report highlights

The events that support the research realized at the CAER are many and varied. In addition to sound research, the contributions that made the year "newsworthy" have been included below in order to illustrate the lab's accomplishments.

organizational

Ari Geertsema took over the reigns of CAER as director in February of 2001. He most recently served as gas processing manager at the Commonwealth Science and Industrial Research Organization (CSIRO) in Australia and has more than 30 years of experience in industrial chemistry, chemical engineering, plant operations, and research and development. He was managing director of South Africa's Sastech Research and Development Division of Sasol for 10 years.

A revised Vision/Mission statement was drawn up by CAER management and accepted in November by the Advisory Board (see page 1). A methodology for screening and prioritizing projects was also developed. This includes considerations such as technological and commercial edge, viability, intellectual property, fundability and capacity to deliver.

Three programs, Coal Cleaning, Dry Beneficiation, and Waste Management were combined into one called Environmental and Coal Technology. The integration of these activities has improved the focus on industrially significant issues for the coal industry.

The newly re-constituted CAER Advisory Board met in November. New members include:
Bill Caylor (Kentucky Coal Association); Jim Cobb (Kentucky Geological Survey, University of Kentucky); Pat Doolin (Marathon Ashland Petroleum); David Gray (Mitretek Systems); Boyd Haley (Department of Chemistry, University of Kentucky); and Carl Bauer in an advisory capacity (U.S. Department of Energy).

The returning Board is comprised of the following members:
Robert Addington (AEI Resources, Inc.); Rocky Adkins (State Representative); David E. Boswell (State Senator); Frank Burke, Chair (Consol Energy, Inc.); David Drake, Vice Chair (East Kentucky Power Cooperative); Nancy B. Jackson (Sandia National Laboratories); Barbara Knutson (Department of Chemical & Materials Engineering, University of Kentucky); John W. Larsen (Lehigh University); Bernard Lee (past president of the Institute of Gas Technology); Mike Musulin (Kentucky Pioneer Energy LLC); Paul Patton (Governor, Commonwealth of Kentucky); Wm. B. Sturgill (East KY. Investment Co.).



PHOTO: FORREST PAYNE

educational outreach

Number of students who worked at the CAER during 2001:

Undergraduate Students	18
Graduate Students	8
Post-Docs. Scholars	6
NonTrad. Students*	2

**Full-time CAER employees pursuing baccalaureate or advanced degrees at UK.*

Several CAER researchers conducted demonstrations for the Rogers Scholars Program at the Center for Rural Development in Somerset, Kentucky. The two-week program exposes high school students from Eastern Kentucky to professional and entrepreneurial opportunities. Bob Rathbone of the CAER also organized faculty members from the UK College of Engineering to participate.

The Center supported a number of K-12, undergraduate and graduate student programs last year. These included: a DoE EPSCoR-funded high school internship; the hiring of two undergraduates to perform research co-funded by CONSOL, INC. and CAER; a five-month research effort by four materials science students from the University of Burgundy; and finally a week's visit by students and a teacher from Belfry High School, Pike County, Kentucky, the result of a Toyota Tapestry Grant for Teachers award.

The CAER contributed $57,500 toward the UK Mining Engineering Scholarship Program last year.

The Center participated in the Annual Kentucky Science Teacher Association Meeting in Lexington. The lab exhibited with The Kentucky Coal Council, UK Mining Department and Kentucky Geological Survey to create a unified coal/minerals educational team approach to expose K-12 science teachers to the organizations' collective work.

technology transfer and service

Analytical services performed:

2000
Number of Services 126
Amount $374K
2001
Number of Services 111
Amount $424K

The University of Kentucky signed a technology licensing agreement related to proprietary additives (D. Taulbee, inventor) with CBS, LLC (Louisville.) Through these efforts, the University of Kentucky received $351,000 in licensing revenue for 2001.

From a project on dry ash separation that began almost a decade ago at the CAER, a company called TFS – Tribo Flow Separations – was formed last year, by John Stencel. Located at the university's Coldstream Research Park, the start-up firm is researching possible applications as diverse as energy and food products. TFS received a two-year, $1.8 million start up grant from the National Institute of Standards and Technology (NIST),making TFS the first Kentucky company to receive a grant from NIST program since its inception twelve years ago.

A patent was granted to Stencel, J.M.; Schaefer, J.L.; Neathery, J.K.; Ban, H.; and Finseth, D. entitled "Particle separation system using parallel multistage electrostatic separators," US 6,323,451.

projects

Proposals Submitted 21
Projects Funded 5

The project entitled *Recovery of Fuel and Carbons* (Robl, PI, Groppo, Co-PI) was selected for continuance into Phase II by the U.S. Department of Energy. The overall objective of phase II is to conduct proof-of-concept testing at an industrial facility (Coleman Generation Station) to demonstrate processes for the recovery of unburned carbon from fly ash and its performance as a supplemental fuel in a utility boiler. The award total is $1,810,000.

Winston Ho, who has a joint appointment with the CAER and the Department of Chemical and Materials Engineering, was awarded a DoE research contract for $929,000, as well as one with H2Fuel for $647,000. His research deals with the production of hydrogen for use in fuel cells using membrane technology.

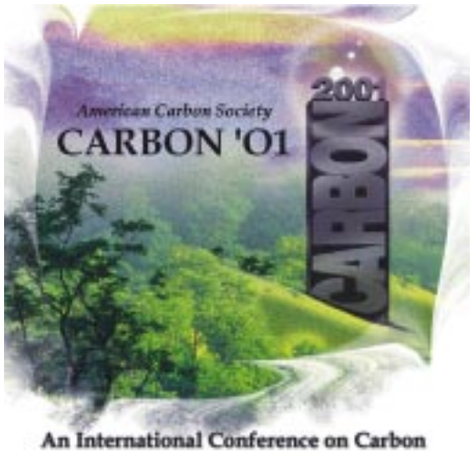
The administration of Kentucky DoE EPSCoR (Experimental Program to Stimulate Competitive Research) has been located at the CAER since 1994. This $11 million program has established the baseline of systemic improvements in fundamental and applied research in fossil energy, environmental sciences, high energy and nuclear physics, and material sciences.

outside organizational participation

Ari Geertsema became a board member of the Kentucky Coal Council, the UK Mining Engineering Foundation, The International Pittsburgh Coal Conference Advisory Board, and the Governor's Kentucky State Energy Policy Advisory Board.

The CAER was accepted as a member of CURC. The Coal Utilization Research Council is a national organization comprised mostly of industrial and research organizations and acts as a facilitator of information relevant to coal interests and coal-related research and development.

CAER became a member of the Gasification Technology Council last year. This is a body comprising about 30 institutions, mostly involved in the operation of gasification plants and in promoting technology for such plants.



conferences

The CAER sponsored and organized three large and prestigious conferences last year: The Carbon 2001 Conference, The 2001 International Ash Symposium, and The 9th International Symposium on Catalysis Deactivation (ISCD). The total number of attendee for the three meetings was about 790.

Two other conferences held in Lexington saw strong participation by CAER: The Coal Utilization Conference and The Society of Mining Engineers Meeting. Both included tours of the CAER.

publications

Refereed Publications 36
Nonrefereed Publications/ 74
Presentations

Snapshots of a project by the CAER Carbon Group appear on the cover of *The Journal of Physical Chemistry* (v. 105, number 51). The CAER group has been collaborating with Drs. Susan Sinnott (University of Florida) and Luke Hanley (University of Illinois – Chicago) on a combined experimental-theoretical study of nanotube functionalization. The article that appears in the issue is entitled "A Combined Computational and Experimental Study of Ion-Beam Modification of Carbon Nanotube Bundles."

accolades

Associate Director Burtron H. Davis is the recipient of the American Chemical Society's 2002 Henry H. Storch Award in Fuel Chemistry. The award recognizes distinguished contributions to fundamental or engineering research on the chemistry and utilization of coal or related materials over the previous five years and is among the most prestigious awards in fuel science.

Darrell Taulbee won a Best Paper Award from the American Foundry Society two years in a row.

B.K. Parekh won the Technical Award for the "2000 Senior Scientist" from the Filtration and Separation Society.

visiting scientists

Kentucky State University Chemistry Professor Kavi Javed received a grant from the Kentucky EPSCoR Committee allowing him to conduct research with students on the formation of monosized low-melting metal powders at the CAER.

Mark Dry from the University of Cape Town in South Africa lent his catalysis expertise to the Clean Fuels and Chemicals group. This was Dr. Dry's second sabbatical at the CAER.