The College Celebrates its 100th Anniversary 1896–1996
This year the College of Earth and Mineral Sciences celebrates the 100th anniversary of its founding as a School of Mines in 1896, and we look back with pride to the accomplishments of generations of dedicated individuals who struggled to build the enviable reputation the College enjoys today. While only a few of the many schools of mines founded in the late 1800s survive, our College has grown in strength and diversity and been transformed into a vibrant institution leading in education, research, and resolving issues of our times.

Our history tells a fascinating story of adaptation and change. In the first decades, the founders and early faculty persevered through financial hardship and constrained resources to provide high quality education for their students, advance their disciplines, and set a course committed to service to the nation’s mineral industries and the Commonwealth. Many alumni of those early years were high achievers, spreading word of the School of Mines across the nation and the world, founding companies, and bringing new pride to the growing school.

By the 1930s the outlines of the present College took shape, when under Dean Edward Steidle, the School of Mineral Industries pursued a strategy of expansion in both size and intellectual breadth, aided by the strong support of alumni who now held positions of responsibility in industry and the public sector. With passing decades the College assumed increasing national and international interests, graduate education grew in significance, and a vigorous program of fundamental and applied research laid the ground for a record of achievement that has continued undiminished to the present day.

From an early emphasis on the unity of the earth sciences and mineral engineering disciplines, the College became an institution of tremendous diversity, with interests in materials and minerals, in geological sciences and meteorology, and in energy resources and the environment, together with a growing emphasis on relationships with human activities and responsibilities to society. It is a breadth that has given the College great strength and resilience, and the ability to turn changing circumstances into opportunity.

At the same time the College has enjoyed exceptional academic freedom and unusual stability of leadership. The intense pursuit of excellence for 100 years has produced a notable academic reputation, reflected today in the Fall 1995 national ranking of doctoral programs that placed the three EMS programs involved—Geography, Geosciences and Materials Science & Engineering—at the forefront of all Penn State doctoral programs, and ranked our Geography program the best in the nation. Further strength comes from our 12,500 alumni engaged in productive and frequently distinguished careers, and demonstrate great loyalty to the College by contributing both their resources and their influence to its continued improvement and well-being.

Today our efforts to lead and set new directions in research, teaching, and service are accelerating. Our students are more capable than ever and we are finding new ways to engage them more intimately in both scientific and societal issues. More than half the College faculty members joined us in the past ten years and bring new intensity and the brilliance of youth to our classrooms and laboratories. Thus we look eagerly toward the years ahead, recognizing that the seeds of success in the second century were sown in the first. For EMS they are vision, commitment, and the intense pursuit of excellence.

—John A. Dutton, Dean
Founding Years of the College
1896-1908

The elms bordering the campus mall are becoming substantial trees and in winter's thin snow no longer have the defenseless posture of saplings... a newly installed arc lamp, heralding the arrival of electricity on campus, illuminates the four-plank fence guarding the main entrance to the 41-year-old Pennsylvania State College. ...the unpaved track leads past the dominating Romanesque bulk of the Main Engineering Building toward the impressively towered Armory... and there standing before the Armory is the familiar shape of the Obelisk, which had risen through that year of 1896 to proclaim the presence of a new School of Mines.

The Penn State School of Mines had been created by the Board of Trustees on January 3, 1896. However, the School had no facilities of its own and was little more than a renamed Department of Mining Engineering engulfed in the Main Engineering Building by the overwhelming presence of the School of Engineering. In these unprepossessing circumstances the new Dean, Dr. Magnus C. Ihlseng, and his two assistant faculty members labored with enthusiasm to establish a viable school for the mineral industries. It was a considerable challenge, given the distance from the mining centers of the state and the lack of substantial support from the Commonwealth's mining and metallurgical companies.

Problems of isolation and the lack of an adequate local professional and industrial constituency had also plagued Penn State in its early years, and for several decades the young land grant college had experienced inordinate difficulties—inadequate financing, contentious relations with the Pennsylvania state legislature, low enrollment, and periods of unstable leadership. In the 1890s, however, under the effective leadership of President George Atherton, these difficulties had eased and the college was undergoing its first period of real growth.

Atherton assumed Penn State leadership in 1882, bent on improving the institution's reputation by developing it as a successful school of technology. At his inauguration he declared, "The conclusive fact remains that the vast majority of those who pursue advanced degrees, do so with a utilitarian aim. Their primary purpose is not the cultivation of their minds, however desirable that may be, but the acquisition of a means of livelihood; and the call for that kind of education is steadily increasing, with the development of our vast material wealth" [Bezilla, p.33].

Thanks to the new focus on engineering and technical education, enrollment surged. From a mere 44 undergraduates at Penn State in 1882, enrollment grew to 181 by 1893, 128 of them pursuing engineering degrees. Improved relations with the legislature in the 1880s brought increased funding and a building program that allowed renovations to Old Main, construction of the Armory, and new buildings for mechanic arts, botany, chemistry and physics. In 1892 the campus was finally connected to the Pennsylvania Railway network via a spur of the Bellefonte Central Railroad that terminated on College Avenue, and a year later, a power plant attached to the new Main Engineering Building provided steam heat and generated electricity for the campus.

As part of the expansion of engineering disciplines, mining engineering was added to the Penn State baccalaureate programs in 1893. President Atherton personally selected Dr. Magnus C. Ihlseng to head this new program and offered him a substantial home on campus—Ihlseng Cottage, located between Pattee Library and Irvin Hall, still stands on the campus today.

Dr. Ihlseng was born in Norway in 1855. He held three degrees from the Columbia School of Mines, where he had served as an instructor of physics before becoming a professor of engineering at the Colorado School of Mines in 1881. He joined the Penn State faculty as professor of mining engineering and geology.

In the Mining Engineering program, Dr. Ihlseng was assisted by Harry H. Stoek, assistant professor of mining engineering and metallurgy, who had received the E.M. degree from Lehigh in 1888. Stoek was a dedicated teacher and talented writer. He was later to become editor of Mines and Minerals and the Colliery Guardian and write many of the mining publications of the International Correspondence School. Later in his career, he was appointed head of the Mining Department at the University of Illinois and became well-known for his work in extension education. It was to be said of Stoek, "To him, more than any other man of his generation, belongs the honor of changing coal mining from a rule of thumb trade to an engineering science"—
significantly, the comment was made by Elmer A. Holbrook, a later dean of the Penn State School of Mines [Read, p. 167].

The third member of the Mining Engineering faculty was Thomas C. Hopkins, instructor, then assistant professor of geology. He had previously been a member of both the Arkansas State Geological Survey and the Illinois Geological survey and had been an author of survey reports on marbles. He too was to prove an energetic and productive member of the team.

According to the 1893 Catalog, the Mining Engineering course aimed: “to fit students for practical work in mining geology and metallurgy by combining practice with theory. The course coordinates with the other engineering courses but gives an opinion in mining or metallurgy. These options are rendered necessary by the extent of the field of mining engineering, which embraces three specialties, geology, metallurgy and mining. The divergence between these is not great, but is sufficient to enable the student to specialize according to his preference for mechanical or chemical lines.”

MINERAL INDUSTRY EDUCATION

Creating technical instruction for the mineral industries was far from being a novelty in the 1890s. In the United States, the first attempts had been made in Philadelphia in the 1850s, but these were been little more than experiments and were short-lived. The first truly successful program was developed in 1864 with the establishment of the School of Mines at Columbia College, New York, offering instruction in mining engineering, civil engineering, metallurgy, geology, and chemistry, primarily at a graduate level. Location, timing, and a strong demand for technical education made no organized attempt to influence or advance mining education. In this it was quite unlike the well-established agricultural societies that worked diligently toward developing institutions that could provide instruction and disseminate information useful to farmers. It took several decades, the persistent efforts of educators and the increasing numbers of graduate mining engineers to effectively change attitudes in the mineral industries and win their support.

The success at Columbia encouraged the creation of similar private institutions across the country. These were joined by large numbers of state schools of mines as state legislators, subscribing to the mandate of the 1862 Morrill Land Grant Education Act, moved to provide “such branches of learning as are related to agriculture and the mechanic arts...in order to promote the liberal and practical education of the industrial classes” at the new land grant colleges.

But as many of these colleges discovered, there is a big difference between a program on the books and a flourishing academic program. Unlike engineering that exploded into immediate success, education for the mineral industries tended to be a long extended minuet of frustration. Financial support was a widespread and critical problem, but this was shared by most academic institutions in the 19th century—more serious was the lack of students and the lukewarm support from the mining industry. In the years between 1870 and 1890 the number of graduates nationwide in any given year never rose above the 61 students graduated in 1884. Most schools graduated two or three students each year, and many of the early schools were forced to close their doors after a decade or so of struggle; others were taken over by schools of engineering.

The slow growth of student interest in mineral industry education was of acute concern to educators toward the turn of the century. Even Columbia School of Mines was not immune, and found that greater numbers enrolled in the engineering programs than in mining or metallurgy. In an attempt to document the problem, Columbia Professor H.R. Munroe sent out a questionnaire to 100 prominent mining engineers. He asked: “How do you account for the small demand, especially from the mining regions, for the instruction offered by our mining schools?” His 70 respondents made these points:

- the demand for mining engineers is not large
- one can become a mine manager without a mining education
- there is prejudice in favor of practical men for responsible positions
- there is strong competition from other engineering curricula
- life in mining regions is not attractive to young men who come from other regions and other walks of life.

In the nation’s mining companies, the attitude toward mineral industry education for most of the nineteenth century was indifference, at best. The American Institute of Mining Engineers, founded in Wilkes-Barre, Pennsylvania, in 1871, focused exclusively on established professionals in its early years and made no organized attempt to influence or advance mining education. In this it was quite unlike the well-established agricultural societies that worked diligently toward developing institutions that could provide instruction and disseminate information useful to farmers. It took several decades, the persistent efforts of educators and the increasing numbers of graduate mining engineers to effectively change attitudes in the mineral industries and win their support.

Negative publicity, particularly the writings of A.M. Wellington, editor of Engineering News, was a further discouragement. In an extensive series of articles on engineering schools written in 1892 and 1893, Wellington inveighed against mining engineering education, asking: “what is there about the ordinary work of the ordinary mining engineer which requires a different training from that of a mechanical engineer?” In his scathing description of the work and duties of the average mining engineer, he declares: “the mining engineer is neither fish, flesh nor red herring. He is not so good an engineer as those who graduate from other engineering courses, because he has not been so thoroughly grounded in engineering. He is not so good a chemist as those who graduate from a chemical course for the same reason. Other things being equal, the civil or mechanical
graduate will beat him on his own ground, while he is not nearly so well qualified to beat them on theirs." Rejoiners emphasizing positive developments in mining course instruction and the statistically proven need for graduate mining engineers, and pointing out errors in Wellington's arguments and statistics, flowed from the pens of professors meeting at the International Engineering Congress, held in association with the Chicago World’s Fair of 1893.

Despite these perceived difficulties, schools of mines and mining engineering curricula continued to be founded across the nation—seven such programs were established between 1887 and 1899, and in the early years of the 20th century a further 13 programs began. It can be argued that among these, the Penn State School of Mines was ultimately to have the most distinguished future.

**FOUNDBING YEARS**

In 1893, Ihlseng, Stoek and Hopkins faced a formidable challenge: to create a viable department of mineral industry instruction within a small land grant college in a rural area far from the flourishing centers of coal and steel production that dominated the Commonwealth’s economy. Only Harry Stoek, who had graduated from Lehigh, was knowledgeable about the mineral industries of Pennsylvania, and it was perhaps his personal contacts in the anthracite region that moved the department’s coal mining focus toward that region rather than the bituminous fields in the early years. Dr. Ihlseng and Mr. Hopkins were from other states, and neither knew Pennsylvania intimately—and perhaps more important, they were not known by the mine operators and manufacturing executives. Ihlseng’s networks were in the mining regions of the Rockies, and through his Columbia contacts, worldwide; Hopkins had spent his career in the Middle West.

As a result, developing appropriate undergraduate instruction in mining engineering, geology, and metallurgy was not the most difficult initial task confronting these professors: the greatest and most urgent challenge was to make Penn State’s program known, and accepted throughout the state’s mineral industries as being trustworthy and of high quality. For future success, building a constituency was of utmost concern.

With no comparable precedent, advertising alone could not build the types of connections with industry that the professors sought. Instead, they looked for inspiration to the outreach work being developed in agriculture, and taking advantage of the funds provided by the legislature for founding the program, devised a publication that would capture the interest of its readers and almost by implication, demonstrate the breadth of knowledge and competence of its authors, and the Penn State program. The publication was called *The Mining Bulletin.*

Being sensitive to their prospective audience and understanding the resistance of some toward academics, their approach was non-invasive and straightforward. Since their resources were so limited, they rarely wrote about their Depart-
mment directly. What they did do was provide clear summaries of papers and articles from a wide selection of professional and trade journals that they felt would appeal to a broad professional audience. As time went by, these summaries became lively commentaries interspersed with editorial comments as the authors relaxed into their work of communication and wrote as to friends whose interests they shared.

The Mining Bulletin was published bimonthly from January 1894 to January 1899 “for the benefit of the mining industry,” subscription free. In his introductory remarks in the initial issue, Professor Ihlseng said that they proposed “to furnish a publication which will give a brief outline of current progress in mining and its allied professions, and serve as a Bureau of Information upon all matters of direct use to the producers and manufacturers of Pennsylvania and neighboring States.” There were in each issue separate sections on Mining, Geology, and Metallurgy.

From the start, the authors tried to gain reader feedback and participation. Immediately they announced the need for materials to enrich student instruction and their intention to establish a small museum appropriate to the mineral industries. Well-wishers were asked to send minerals, metal samples, tools, or written materials in support of the School’s work. Each gift was then acknowledged in subsequent Bulletin issues. Reader questions were answered in some issues and there are signs that the correspondence of the School was substantial, and it was fortunate that typewriters were becoming widely available in the 1890s—one gift was from the Hammond Typewriter Company.

Publication and distribution of the Bulletin was a mammoth undertaking. Typesetting and design were to the professional standards of the time, with the printing undertaken by The Watchman Printing House, Bellefonte. The press run was an astonishing three thousand copies, which suggests that the ambitious professors must have sent their Bulletin to every company, college and individual they could think of across the state and the nation. And yet, in the second issue, they were able to report: “By the receipt of congratulatory letters and requests for copies to be sent to friends . . . all requests have been complied with until as many of the edition of 3,000 as could be spared has been distributed.”

The Bulletin contents provide a fascinating picture of current developments in minerals, metallurgy, and mining economics. At first, the entries are brief and stilted, but by the end of their second year of publication, the editors had become confident enough of their audience to present virtually an entire issue on “the fuel problem,” supplementing excerpts from the inaugural address of the president of the American Institute of Mining Engineers with those of a speech by an eminent anthracite leader and a lengthy commentary combining material from a number of trade and professional sources. Another issue was devoted to geology, with an article by Penn State Professor William Buckhout, well illustrating his conservative outlook, followed by a discussion of progress to date in topographic and geologic surveys in the United States, by Professor Hopkins.

The range of topics covered in depth in the publication is remarkable—safety equipment, explosions, the work of the geodetic survey, oil production, the geology of Pennsylvania, magnetic concentration of ores, a comparison of methods for the analysis of iron, steel and ores, the grading of pig iron, economic development of the steam engine, the theory of electrometallurgy, a classification of Pennsylvania minerals, discussion of proposals to appoint a national secretary of mines, and other subjects ranging across the entire mineral industry field. Tables of statistics were provided wherever possible, occasionally illustrations. In 1897 the issues consisted of very extensive classified bibliographies on mineral industry topics for the use of readers; these included mining, metallurgy, ore dressing and coal washing, and economic geology.

There is every indication that The Mining Bulletin was a great success and effectively accomplished the goal of publicizing the Penn State School of Mines throughout Pennsylvania and the mineral industry community. Today, it provides a unique record of the work of our founders, the more poignant because the publication was so short-lived: in 1899 the Pennsylvania legislature withdrew funding and The Mining Bulletin was terminated. The School had no comparable avenue of communication until 1931 when Mineral Industries was founded—significantly, this publication now Earth and Mineral Sciences is still widely known as the Bulletin.

ACADEMIC ACTIVITIES

In its first year, the Mining Engineering program enrolled nine students, and when the School of Mines was established there were perhaps two dozen students. Accurate student numbers are very hard to gauge in these early years because many students attended only briefly or failed to pursue their studies to graduation. The faculty made vigorous efforts to promote a sense of identity among their students, and beginning in Fall 1894 the students organized themselves into the first Mining Engineering Society to extend their social and professional interests. In The Mining Bulletin, Professor Ihlseng announced the Society: President J. L. Harris ’95, Vice President B. F. Williams ’95, and Secretary William C. Alexander ’97, and asked readers to send “descriptions of contrivances or methods used in or about mines” that students could read and discuss at Society meetings.

Instruction was enhanced by the more than 150 gifts of samples, catalogues, blueprints, and papers received from companies and individuals across America. Contributions continued to arrive throughout the early years, and allowed the development of a museum and a library. While some gifts were inconsequential, others were of real value to an academic program: suites of ores, mineral and metal specimens, tools and equipment, including a wheelbarrow from a Chicago barrow-maker. In the late 1890s, the School of Mines was receiving transactions, journals, and reports from numerous professional societies nationwide, together with many gifts of photographs that could be used in teaching from professors in other institutions.

In 1895 a large finely crafted model of a coal breaker and washer was designed and built by J. Mytroff, Jr. for student instruction in coal preparation. The model was accurately detailed, with moving parts, and allowed students to study processes they
would later see in the field in study practicums. The new model joined the model of an ore dressing mill which had been purchased by Dr. Ihlseng after serving as an exhibit at the World’s Fair in Chicago in 1893.

The baccalaureate program included a compulsory summer school conducted at the conclusion of each academic year. The students in mining engineering devoted their freshman session to surface surveying, the junior year to underground mine surveying, and the sophomore year to mine inspections.

In June 1894 the six members of the sophomore class took the six-hour train journey to Nanticoke and the Wyoming Valley in the anthracite region of eastern Pennsylvania to have guided lecture tours of underground anthracite mines, collieries and breakers. At the Susquehanna Coal Company, the students spent a night underground watching operations of the night shift, carried out surveying exercises using the mine’s survey equipment, and then went on to study surveying methods under high roof and methods of pillar robbing in thick seam. By contrast, at Glen Lym mine, they inspected mining under difficult conditions, where virtually every known method of roof timbering was in use to hold a poor top. The students then studied a range of breakers and collieries, watched the construction at Ashley of one of the largest breakers ever built, and descended a record-breaking shaft. A day of mine surveying in the Wyoming colliery was followed by a visit to the Hazard Manufacturing Company to observe the manufacture of steel and iron ropes and cables. By the conclusion of the field trip they had visited a dozen different operations. The final day was devoted to a review and completion by the students of the notes they had taken on each process and operation.

The fourth annual summer school in June 1897 was another week-long visit to eastern Pennsylvania. By now, collieries in the anthracite region went out of their way to make special arrangements for students to see unusual conditions and up-to-date features of their mines, and provided lectures on their operations; a pump works had a special display of a large compound duplex pump dismantled for their inspection. The class proceeded to the Lehigh Valley where they visited the Bethlehem Steel Works and a neighboring zinc mine. Dean Ihlseng noted: “On these trips the students will each take notes of their observations and enter results in the proper form for presentation to the instructors in charge. Sketches will be required of all the more striking features which are observed and every attempt will be made to make the excursion highly instructive in emphasizing and supplementing the classroom work.”

EXTENSION INSTRUCTION FOR INDUSTRY

In addition to the 4-year baccalaureate programs, in spring 1894 the Department of Mining Engineering began to offer shorter courses of instruction for employees in the mining industry who were unable to spend four years in college. These courses appear to have been popular since they continued to be offered for many years.

One course was for two years, with instruction that included physical geography in the first year, and in the second year, instruction in: assaying, timbering, ventilation, metal work, mining machinery and methods, platting mines, heat and combustion, metallurgy of steel and fuels, principles of bookkeeping, and underground railways. There was also an intensive ten-week course which boasted 20 hours on testing mine gas, 60 hours on drawing, and 44 hours on boiler and engine testing, in addition to 134 lectures on basic mine-related geology, chemistry, and mining engineering material.

In June 1894, the Bulletin announced a series of free lectures “to the mine employees at their customary places of assembly upon matters of interest to them in their occupations. Any local branch of the Mine Worker’s Union, or any group of wage earners, may secure a course of these lectures by corresponding with the authorities of the College.” Topics included: the care of explosives, the dangers of safety lamps, the cause of mine explosions, propping and pack walls. By 1898, these lectures included: mine gases, the growth of coal, timbering, and the geological making of Pennsylvania.

SERVICE TO INDUSTRY

An important goal of the School of Mines was to provide useful service to the industry of the state, and here the faculty’s approach was both imaginative and sensible. Since their re-
sources were very limited, they did not take the obvious path toward work in coal or metals, but looked instead for an opportunity to make a contribution in a less-frequented field. They found it in the Pennsylvania building stone industry.

Stone was a very popular construction material in the 1890s. This was the prime decade for demonstrating public responsibility through the construction of banks, libraries, public buildings, schools and mansions, all massively wrought in stone, and the Commonwealth then led the nation in value and quantity of building stone. In the Bulletin, Dr. Ihlseng tells of numerous queries received by the department concerning aspects of structural stone. In attempting to answer these queries, the faculty discovered that very little information was available on the Pennsylvania industry, and they recognized this as an opportunity to demonstrate their versatility.

In order to obtain data, circulars with appropriate blank forms were sent out to every quarryman known in the state—as Ihlseng writes “with, we regret to confess it, but a small modicum of replies.” Undaunted, they made repeated efforts until they achieved success. Initially, the faculty intended only to collect quarry descriptions together with information about output, but then had the bright idea of collecting specimens also. These at first were hand specimens, but then came the notion of constructing an obelisk of dimension stones to represent the Commonwealth's resources. The secretary of the student society, William Alexander, was engaged to assist in the letter writing effort, and later spent the better part of a summer visiting quarries on an extended bicycle trip to arrange for shipment of the building stone samples. As Mr. Alexander later wrote, “as some inducement, prospects were given the privilege of cutting their names on the face of the stones donated.” The result of their persistent efforts brought forth some 281 stones from 139 quarries.

Construction of the Obelisk was only a sideline of the larger project, which was to research and write a handbook for the use of the building stone industry and its customers. The faculty collected what statistics they could from the independent companies, together with descriptions of the quarries. As stones were received by the School, thin sections were made of every sample so they could be studied under a microscope. Chemical analyses and primitive strength tests were carried out.

The results of the project included a classified directory of sources and companies for all the quarries in the state then producing structural materials. Professor Hopkins wrote a useful article on the definitions and names of 38 different stones as they were used commercially and in the scientific literature—there was at that time much confusion and contradiction in terminology, both among dealers, scientists, and quarrymen, and from place to place. Based on his studies of the rock samples, Hopkins wrote a paper on The Structural Characteristics of Building Stones, in which he discusses weathering agents, absorption factors and frost effects, and summarizes what was then known about stone durability. He concluded the handbook with an essay on the Geology of Pennsylvania, which he also presented to the Penn State Scientific Association on March 23, 1897.

In 1896 construction of the Obelisk was underway by Michael Woomer, a State College stonemason, in a prominent location suggested by President Atherton. In the March 1897 issue of The Mining Bulletin, the cover is resplendent with a photograph of the completed polyolith. Its caption reads: “This polyolith constructed by the School of Mines forms a comprehensive display of the natural resources of the State in structural materials, geologically arranged. It is a prospecting guide to the explorer for stone, and furnishes a comparative test of their durability by an equal exposure of all the quarry products to atmospheric influence. Reports of the mechanical and chemical tests to be made on the spallings of each stone completing the exhibit for the varied purposes of architect and builder will soon be ready for general distribution.” Elsewhere he writes: “In addition to being a mere structural pyramid, the polyolith will be made to serve as an instructional aid to student and visitor, by exhibiting the stones in courses correlative to the geological position of the horizon from which they were derived.”

Today we celebrate the Obelisk as the oldest monument on campus and the historical symbol most closely associated with the College of Earth and Mineral Sciences.

**SCHOOL OF MINES**

With the creation of the School of Mines in 1896, a new faculty member Dr. F.J. Pond was added to the teaching staff as Instructor of Assaying. His initial contribution to the pages of The Mining Bulletin is a Comparison of Methods for the Analysis of Iron, Steel, and Ores. This is not an academic discussion but a detailed listing of the actual methods used by seven different Pennsylvania companies to determine measurements of phosphorus, iron, sulfur, manganese, and silica in iron ores, and various elements in pig iron and steel, based upon information he had obtained from the company laboratories. Dr. Pond had previously published this work in the proceedings of the Engineer's Society of Western Pennsylvania.

In 1898, Dean Ihlseng wrote, with deep regret, of the departure of Harry Stock from the faculty to take up an editorial appointment with Mines and Metallurgy. Later in the year, his place is taken by N.W. Shed, Assistant Professor of Mining Engineering and Metallurgy, and an additional instructor in metallurgy, W. S. Thynge is noted. The Dean himself is now contributing a number of articles to the Bulletin on national mineral policy issues, lengthy discussions of safety issues in mines, a signed essay: “Some Thoughts on the Iron Industry,” and other technical topics.

Professor Hopkins, meanwhile had turned his attention to clays, kaolins and feldspars. In 1898 he reports on a second summer of field studies, these in southeastern Pennsylvania—“the attempt was made to visit and examine every clay pit and feldspar quarry, and every brickyard, pottery, tile and terra cotta works in the area, also to examine, as far as possible, clay deposits of promise that are not being used at present.” Specimens
The students of the School of Mines, class of 1904, carried out their summer field course at the Mosgrove Coal Works in western Pennsylvania in 1902. Coal from the Mosgrove mine was shipped to a PPG glass factory at Ford City. **Photo left:** The group poses at the mine's motor barn. William Affelder '99, then the mine superintendent, is shown standing top right. Affelder became a Penn State trustee and ultimately Chairman of the Board of Hillman Coal and Coke Company, Pittsburgh. George Deike, Sr., shown standing left, spent the summer working for Affelder. Deike served as superintendent of the Mosgrove Mine from 1907-10, and later founded the Mine Safety Appliances Company in Pittsburgh. **Photo right:** The class assembled on the porch of the Mosgrove Hotel with other hotel guests. George Deike is seated in the chair, center.

were obtained from every kaolin and feldspar quarry in the region for display in the School's museum, and through his personal contacts with the companies he was able to acquire special exhibits showing tile samples and the products obtained in washing kaolin. "The collection of clays and clay products at the [School of Mines] now is probably the largest and most complete of any in the State," the Bulletin reports.

Hopkins also notes that the State is richer in high-grade clays "than is commonly supposed" and that the clay industries are more productive and numerous than the state government statistics indicate. The report then in preparation would describe the deposits and industries of the Commonwealth, treating "the chemical mineralogical, geological features of the materials as thoroughly as the time and facilities will permit." According to Dean Steidle, this report was published as a book: *The Clays and Clay Industries of Pennsylvania* in 1898. Once more, there was student involvement in faculty research. William Affelder '99 worked with Hopkins and wrote a chapter in the book, titled Clay Industries of Allegheny County, for which he may have carried out field research, thus becoming the first student known to study ceramics topics in the School of Mines.

In addition to their work on the major research projects on stone and ceramic materials, the School's professors carried out independent studies on topics of interest and presented the results as papers which they read to the Scientific Association of the Pennsylvania State College. One year, Professor Hopkins presented a seminar at the University of Chicago; and in April 1897, he traveled to Johns Hopkins University to attend a weeklong course of lectures from Sir Archibald Geike, director of the Geological Survey of Great Britain and Ireland, and local geological field excursions organized by the Maryland Geological Survey. The issues of the Bulletin are above all evidence of the voluminous quantity of reading, studying and writing sustained by members of the faculty throughout this period, and the extensive correspondence of the School is witnessed in numerous comments on letters received from engineers and academics from Australia and Europe as well as the United States.

**AN ABRUPT HIATUS**

The Pennsylvania legislature in 1899 cut financial support to the School of Mines so drastically that not only could the Bulletin no longer be produced, but the staff itself was decimated. In September 1899 Dean Ihlseng wrote to his Bulletin audience: "The College regrets to announce the discontinuance of the Mining Bulletin... Trusting that the service which the School has rendered in the past has received your approval and will impel you to bespeak for it the aid and support of your friends..."

Without additional means of funding, the School of Mines was terminated and as a Department of Mining Engineering was transferred into the School of Engineering. Magnus Ihlseng would not leave his students without an instructor and continued to teach to the end of the academic year; he then resigned.

The faculty may have anticipated and feared this political bombshell. In 1895, the state legislature had authorized a department to be known as the Western Pennsylvania School of Mines and Mining Engineering in Pittsburgh, and subsequently gave the Western College of Pennsylvania the princely sum of $50,000 for a building and equipment; significantly, local people in Pittsburgh raised an equal amount in support of the school. In 1899, the legislature was in no mood to provide additional funds for mining education. Penn State had no local constituency; no influential alumni or network of neighboring industry, and could easily be ignored.

And yet all was not lost. Through their exemplary efforts, beginning from ground zero, the School's staff had developed cordial relations with mineral industry personnel throughout the state and the program was widely known. The founding professors had established a strong identity for the School of Mines in
which a balance was maintained among geological, metallurgical and mining engineering subjects. Though coal and anthracite mining received considerable attention—especially in the development of extension services—this did not preclude extensive coverage of metallic and nonmetallic mining topics both in instruction and the School’s outreach efforts. The School of Mines at Penn State was a mineral industries program, not a coal mining school.

Among the 26 students graduated in the first years, several are known to have achieved positions of distinction. Of the School of Mines first graduating class of four students in 1897: James A. Dunsmore was superintendent of the Argyle Coal Company in 1926, James S. McMichael was with the Carnegie Steel Company, Charles William Hardt became the resident engineer of the Pennsylvania Department of Highways, and William Clinton B. Alexander, the first student secretary and then president of the Mining Engineering Society, became a research and consulting engineer in Washington, D.C. He was also the first student of the School of Mines to receive an advanced degree: the degree of Engineer of Mines was conferred in 1903. William Affelder ’99 became president, then chairman of the board of the Hillman Coal and Coke Company in Pittsburgh, and served as a member of the Penn State Board of Trustees. In 1934 Affelder was among the alumni providing funds for establishing the program in geophysics and continued to take a strong interest in college affairs into the 1960s. But perhaps the most influential alumni was Lewis E. Young ’00 who became director of the Missouri School of Mines at Rolla, a well-known educator, mining consultant, mine mechanization pioneer, and the 1948 president of AIME.

And there is no doubt that President George Atherton had appreciated the work of his Mines faculty and supported their goals—when he sought a new leader for the program, he continued to look for the best candidate he could find, and it is to the credit of the early work of the Penn State School of Mines that geologist and mineralogist Dr. Marshman E. Wadsworth, director of the School of Mines at Houghton, Michigan, agreed to take on the difficult task of reestablishing the School.

**THE WADSWORTH YEARS 1901-1908**

Dr. Wadsworth’s immediate challenge was to build student and staff morale and to increase enrollment, a task magnified by events in the anthracite industry that in 1902 was in the throes of a six-month general strike bringing crisis and violence to the entire hard coal region. The physical status of the department was, as before, a few rooms in the Main Engineering Building and an all-purpose Metallurgical Laboratory. The bright notes were the museum and the library that thanks to the efforts of the founding faculty included “over 800 volumes devoted exclusively to mining engineering and its technical branches, besides journals, magazines, proceedings, and the reports of State Mine Inspectors of 10 states; complete sets of the 1st and 2nd Geological Survey of Pennsylvania; most of the U.S. Geological Survey Reports, other state reports, and publications of various societies of the United States and Europe.” The Oberlin remained the physical symbol of the program.

Marshman E. Wadsworth was both a fine scholar and an able and experienced administrator, well-known throughout the academic mining engineering world. Before coming to Penn State he had served for nine years as director of the school of mines at Houghton, Michigan. He was born in Livermore Falls, Maine in 1847, and received his A.B. from Bowdoin, and A.M. and Ph.D. degrees from Harvard, during which time he also held a number of positions ranging from assistant with the geological survey of New Hampshire to professor of chemistry at the Boston Dental College. In 1884-85 he studied at the University of Heidelberg, Germany, returning to a teaching position as professor of mineralogy and geology at Colby College. In the summer of 1886 he served as assistant geologist with the Geological Survey of Minnesota. He was author of some 200 papers and articles, and the books: Geology of the Iron and Copper Districts of Lake Superior (1880), Lithological Studies (1884), and Crystallography (1909).

In 1887 Wadsworth joined the newly formed Michigan School of Mines at Houghton on the Upper Peninsula and quickly became a strong force on its faculty. By the time he became director in the early nineties, there were 101 students and it was by far the largest school of mines in the United States—Lehigh was in second place with 64, and the Colorado School of Mines had 13 students. In the years at Houghton Dr. Wadsworth gained a national reputation as an educational innovator through his promotion of the Elective System to give students much greater choice among courses. He rejected existing systems in which all students regardless of major followed the same basic curriculum and declared that “the engineering faculty, and they alone, are the parties competent to formulate the list of studies for engineering students, and their decision in such matters must be final, if engineering courses are to be freed from driftwood and barnacles.”

Unfortunately we lack direct information about the Wadsworth years at Penn State and can only read faint indirect clues to his substantial achievement. From the Catalogs we can deduce signs of Wadsworth’s educational ideas being adopted in the School of Engineering in the period 1901-1906. As the years progress, the catalog listings have a new precision and professionalism, laboratory courses are coordinated with lecture courses, prerequisites are listed, exactly as he had recommended in his writings. In the Mining Engineering Department, new courses were offered in Optical and Microscopical Mineralogy, and Microscopical Petrography, together with courses in Stratigraphical Geology and Paleontology, no doubt reflecting Wadsworth’s expertise. In 1904, students in the Metallurgical Laboratory were testing fuels using the newly developed Atwater Bomb Calorimeter, and taking a new course on Metalliferous and Nonmetalliferous Deposits. Meanwhile, Dr. Wadsworth’s talents as an administrator were being praised by President Atherton and other administrators, and his enthusiasm and dedication can be seen in the rapidly rising enrollment.

True evidence of his success came five years after his ap-
pointment, when Wadsworth finally achieved his major goal: re-
establishment of the department as an independent School of
Mines. In celebration, Dean Wadsworth named his school the
School of Mines and Metallurgy, to reflect the growing impor-
tance of its work in metals. At this time, with 97 undergraduates,
the Penn State School of Mines and Metallurgy was claimed to
be the largest mineral industry school in Pennsylvania and the
fifth largest in the United States.

A HOME AT LAST

Another achievement of equal significance was the acqui-
sition of a building for the School. Thanks to a gift of $5,000
from Andrew Carnegie, the wooden frame building that had
housed Mechanic Arts in the early 1880s was moved along Col-
lege Avenue to the approximate location of the current Power
Station. The building was substantially enlarged and assaying,
metallurgical and mining laboratories were created. In 1907, a
state appropriation of $20,000 allowed another large wing to be
attached to the back of the building and additional improvements
to be made. This rambling frame structure became known with
some affection as the Old Mining Building. Though it was less
than perfect, it was a great improvement over shared quarters.

In March 1907 an announcement for the School of Mines
and Metallurgy was published, and in it we see the full flowering
of Wadsworth’s elective system and can deduce his pride in the
School. The proliferation and sheer exuberance of the course of-
ferings, to say nothing of the scores of electives, is startling.
Given the number of students enrolled or even optimistically
hoped for, it is apparent that many of the courses would never be
more than a catalogue listing. Dean Wadsworth nevertheless
used this Catalog to demonstrate his vision of a School of Mines
and Metallurgy. The table below gives some indication of the
breadth of his goals in 1907.

Dean Wadsworth’s goals in 1907 were in fact not so far
from the objectives outlined thirty years later by Dean Edward
Steidle—the significant difference was that under different po-
itical and economic circumstances, Steidle was able to accom-

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**Course Listings, School of Mines and Metallurgy, 1907**

**Geology:** the principles of geology, engineering
geology, elements of physical geography, advanced physical
geography, advanced physical geography continued (textbooks included
*Elementary Meteorology*), general and field
gеology, paleozoic geology, mesozoic and
cenozoic geology, glacial geology, prehistoric
man, geology of the United States, geology of
Pennsylvania, volcanoes and earthquakes, azoic
or archean geology, history of geology and
paleontology, the philosophy of geology, the
philosophy of geology continued (Lyell),
physical and chemical geology, physical and
chemical geology continued. Geological
Laboratory: a range of field geology and
gеological surveying and mapping courses,
summer schools in geology, and practical work
in geology (related to mining).

**Metallurgy:** metallurgy of engineering
materials, principles of metallurgy, metallurgy of
metals; fuels, furnaces, calorimetry, pyrometry
e.g. refractory materials; gas producers;
metallurgy—microscopy of metals and
alloys; blast furnaces, foundry work, cast iron;
steeл; copper; lead; gold and silver; metallurgy of
minor metals; alloys; electro metallurgical
processes. Metallurgical Laboratory: 24 courses
including experimental work, fuels and fuel
testing, field trips, assaying, metallurgical
calculations, metallurgical design, and research
work.

**Mineralogy:** crystallography and mineralogy,
mineralogy and petrography, mathematical
crystallography (2 courses) physical and chemical
mineralogy (4 courses); mineralogy of the United
States, mineralogy of Pennsylvania, Mineralogical
Laboratory: a series of mineralogy and petrography
and crystallography courses.

**Mining:** principles of mining; mine gases,
vacuuming, lighting, mine accounts, mine layout;
mine calculations and estimates; coal mining (2
courses); metal mining (2 courses); hydraulic
mining and dredging; mining engineering (2
courses); mine sampling, valuation, economics,
accidents; mining and ventilation machinery; power
generation and transmission in mines; mine
drainage and pumping; mine hoisting and haulage;
exploitative, boring and shaft sinking; expansion
and support including timbering; advanced mine
surveying; mine labor, management. In addition a
range of courses on mine laboratory and design,
practical field work, and graduate work.

**Mining Geology:** economic geology; memetallites
or nonmetalliferous deposits; ore deposits of the
United States; ore deposits of Europe; ore deposits
of Africa, Asia etc.; mining geology of Pennsylva-
nia; precious stones or gems; clays, their occurrence
properties and uses; cement limes and clasters;
coal, origins, properties; petroleum, natural gas and
other hydrocarbons; road and refractory materials,
abrasives, fluxes, phosphates—and at a graduate
level: waters, salines, pigments and glassmaking;
copper deposits; gold, silver and silver-lead
deposits; tin lead zinc, mercury; aluminum,
chromium, manganese, nickel, platinum; the
theory of ore deposits. Also laboratory sessions.

**Mining Law:** principles of law and law of
contracts; mining law and law of mining injuries;
law related to oil and gas; law of negligence and
personal injuries in mines; law of contracts,
limitations and frauds as applied to mining; law
of engineering operations; mining laws of Great
Britain; mining laws of Mexico and other
countries.

**Ore Dressing and Coal Washing:** principles; ore
dressing operations and machinery; coal washing
and preparation for market; gold and silver
milling; hydrometallurgy (including the cyanide
process, the chlorination process, hyposulphite
process etc.) and an accompanying series of
laboratories.

**Paleontology:** an entire series of courses on both
countology and paleobotany, together with
countology and paleobotany laboratory
sessions.

**Petrography:** optical and microscopic
mineralogy and petrography; microscopic
petrology; origin of minerals, rocks and ore
deposits, their alterations, relations and
classifications; together with a series of
laboratory sessions, and including petrographical
field work.
plish his goals: Wadsworth was not.

In 1906 the Western College of Pennsylvania began moving from its old site in Allegheny to a new site in Oakland district of Pittsburgh. Its name was changed to the University of Pittsburgh in 1908 and finally the School of Mines was effectively organized. The position of founding dean was offered to Dr. Marshman E. Wadsworth—it was a position he could not refuse.

On the Penn State campus, the death of President George Atherton in July 1906 was followed by a time of troubles, dubbed the Beaver interregnum, when the outspoken trustee and former Pennsylvania Governor James A. Beaver became acting president. Beaver was incensed at the high failure rate among students, particularly since some of these failures were among the sons of influential Pennsylvanians who were not slow to criticize the Pennsylvania State College, and he beated the faculty for providing inferior instruction. A battle for power ensued between faculty and administration. Beaver's appointment of Judson Welsh as vice president—a man who took the system of centralized purchasing to extremes and waylaid all budgets on their way to the president's office—led to faculty turmoil and the resignation of Engineering's Dean Reber, and contributed to the departure of Marshman Wadsworth. In one stroke Penn State lost two inspiring leaders and effective and energetic administrators. [Bezilla p.70]

Dean Marshman Wadsworth's tenure at Penn State was not long, but it was of great significance. He had the strength of leadership to save the School at a point when all could have been lost. Under a lesser man, the fate of the program would have been to remain a small program within the School of Engineering, as was the case in similar schools throughout the United States. Thanks to his efforts, our College celebrates its centennial this year.

The measure of Dean Wadsworth's success is seen most clearly in the achievements of his students. The students nurtured in the Wadsworth years dispersed across the United States and abroad to pursue productive and distinguished careers in a remarkable variety of fields. This too was his legacy.

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Graduates of the Wadsworth Years

1902
William A. Maxwell
president, Colorado Fuel and Iron Company, Denver.

1903
George H. Deike
co-founder, Mine Safety Appliances Company, now MSA, Pittsburgh; member, Penn State Board of Trustees.

Edward N. Zeno
professor and head, Department of Mining Engineering, University of West Virginia.

1904
Bruce McCuamant
chief chemist, Crucible Steel Co., Spaulding & Jennings Works.

Horatio Ray
engineer, Tshikapa, Belgian Congo.

Hugh McGlith
supervisor, P.R.R., Cape Charles, Virginia.

T. E. Breslin
manager, mining division, American Rolling Mill Company; independent oil geologist, Shreveport, Louisiana.

1905
Jere Zalzinger
manager, sales, Universal Atlas Cement, Kansas City.

Charles Connor
consulting engineer, Denver.

Harry D. Easton
physician, State College.

Winfield McDowell

1906
Horner Bradock

Grover Glenn

Ray Farrington

Frank A. Dahrberg

John C. Cosgrove

Harry W. Montz

T. E. Breslin

A. G. Lang

Howard Dugger

Daniel Dodge

C.R. Garrett

Howard Gregg

Edgar Doysher

Edgar Gephart

John T. Ryan

1907

1908

1909

Spurgeon Thompson

Howard German

Howard Gregg

Harry Henry

Howard Ira Smith

Alfred Lang

Edgar Gephart

John T. Ryan

Max Dillon

John Snider

William Dunn

Ralph Irvine

Joseph Xav

William B. Plank

George Purcell

Clyde Orndoff

R.H. Allport

Arthur Barnett

Lewis Lindemuth

Clarence Reiter


assistant to president, Driver-Harris Co., Harrison, New Jersey.

division engineer, Pennsylvania Coal & Coke Corp. president, Creighton Fuel Co. Pennsylvania State College.

chief, mining division, USGS, Washington D.C.

vice President chief engineer of operations, Pacific Portland Cement, San Francisco.

assistant chief lithoponetac, New Jersey Zinc Co. co-founder, Mine Safety Appliance Company, Pittsburgh; president of the Penn State Alumni Association.


department manager, chemical labs, Shell Oil, Florida. chief engineer, Island Creek Coal Co., West Virginia. professor and head, Department of Mining Engineering, Lafayette College, Pennsylvania. secretary and treasurer, Stevens Metal Products, Niles, Ohio.

Superintendent, store and slag division, Bethlehem Steel Corporation.

district mining supervisor, USGS, New Mexico. consulting engineer, Huntington, West Virginia. consulting engineer, steel production, New York city manager, Bend, Oregon.

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Judy Kiousalaas, EMS Editor
SHOEMAKER LECTURE

The Shoemaker Lectures in Mineral Engineering have been established to support presentations by outstanding leaders of the energy and mineral resource industries. The Series was endowed in 1992 by Mercedes G. Shoemaker to honor the memory of her husband, G. Albert Shoemaker, a Distinguished Alumnus of Penn State, former Penn State Trustee, and president of the University Board of Trustees from 1970 to 1972. Most of Mr. Shoemaker’s career was spent in the coal industry, much of it with the Consolidation Coal Company in Pittsburgh. He served as president of Consol from 1960 to 1966. The series is administered by the Department of Mineral Engineering.

The 1995 Shoemaker Lecture was presented by Dr. H. Douglas Dahl, President and Chief Operating Officer, Drummond Coal Company, Inc. [Since this lecture took place, Dr. Dahl has become President, Eastern Associated Coal Corporation and President, Peabody Coal Company]

Dr. Dahl holds three degrees in Mining Engineering from Penn State and in 1987 was honored as a Penn State Alumni Fellow. Prior to accepting his position as President and CEO of Drummond Company in 1990, he was a member of the Board of Directors and Executive Vice President for Engineering, Exploration and Environmental Affairs for Consolidation Coal Company. He serves as a director of numerous leading organizations in the minerals industries and has received a number of awards, including the Jackling Award and Rock Mechanics Award of SME. He received the SME Distinguished Member Award in 1991.

We present an abridged version of Dr. Dahl’s lecture.

4th Annual G. Albert Shoemaker Lecture in Mineral Engineering

Labor, Management, Productivity, and Coal: a Cocktail for 2000?

H. DOUGLAS DAHL
President and Chief Operating Officer
Drummond Coal Company, Inc.

During the years of my education at Penn State, my field of specialization was mining engineering, with particular emphasis in my Master’s and Doctoral work on rock mechanics. A career in the management of mines of or of companies benefits from a specialization such as that, but does not permit the luxury of resting on your laurels. You become involved with coal mining in all its variety—its technical aspects, both theory and practice; its business side, dealing with management and labor, accountants and lawyers, politicians and environmentalists. I have also been involved with related fields—construction, exploration, barges, railroads, ships and docks, supply houses, the coke business; you name it.

Throughout all these various aspects of the business, my experience has reminded me daily that if you are into mining, you are into the business of people. The topic I will talk with you about today is people; or more specifically the relationships between those groups of people in the coal business who have historically identified themselves as labor or as management.

Between these two groups there has historically existed something of a divide—the company men and women, mostly salaried employees who provide the management, the staff, the supervisors, and the administrators of the business; and on the other side as it existed in the past are the men and women who are coal miners, earning an hourly wage rather than a monthly salary, and mostly union-represented. In the coal mining business, some of the people on both sides of the divide have climbed up and looked over it—and had some interesting conversations at the summit. The divide is still there, but today it’s not as foggy and insurmountable as once was thought.

I want to offer you my thoughts on how we arrived at today’s situation in labor-management relations—where we are headed unless something changes—and give you one man’s opinion on the best of all worlds.

First, let’s look at the coal business as a whole. Ever since the boom years in the 1970s there has been a continuing shakeout in the business, largely because of overcapacity. There are too many miners chasing after too few coal buyers. The result is obvious—declining prices.

The Department of Energy recently published some coal price figures from 1949 through 1993. In real dollars (1987 dollars with the gross domestic product price deflator figured in) the average ton of coal sold for $24.52 in 1949; in 1993 it sold for $16.55. The top selling price in the DOE list F.O.B. mine was $39.09 a ton in 1975—well over twice the 1993 price. Even if you use current prices not adjusted for inflation, the price of our coal has gone down for the past 11 years—the tremendous growth of lower-cost Western coal is a factor of course, but it does not account for all the decreases in price.

When you are facing heavy competition and receiving less money for your product, you take a hard look at your costs. Here the large companies benefit from some economics of scale—they can afford new updated equipment that allows higher production for less money. Smaller operators are less fortunate. I could quote numbers that show that now there are fewer coal companies and fewer coal mines, and the surviving mines are on average larger.

The same trend applies to coal miners: there are fewer and fewer of them. Today DOE lists about 100,000. Compare that with 200,000 as recently as
Fewer companies, fewer mines, fewer miners. A changing picture? No, it is a changing picture, and one to which everyone in the industry must adapt. The numbers are all true, but be assured coal is still going to be around. For many, many years to come most of this coal will be used to power the majority of kilowatts generated in the power plants of this country. What concerns us here is the matter of who will mine the coal and how these people will be organized.

In this ever-changing picture of the coal industry, we are seeing new records in production being set by fewer miners than there have been at any time in the past century. The reason of course is much higher productivity. A great deal of the manual labor in coal mining has been replaced by machines. New equipment and computers have not only increased production but improved safety as well. Improved mining procedures and more and better employee training have also had an effect.

Productivity in 1993 was 4.7 tons per miner per hour, which is more than six times the productivity figure in 1950. In both underground and surface mining, the productivity figures have doubled over a ten-year period. Looking at the years 1983 to 1993, underground miners moved from 1.6 tons per miner per hour to 3.2; surface miners increased productivity from 3.9 tons per hour to 7.8.

Coal mining does not exist in a vacuum—trends, new management theories, new ways of employee relations affect mining as much as any industry, although the changes tend to come more slowly. What are these trends? They are described by buzzwords: mobility, empowerment, teams, re-engineering, outsourcing, and others, and they are seen against the new employment seen of job insecurity—the fading traditions of lifetime employment, steady advancement, a hierarchy, and some degree of paternalism. Will these trends affect the coal business? The short answer is yes, and I will tell you why. But first let me make a rather jarring statement: There is a real possibility that unions won’t be around 10 years from now.

UNIONS AND LABOR RELATIONS

Overall, unions appear to be weakening. Coal mining is #12 in the Bureau of Labor Statistics list of most rapidly declining industries—employment is expected to decline by 36,000 between 1992 and 2005, even as production continues to increase. Since 1983 union membership has dropped 6% and in 1993 made up only 15.8% of the workforce. At the same time, productivity of miners in the United Mine Workers of America union was 3.17 tons/miner/hour in 1993 [Department of Energy] and productivity of nonunion miners was 5.36 tons/miner/hour. This trend was apparent in surface and underground mines and, with some regional exceptions, in all three coal regions: Appalachian, Interior, and Western.

Richard Trumka, international president of UMWA, was certainly aware of these trends in 1992 when he called together representatives of six coal companies in the Independent Bituminous Coal Bargaining Alliance (IBCBA) to discuss new collaborative efforts for management and labor to work together. Four companies accepted Trumka’s invitation: Jim Walter Resources, U.S. Steel Mining, Westmoreland, and Drummond, and we began negotiations toward a new contract.

I stated at that meeting: “The time has come for all of us—labor, management, union, company, all the stakeholders in our industry—to realize that we are all in the same boat, and we all have a common interest of making progress, individually and as a group, over some rather stormy seas. As a starting point to realizing that goal, we are looking forward to a novel approach to negotiating our next labor contract.” I didn’t know at that time just how novel those negotiations would be.

We were negotiating for a profoundly new kind of miners’ contract, one based on trust, so the negotiations were conducted accordingly, with shared information from both sides. Opinions were respected, not shouted down. Any topic was open for discussion. It was not easy, but all of us knew that it was too important to allow it to fail. And nine months after we started a joint agreement was announced that affected 7,500 active UMWA members in Alabama, Pennsylvania, Virginia, and West Virginia. Trumka called it “a milestone in the history of labor-management relations in the coal industry.”

The enthusiasm was prompted by one of the key elements in the agreement, the Labor-Management Positive Change Process (LMPCP), initiated by Trumka. At the heart of the process was the setting up of an LMPCP committee at each mine “for the purpose of improving labor-management relations, communications, operational effectiveness, and job security.” This time the agreement signaled a commitment to principles and values—respect for dignity, openness and flexibility, opportunities for sharing benefits, honesty, integrity, trust, increasing shareholder value—not just words, but honest words aimed at helping to solve problems rather than allowing a slide into win-lose conflict resolution.

The new openness actually works. Soon after the agreements were in place we had an opportunity at Drummond to put it to good use. Under the old traditions and procedures, we would have closed a mine, but under the LMPCP, we have continued operation for two additional years, until its reserves were exhausted—a bonus to both employees and the company. Why did this happen?

At a company fishing tournament, three miners came up to me and said in effect, “We know that our mine is at risk. We’ll do a lot to save our jobs; you need to get together with us.” And we did. We gave them the facts. We laid the costs in front of them—labor, benefits, black lung, taxes, royalties, shipping costs. We gave them our market prices, showed them how much it was going to cost to build a dragline relocation road to continue the mine in another reserve. We basically asked them if they would spend millions of dollars when they knew they would make nothing. Then we said, “We need to reduce costs by a couple of bucks a ton to justify doing this.”

So together we went after some things they could agree to—flexible work schedules, 10-hour shifts four days a week, a major reduction in overtime, subcontracting of coal hauling, and others. It was a major change in the old way of doing things, but the miners’ jobs were extended for at least two years.

Another agreement under the LMPCP allowed Drummond to open a new mine. Drummond Company has a $160 million investment in its new Shool Creek underground mine, but to make it successful some scheduling and other changes in traditional procedures were necessary. Before opening the mine a year ago we did something most unusual within a union company—provided our miners with information on each of our mines, how much coal remains, its ex-

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Earth & Mineral Sciences
pected life, its outlook. The miners were then given the opportunity to bid on jobs at any of the mines, including the new one which has a 30-year life. Many surface miners elected to work at the new underground mine, and for the most part they have worked out very well.

At each of our mines the Labor-Management Positive Change Process is alive and we are learning more week by week about how to use it effectively for everyone’s benefit. It hasn’t all been roses; the old ways die hard. But it is working, and it must.

Earlier I claimed that there is a real possibility that unions won’t be around 10 years from now. My point is this: if unions continue on the old pathways they have followed for the past century, they will find that these lead straight to oblivion. But if unions seriously and conscientiously take a more realistic approach, they can survive and can be useful instruments for both their members and the companies that employ those members. What needs to happen? Unions need to stop using the subject of safety as a club over an industry that puts tremendous effort into safe operation. They must learn to negotiate more realistic health care provisions. Time at the face needs to be increased. And of equal importance, basic attitudes must be changed. Management is not the enemy—Rich Trumka knows that; many union people know that; but the message has not filtered down to the rank and file.

The means for the Positive Change Process are in place; to make them work requires leadership—at both the union and management levels. In my region we have the advantage of effective union leadership in John Stewart, president of UMWA District 20, who is here as a guest today. John and I often begin on opposite sides of a question but we sit down as reasonable people with great respect for each other and an understanding of what we are both trying to achieve. John certainly provides clear leadership for his people, as I attempt to do for mine. From that beginning it is amazing what you can achieve.

You may think I have climbed pretty far out on the limb of idealism in what I have said today, but let me go one step further and offer some ideas on the “best of all worlds” as they relate to employee relations. This is the vision I work toward at Drumm should get more out of their job than just a paycheck.

The resolution of labor-management issues needs individuals with these kinds of goals; it also requires individuals possessed of qualities of integrity, intelligence, initiative, and interpersonal skills needed to ‘make it’ in today’s world.
Jon Merritt is New Student Advisor

The College of Earth and Mineral Sciences is pleased to announce that Jonathan H. Merritt has been appointed as Director of Academic Advising and Senior Coordinator for Penn State's Division of Undergraduate Studies. He will direct the EMS Student Center and be the main advisor for undergraduates in the College. He succeeds Garry L. Burkle, now Director of Enrollment Services for the University.

Merritt was previously an instructor in the Department of Meteorology and served as Coordinator of the Weather Station since 1986. From the Weather Station, he directed liaison with the University community and the public, maintained local climatic database and satellite imagery archives, supervised a staff of student assistants, and served as advisor to the student-run Campus Weather Service. Over the past several years, he has served Meteorology as undergraduate advisor and admissions officer, scheduling officer, supervisor of the summer internship program, and supervisor of the graduate student teaching assistants for the general education meteorology practicum.

He has taught courses in meteorology, including introductory forecasting and analysis, introductory synoptic and dynamic meteorology, and core synoptic meteorology. In 1994, the enthusiastic endorsement of the students in Meteorology led to his successful nomination for the College's Wilson Award for Outstanding Teaching.

Before coming to Penn State, Mr. Merritt held positions as caseworker in the Family Service of Rochester, NY, and as Substance Abuse Counselor for the East Irondequoit N.Y. Central School District. He holds a B.A. degree in history from Brown University, and M.S. in Meteorology from Penn State.

New Coordinator of Minority Programs

Josephine B. Herrera has joined the College of Earth and Mineral Sciences as Coordinator of Minority Programs, succeeding Dr. John D. Lee, who has been appointed as the College's Mathematics Tutor.

She comes to University Park from Penn State's DuBois Campus where she served as a lecturer in environmental sciences and taught courses in geosciences, geography, and meteorology. Concurrently, she is pursuing her D.Ed. degree in earth science at Penn State. She already holds a B.S. in geology from Columbia University and M.Ed. in earth science from Penn State.

Herrera's interest and involvement in minority science programs is longstanding. At Penn State, she served as the first coordinator for the Business, Engineering Science and Technology (BEST) Summer Program for minority students, and as an instructor for an orientation course for engineers. She has been active in a number of committees to enhance the climate for minority students, including the WISE Forum and the liaison committee to the Commission for Women at DuBois Campus, and served as a volunteer counselor and tutor in the College of Earth and Mineral Sciences.

Before coming to Penn State, Herrera taught at DeWitt Clinton High School in New York City, where she was selected as "Rookie Teacher of the Year." She also coordinated a program to encourage disadvantaged students to stay in school, and taught an outward bound program to build leadership and survival skills for inner city students.

The office for minority affairs in the College of Earth and Mineral Sciences is now located in the EMS Student Center, 25 Deike Building.

Dietz Leads EMS Development

John L. Dietz, Jr. has joined the staff as Director of Development for the College of Earth and Mineral Sciences. He succeeds Michael Rishell.

John Dietz has worked in development since 1978 and has been at Penn State for the past seven years. Prior to his appointment in EMS, he served as Associate Director of Corporate and Foundation Relations for Penn State.

Dietz was previously Director of Development for Midway College, a liberal arts college in Kentucky. He spent the first eight years of his development career with the March of Dimes Birth Defects Foundation as Executive Director of the Bluegrass Chapter in Lexington, KY. Dietz holds a B.S. degree from the University of Pittsburgh at Johnstown and M.Ed. in higher education from Penn State. He and his wife Eileen Kulbaba Dietz have two sons.

EMS Welcomes New Faculty Members

Andrew Sluyter has joined the faculty as Assistant Professor of Geography. He received his doctorate in geography from the University of Texas at Austin in 1995, and holds B.A. and M.A. degrees from the University of British Columbia. His dissertation was titled, "Changes in Environment, Land Use and Settlement during the Prehispanic and Colonial Periods in Central Veracruz, Mexico: A Contribution to the Holocene Human Ecology of the Southern Gulf of Mexico Tropical Lowland." Sluyter has carried out extensive field work in Mexico and other areas in Middle and South America and expects to continue his studies of environmental change, development and resource management in Middle America.

Todd A. Sowers comes to Penn State from the Lamont-Doherty Earth Observatory where he was a post-doctoral research scientist studying the isotopic composition of dust from the GISP2 ice core and its implications for under-
standing abrupt climate change. Dr. Sowers has been appointed as Assistant Professor of Geosciences. His research interests are in Pleistocene-Holocene paleoclimatology and assessment of the anthropogenic impact on the composition of the atmosphere. He holds Ph.D. and M.S. degrees in Oceanography from the University of Rhode Island Graduate School of Oceanography, and B.S. in Chemistry from Arizona State University. His dissertation was concerned with the isotopic composition of trapped O$_2$ and N$_2$ in ice cores. Sowers has a number of publications on polar and Greenland ice, and gave an invited presentation at the Gordon Conference on chemical oceanography in 1993. In 1991-92 he served as co-chief scientist for the joint American-French-Russian expedition to Vostok Station, Antarctica, and since 1989 has spent three seasons carrying out research at the GISP2 ice coring project at Summit, Greenland. In 1988-89 he was a visiting scientist at the Laboratoire de Glaciologie, Grenoble, France.

Clive A. Randall, a Senior Research Associate and Associate Professor of Materials at the University’s Intercollege Materials Research Laboratory, has formally joined the EMS faculty. Dr. Randall holds a B.Sc. (Hons.) in Physics from the University of East Anglia (U.K.) and Ph.D. in Experimental Physics from the University of Essex (U.K.). He served as a visiting scientist at Bell Communications Research and the Oak Ridge National Laboratory, High Temperature Materials Laboratory, before coming to Penn State in 1987. He has published extensively, primarily in ferroelectrics, electroceramics, and composite materials, and has given many presentations at universities, companies, and conferences. He has developed and taught courses in electrical and magnetic properties of ceramics, and practical transmission electron microscopy, and a materials seminar on electroceramics.

Ralph H. Colby, who has joined the Penn State faculty as Associate Professor of Polymer Science, is an experimental rheologist with current research interests in the rheology of structured fluids, the linear viscoelasticity of miscible blends, charged polymer solutions and gels, and polymer/surfactant reversible gels. He was previously a research scientist in the Corporate Research Laboratories of Eastman Kodak Company and an Adjunct Assistant Professor in the Department of Physics and Astronomy at the University of Rochester. From 1979 to 1981 Dr. Colby was associated with the Plastics Technology Program of General Electric’s Corporate Research and Development Center, and from 1983 to 1985 carried out doctoral research as a visiting scholar at the Corporate Research Science Laboratories of Exxon Research and Engineering Company. In 1987 he received Kodak’s C.E.K. Mead Award for excellence in scientific research and technical reporting.

### College Programs Rank Highly: Geography #1

National Research Council rankings of academic doctoral programs in the United States were announced in September 1995. Three EMS doctoral programs were involved in the ranking procedure:

- Geography, Geosciences, and Materials Science.
- Geography was ranked #1 out of 36 ranked programs.
- Geosciences was ranked #12 out of 100 ranked programs.
- Materials Science was ranked #9 out of 65 ranked programs.

These three EMS programs plus Industrial Engineering in the College of Engineering were the highest ranked programs at Penn State.

### EMS on the Web

The EMS site on Internet’s World Wide Web is growing constantly in size and complexity as Departments, Programs, and Research Centers work to enhance the appearance and content of the material accessible through the EMS Home Page. The site is reached at http://www.ems.psu.edu

In the past few months the EMS site has received a range of awards from organizations that scan the web for interesting and informative locations. Editors at McKinley’s Internet Directory have awarded the overall EMS Home Page their Magellan Three Star Rating. A Magellan Four Star Rating (the highest award) was given to the Weather Pages. The Home Page and Weather Pages both received the Point Survey award as being among the Top 5% Web Sites. Professor Alistair Fraser’s home page essays on Bad Science have been cited by the Teacher’s Association and the New York Times, and his page was selected as Science Page of the Day on October 25, 1995. His site was recently awarded as a winner in the Science category of the Iway 500, an annual ranking of the best 500 web sites worldwide. Bad Science placed tenth out of 25 winners. The site can be reached through the EMS Home Page, or directly at http://www.ems.psu.edu/~fraser/badscience.html

The EMS Home Page offers a wealth of educational entertainment and information for the web browser. Highlights include the multimedia material of the Geography home page that was developed for the department’s 50th anniversary; the Pennsylvania State Climatologist page which contains interesting visuals and archived Pennsylvania climatological data; the Hydrogeologists page that also provides convenient access to numerous sites of interest to professionals in the field; and the Meteorology page. For alumni, the EMS Home Page provides information on GEMS, a guestbook, and access to the Point of First Contact program. Online course material and data access are offered for students, and department program and course descriptions, and other information is available for potential students.

The web site’s highly popular Weather Pages have been accessed more than 100,000 times per week recently. In addition to current weather forecasts, this site offers: Decoded Offshore Weather Data updated every 15 minutes and archived for 48 hours; hourly US Weather Statistics for the past ten days; a Virtual Reality Weather Page; a number of quick-time VR movies on weather
phenomena; user Weather Observations; and the northeastern US Weather Page.

The EMS Home Page development is under the direction of Tim Robinson; the weather Pages are developed by Robert Hart.

Faculty Activities

RICHARD E. TRESSLER, Head of the Department of Materials Science and Engineering, has been elected as an academician of the Academy of Ceramics, an international organization based in Faenza, Italy, which provides the focus for scientific interaction and cultural exchange among the national ceramic societies and the international ceramics community. Dr. Tressler will be formally introduced to the Academy Council and other academicians at the inaugural session to be held in Krakow, Poland in June, 1996. He has been designated as a Professional member of the Class "Science."

Dr. Tressler has also been elected as a director of AVX, a manufacturer of electronic components.

R.V. RAMANI, Head of the Department of Mineral Engineering, has been appointed as a member of the U.S. Bureau of Mines Advisory Board. The establishment of the new 15-member Advisory Board was announced by Secretary of the Interior, Bruce Babbitt. The Board, composed of experts from various minerals-related fields will advise the Bureau of Mines on the direction, priority and scope of program activities. Members will serve two-year terms. The Advisory Board is chaired by Ray Beebe, a consultant from Arizona and former member of the National Materials Advisory Board.

He has also been appointed by U.S. Secretary of Labor, Robert B. Reich, to the Department of Labor’s National Advisory Committee on the Elimination of Pneumoconiosis among Coal Miners. This committee has been created to advise Mr. Reich on improved methods for eliminating black lung and silicosis among underground and surface miners.

JAMES KASTING, Professor of Geosciences and Meteorology, has been awarded as a Fellow of the American Association for the Advancement of Science.

MICHAEL A. ARTHUR, Head of the Department of Geosciences, has been awarded the Francis P. Sheppard Medal in Marine Geology by the Society for Sedimentary Geology.

T. DerRoy, Professor of Materials Science and Engineering, delivered a keynote address on Nitrogen Dissolution in the Weld Metal—Current Status and Research Opportunities at the Third International Seminar on Numerical Analysis of Weldability held in Graz, Austria. He also presented an invited lecture on Mass Transfer in Fusion Welding: Practical Implications and Case Studies at the International Workshop on Recent Trends in Welding held in Bangalore, India.

ROBERT W. WATSON, Associate Professor of Petroleum and Natural Gas Engineering, has received the Distinguished Service Award of the Society of Petroleum Engineers. The award was presented at the SPE Regional Meeting in West Virginia in September.

Three members of the Department of Materials Science and Engineering have been elected as Fellows of the Electrochemical Society and were honored at the Fall 1995 meeting of the society in Chicago. DEB D. MACDONALD, Professor of Materials Science and Engineering and Director of the Center for Advanced Materials, was cited for his "wide range of theoretical and experimental contributions to electrochemistry and the applications of the science and technology to corrosion and battery research." HOWARD W. PICKERING, Distinguished Professor of Metallurgy, was honored for his "contributions to the understanding of corrosion processes and longtime contributions to the Journal and to the Society," and KARL E. SPEAR, Professor of Ceramic Science, was named a Fellow in recognition of his work in the coupling of experimental and thermodynamic and kinetic modeling, which led to fundamental advances in the utilization of chemical, thermodynamic, phase equilibria, and kinetic principles as practical tools for predicting and understanding the high-temperature behavior of dynamically reacting heterogeneous systems."

Hubert L. Barnes, Distinguished Professor of Geochemistry and Director of the Ore Deposits Research Section delivered the Van Tuy Lecture of the Colorado School of Mines on Deciphering the Iron Sulfides for Mineral Exploration.

Dr. Barnes also has been awarded the University of Wales' highest honorary title of Distinguished Visiting Fellow associated with the Department of Earth Sciences, Cardiff. The period of the award is for five years starting January 1, 1996. The award is to encourage and recognize liaison and association with industry and commerce, government, research establishments, and the arts.

E. WILLARD MILLER, Emeritus Professor of Geography, was presented with the Distinguished Mentor Award by the National Council for Geographic Education at its 1995 annual meeting in San Antonio, Texas, for his contributions to geographic education at the graduate level.

ERIC J. BARRON, Professor of Geosciences and Director, Earth System Science Center, has been appointed as Editor-in-Chief of a new journal for the earth sciences that will be published only in electronic form on the Internet. The journal, Earth Interactions, is the joint product of the American Meteorological Society, the American Geophysical Union, and the Association of American Geographers, with support from the Ecological Society of America and the Oceanographic Society of America. Earth Interactions is sponsored by NASA and will reside on the computer of the Goddard Space Flight Center. Submissions, peer review, editing and publication will all be on-line. The journal will take advantage of the use of color, time-lapsed video clips, and linked access to data sets. Readers interested in learning more about the journal should contact Dr. Barron by email: eric@essc.psu.edu

He has also been elected as a Fellow of the American Meteorological Society. The award was presented at the Society’s 76th Annual Meeting in Atlanta, Georgia.

LEO B. KIRKUSNOV, a Research Associate in Penn State’s Center for Advanced Materials (CAM), has been selected to receive the 1996 Tajima Prize for young authors, which is awarded annually by the International Society of Electrochemistry to recognize excellent scientific work in the field of electrochemistry. The award was presented at the 47th Society meeting in Hungary.
Pennsylvania State Climatologist Office Established

The Pennsylvania State Climatologist Office has been established in the Department of Meteorology at Penn State, in cooperation with the National Weather Service's Central Pennsylvania Forecast Office and the National Climate Data Center (Asheville, NC).

The Office of the Pennsylvania State Climatologist is a service to the Commonwealth by the College of Earth and Mineral Sciences. Meteorologist Paul G. Knight has been appointed to direct the office as the Pennsylvania State Climatologist.

State Climatologist programs were previously in operation nationwide but were orphaned by the Federal Government during the 1973 recession and state climatologist positions were suspended. Recognizing the value of state-focused data and expertise, every U.S. state subsequently reestablished a state climatologist program. Pennsylvania has now filled this vacancy after more than two decades.

Paul Knight holds B.S. and M.S. degrees from Penn State and has been an instructor in the Department of Meteorology since 1983—he received the Wilson Award for Outstanding Teaching in 1994. Knight is a member of the Weather Communications Group and is well-known throughout the Commonwealth for his work with the PBS-TV program Weather World.

The Pennsylvania State Climatologist provides the public with a range of climatic information about the Commonwealth. Much of the information is now disseminated via the Internet, where Paul Knight maintains a web page at http://www.ems.psu.edu/PA_Climatologist/PA_Climatologist.html This site can also be accessed from the EMS home page.

Information includes daily observations from 180 statewide sites from 1948-1995; recent and local information from the state airports, summarizing statistics for the state and some sites, and information about climate trends. Data may also be obtained directly from the office. There will be a fee for some services. For further information, contact: The Pennsylvania State Climatologist Office, 503 Walker Bldg., University Park PA 16802, telephone: 814-867-8732.

New Faculty Books

Harold H. Schobert, Professor and Program Chair of Fuel Science in the Department of Materials Science and Engineering, is author of Lignites of North America, published in 1995 in the Coal Science and Technology Series of Elsevier. This monumental (714 pages) work is the most comprehensive study of lignites compiled to date. Successive chapters deal with the location of lignite deposits, their deposition and formation, the organic structure, and organic reaction chemistry, the nature and behavior of inorganic constituents, and lignite's physical properties and moisture content. The mining, transportation, storage and beneficiation of these coals are discussed, followed by investigation of lignite combustion, liquefaction, gasification, and chemical products. Understanding that the work will be used primarily as a work of reference, Dr. Schobert has gone to extraordinary lengths to provide useful annotated references to the original work—no less than 1,830 citations are made to the literature, and an extensive index further assists the reader.

E. Willard Miller, Emeritus of Geography, and Ruby M. Miller, retired Penn State associate librarian, are authors of America’s International Trade, published by ABS/CLIO, Santa Barbara, California. Dr. Miller writes: “Throughout most of the history of the United States, the domestic market has provided the dominant force in the national economy. With the evolution of the present-day global economy, the international trade of the United States has increased rapidly. This book begins with an analysis of the evolution of the international trade policies of the nation. This is followed by chapters that provide information on a variety of topics. A chronology lists important data in the evolution of national and international laws and regulations. A listing of public and private organizations at both national and international levels provides information on trade relationships. A selected bibliography of annotated books and over 1,000 articles from journals and government publications is provided. The book concludes with an annotated list of films and a glossary.”

E. Willard Miller, S.K. Majumdar of Lafayette College and F.J. Brenner of Grove City College are coeditors of Environmental Contaminants, Ecosystems and Human Health published by the Pennsylvania Academy of Science. Dr. Miller writes: “Ever since the industrial and agricultural revolution humans have been discharging contaminants into natural ecosystems which not only adversely impacts these systems but also human health. Many of these issues are now major public policy frontiers in the 1990s. The solution to these problems centers around critical decision processes in both advanced and the Third World nations.” E. Willard Miller and Peter Gould, Professor of Geography, were contributors to the book.

Four Penn State meteorologists are authors of a new text and laboratory book titled, A World of Weather: Fundamentals of Meteorology that combines rigorous science with a relaxed and accessible text and up-to-the-minute data and examples. A World of Weather was written by Jon M. Nese, Associate Professor of Environmental Science, Lee M. Grench, instructor in the Department of Meteorology, graduate student David J. Mornhinweg and Timothy W. Owen of the National Climatic Data Center. It was published in 1996 by Kendall Hunt Publishing Company.

The book is equally appropriate for introductory classes in traditional meteorology programs and for use by colleges offering only one course in weather. Wit and nontraditional writing style give a nineties spin to a text that deals with meteorological measurement, fundamental weather phenomena, storms, flood and drought patterns, together with chapters on human impact on weather and climate, and the climatology of Pennsylvania and Florida. Each of the sixteen topic chapters is followed by a series of questions for thought; questions for laboratory experimentation; and questions for review in addition to regular features on weather folklore. The 500-page book has extensive maps and diagrams, black/white and some color photographs, and substantial statistical material.
Geographers in Washington, DC.

An expert on the geography of intercommunications technologies, he is coauthor or editor of seven books, including *Corporate Networks: International Telecommunications and Interdependence: Perspectives from Geography and Information Systems* (Belhaven, 1993), *Geography’s Inner Worlds: Pervasive Themes in Contemporary American Geography* (Rutgers, 1992), and *Spatial Organization: The Geographer’s View of the World* (Prentice-Hall, 1971). For the *Comparative Atlas of America’s Great Cities: Twenty Metropolitan Regions* (Minneapolis, 1976), he was awarded the Geographical Society of Chicago Publication Award in 1976. He coedited *The Atlas of Pennsylvania* (Temple, 1989) with four other geographers from Penn State, Temple University, and the University of Pittsburgh, for which they were awarded the 1990 Distinguished Scholar Award by the Pennsylvania Geographical Society.

In 1985, he was elected a Fellow of the American Association for the Advancement of Science “for contributions to the development of location theory and its application to national and international communications systems.” In 1990 he was awarded the Centenary Medal of the Royal Scottish Geographic Society. He received the Association of American Geographers’ highest award, AAG Honors, in 1995.

Dr. Abler has a distinguished record of professional service, including a term as President of the Association of American Geographers from 1984-87. He currently serves on the Boards of Directors of the Consortium of Social Science Associations, the Renewable Natural Resources Foundation, the National Humanities Alliance, and the National Center for Geographic Information and Analysis. During 1989-92, he served as a Member of the National Research Council’s U.S. National Committee for the International Geographical Union. He was elected to a four-year term on the State College Borough Council in 1978.

Dr. Abler received a bachelor’s degree in 1963 from the University of Minnesota, and master’s and doctoral degrees in geography from the same institution in 1965 and 1968.

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**Retirements**

**RONALD F. ABLER** has retired as Professor Emeritus of Geography after 28 years as a member of the faculty of the Department of Geography. Dr. Abler joined Penn State in 1967 as an Assistant Professor of Geography, becoming an Associate Professor in 1971 and a Professor in 1977. He served as head of the department from 1976 to 1982.

From 1984 to 1988, he was Director of the Geography and Regional Science Program at the National Science Foundation in Washington, DC. While at NSF, he expanded funding for physical geography and coordinated the establishment of the National Center for Geographic Information and Analysis.

Dr. Abler has served as a visiting professor at the University of British Columbia, the University of Minnesota, and the Stockholm School of Economics; in 1989, he was the Harry Lyman Hooker Distinguished Visiting Professor of Geography at McMaster University and the Winegard Visiting Professor of Geography at Guelph University. Since 1990, Dr. Abler has been on leave from his position at Penn State, serving as Executive Director of the Association of American Geographers in Washington, DC.

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**PEIRCE F. LEWIS**, a renowned expert on the origins, morphology, and symbolism of the American landscape, has retired as Professor Emeritus of Geography after more than 35 years as a member of the EMS faculty. He is a popular and widely respected teacher, noted for his informative and lively field trips of the central Pennsylvania region. His outstanding teaching has been recognized by the 1981 Christian R. and Mary F. Lindbeck Award for Distinguished Teaching, the 1989 Matthew J. and Anne C. Wilson Outstanding Teaching Award, the 1982 Distinguished Teaching Award from the National Council for Geographic Education, and the Provost’s Award for Distinguished Multi-Disciplinary Teaching in 1992. In 1984, he received a Certificate of Achievement from the Penn State Undergraduate Student Government for “outstanding service to the students of the University” and in 1992 was named to “The Incomplete List of Excellent Honors Instructors” by the students of the University Scholars Program.

Dr. Lewis is author of *New Orleans: The Making of an Urban Landscape* (Ballinger, 1976), coauthor of *Visual Blight in America* (Association of American Geographers, 1973) and of a great many research articles, essays, and monographs. During his career, he has presented scores of invited lectures to diverse audiences at universities, schools, museums, historical societies, and civic groups.

He has received the Distinguished Geographer Award from the Pennsylvania Geographical Society and a National Honors Award from the Association of American Geographers, and in 1993, he was awarded the John H. Bracken Medal from Penn State’s Department of Landscape Architecture for his outstanding contributions to the study of the American landscape. He is also the recipient of a Woodrow Wilson Fellowship, a John Simon Guggenheim Fellowship, a Trustee of America Award from the Center for Historic Preservation at Mary Washington College.

Lewis served as president of the...
Deane K. Smith, an international expert in mineralogy and crystallography, retired as Professor Emeritus of Mineralogy after 27 years as a member of the EMS faculty.

During his career at Penn State, he has taught courses in mineralogy, crystallography, and x-ray diffraction, as well as providing instruction on gem cutting, physical geology, field methods, and laboratory techniques. Throughout his career, his research has focused on the application of crystallography and X-ray diffraction techniques to studies of mineral and related compounds. Such applications have included the synthesis of new materials for laser and nonlinear optical devices as well as for use in nuclear waste management.

Dr. Smith is the founding editor-in-chief of Powder Diffraction, an international journal of materials characterization, and has published nearly 125 research articles in scientific journals and as symposium contributions and book chapters.

He is a fellow of the Geological Society of America and the Mineralogical Society of America, and was elected to the Commission on Powder Diffraction of the International Union of Crystallography for 1993-96. He has served in various capacities within the American Crystallographic Association and the Joint Committee on Powder Diffraction Standards (now the International Centre for Diffraction Data), and as a long-time advisor and supporter of the Nittany Valley Gem and Mineral Club.

Dr. Smith received the C.S. Barrett Award in Diffraction Analysis in 1991, and the same year was awarded the unusual honor of having a newly-discovered mineral named for him and approved by the Commission on New Minerals and Mineral Names of the International Mineralogical Association. Deaneolith, an exceedingly rare mercury chromate sulfide, was found in association with cinnabar near the former Clear Creek mercury mine in California.

A native of California, Smith received his bachelor’s degree in geology in 1952 from the California Institute of Technology and Ph.D. in geology from the University of Minnesota. From 1956 to 1960, he served as a research associate of the Portland Cement Association Fellowship at the National Bureau of Standards (now at the National Institute of Science and Technology) in Washington, D.C. During the 1960s, he worked as a chemist in the Inorganic Materials Division of the now Lawrence Livermore National Laboratory, and later as assistant section leader of the lab’s Properties of Materials Section. He joined the faculty of the Department of Geosciences in 1968.

Alfred Traverse, Professor of Palynology in the Department of Geosciences, has served as Professor Emeritus after nearly 30 years at Penn State.

Dr. Traverse is an internationally recognized expert on the palynostratigraphy and paleoecology of the Devonian, Triassic/Jurassic, and Cenozoic rocks of North America, the origin of plants, and the sedimentation of palynomorphs in modern environments and in rocks of all ages. He is author of Paleopalynology (Unwin Hyman, 1988), the first comprehensive text on the subject and the standard reference and textbook in the field. He is editor of Sedimentation of Organic Particles (Cambridge, 1994), an overview of current research on palynosedimentation.

Earlier, he served as editor for many volumes of the Catalog of Fossil Spores and Pollen, a series published by Penn State.

Dr. Traverse is an elected Fellow of both the American Association for the Advancement of Science and the Geological Society of America. Throughout his career, he has played an active role in the Botanical Society of America and the International Association for Plant Taxonomy (IAPT), and was for many years secretary of the Committee on Fossil Plants of IAPT. He served as founding secretary-treasurer of the American Association of Stratigraphic Palynologists, and in 1970-71 as the association’s president. From 1976 to 1980 he served as president of the International Commission for Palynology (now called the International Federation of Palynological Societies).

He was awarded the “International Medal” for 1991-92 by the Paleobotanical Society of India in recognition of his “outstanding contributions to the field of paleobotany and palynology.” In 1992, he served as a Fulbright Professor at Senckenberg Natural History Museum in Frankfurt, Germany, and was subsequently elected as a corresponding member of its governing society, the Senckenbergisches Naturforschende Gesellschaft, a highly exclusive group whose corresponding members once included Charles Darwin.

Traverse served as an honorary adjunct professor of geobiology at Juniata College in Huntingdon, PA from 1977 to 1982, and was guest professor at the Geological Institute of the Swiss Federal Technical Institute (E.T.H.) in Zurich, Switzerland during 1980-81. In the summer of 1975 he was on-board scientist on the “Glomar Challenger” in the Black Sea.

Traverse received his S.B. in biology, magna cum laude, from Harvard University in 1946 and was elected to Phi Beta Kappa. In 1946, he was awarded a Lady Julia Henry Fellowship to study at King’s College at Cambridge University (UK), where he received a certificate in botany. Returning to Harvard as an Anna C. Ames Scholar, he went on to receive his master’s degree in 1948, and doctoral degree in 1951, both in paleobotany.

Early in his career, Dr. Traverse worked as a coal technologist for the U.S. Bureau of Mines in Grand Forks, ND and later as head of the Bureau’s Coal Microscopy Laboratory in Denver, CO. In 1955, he
joined Shell Development Company in Houston, TX as a research palynologist, specializing in the recent pollen sedimentation of the Gulf Coast. From 1962 to 1965, he worked as a consultant for Shell and also enrolled at the Episcopalian Theological Seminary of the Southwest in Austin, TX, receiving an M.Div. degree in 1965. During 1965-66, he was instructor and then assistant professor of geology at the University of Texas in Austin. In June 1966, Dr. Traverse joined the Penn State faculty as an associate professor of geology, becoming professor of palynology in 1970.

Hans H. Neuberger, 85, died Wednesday, January 17, 1996, in Sun City, Florida. He was born February 17, 1910, in Mannheim, Germany, where he studied mathematics, meteorology and seismology at the Universities of Heidelberg and Hamburg, respectively. Immediately following the completion of his doctoral studies in marine atmospheric condensation nuclei on the Island of Sylt, for a thesis accepted at Hamburg in 1936, he escaped the national socialist holocaust by emigrating to the U.S. as a cabin boy on a trans-Atlantic ocean liner. Penniless on arrival, he worked as a bellhop in New York until the founder of the Department of Meteorology at Penn State, Dr. Helmut Landsberg, an earlier German immigrant, offered him an appointment as an instructor at the University. Thus, as, essentially, one of the founders of the Department, and its head from 1941 to 1961, Professor Neuberger served 33 years on the faculty until his retirement in 1970. He was widely known for his interests and scientific accomplishments in physical meteorology, early studies of atmospheric ultraviolet radiation and its interaction with natural and pollutant particles, interpretation of atmospheric sound propagation, analysis of a variety of atmospheric electrical phenomena, and the role of atmospheric phenomena in human health and behavior, and also for his eclectic interests in art, music and poetry. Following retirement he moved to Sun City Florida and taught Meteorology at the University of South Florida. He is survived by his wife Maria Elizabeth Neuberger; a daughter, Eve Voigt; a son, Damian Neuberger; three grandchildren; one great grandchild; and a sister, Emmy Plow.

1995 Given Memorial Lectures

Dr. Leon Stock, a distinguished coal scientist and Director of the Chemistry Division of the Argonne National Laboratory, visited University Park for a week in October to deliver the Peter H. Given Lectures in Coal Science and participate in informal discussions with students and faculty in Fuel Science. He gave three lectures in the Given Memorial Lecture Series: “A Study in Scarlet. Pocahontas No.3 Coal;” “Ruthenium (VIII) Oxidation Studies of Fossil Materials;” and “The Chemistry of Coprocessing.”

Dr. Stock holds a joint appointment with the Argonne National Laboratory and the University of Chicago, where he is Professor of Chemistry. Since 1978, his work has been focused on the chemistry of fossil fuels, primarily structural problems and on the reaction sequences that are important in the liquefaction and gasification of coals. In 1987 he received the Storch Award of the American Chemical Society for his introduction of novel coal modification strategies to define reaction patterns in highly complex reaction systems.

This was the sixth annual Given Memorial Lecture Series. The distinguished lectureship was established in 1990 to honor the memory of Dr. Peter H. Given, a member of the Penn State faculty from 1961 to 1985 whose research into the geochemistry, molecular structure and organic reactions of coal gained international recognition. Professor Given died in 1988.

1995 Taylor Lecture Series

In October, Thomas W. Eager, Head of the Department of Materials Science and Engineering at the Massachusetts Institute of Technology, presented the Nelson W. Taylor Distinguished Lectures, speaking on the topic, “Whither Advanced Materials and the Future of Metals” and on “The Science of Welding and Joining Processes.”
Throughout his distinguished 20-year career, Dr. Eagar has been a member of the MIT faculty. In 1990 he was named the Richard P. Simons Professor of Metallurgy, and in 1993, the POPSCO Professor of Materials Engineering. He served as director of the MIT Materials Processing Center from 1991-1993, and was named Department Head in 1995.

Among his many honors are the Charles H. Jennings Memorial Medal, the Warren F. Savage Award, the William Irgang Award, and the William Spraragen Award of the American Welding Society, the Henry Marion Howe Medal of ASM International, and the Champion H. Mathewson Gold Medal of TMS-AIME.

The Taylor Distinguished Lecture Series was established in 1965 to honor the memory of Nelson W. Taylor, Head of the Department of Ceramics from 1933 to 1943. The series has consistently attracted scientists and engineers of the highest caliber to discuss their work.

Alumni Receive Awards

DONALD HEANEY, a graduate student in the Center for Advanced Materials received the Mars Fontana Fellowship Award of the National Association of Corrosion Engineers International.

KATHERINE T. FABER, Professor of Materials Science and Engineering and Associate Dean for Graduate Studies and Research of the McCormick School of Engineering at Northwestern University has received the 1995 Society of Women Engineers Distinguished Engineer Educator Award. Dr. Faber received her M.S. in Ceramic Science from Penn State.

DELBERT E. DAY, '60 M.S., '61 Ph.D., Professor of Ceramics at the University of Missouri, Rolla, was installed as President of the American Ceramic Society earlier this year. JAMES W. McCauley, '65 M.S., '68 Ph.D. became ACerS treasurer.

RICHARD M. SPRIGGS, '52 Ceramic Science, Professor of Ceramics at Alfred University, has been awarded as an honorary member of the Materials Research Society of Japan.

1995 Alumni of the College of Earth and Mineral Sciences

According to the best figures available* the College had 12,294 active alumni in 1995: of these, 9,088 held EMS baccalaureate degrees, 1,826 held an EMS master degree, and 706 held an EMS doctorate.

EMS alumni are widely distributed. In 1995, our records claim:

- Pennsylvania: 4,634
- Virginia/Maryland/Washington, D.C.: 1,108
- Texas: 687
- California: 546
- Ohio: 454
- New York: 443
- Colorado: 363
- New Jersey: 319
- Florida: 299
- Massachusetts: 240

We have alumni in all states; not many in Canada.

The 1995 records suggest 425 alumni live abroad. Of these, 234 hold EMS M.S. degrees and 92 hold EMS doctorates; 33 are female.

Of the 15,468 degrees ever granted by the institution, 14,033 were to men; 1,437 to women. [these numbers include people deceased, ‘lost’, multiple degrees to a single individual, 583 associate degrees, and the early honorary E.M. degree]

Membership in GEMS, the EMS alumni society currently stands at 4,697, or 38.2% of active alumni.

* These statistics are from the University database.

Particulate Materials Center News

Penn State's Particulate Materials Center, directed by GARY L. MESSING, Professor of Materials Science and Engineering, has recently been awarded Industry/University Cooperative Research Center status by the National Science Foundation. Among the industrial companies supporting graduate level research projects already underway in the NSF program are: DuPont, Eastman Kodak, Kennametal, Air Products & Chemicals, Osram Sylvania, Harbison Walker Refractories, Keystone Carbon, Robert Bosch GmbH, and Spang & Company. EMS faculty members involved in the research are: GARY MESSING, PETER T. LUCKIE, RICHARD HOGG, SUBHASH CHANDER, PAUL W. BROWN, and CLIVE RANDALL. Further information on the work of the Particulate Materials Center can be obtained from Bob Cornwall at 814-863-8735.
New Obelisk Members

Thomas and Gwendolyn Bates were inducted as 1995 members of the Obelisk Society.

Dr. Bates is a Professor Emeritus of Mineralogy; he joined the faculty of the School of Mineral Industries in the early 1940s and was with Penn State for 34 years—serving also as Assistant to the Vice President for Research (1961-67), Director of the Institute for Science and Engineering (1963-65), Assistant Dean for Programs in the Graduate School (1964-67), and Vice President for Planning (1967-72). He subsequently joined the U.S. Geological Survey in Denver with responsibility for the western U.S. activities of the Office of Land Information and Analysis. Mr. and Mrs. Bates have provided money for us to establish a fund to support undergraduate research in the Department of Geosciences.

1995 Alumni Fellows Honored

Carl P. Giardini, Executive Vice President for Worldwide Exploration and Production for Marathon Oil Company, has been honored as a 1995 Alumni Fellow. He came to Penn State late in September to receive the award at a reception hosted by President Graham Spanier at the Nittany Lion Inn, and met with students and faculty members in the Petroleum and Natural Gas Engineering program.

Mr. Giardini graduated from Penn State in 1957 with a B.S. degree in petroleum and natural gas engineering, and has been with Marathon Oil Company throughout an eventful and distinguished career. After initial assignments as a petroleum engineer in the Midwest, he served as reservoir engineering supervisor in Alaska, then as engineering manager for Marathon’s western U.S. properties.

In 1977 he was appointed manager of engineering for Marathon International Oil Company and moved to the United Kingdom, where as manager of the Brae Fields he became a key leader in the development of Marathon’s oil interests in the North Sea. He was named president of Marathon Oil U.K. Ltd. in 1985.

He returned to the U.S. in the late 1980s to hold a number of senior executive positions at Marathon’s Houston headquarters, assuming his current position as executive vice president in 1991. Mr. Giardini also serves as a director of Marathon Oil Company, member of the corporate policy committee of USX Corporation, and director of the American Petroleum Institute.

Throughout his career, he has maintained strong ties with the College of Earth and Mineral Sciences. He and his wife Mary Ann are members of the college’s major support group, the Obelisk Society, and established a graduate fellowship in Petroleum and Natural Gas Engineering in 1989.

Dr. Thomas D. Potter, Director of the Western Region of the National Weather Service, has been awarded as an Alumni Fellow of the College of Earth and Mineral Sciences. He visited campus in early September to be honored at the college’s annual Obelisk Dinner. Dr. Potter received his doctorate in meteorology from Penn State in 1962. He has directed the western operation of the National Weather Service since 1989. He was previously with the World Meteorological Organization in Geneva, Switzerland, where he directed the World Climate Program, and then the World Weather Program.

He received his undergraduate education in meteorology and mathematics at the University of Washington, and joined the U.S. Air Force as a weatherman during the Korean War. He stayed in the Air Force for 24 years and rose to become head of the armed forces’ worldwide weather organization, providing environmental and weather services to both the Air Force and Army. During his military service, he also attended Penn State and the Industrial College of the Armed Forces, and graduated from the Advanced Management Program at Harvard Business School.

On his retirement from the Air Force, Dr. Potter initially joined the faculty of St. Louis University, but soon left to become director of the National Climatic Center of the National Oceanic and Atmospheric Administration (NOAA), in Asheville, North Carolina. From 1977-82, he served as director of NOAA’s Environmental Data and Information Service in Washington, D.C.

Dr. Potter is an elected Fellow of the American Meteorological Society, and holds the Legion of Merit from the U.S. Air Force, and the Presidential Award of Meritorious Executive in the Senior Executive Service.

During his visit, he was hosted by the Department of Meteorology and met undergraduates and graduate students in meteorology to discuss changes at NWS and professional career opportunities.

Geographer Receives 1995 Hosler Medal

The 1995 Hosler Medal was presented to Dr. David Ley, professor of geography at the University of British Columbia, by Dean John A. Dutton at the banquet of the 50th Anniversary Celebration of the Department of Geography.

The Charles L. Hosler Alumni Scholar Medal recognizes former students of the College of Earth and Mineral Sciences who have made outstanding contributions to the development of science, through research, teaching or administrative leadership. The award was established in 1992 on the occasion of Dr. Hosler’s retirement as Penn State Senior Vice President for Research and Dean of the Graduate School with the intent of recognizing the very best among the many outstanding alumni who call this college alma mater.

David Ley is widely recognized as an international leader in the field of ur-
ban geography. He entered the graduate program of Geography at Penn State in the fall of 1968, after obtaining first-class honors at Oxford. He received his Master's degree in 1970 and his doctorate in 1972, under the supervision of Dr. Peter Gould, Evan Pugh Professor of Geography, and supported for two years by a Woodrow Wilson Foundation Fellowship. His dissertation was published by the Association of American Geographers in their distinguished monograph series as The Black Inner City as Frontier Outpost and has become a classic in urban social geography.

Over the past two decades, Dr. Ley has distinguished himself as one of the foremost geographers in the field of urban and social geography and has contributed significantly to major theoretical and philosophical debates in human geography. His research has focused on inner-city issues such as gentrification, urban restructuring, the politics and culture of consumption, minority group relations, social movements, and cultural landscapes.

He is the author or editor of eight books and more than 60 journal articles, and has received the Award for Scholarly Distinction of the Canadian Association of Geographers, and the Killam Research Prize from the Univ. of British Columbia.

Museum Notes
Andrew A. Sicree
Museum Curator

One-hundred-fifty grade school students and their parents took part in the first annual Minerals and Materials Sciences Junior Education Day on June 10. Held in the Earth and Mineral Sciences Museum, the education day introduced youngsters to the amazing world of minerals, metals, rocks, ceramics, and other materials.

Professor Darrell Schlom of Ceramic Science and Engineering and Professor Paul Howell of Metals Science and Engineering organized a roomful of materials demonstrations. Students witnessed demonstrations of superconductivity, malleability of metals, and the nature of sintered metals. Given samples of copper pennies which had been stretched out in a rolling mill to illustrate the malleability of copper as well as samples of the copper ore mineral chrysocolla, students learned how metals are found as ores in nature. Dr. Schlom showed visitors how "shape-memory alloys" such as those used in high-tech eyeglass frames worked. Several graduate students from the Materials Science Department assisted in running these materials demonstrations.

A series of activity tables were set up on the first floor of Steidle Building. Students attending the education day were asked to bring along an empty egg carton. As they walked from table to table they were given free minerals and materials samples to carry home in the cartons. Volunteers staffing the tables encouraged students to label their specimens and showed them how to begin a proper mineral collection. Demonstrations included hardness of minerals, how crystals such as calcite cleave, and radioactivity in natural and man-made materials. These tables were staffed by members of the Nittany Mineralogical Society, a group of local residents, students, faculty and staff dedicated to the study of minerals, rocks, and fossils. Among these volunteers were, Michaeleen Pacholski, a graduate student in Chemistry, who distributed fossils from near her home in upstate New York to youngsters; John Passaneau, Vice-President of the Nittany Mineralogical Society and a staff member from the Department of Physics, who demonstrated the property of streak; and Mikel Sheasley, a resident of Mill Hall, PA, showed students and their parents the properties of cleavage and double refraction in calcite crystals.

The education day was cosponsored by the Nittany Mineralogical Society and the Museum. Organizers included Joe Dague, a volunteer at the Museum, Dr. David Gold of the Geosciences Department, Dr. Paul Howell, and EMS Museum Curator Andrew Sicree. Kinko's Copy Center contributed free labels for the minerals and materials samples. All minerals, fossils and metals samples given away during the event were donated by members of the Nittany Mineralogical Society. The Society and the Museum thank the students, faculty, and local residents who helped to make this first education day a success.

Youngsters attending the education day came from throughout Centre County and as far as Clearfield, Lock Haven, and Huntingdon. Gasp of "wow" and "cool" showed that students really enjoyed the education day activities. Parents seemed to enjoy it as much as their kids. As they went out the door, may asked "are you going to do this again next year?" Plans for the 1996 Junior Education Day, to be held in late Spring, are currently on the drawing board.

For more information, please call the Museum at 814/865-6427.
A total of 77 degrees were granted by the College of Earth and Mineral Sciences at the University’s 1994 Summer Commencement in August: 32 bachelor of science degrees, 45 advanced degrees. Following is a list of the advanced degree recipients and titles of their theses or papers.

Requests to borrow these may be made through the borrower’s community, company, or University library. Libraries should address requests to: Interlibrary Loan Service, Pattee Library, The Pennsylvania State University, University Park, PA 16802.


Fuel Science - David James Clifford, M.S., Maturaion Effects on the Chemical Composition of Polylyabndan Resinities in Coal; Tzung-Huei Huang, Ph.D., Partially Conflned Hot Fragment Conductive Ignition Study of Nitramine-Based Propellants; Syang Sun, M.S., Reduction of Chemical Reaction Model for Combustion Application; Manohar Vittal, M.S., Novel Methods of Catalyst Preparation Using Microemulsions: An Exploratory Study.


Geosciences - Susan Jeanne Altman, Ph.D., Behavior of Nutrients in Groundwater of an Agricultural Valley and Its Riparian Zone; Matthew Brooks Clark, Ph.D., Kinematics and Structural Evolution of the Slate Belt and Meta-morphic Core of an Active Arc-Continent Collision, Taiwan; Yoko Furutaka, Ph.D., Reactions Forming Smyhite, Fe₃SiO₄, Donald David Machusak, M.S., Environmental Controls on Groundwater Chemistry in an Offshore Island Aquifer: Fiesta Key, Florida; Joao Batista Guimaraes Teixeira, Ph.D., Geochemistry, Petrology and Tectonic Setting of Archean Basaltic and Dioritic Rocks from the N4 Iron Deposit, Serra Dos Carajas, Para, Brazil; Mingguang Wang, M.S., Use of Teleseismic Broadband SV Waves in Source Parameter Studies.


Polymer Science - Catherine Ashley Barron, Ph.D., Microstructure and Crystal-Amorphous Interphases in Melt-miscible Semicrystalline Polymer Blends; SureshLaxman Shenoy, Ph.D., Phase Behavior of Hydrogen Bonded Polymer Blends, Solutions, and Gels; Ge Wang, Ph.D., Differential Scanning Calorimetry: Applications and Melting Simulation; Zhiqiang Wang, Ph.D., Characterization and Surface Chemistry of Model SIO, Thin Films.


A total of 124 degrees were granted by the College of Earth and Mineral Sciences at the University’s 1994 Fall Commencement in January: 62 bachelor of science degrees, 62 advanced degrees. Following is a list of the advanced degree recipients and titles of their theses or papers.


Fuel Science - Joshua Iseanyichuku Ume, Ph.D., Importance of Surface Chemical Properties of Carbons for Their Use as Adsorbents in Aqueous Media.

Geography - Ralph Aribert Heidl, M.S., Water-
shed-Scale Nonpoint Source Pollution Modeling Using Geographic Information Systems; David Lawrence Howard, M.S., A Framework for Exploring Bivariate Maps; Roger Alexander Hunt, Ph.D., The Lonely American Voter: Geography and Turnout in American Presidential Elections, 1940-1992; David Lee McGinnis, Ph.D., Climate Change and GCM Simulation of Water Resources from Mountain Snowpack; Christopher John Rosin, M.S., Ahora, No Es Gran De Oro: Smallholder Response to the Coffee Crisis in Costa Rica; Martin Christoph Von Wyss, M.S., The Use of Scale Changes in an Animated Map Project; Jeanne Carol Zuhn, M.S., GeoLiteracy: A Fluent Reading of Geography.

Geosciences - Scott Allen Engel, M.S., Quaternary Soil Chronosequences on the Lower Terraces of the Susquehanna River, Pennsylvania; Derek Robert Evans, M.S., Geochemical Field Evaluation of a Lime Addition Method for Inhibiting Acid Drainage from Coal Mine Spoil, Clearfield County, Pennsylvania.


Materials Science & Engineering - Emmanuel Ernest Boakye, Ph.D., Micromulsion-Mediated Synthesis of Nanosize Molybdenum Sulfide Particles; Dajiang Chen, M.S., Densification and Microstructural Evolution in Nanocrystalline Yttria-Stabilized Zirconia Ceramics; Priya Jain Dwivedi, Ph.D., Crack-Shape Evolution during Subcritical Crack Growth in Glasses; Mark Andrew Fenton, M.S., Relative Thermodynamic Stability of Diamond and Graphite Surfaces during High Temperature Chemical Vapor Deposition; Lei Hou, Ph.D., Nuclear Magnetic Resonance Imaging of Coal; Korakoch Meechumnam, M.S., Liquid Crystal Polymer Reinforced Polyethylene Blends for Thin Film Applications; William Allan Pratt, M.S., Laser Beam Welding of Nickel Aluminide Alloys; Kevin Lewis Rugg, M.S., Subcritical Crack Growth in Carbonarum Alpha Silicon Carbide Fibers at Elevated Temperatures; Matthew Alan Stough, M.S., Zirconia-Coated Sapphire Fiber Surfacing; Xiaoming Yang, Ph.D., Equilibrium Constants and Predictions of Miscibility for Hydrogen Bonded Polymer Blends; Etxian Zhang, Ph.D., Aliphatic Structures in Some Perhydrous Vitrimers and Their Influence on Optical Properties.


Mineral Economics - Kristen Lee Stelz, M.S., A Comparison Between Continuous Distance and Discrete Zones in Hedonic Housing Studies.


Mining Engineering - Pallab Ranjan Chakraborty, M.S., Evaluating the Effectiveness of Computer-Based Instruction for Satisfying Several of the Annual Refresher-Training Requirements for 30 CFR Part 48.8; Leonid Vladimirovich Entov, M.S., A Damage Mechanics Approach to the Study of Failure around Underground Excavations; Matthew Prakat Oo, M.D., Production Monitoring of Continuous Miner Sections: Analyses of Electrical Parameters by Principal Components and Neural Networks; Zhihua Ouyang, Ph.D., An Investigation of Dislocations Propagating in Porous Media; Terry William Schmidt, M.S., Coal Remining Analysis for Maximum Resource Recovery and Environmental Improvement; Avnish Sharma, M.S., Dust Generation and Entrainment at Longwall Faces; Praveert Sharma, M.S., Spectral, Geostatistical, and Fractal Simulation of Sulfur Distribution in a Coal Seam; Mahesh Swaminathan, M.S., A Knowledge Based System (KBS) for Mine Ventilation Design; Schichang Zhao, M.S., Physical and Geochemical Modeling of the Long-Term Influence of Longwall Mining on Groundwater Quality.


R. Dunkelberger, “Tapping Electric Arc Steel Furnace”