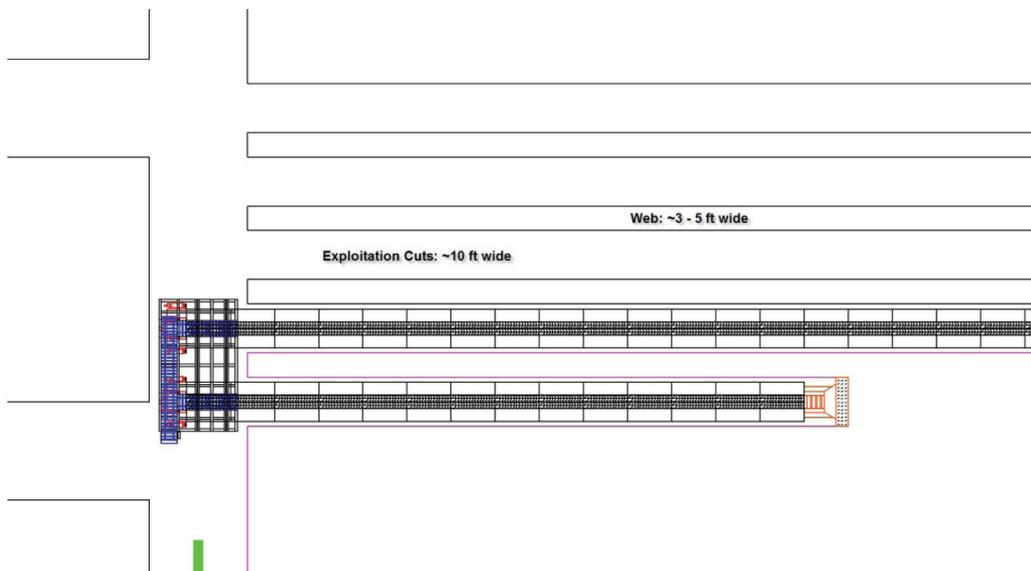
Unfortunately, coal production in Kentucky has been slowly declining over the last 20 years. Reasons for this decline are numerous, but a key component is the depletion of thick coal reserves in the Eastern Kentucky Coal Field. However, there are still large amounts of coal in thin-seam reserves. Although precise amounts are unknown, it is estimated that over 33 billion tons of the original 64 billion tons of coal in the Eastern Coal Field exists in coal seams 14 to 28 inches thick, and most of this coal still remains in the ground. Consequently, the continued economic benefits of coal mining in Kentucky depend on the successful implementation of thin-seam coal mining.

It must be recognized that thin-seam mining equipment is a relatively small market nationally, and it is difficult for equipment manufacturers to justify the investment of large amounts of capital into the development of completely novel systems suitable for thin-seams. Consequently, development of this type of equipment must progress in an evolutionary rather than revolutionary manner. A recent research project funded by the Kentucky Department for Energy Development and Independence and conducted by the UK Department of Mining Engineering has focused on the development of such a system.

The conceptualized system has characteristics of continuous mining, longwall mining and highwall mining, as

well as having several novel characteristics. The system is implemented as a retreat mining method in which development consists of driving panels perpendicular to main (or submain) entries. These development entries would be driven by traditional continuous mining methods that would necessitate cutting roof and floor rock in addition to coal. This would isolate large blocks of coal for exploitation by the thin-seam miner. Subsequently, the thin-seam miner would be set up in the entry adjacent to the solid block of coal and successive cuts would be taken perpendicular to the development entries. No roof or floor rock would be cut by the thin-seam miner and no roof bolting would be conducted in the exploitation cuts. In addition, no mine personnel would enter the exploitation openings.

The major components of the thin-seam miner include a cutter head for coal cutting, a cutter drive unit for providing sump force to the cutter head and a series of enclosed augers for transporting the cut coal. The system also includes crawlers for tramming, hydraulic cylinders for supporting and bracing the system in the entry as well as chain conveyors for transferring the coal from the thin-seam miner to a conveyor belt. A unique method has been devised for storing and handling the individual enclosed conveying augers that should permit nearly continuous production for the full length of each cut. The thin-seam miner also incorporates a unique method for positioning the miner for each cut that will allow quick alignment, permitting each cut to be parallel to the previous one. Although cut dimensions would depend on specific geologic conditions, they would be approximately eight to ten feet wide and up to 500 feet long. Coal recovery in the exploitation block should range from 65% to 80%.



Typical layout for thin-seam mining system.

## Mining Engineering Celebrates 25th Anniversary

When Catesby Clay, president of Kentucky River Coal, stepped up 25 years ago to offer \$500,000 in matching funds to help form the Mining Engineering Foundation, he might not have realized how many industry presidents, CEOs, government and educational leaders would graduate from the University of Kentucky Department of Mining Engineering in the years ahead.



*Catesby Clay*

Clay welcomed many of these leaders back to the University on Nov. 7, 2008 to celebrate the 25th anniversary of the Mining Engineering Foundation. With his ever-present smile and quick wit, Clay entertained the crowd with his reflections of the past and views on the future. Many of the original founding members attended, and the department is deeply grateful to all those individuals and companies for their foresight and commitment to engineering education.

After a delicious meal during which blast-from-the-past pictures were shown, Foundation Chairman Steve Gardner presided over the board meeting.

The University of Kentucky encourages all friends and graduates to stay involved with the Mining Foundation — Catesby Clay helped lay the groundwork, but we need all of you to step up as he and others did, so the department can provide the best education for tomorrow's leaders.

### *Fall Mining Foundation Meeting*

*Friday, November 6, 2009, 10:00 a.m.*

*Hilary J. Boone Center*

*Lunch will follow*

## New Appointments to UK Mining Engineering Foundation Board

The University of Kentucky Mining Engineering Foundation welcomes the following new members as recommended by the foundation board and approved by the UK Board of Trustees on June 9, 2009:

Harry Childress: government affairs agent, Cumberland Resources Corporation

David W. Gay (B.S.MNG '81): vice president of corporate development, Alpha Natural Resources

Dennis Kennedy: commercial manager for mining chemicals, Georgia Pacific Chemicals

Tom Myers (B.S.C.E. '81): assistant vice president for mining, Mosaic Fertilizer LLC

David Rasnick (B.S.C.E. '77): vice president and project manager, Summit Engineering, Inc.

Joseph Sottile: professor, University of Kentucky

The foundation and the department greatly appreciate their willingness to provide the time and effort in serving the board. We look forward to working with them in our quest to develop the richest environment possible for mining engineering education in the U.S.

## 2009 Student Award Winners

Academic Excellence Award — Logan Curry

Tau Beta Pi Recognition

Outstanding Senior — Nate Waters

Outstanding Teacher — Dr. Braden Lusk

Catesby Clay Leadership Award — Aaron Burton

Careers-in-Coal Lamplighter Award — Logan Curry

Old Timers' Club Award — Nate Waters



*SME officers receiving the national awards: (L to R; Clifton White, Mallory Miller, Brian O'Dea 2007-08 President, Dr. Braden Lusk, Nate Waters 2008-09 President, Aaron Burton, Seth Mittle)*

## Department 2008-09 Highlights

- Dr. Daniel Tao and two of his former graduate students, Dr. Xinkai Jiang '02 and Dr. Maoming Fan '08, received the 2008 Stefanko Best Award at the 2009 SME meeting in Denver.
- Dr. Braden Lusk was a co-host for the Discovery Channel series "The Detonators."
- The Norwood Student Chapter of SME received the 2008-09 Outstanding Student Chapter Award and the 2008-09 Government, Education and Mining Award at the 2009 SME meeting.
- Dr. Rick Honaker received the 2008 Distinguished Service Award from the Coal & Energy Division of SME.
- Foundation charter member Mr. David Zegeer received a citation from UK President Lee Todd honoring his service and dedication to the University of Kentucky at the spring 2009 Mining Engineering Foundation meeting.
- Dr. Braden Lusk was recognized as the 2008-09 Outstanding Teacher of the department and was a finalist for the Provost's Outstanding Teacher Award.
- Dr. Andrew Wala entered the phased retirement program effective January 2009.
- Joy McDonald joined the staff as the student services assistant in fall 2008.
- Henry Francis was hired as a senior laboratory consultant to oversee the Alliance Coal analytical laboratory. He has over 30 years of coal analysis experience.
- A gallery of graduate composites has been installed in the hallway near the student lounge on the 2nd floor of the Mining & Minerals Resource Building.
- A student chapter of the International Society of Explosives Engineers (ISEE) was organized.



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