

Winter 1979

OKCHE

SCHOOL OF CHEMICAL ENGINEERING AND MATERIALS SCIENCE THE UNIVERSITY OF OKLAHOMA



CEMS STUDENTS— Papers read “round” the world.

GOAL EXCEEDED FOR 1978 PERRY CHALLENGE GRANT RENEWED FOR 79!

The Perry Challenge Grant goal of \$10,000 has been exceeded. Contributions to OkChE were made by 91 alumni, faculty and friends of the School of Chemical Engineering and Materials Science in the grant period from October 1, 1977, through September 30, 1978.

This past year's response was the highest level of contributions to OkChE since this support group was established in 1969. Contributions totaling \$10,068 were received during the Challenge Grant period. With the matching funds from Charles Perry and \$1,155 in employer matching funds, the income to OkChE during the Challenge Grant period totaled \$21,223. Thanks are due to the many alumni, faculty and friends of the School of Chemical Engineering and Materials Science who contributed, as well as Charles Perry and Perry Gas Companies, Inc., for this fantastic level of giving.

Challenge Grant funds will be used for support of continuing improvements in the undergraduate unit operations laboratory, for undergraduate scholarships and for support of special student activities such as Engineering Open House, student technical meetings and student travel.

The School is fortunate that Charles Perry has issued a new challenge: For the period from October 1, 1978, through September 30, 1979, Charles Perry/Perry Gas Companies, Inc., again will match individual contributions up to \$10,000.

We hope you will consider contributing to OkChE again this year. Remember, many employers match your tax-deductible contribution.

A LESSON IN LEVERAGE

$$X \geq 10X$$

X is greater than or equal to 10X??? How can that be? Here's how:

For 1978, \$4,000 from your contributions generated \$43,190!

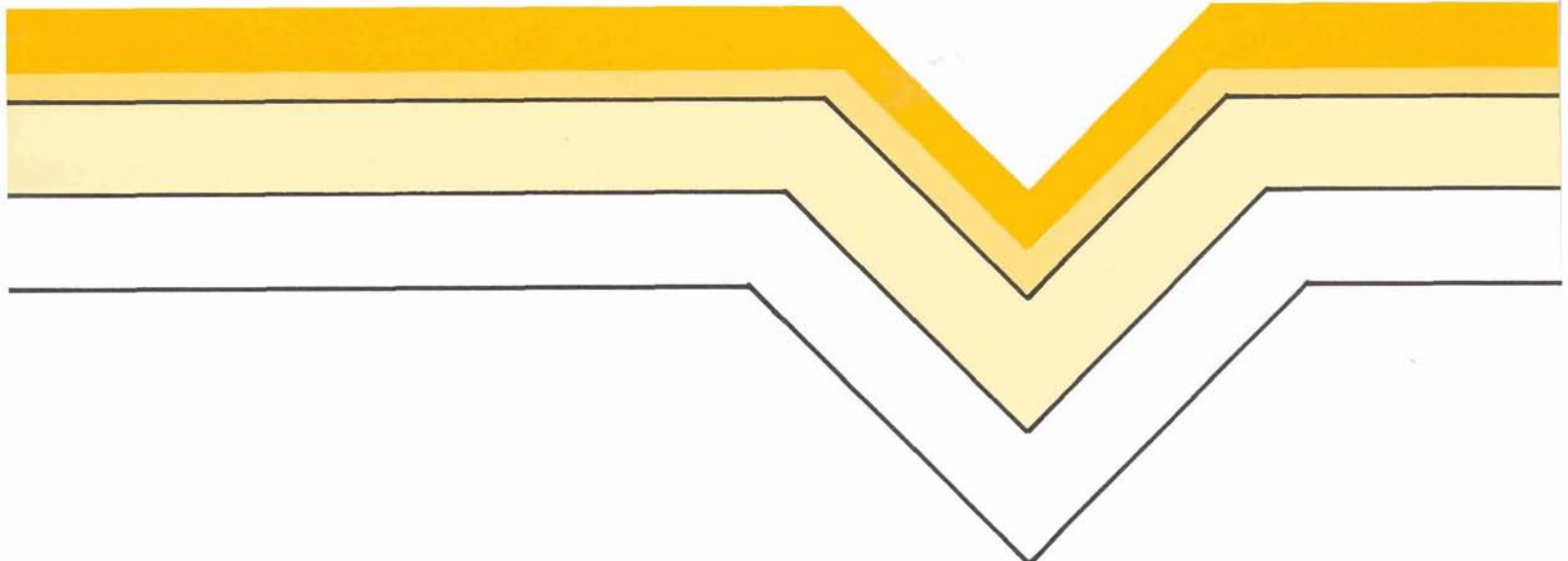
$$4,000 \geq 43,190$$

General Alumni Donors.....	\$ 4,000
(not including company matching)	
Charles Perry Matching	\$ 4,000
Mobil Oil	\$ 5,500
Gulf Oil.....	\$ 5,290
National Science Foundation.....	\$12,200
OU Provost	\$ 9,150
College of Engineering	\$ 3,050
	<hr/>
TOTAL	\$43,190



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SCHOOL OF CHEMICAL ENGINEERING AND MATERIALS SCIENCE

MEMBERSHIP 1979-80

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*OkChE needed a world.
We did not want a traditional world.
We wanted one that symbolized the
travels of our CEMS students who
traveled far and wide to present their
research papers.*

*Bill Williams, director of the OU
Publications Department, created such a
world for our cover. He made a press to
hold a stack in place while he painted
continents and oceans on a world made
of paper.*

On the cover, you see the results.

On the cover—

Our world is made of paper. We thought that appropriate since our students made their way across the nation and around the world with their papers — papers they presented at scientific conferences.

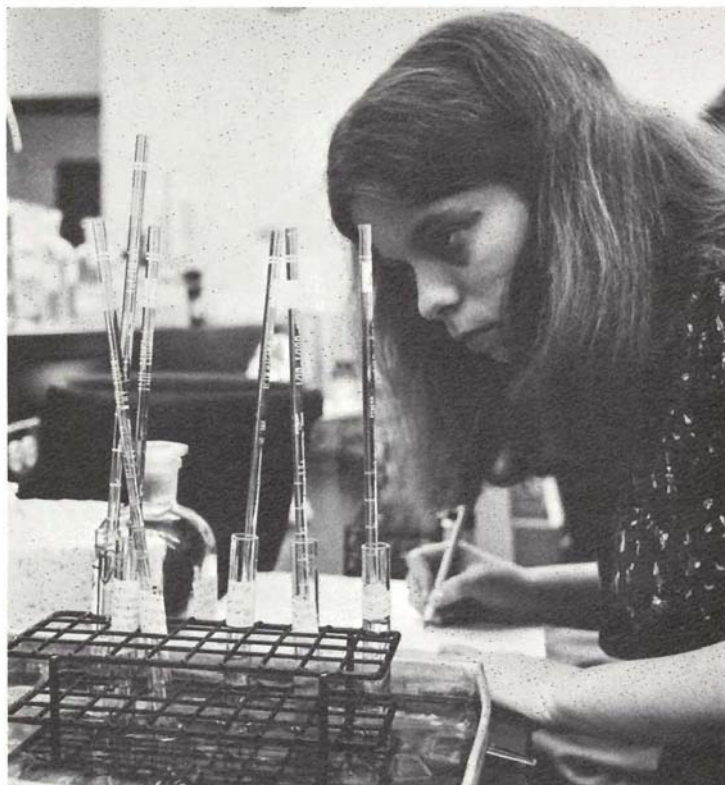
Students delivering papers at scientific meetings? You may think that students are not supposed to do that. After all, how can you expect mere students to face assembled scientists and not only report on their own original research, but field all those heavy questions which always follow?

But OU CEMS students can. And did. And will.

In this issue of OkChE, 12 such students — both graduate and undergraduate — relate their experiences as *bona fide* “paper presenters” and discuss their research.

We take pride in our ambitious dozen and feel their accomplishments point the way for future students.

OUR AMBITIOUS DOZEN...taking the show on the road.



O'Brien

Maureen O'Brien, 1978 graduate

The American Institute of Chemical Engineers does not ordinarily allow students to present papers at their meetings. Consequently, when a paper authored by myself and doctoral candidate Abraham Matthews was chosen to be one of eight papers included in the Enzyme Engineering Section of the 84th annual meeting of AIChE, we were especially pleased and honored.

Our paper was entitled "Studies of the Activation and Inactivation of Potential Carcinogens. I. Oxidation and Glucuronidation of -Naphthylamine Two-step Synthesis in One Model." The final text included results from almost 12 months of experimental work on the enzymatic synthesis of carcinogen metabolites (see OkChE Fall/Winter, 1976). Contributions were made by many other students working in Dr. Sam S. Sofer's lab. They are still involved in synthesizing the carcinogenic metabolites or other substances not included in our paper.

I was never worried about the actual content of the paper or the presentation. I knew our results were

good. Everyone in the lab was very cooperative and worked hard to insure correct results. The logical experimental sequence which developed over the twelve months of work was designed to check and double-check data. Dr. Sofer was our sternest critic. He continually raised doubts and questioned everything from experimental technique to the phrasing of a sentence in the final draft of the paper.

We wanted everything perfect before we headed for the conference, which was held in Atlanta, Georgia. I was worried about the fact that students did not normally give presentations at the conference. For this reason, I felt my presentation not only had to be as good as the other seven in our category, but it probably should be better. I knew most of my audience would be top-notch enzymologists. I had nightmares for a month that one of them was going to ask me a question I couldn't answer.

Our paper was scheduled last. Talking with the other speakers helped calm my nerves. And my own understanding of the proceedings also helped to reassure me. Surprisingly, I understood almost everything the other speakers discussed. This gave me confidence in my ability to

answer all those questions I knew were going to be coming my way.

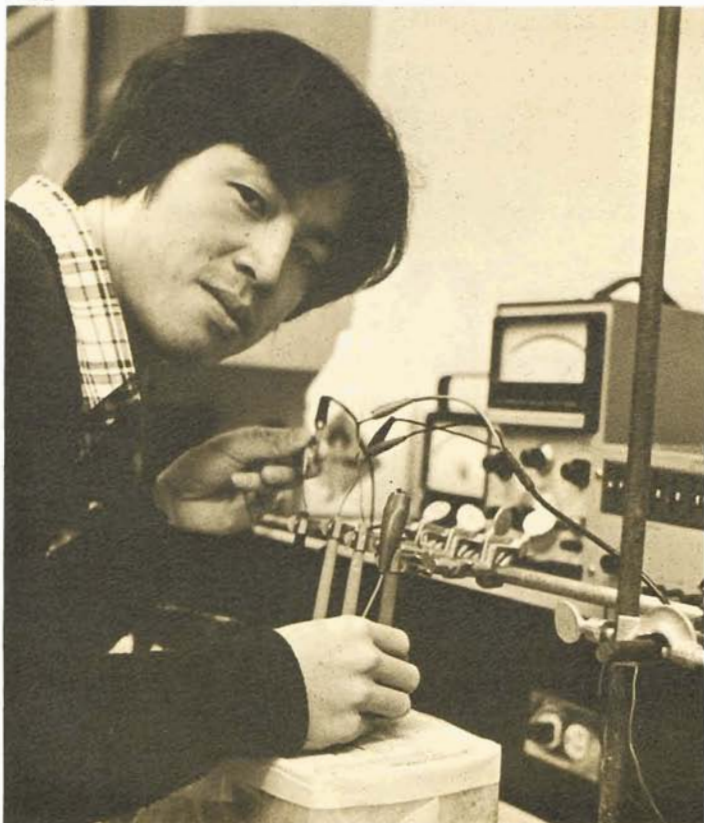
The presentation went very well. All of the delegates were surprised when they found out I was "a mere undergraduate," which was how the chairman of the Enzyme Engineering Section referred to me.

Other delegates to the conference besides Abraham and myself were Dr. Sofer and Dr. J. M. Radovich. We all attended as many of the other sections as we could during the conference. It was a great opportunity to hear professionals speak on their areas of expertise.

Dr. Radovich and Dr. Sofer feel more students should be encouraged to participate in such conferences and hope AIChE will develop programs to include large numbers of students. I certainly agree.

I would personally encourage any of the ChE students at OU to participate in a research project and to present their results at a meeting like AIChE if they have the opportunity.

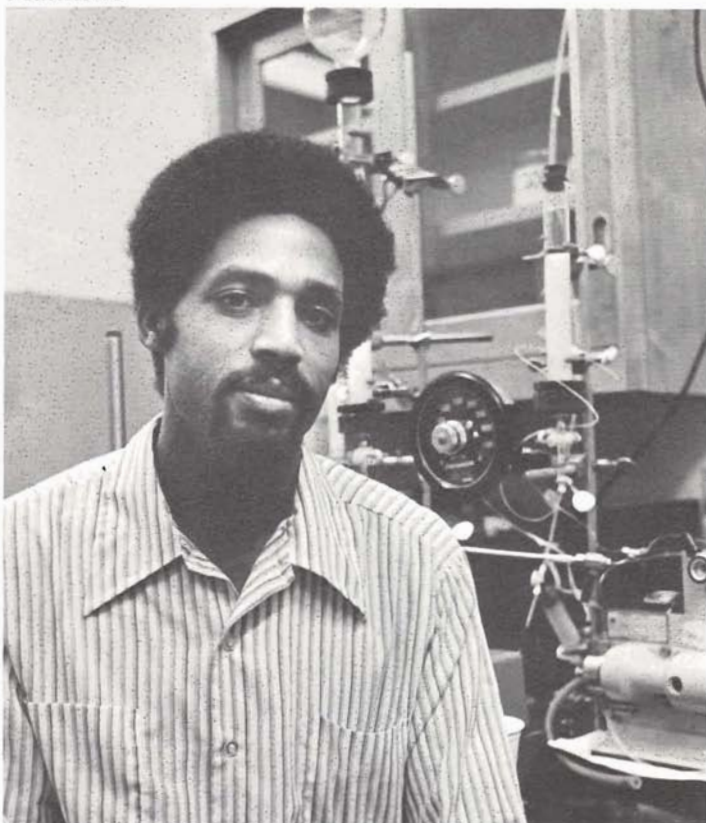
It is a good feeling to find out firsthand that our work is on a par with experts in the field. All of the group that contributed to the final paper have reason to be proud of their work.



Chen-Mo Hsu,
graduate student

I presented a paper entitled "Measurement of the Depth of Partial Impregnated Concrete" at the annual meeting of the Oklahoma Academy of Science in Stillwater.

The most common way to measure the depth of polymer penetration in partial impregnated concrete is to take a core sample and compare the slight color difference between two layers — the polymer impregnated concrete and the plain concrete. A non-destructive resistivity measurement made from the surface of the concrete has been found to be a feasible method of determining the penetration depth. The measurements are made using the Wenner-4 pin surface resistivity method that has been used for many years for soil resistivity determinations. A Moore Cumulative Curve Method of data treatment is used to delineate the penetration depth. It shows a good result to determine the impregnation depth within 0.6 cm for a depth of 2-4 cm.



Abraham Matthews,
Ph.D. candidate

We have been working in the area of reaction engineering pertaining to the chemical transformation of specific environmentally hazardous substances. A typical example of one such substance (chemical) is β -naphthylamine, which is known to cause cancer in humans. The kinetics of the majority of these hazardous chemicals is mediated by enzymic catalysis-*in-vivo*. The degree and nature of hazard posed from these chemicals primarily depends upon the nature and relative magnitude of high-energy intermediates formed during enzymic conversion. Given favorable conditions, these intermediate reactive forms are the cause of initiation of cellular damage. Thus, they are termed activated forms. But due to the fact that numerous enzymes with various catalytic functions co-exist in metabolic cells, the amount of these activated forms can be significantly reduced via a second reaction involving a different enzyme. This second step is referred to as deactivation. Thus, this type of activation and deactivation sequential reaction kinetics has been of great interest for environmental agencies such

as EPA and NCI.

Up to date attempts to show this activation/deactivation phenomenon simultaneously in a single reaction system have been unsuccessful due to the inherent unstability of the intermediate. In Dr. Sam Sofer's lab, taking β -naphthylamine as the model compound, we studied the kinetics of activation and deactivation 2-step sequential bienzymic reaction in a batch reactor. Optimizing the kinetic parameters for product distribution profiles for the series reaction, we were able to demonstrate for the first time the activation and subsequent deactivation kinetics of β -naphthylamine in a single reactor model.

A paper on this work was presented in the enzyme reaction engineering division of the 85th National Conference of AIChE in Atlanta, Georgia, February 1978.

To increase the stability and reusability in plug-flow reactor configurations, the enzymes have been recently immobilized in various porous-matrix supports, such as porous glass beads, alumina, collagen, etc. Continued work is being done in our laboratory on kinetic optimization using these immobilized enzymes.

Sarcon



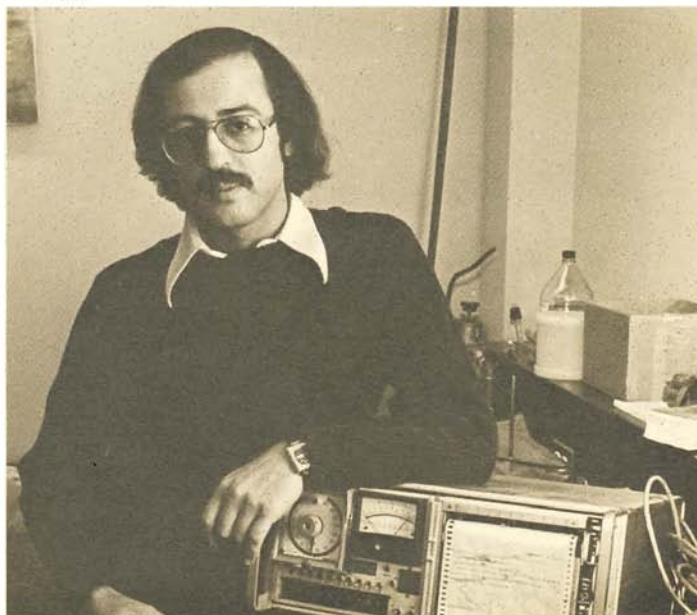
**Kaivan Sarcon,
undergraduate**

The continuous centrifugation has long been established as a powerful method of separation in industries. Its unique design allows the system to be applied to other areas of science as well, with only minor modifications. The system performs very efficiently for less delicate materials, but when applied to blood separation, the use of existing devices is more limited because of the fragility of blood components. One alteration is to eliminate rotating seals, thereby reducing sheer stresses and crimping of the tubing. Such a device was built and studied by Bernie Van Wie, Janet Ray and myself.

The experiment with this system showed that red blood cells and white blood cells could be concentrated from an initial concentration of 25 percent to a final concentration of 40 percent. Furthermore, we obtained cell-free plasma.

The outcome of the experiments demonstrated the need for more improvements. To obtain ideas for improving the centrifuge, we consulted Dr. Kolobow of NIH in Maryland. At this meeting, the design by Dr. Kolobow was observed and suggestions were given for further improvements. Currently, a new centrifuge is being constructed by Van Wie and undergraduates Will Kastens, Paris Hajali and Arthur Van Wie.

Siman



**Aziz Siman,
graduate student**

Three years ago, when I came to OU as a graduate student, I could have never imagined such an exciting experience was coming my way. Everything started when my advisor, Dr. Carl Locke, was informed about the 7th International Congress on Metallic Corrosion in Brazil and encouraged me to present a paper based on the results of my research. The rest of the story was like a dream, and when I opened my eyes I was standing in front of thirty people with a microphone in one hand and a pointer in the other — I was talking about the corrosion process of reinforcing steel in concrete due to salt contamination. Some 230 papers were presented by the representatives of 32 countries in this tri-annual meeting of the world's most active corrosion scientists.

Besides the learning experience of this trip, I had the opportunity to meet many important figures in corrosion science. The informal chats with them along Copacabana sidewalk restaurants have established a direct communication line which I am sure will be of great help to me some day.

Now that everything is over, I am indebted to our department and most of all to Dr. Locke, whose encouragement and support made this dream possible.

I felt like a high school quarterback playing with the Dallas Cowboys. I am glad I did not fumble!!!

While visiting in Maryland, we took advantage of an opportunity to attend the Circulatory Shock Conference at Airlie, Virginia, which proved to be helpful from the point of view of the application of continuous centrifugation to other areas involving blood.

For example, the effects of traumatic shock caused by certain species of bacteria may be reduced with utilization of the centrifuge. These bacteria release a toxic substance (endotoxin) causing the shock effects which may lead to liver failure and death.

Theoretically, if the endotoxin remained in the plasma after separation in the centrifuge, then the plasma could be perfused through a perfusion chamber (e.g. charcoal beads) to remove the endotoxin.

For further improvement of the centrifuge, research is underway for viability of white blood cells under conditions of experiment. It is proven that the contact of blood cells with tubing and cellophane membrane activates the white blood cells, which causes the release of an activated complex (C₅, C_{5a} complements). These complements induce granulocyte aggregation, which results in acute granulocytopenia. The experiments are proposed for studying the viability of white blood cells with trypan blue technique, which is a less toxic staining method

Khan Zafar Iqbal, Ph.D. candidate

Since 1974 I have been involved with nonconventional energy conversion systems research. For any new ideas to prosper, these must be presented in a forum where constructive criticism can be expected. Oklahoma Academy of Science's (OAS) annual meetings provide such an environment. Being a regular participant in OAS meetings since 1975, I have benefited a great deal from my presentations to these meetings. OAS meetings provide an opportunity to meet students, scientists and engineers from the state of Oklahoma.

The Intersociety Energy Conversion Engineering Conference (IECEC) is supported by seven major societies (including AIChE, ACS). Its annual meetings provide an international forum to present and discuss engineering aspects of advanced technology or nonconventional energy conversion systems and devices. I attended two meetings of IECEC. One was held in Washington,

D.C., in 1977, and the other was held in San Diego, California, in 1978. The conference in Washington, D.C., was attended by scientists and engineers from all over the world, giving me a chance to meet with and to hear some very well-known researchers in the scientific community. In addition, I got some fresh new ideas to try in my own research.

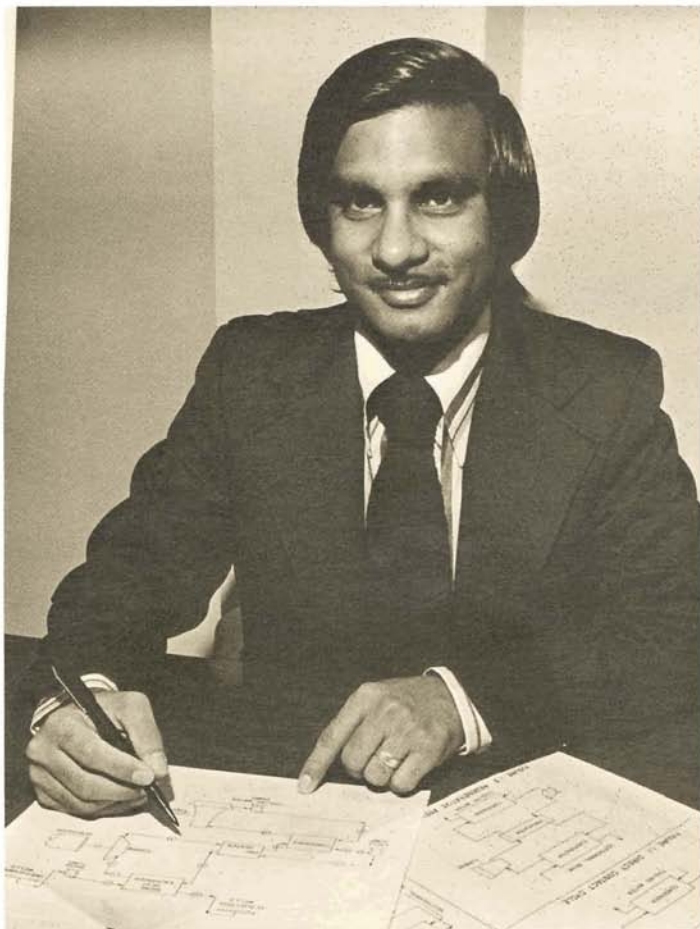
This semester I am in the process of writing my Ph.D. dissertation, which deals with the analysis of the geothermal binary cycle using paraffin hydrocarbons as working fluids.

Bernie Van Wie, Ph.D. candidate

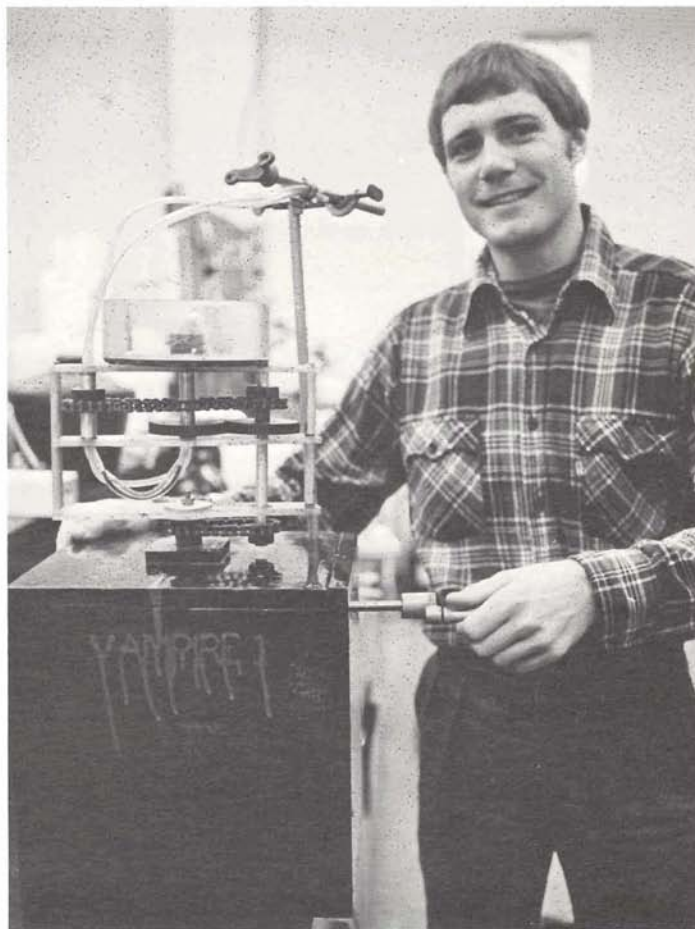
I feel that the experience of presenting a paper at the German Conference on Methods of Liver Assist was a fantastic opportunity. Since the design of liver assist devices requires a strong background in mass transfer, fluid mechanics and chemical reaction

kinetics, there is a strong need for more chemical engineers in the field. However, for a chemical engineer to familiarize himself with any new application of chemical engineering principles, it is important for him to rub elbows with the people who have laid the groundwork in that particular field — in this case, the medical doctors and biochemists. The German conference provided just that opportunity for Dr. Sofer and myself. Not only were we able to meet and chat with other colleagues in the field, but we felt we had come away with a wealth of new ideas which we can incorporate into our own studies here at OU. Furthermore, the possibility exists for joint research with a few of the researchers we met who are interested in what we are doing.

To sum things up, I feel that the time spent in Germany at the conference was well worth it. And having a hearty appetite certainly paid off — German food and "beverage" is simply phenomenal!



Iqbal



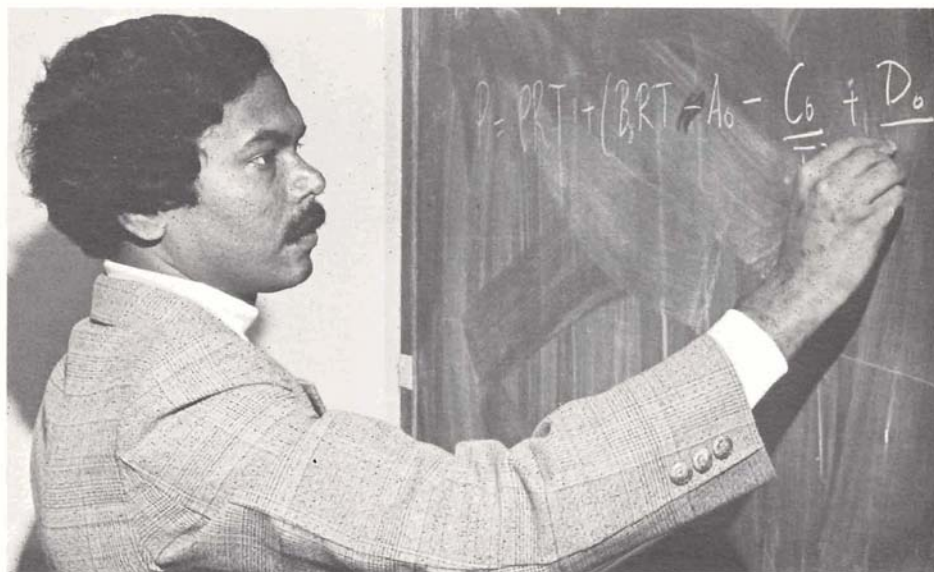
Van Wie

**K. H. Kumar,
Ph.D. candidate**

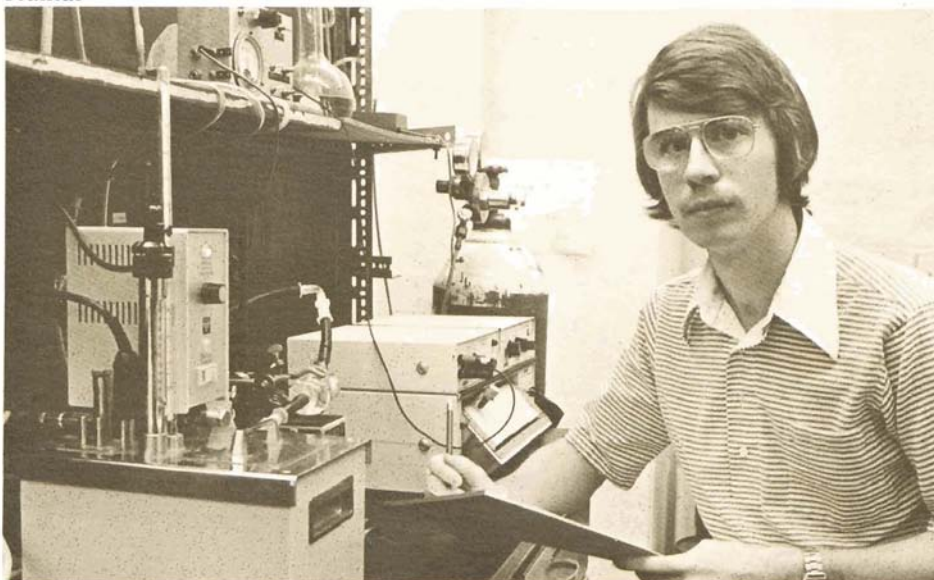
The saturated hydrocarbon isobutane is considered as a primary candidate working fluid in the geothermal binary cycle. In view of the importance of geothermal energy in the national energy picture, accurate thermodynamic property values are needed for the successful design of a power plant utilizing geothermal energy.

The paper presented at the recent Oklahoma Academy of Sciences meeting at Stillwater, Oklahoma, was on the correlation of isobutane thermodynamic properties. The equation of state used was a modified Benedict-Webb-Rubin equation developed by Professor Kenneth Starling in the early 70s. The equation of state gives thermodynamic property values over a wide range of fluid states. The uncertainty in the calculated property values is well within one percent of the experimental values.

Present research involves the development of an analytic equation of state which is cubic in density. The equation of state is expected to perform well for a wide range of fluids, including hydrocarbons, halocarbons, water, ammonia and coal fluids. The simple nature of the equation of state and the speed in property computations would be the amin-attractive feature for its wide use in industry.



Kumar



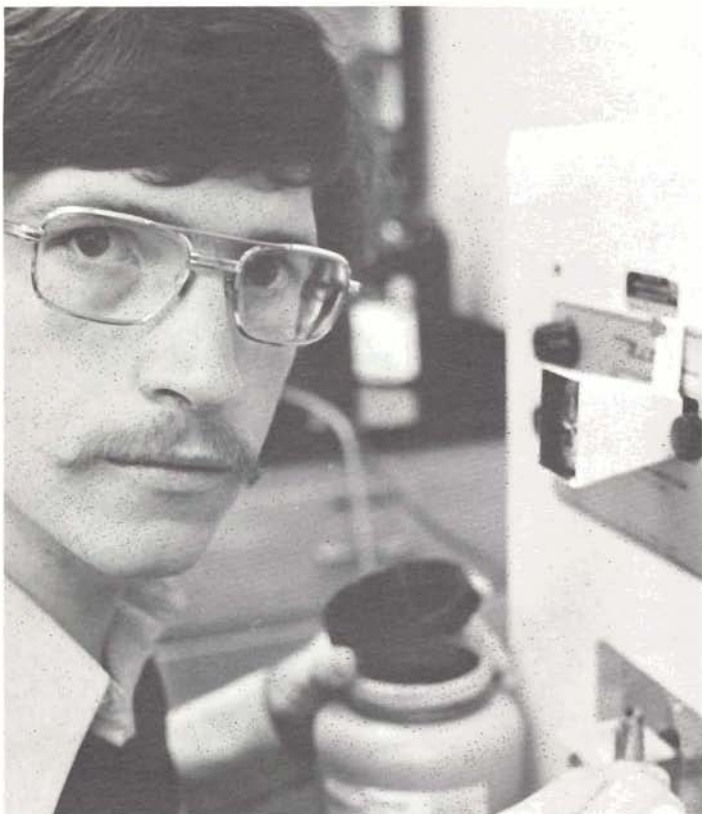
Caldwell

**Michael A. Caldwell,
undergraduate**

I research the kinetics of the oxidase-TPNH enzyme system varying the concentration of TPNH. We have a preliminary overall design for a hepatic (liver) assist device, modeled on the liver function of detoxification. The reaction was optimized to provide design parameters for a detoxification unit in the assist device. I reported my findings at the Fall 1978 Oklahoma Academy of Science meeting.



Wills



**Bob Wills,
Ph.D. candidate**

I very much enjoyed being able to present a paper to the 30th Annual Conference on Engineering in Medicine and Biology last November. It was an exciting experience to be exposed to all the innovations and ideas in this mixed area of engineering and biology.

The paper which I presented was on the mimicking of enzyme systems of the body and their potential for use in a liver assist device.

I have always wanted to help bridge the gap between engineering and medicine, and this was a small contribution in that area. Chemical engineering, when teamed with my background in biology, provides an excellent basis for biomedical research. Many functions of the body can be simulated by chemical engineering technology. For instance, a fixed-bed reactor is similar to a liver in its catalytic ability.

I hope I will be able to attend more of these conferences and expand my background further. In any event, I plan to continue using my biological/engineering knowledge to tackle medical problems.

**Alan Pegues,
graduate student**

I have been developing adsorption isotherms and adsorption rate kinetics for the activated charcoal-endotoxin system.

This activated charcoal-endotoxin system is the foundation of an adsorption process which is important in a possible treatment of endotoxin shock.

I attended the June 1978 conference on Circulatory Shock in Airlie, Virginia, to discuss cause and treatment aspects of endotoxin shock with medical professionals.

At the AIChE 71st Annual Meeting held in November in Miami Beach, I presented a paper on the activated charcoal-endotoxin system. During this sorbents symposium other chemical engineers spoke on adsorption isotherms, mass transport, diffusion and process considerations for several other adsorption systems.

Aspects of adsorption as seen by chemical engineers is becoming increasingly important in development of devices for use by medical professionals in treating poisonings, toxin insults and drug overdoses.



**Sam Penrod,
undergraduate**

I plan to present my work on the carcinogen activation project at the regional student AIChE meeting to be held at the University of Oklahoma next March.

I traveled to the National Center for Toxicological Research in November of 1977, and last March I corresponded with Dr. Fred R. Kadlubar, one of the project directors. Last May, I attended the First Annual Conference on Shock which was held in Airlie, Virginia.

I feel that it is important to be in personal contact with the prominent investigators. So much more information can be communicated about your work when you don't have a time limitation, as with a phone. Furthermore, our meeting resulted in the fast, successful accomplishment of the project goals, saving many weeks of valuable time.

ALDAGS RUSSIA BOUND



The Aldag Family "suit up" for their journey to Russia. Left to right are Laura, Art, Lynda, Jim and Phyllis.

Excitement is beginning to mount at the Aldag household in Norman. They are preparing for a journey that should prove an extraordinary adventure for this Oklahoma family.

In April, Arthur and Phyllis Aldag, along with their three children — Laura, 16; Lynda, 13; and Jim, 10 — will embark on a four-month trip to Russia.

They have been provided this unique opportunity through the efforts of Professor Arthur Aldag and his research into chemical catalysis. The trip is a result of a cooperative scientific exchange program

in chemical catalysis.

The U.S. and Soviet governments have sponsored limited exchange programs in education, culture, information, and science and technology since 1968. In the wake of the Summit Meetings in Moscow (1972, 1974) and Washington (1973), the scope of the exchange program was greatly expanded to include more specialized areas of mutual interest to the two governments. The Science and Technology Program, which was initiated in 1972 and renewed on July 8, 1977, for another five-year term, details cooperative research in com-

puter applications, chemical catalysis, electrometallurgy, forestry, metrology, microbiology, physics, science policy, science and technology information, water resources, and corrosion. Other programs include Environmental Protection (1972), Medical Science and Public Health (1972), Artificial Heart (1974), Space (1972), Agriculture (1973), Oceanography (1973), Transportation (1973), Atomic Energy (1973), and Housing (1974).

Of the various groups in the Science and Technology Program, the area of chemical catalysis has perhaps been one of the most active. Over the past five-year period, there have been 69 technical articles jointly authored by Soviet and U.S. scientists. To date, 34 Soviet research fellows have worked in U.S. laboratories for a total of 156 man-months, and 30 U.S. research fellows have visited Soviet laboratories for a total of 169 man-months. The U.S. program is sponsored by the American Chemical Society and supported by grants from the National Science Foundation.

Research areas identified in the catalysis program include Catalytic Reaction Engineering, Fundamental Aspects of Catalysis and Development and Study of Catalytic Systems of Applied Interest. Aldag will be at the Institute of Chemical Physics in Moscow as part of a grant to the Catalytic Reaction Engineering group. The coordinators for this group are Professor J. J. Carberry of the University of Notre Dame and Professor M. G. Slin'ko at the Karpov's Research Institute in Moscow. Professor Aldag will work in collaboration with Dr. L. Ya Margolis in the area of oxidation catalysis. In particular, the work will involve the development of kinetic models for the partial oxidation of ethylene and propylene using a gradientless reactor. Once the kinetic parameters have been determined, the rate equation will be incorporated into a mathematical model for tubular flow reactors used to design and assess the performance of the reactor under stationary and unstationary state conditions.

In addition to his involvement with the Catalytic Reaction Engineering group, Aldag also has submitted a proposal to the NSF for support through the group involved in the Development and Study of Catalytic

Reactions of Applied Interest. He has recently learned that the proposal will be funded in early 1979, and he will be awarded approximately \$100,000 to pursue his research.

Other universities currently receiving NSF for the exchange program in catalysis are Notre Dame, Houston, California (Berkeley), Wisconsin (Madison and Milwaukee), Stanford, Princeton, California Institute of Technology, Rice, Worcester Polytechnic and Yale. This proposal was co-authored with Professor Roger Frech of the OU Chemistry Department and details a systematic study of the rhenium oxide olefin metathesis catalyst using combined laser Raman IR Spectroscopy and kinetic measurements. The metathesis reaction was first discovered and subsequently commercialized by the research group at the Phillips Petroleum Company. There have been and continue to be many novel applications of the metathesis chemistry to the petrochemical field, and rhenium-based catalysts are some of the most active and selective promoters. Given that many catalysts can be derived from both homogeneous and heterogeneous transition metal complexes, the metathesis reactions offer unique opportunity to explore similarities in catalysis on surfaces and in solution.

According to Dr. Sam Sofer, director of CEMS, it is quite an honor for Aldag to be selected for this program. "It is a credit to Aldag's competence and his rising international recognition," said Sofer.

Last May, Professor Aldag traveled with a group of U.S. scientists to attend the Fifth US/USSR Symposium on Chemical Catalysis in Baku, USSR. While in the Soviet Union, he visited general research laboratories in Moscow and discussed the possibility of a joint research program in the metathesis area. As a result of these discussions, a collaborative research program in this area was incorporated into the protocol signed by representatives of both governments on May 18 in Baku. The designated principal investigators are Aldag and Dr. E. I. Tenyakova of the Topchiev Institute of Petrochemical Synthesis in Moscow. Research funds would provide support for the exchange of graduate students and senior scientists between the laboratories in Moscow and the University of Oklahoma.

THE PRRRIDE OF OKLAHOMA

Yet another award has come the way of Cedomir M. Sliepceвич, who is already one of the University's most honored professors and one of the country's most lauded chemical engineers.

Sliepceвич, George Lynn Cross Research Professor of Chemical Engineering, has been named recipient of this year's William H. Walker Award for outstanding contributions to chemical engineering literature.

He received the award at the annual meeting of the American Institute of Chemical Engineers, which was held during November in Miami Beach, Florida. The Walker Award is considered one of AIChE's top honors and consists of a plaque and \$1,000.

Sliepceвич's wife, Cleo, commented that he was "naturally very pleased to be chosen for such an honor. He has probably written more chemical engineering papers than anyone else in the country."

Over a 35-year career, Sliepceвич has conducted research covering a variety of areas including energy scattering, high pressure design, reaction kinetics, catalysis, thermodynamics, heat and mass transfer, and medicine.

A native of Anaconda, Montana, Sliepceвич received his M.S., B.S. and Ph.D. degrees in chemical engineering from the University of Michigan.

In 1948 he was appointed assistant professor of chemical and metallurgical engineering at the

University of Michigan. Three years later he became an associate professor in the same department.

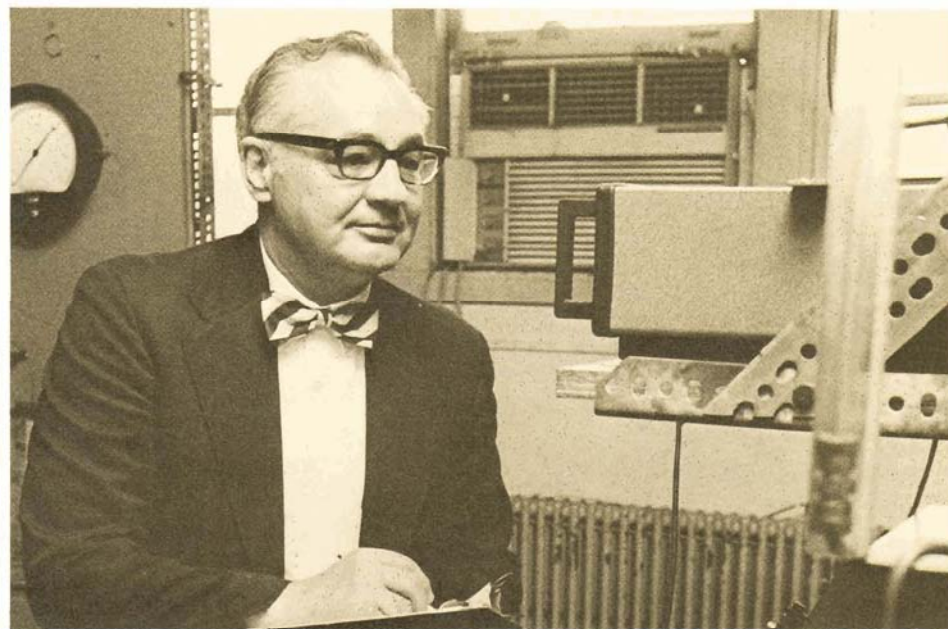
He came to OU in 1955. Since that time he has served as professor and chairman of the School of Chemical Engineering and Materials Science. He was associate dean of the College of Engineering from 1956 to 1962, and in 1962 he was named chairman of the School of General Engineering in addition to his duties as associate dean.

In 1963 he relinquished all administrative responsibilities to devote full time to teaching and research.

Among his many other awards and honors, Sliepceвич received the George Westinghouse Award in 1964 from the American Society for Engineering Education for distinguished contributions to the teaching of engineering students, and in 1974 he was named "Engineer of the Year" by the National Society of Professional Engineers. In November 1974 he was inducted into the Oklahoma Hall of Fame, and in 1975 the University of Oklahoma awarded him the Distinguished Service Citation.

Sliepceвич, who is known as "Cheddy" by his friends and colleagues, was featured in a past issue of OkChE. The sheer volume of his accomplishments prevents all of them from being named again here.

As far as OU CEMS is concerned, "Cheddy" is the Prrr-ide of Oklahoma.



Dr. Cedomir M. Sliepceвич — "Cheddy" strikes again.

OKCHE BOARD LOOKS TO THE FUTURE

The annual meeting of the OkChE Board of Directors was held October 27, 1978. OkChE Directors in attendance were Zane Q. Johnson, President, Gulf Science and Technology Company; Garman Kimmell, President, Kimray, Inc.; William P. Orr, President, C. E. Lummus; Charles R. Perry, President, Perry Gas Companies; Sam S. Sofer (ex-officio member), Director, OU School of Chemical Engineering and Materials Science; and J. Frank Wolfe, Manager, Production Operations Division, Exxon Production Research Company.

The Board heard status reports in the following areas by CEMS faculty: overview on the state of CEMS by Sam Sofer; graduate program by Carl Locke; undergraduate program and laboratory by Jay Radovich; research by Sam Sofer; and alumni and industrial relations by Ken Starling. Action taken by the Board included approval of 1978-79 OkChE expenditures of \$8,000 for student scholarships and \$3,500 for unit operations laboratory improvements.

The Board was pleased with the results of the improvements in the unit operations laboratory which were made during the past year and partially supported by OkChE funding. The Board also was pleased with the success of the Perry Challenge Grant for 1978 (see related article).

In looking to the future, it was the general conclusion of the OkChE Board that efforts should be mounted to provide a base for CEMS funding from private and industrial sources which can impact future as well as current years. The concept of developing a trust fund from which only the yearly earnings are used was proposed and discussed. Charles Perry and Sam Sofer will look into this concept and prepare a proposal for consideration.

OkChE Board members hosted the Program of Excellence Scholars at an afternoon reception. A dinner for Board members and faculty was hosted by Ray Daniels and his wife, Libby, to conclude the day's events.

As promised in the last issue of OkChE, we are publishing a list of CEMS graduates for the years 1946 to 1962. A list of graduates prior to 1946 was published in the Fall 1978 OkChE. And in the summer of 1979, we will publish the names of the graduates from 1963 to 1979.

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ALUMNI NOTES

Let us know where you are and what you are doing. Please fill out one of the enclosed information cards and send it to us. We will publish the information in our next issue of OkChE.

DEATHS

D. L. Haynes, bs'37, December 22, 1977. He was formerly the president of Barpro Company of Polson, Montana.

1920 to 1939

Thurman J. Dupy, bs'35, has retired from Gulf Oil Company. He lives in Toledo, Ohio.

Omar R. Lyon, bs'20, ba'23, lives in Wood River, Illinois. He retired from Prudential Insurance in 1963 after 36 years of service. Lyon and fellow student, Larve Bratton were the only two graduates in the 1920 class of Chemical Engineering who started as freshmen in 1916. The two kept in touch until Bratton's death. Lyon remains active in church and civic affairs. He keeps up with sports and is an active golfer.

Hubert H. Thompson, bs'28, retired from Standard Oil Company of Indiana after 35 years of service. He lives in San Diego, California.

Clifford T. Woods, bs'20 Civil Engineering, has two grandsons. He retired in 1960 and lives in San Pedro, California.

1940 to 1949

Glenn E. Alldredge, bs'49, is executive vice president of Shell and Tube, Inc., of Tulsa. He and his wife have four children.

W. Jack Anderson, bs'43, is president and owner of Jack Anderson Consulting Service in Santa Barbara, California. He just completed a "record time start-up" of an LNG plant in Borneo, Indonesia.

Howard B. Hopps, Jr., bs'45, lives in Oklahoma City, where he is the manager of asphalt sales for Kerr-McGee Refining Corporation.

Amos R. Jarman, bs'47, is vice president in charge of sales for E. F. Houghton and Company of Philadelphia. He and his wife, Virginia, have a nine-year-old daughter.

Neal J. Mosely, bs'43, JD'50, and his family reside in Houston, where he is a patent attorney. He and his wife, Dorset, have four children, two of whom are in graduate school.

1950-59

Thomas D. Barbour, bs'50, is president of Allied Materials Corporation of Oklahoma City.

Mitch Burrus, bs'57, resides in Slidell, Louisiana, with his wife and three children. He serves as propellant conservation project manager with Rockwell International Corporation at the NASA Test Labs, Bay St. Louis, Mississippi.

Clark Dougherty, Jr., bs'58, JD'66, is a patent attorney with Laney, Dougherty, Hessin and Beavers of Oklahoma City. He and his wife make their home in Edmond. Two of their four children are attending OU.

Robert L. Hedworth, bs'52, lives in Kinnelon, New Jersey. He is with GAF Corporation in New York City, where he serves as director of manufacturing for the chemical group.

William T. Hill, bs'55, works as a process engineer with Hercules Incorporated of McGregor, Texas. He and his wife and fourteen-year-old son make their home in Waco.

John C. Ladd, bs'57, lives in La Porte, Texas. He is an area engineer with DuPont.

Phil C. McKee, bs'52, serves as vice president in charge of sales with Slagle Manufacturing Corporation in Tulsa.

Robert H. Schwartz, bs'59, is with Weatherford International, where he is the marketing manager. He makes his home in Houston.

Frank Williamson, bs'50, has recently assumed a position with Carter Oil Company in Houston. He is the engineering advisor for synthetic fuels.

1960 to 1969

L. Edward Brown, ms'67, PhD'72, is president of Energy Analysts Inc. of Norman.

James D. Butterworth, bs'62, serves as manager of Nonimpact Printing Products at Texas Instruments in Houston. He and his wife, Carol, have three children.

Henry H. Chao, PhD'67, has lived in Wisconsin Rapids, Wisconsin, for 11 years. He is a research associate with Consolidated Papers Inc.

J. M. Cockrell, bs'60, is with Union Carbide Corporation, where he is production manager for low-density polyethylene. He makes his home in Bound Brook, New Jersey.

Michael Heymann, PhD'65, is a professor of electrical engineering at the Technion, Israel Institute of Technology, Haifa, Israel.

Michael Kopplin, bs'69, serves as senior staff engineer with C-E Crest in Houston.

Wilson Lee, ms'68, is senior chemist with Hoffmann-La Roche, Inc., of Nutley, New Jersey. He makes his home in Bloomsfield, New Jersey.

Ronald J. Spencer, bs'63, is the manager of engineering sales with The Trane Company of Tulsa. He serves as president of the North-eastern Oklahoma Chapter of ASHRAE. He and his wife, Durla, have three children.

Steven Swafford, bs'65, ms'69, is with Howe-Baker Engineers, Inc., of Tyler, Texas, where he is project engineer. He and his wife have two daughters.

Jim L. Thompson, bs'65, is manager of special sales at Getty Refining and Marketing Company of Tulsa.

Donald Waller, bs'64, professes to being a "clown" with Hughes Aircraft Company. He also grows the best pears and walnuts in San Luis Obispo County, California.

1970 to 1978

Jefferey C. Arnoldi, bs'76, is a process engineer with Celanese Chemical Company of Houston.

Hafez-Hafezzadeh, ms'77, is with Syntex, Inc., of Springfield, Missouri.

Fred Hall, bs'71, is section manager for the Systems Engineering Department of Taylor Instrument Company in Rochester, New York. He makes his home in Fairport, New York.

J. Scott Heller, bs'72, married Pat Selvey of Skokie, Illinois, in March. They live in Baton Rouge, Louisiana, where he is a mechanical design engineer with Ethyl Corporation.

William Gary Jones, bs'76, is a process engineer with Diamond Shamrock in Houston.

John Jatala, bs'72, is a production engineer with Dow Chemical Company in Freeport, Texas. He and his wife, Sara, and their two children make their home in Lake Jackson, Texas.

Kent E. Lyon, bs'77, serves as a reservoir engineer with Hunt Energy Corporation in Dallas.

Denis E. Martin, bs'74, and his wife, Janet, have a new daughter who was born July 5, 1978. They make their home in Marshalltown, Iowa, where he is a systems engineer with Fisher Controls Company.

Charles J. Pellern, ms'74, is a program manager with the PRAM Program Office, ASD/RAO, Wright-Patterson AFB, Ohio.

Stephen C. Slagle, bs'73, lives in Rogers, Arkansas, where he is a metallurgical and process engineer with TRW/Carbide Operations.

Alan G. Wonders, bs'76, received his master's degree from the University of Texas in 1978. He works for Texas Eastman as a development engineer. He and his wife, Billie Ruth, have a daughter who was born August 5, 1978.

Sun-Fu Yang, PhD'74, is a research engineer with Chem Share Company of Houston.

CEMS ENROLLMENT FIGURES FOR FALL 1978

59 Graduate Students
298 Undergraduate Students
<hr/>
357 Total

COMING IN THE NEXT ISSUE OF OkChE

Where are the ex-CEMS professors and what are they doing now?
Students participating in the "Coal-Calc" project.
What's happening in Metallurgy?

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