

**STATUS REPORT**  
**CHEMICAL ENGINEERING**

**The University of Tulsa**  
**600 South College Ave.**  
**Tulsa, OK 74104**

**SEPTEMBER, 2002 - AUGUST, 2003**

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## GENERAL NEWS

There are so many good things to report this year, that it is difficult to pick out any particular event to highlight, so let's start in no particular order.

We had a marginally successful undergraduate recruiting year. We got 19 new students, with 16 being freshmen. This number will keep us basically stable in total student numbers, but we would like to grow. We are again going to work hard in recruiting this year with hopes that a bigger freshman class can be recruited for next year. Looking ahead, our senior and especially junior classes are quite small, and as we graduate those small classes, we will begin to pick up in terms of total numbers of students, provided we can do at least as good as we did this year. However, our goal is more like 30 freshmen. We have a number of programs and aggressive recruiting tactics planned again for this year. Those include 1) calling students on the university prospects list (last year, this was not done in timely fashion because of a mistake in getting phone numbers), 2) creating a folder for prospective students that provides information on the department, highlights the effective teaching in the department, and provides copies of research papers which includes undergraduate student participation, 3) having evening AIChE student chapter meetings where careers are discussed and prospective students are invited, 4) running a Chem-E-Car competition for high school students (see below), 5) having all students who have mentioned Chemical Engineering as a major of interest come to the department for a tour when they arrange a campus visit through the admissions office, and 6) offering prospective students a tour to Tallgrass Prairie research station.

Christi Patton was honored with a campus wide outstanding teacher medal. This award is the top prize at the university level and Christi deserves special praise for this achievement. Recognition of outstanding teaching in the department is growing, and we are trying to highlight this more in a prospective student information packet, and on our website.

Naji Shaban, a senior chemical engineering student, has been selected as a recipient of the AIChE \$1,000.00 Donald F. and Mildred Topp Othmer National Scholarship Award for the 2003-2004 academic year. This award is a reflection of Naji's excellent academic record, his enthusiastic involvement in AIChE activities and his chemical engineering career plans. Naji's achievement will be recognized at the 2003 AIChE Annual Student Conference in San Francisco, California in November of this year. Also high on our list of distinctions this year is an award to Chemical Engineering graduates Jason Scott, Derrick Oneal, and Mark Wilson who graduated in Spring of 2003. Working in Frank Manning's and Keith Wisecarver's senior design class, their solution to the student contest problem received a second place finish in the annual AIChE Student Contest Problem, which is a national level competition among chemical engineering seniors. The award ceremony will also be at the AIChE Annual Meeting in San Francisco. This achievement not only honors these students, it also reflects on the extraordinary talent of their instructors.

Dr. Daniel Crunkleton joined the faculty this Fall semester, and has gotten started on the right road. We have high expectations for Daniel, and he has impressed everyone in his first semester here.

I was so impressed with the high school Chem-E-Car competition organized by Laura Ford and Christi Patton in the spring of 2003. Five teams from area schools participated, and we expect for the participation to be exceeded this year, as a number of schools have expressed an interest in coming next year. The crowd was rowdy and excited

and the competition was great. Both the TU undergraduate students who served as judges and organizers and the high school students had a wonderful time. This kind of endeavor gets our name out there and can yield benefits in recruiting efforts.

Improvements in the undergraduate lab continue. Several experiments have been automated with the Honeywell system now, and some of these are slated for use in the lab class in the next few weeks. Thanks to Tom Russell and his son, Matt for helping in the design and fabrication of a new packed column which we hope to send on its maiden voyage in the spring, 2004 lab class. Kent Van Valkenburgh also helped in specification of control elements and donated some of the controls.

Fund raising efforts have also been fruitful this year, and are poised for further progress. The W. L. Nelson scholarship fund crossed \$50,000 in commitments this year, and new efforts by Wayne Rumley, Wayne Wilson, and another benefactor set the \$100,000 mark as a goal by providing matching funds for new dollars which will go into the fund. Wayne will give us an update on this program. Also, I have had some success in attracting dollars to a lab fund. We have spent virtually all the money we have had for lab improvements, and more is needed to continue the progress we are making. Finally, ConocoPhillips has come through with a big help in providing a grant which allows us to replace the aging computers in the Buthod Computer Lab. The students in the department will benefit directly from this gift. The computers are on order as of this writing, and we expect to install them either over Thanksgiving or Christmas break.

Finally, as always, a big thank you goes out to the Advisory Board for taking the time to help us. A sadder note we report to you, though, is that Mike Soper has resigned from the board to focus more of his energy on his practice. We will miss Mike, but as always, we appreciate the commitment he and all the other board members provide.

## FACULTY ACTIVITIES

**Daniel Crunkleton** started with our department this semester is currently teaching Engineering Thermodynamics (ES 3053) and will teach Heat Transfer (ES 3073) next semester.

Beginning next semester, Daniel will be advising two graduate students. Qin Zhili will be working on a Ph.D. project designed to fabricate and characterize efficient electrolyte materials for solid oxide fuel cells. Another master's student will be fabricating oxygen nanosensors and modeling carrier transport through solid electrolytes.

Daniel will be submitting several research proposals over the course of this year. Two proposals, one to the Petroleum Research Fund and the other to the Oak Ridge Associated Universities, are complete and seek funding for his electrolyte development project. Another proposal to the TU Faculty Summer Development Program will allow the development of numerical models of non-ideal operation of electrolytes in contact with fluids. In association with the latter, Daniel has submitted a paper entitled "A Numerical Study of Flow and Thermal Fields in Tilted Rayleigh-Bénard Enclosures" to *International Communications in Heat and Mass Transfer*.

In the long-term, Daniel anticipates the submission of a proposal studying oxygen nanosensors to the Young Investigators Program of the Navy and a CAREER proposal to the Directorate of Materials Research (DMR) of the NSF to study thin film deposition.

In August, Daniel participated in a Faculty Development Workshop in Orono, Maine, organized by the NSF to help young faculty prepare for future proposal submissions.

In October, Daniel began serving on the College of Engineering and Natural Sciences Computing Committee.

**Laura Ford** taught Engineering Science Fluid Mechanics (ES 3003) and graduate Heat and Mass Transfer (ChE 7043) last spring. This fall she is teaching Fluid Mechanics and co-teaching Unit Operations Lab.

Laura is advising two graduate students. Sumathi Chandrasekaran is studying etching copper indium diselenide in the chemical vapor etching reactor. Pravin Utekar is building the ultra-high vacuum chamber funded by the National Science Foundation and TU. IPEC has funded a continuation of the Remediation of Brine Spills with Hay project. Shailendra Singh is co-advised by Dr. Sublette on this project. Laura is also the chemical engineering advisor for several graduate students working under faculty in other departments.

A paper comparing *ab initio* calculations to experimental results for carbon monoxide adsorbed on metal surfaces has just been submitted to *Surface Science*. A paper on Water Day, which is done in her Fluid Mechanics courses, appeared in *Chemical Engineering Education* this summer.

Two teams competed in the regional AIChE Chem-E-Car Competition this spring. The students qualified to race in the national Chem-E-Car Competition in November. Our chapter will be hosting the Mid-America Regional Conference in the spring. So far \$3,400 (of \$20,000 expected expenses) has been raised (as of Oct. 17, 2003).

The first high school Chem-E-Car Competition was held last spring. About 60 high school students came to campus for the competition. The winning car came within a foot of the target distance! Announcements for the second competition next April have been sent out. Drs. Patton and Ford made a presentation at the American Association for Engineering Education national meeting this summer about the high school Chem-E-Car Competition.

**Kraemer Luks** is working on fundamental classical thermodynamics problems in the area of phase equilibrium computations. A paper entitled "Solid-Fluid Phase Equilibria of Compositionally Complex Mixtures: Contrast of Equilibrium and Process Treatments", coauthored with undergraduate chemical engineering student Joseph Labadie, appeared recently in the international journal *Fluid Phase Equilibria*.

Professor Luks is currently studying problems on the:

1. Thermodynamic phase space topography of n-phase azeotropy;
2. Solid-fluid phase equilibria in binary mixture of widely diverse solute and solvent, e.g., methane + carbon dioxide;
3. Limitations to pseudoization in complex compositional solid-fluid equilibrium systems.

This last work is a collaboration with graduate student Robert Holderman, is completed, and should be submitted for publication shortly.

Professor Luks is teaching ChE7003, "Advanced Fluid Mechanics" and ChE3063, "Equilibrium Thermodynamics".

**Frank Manning** taught or co-taught 9 courses (3 courses in the fall, 4 in the spring and 2 in the summer) during the calendar year, September 2002 – August 2003. In addition, Frank taught two reviews (Introduction and Thermodynamics, Fluid Mechanics and Engineering Economics) of the eight Saturday morning sessions for the F.E. examination. This F.E. review was offered in both the fall and spring semesters.

Frank Manning continues to serve as the College's designated representative to the Midwest Section of the American Society for Engineering Education and attended the annual meeting in September, 2003. He also serves as the College's campus representative.

Frank continues to serve as the College's representative to the Faculty Financial Review Committee and chaired the committee in 2002/2003. He is also a member of the Faculty Development Summer Fellowship Selection Committee.

**Christi Patton** continues in her position to focus on teaching and was awarded for her efforts with the University of Tulsa's Outstanding Teaching Award. In 2003, she has taught 6 courses. During the Spring semester she taught ChE 1012 (Introduction to Chemical Engineering Problem Solving), ChE 2003 (Principles of Chemical Engineering) and ES 3073 (Heat Transfer). This Fall she is teaching ChE 1002 (Introduction to Chemical Engineering), ChE 4063 (Reactor Design) and ChE 7213 (Advanced Problem Solving for Chemical Engineers).

The freshman courses are being re-developed this year. ChE 1002 is doing a study of the environmental problems at Tar Creek. They read articles about the origins of the problem and the ongoing debates about solutions. Next week they will take water and soil samples to begin testing for a variety of substances. Through this project they will learn about safety, ethics, laboratory equipment and procedures, economics and more. ChE 1012 will become a 3-hour course (ChE 1013) in the spring to include a more extensive coverage of Visual Basic for Excel.

Christi continues to be active in long-term recruiting of engineers. The Brownie Science and Math Workshop continue to fill each time it is offered. Brownie Day will next be held on November 8. In April, she and Laura Ford held a Chem-E Car competition for high school students in the atrium of Keplinger Hall. Although budget cuts prevented the larger public schools from participating, it was a very popular event and received nice news coverage from Channel 23. They look forward to repeating the event in May 2004. In June, Christi and Laura presented a paper on this event as a recruiting activity for chemical engineering.

The Chemical Engineering Honor Society, advised by Dr. Patton, is in line to become the Beta Psi Chapter of Omega Chi Epsilon. The group is waiting for final notification from the national organization that all chapters have voted to accept their charter.

**Geoffrey Price's** NSF grant on Zeolite Based Automotive Emission Catalysts expired last year, and the General Motors' researchers he had been working with have temporarily lost GM funding in the area. Some of the final aspects of the project are still under investigation, though funding for the project has largely dried up, and new funding solicitation is currently in limbo. This project was very successful, however, and the model that was used to staff and manage the research work will be used in future endeavors. A proposal on solid-state ion-exchange of zeolites was declined twice by NSF last year, though reviews were quite good. The proposal is being tweaked and will be resubmitted shortly.

Geof was invited out to ConocoPhillips in Bartlesville last summer to give an overview of zeolite and catalysis research work going on in his labs at TU. The purpose of the visit was to find common areas of research work whereby ConocoPhillips might be interest in funding research at TU.

Geof's class schedule last year was ChE 4013 Lab last spring, ES 3073 Heat Transfer over the summer, and ChE 7033 Reaction Kinetics (the core graduate class) this fall. He is scheduled to teach ChE lab again next spring to help in the implementation of the Lab Automation Project.

**Kerry Sublette** organized and chaired the 9<sup>th</sup> International Petroleum Environmental Conference held in October 2002 in Albuquerque, NM attended by over 350 industry, regulatory, and academic professionals. As usual eight TU students were provided scholarships to the conference and several presented posters or oral papers. The 10<sup>th</sup> conference is coming up November 11-14, 2003 in Houston, TX. Kerry has also been leading a major multi-institutional initiative to obtain federal funding for the Integrated Petroleum Environmental Consortium (IPEC). IPEC is a consortium of the University of Tulsa, the University of Oklahoma, Oklahoma State University, and the University of Arkansas. Since 1998 IPEC has operated as an EPA Research Center with \$7.4 million in federal funding through the VA/HUD Appropriations Bill, \$800,000 in matching state funding, and \$2 million in competitive grants. FY04 funding is currently pending in Congress.

In December 1999, Kerry was instrumental in arranging the donation of the Bio-Sep patents from DuPont. Bio-Sep is a unique immobilization matrix for microorganisms with wide ranging applications in biomonitoring and groundwater and waste water treatment. Since acquiring the Bio-Sep technology, the material has undergone several improvements which have led to a new issued patent and one pending patent application both assigned to the University of Tulsa. In August 2002 TU signed its first licensing agreement for applications of Bio-Sep in biomonitoring. This licensing agreement has begun to generate a revenue stream for TU. Kerry has also obtained three new federal grants (2 EPA, 1 DOE) to further develop applications of the Bio-Sep technology.

Kerry's recent grant activity has included: 1) the restoration of soil ecosystems following crude oil and brine spills (DOE); 2) development of "smart" proppant materials (DOE); 3) bioreactor design for microbial oxidation of hydrogen sulfide (DOE); and 4) use of Bio-Sep bug traps to evaluate natural attenuation of hydrocarbons and MTBE in groundwater (EPA/IPEC).

Kerry continues to lead a task force to raise funds for the construction and operation of an ecological research station in the Tallgrass Prairie Preserve in cooperation with The Nature Conservancy. Construction began in March 2003 on a 7000-ft<sup>2</sup> research and education building featuring two laboratories, two classrooms, a specimen collection room, library and conference room, two offices, and a student commons area. Renovation has also begun on an existing structure which will be used as residential housing. Thus far, over \$2 million has been raised for this project. Fundraising is continuing to provide additional operation and maintenance endowments. Recent pictures of the research station under construction are shown below.



Main entrance (facing N)

W side classroom wing



E side laboratory / office wing



Back entrance (facing S)  
(classroom wing left, laboratory/office wing right)



N side laboratory / office wing



Main entrance to residential structure



N side of residential structure

**Keith Wisecarver** is continuing his work as co-PI of the Tulsa University Delayed Coking Joint Industry Project. This project is currently supporting seven graduate students (three PhD students, Hamad Al-Merri, Pradipta Chattopadhyay, and Joshua Hogue; and four MS students, Kay Akinmade, Ashok Pushpalayari, Aashit Shah, and Srikanth Yalamanchili). We have just completed the first year of the three-year JIP, which is a renewal of our previous three-year JIP. The project currently has 11 members and DOE sponsorship, with a total three-year budget of \$2.34 million. A major focus of this JIP is developing an understanding of foaming problems in delayed coking drums. We have a gamma densitometer setup to scan the coke drum during the coking process, which has allowed us an unprecedented look at the delayed coking process and at foam formation and break down. More information on this project can be found on the Tulsa University Delayed Coking Project website, [www.tudcp.utulsa.edu](http://www.tudcp.utulsa.edu). Keith's other research interests include fluid catalytic cracking, Fischer-Tropsch processes, and multiphase reactor design in general.

Keith was honored as an invited lecturer for the Ohio State University Department of Chemical Engineering Centennial Seminar Series, and gave a talk there on his Delayed Coking research on June 5, 2003. He also made two presentations at the 2003 AIChE Spring National Meeting in New Orleans, one on "Relating Gasoline Production and Coke Formation to Feedstock Composition and Operating Conditions in Fluid Catalytic Cracking" and one on "A Delayed Coking Pilot Plant". Keith has just published, along with Chuck Sheppard, a paper in *Energy and Fuels*, "Relating Feedstock Composition to Product Slate and Composition in Catalytic Cracking. 6. Feedstocks Derived from Merey, a Venezuelan Crude," (vol. 17 no. 5, 2003, pp. 1360-1366), and also published a paper on fluid catalytic cracking in AIChE's *6<sup>th</sup> International Conference on Refining Processes*,

On the teaching front, Keith continues to co-teach the senior design courses with Frank Manning, and is also co-teaching the senior Unit Operations Labs. We are making some changes to the labs this year by incorporating the new Honeywell PlantScape system into some of the senior lab experiments. Keith was chosen as Tau Beta Pi Professor of the Month for March, 2003.

## UNDERGRADUATE PROGRAM

The quality of our undergraduate students continues to remain excellent. The following seniors were recipients of the Wilbur L. Nelson Award for academic excellence at the annual Awards Ceremony in April, 2003:

NAME	CURRENT POSITION
Amrella Saeed	Graduating December, 2003
Deidra Roberts	Graduating December, 2003
Derrick Oneal	ExxonMobil-Houston, TX
Christina Guidroz	Education- St. Louis, MO
Misha Baker	BP-Houston, TX

Undergraduate enrollment in the Department of Chemical Engineering continues to decline but looks very promising. We have 3 fewer students this year than last; our prior year's decline was 12. This decline can be attributed largely to two effects. We are still graduating more students than we recruited into the freshman class, but the margin is closing. We graduated 14 for spring and summer '03 and we have 17 new freshmen this semester. The other problem remains in the middle—the junior and sophomore classes—where we didn't recruit enough and lost too many to other majors. Recruitment and retention of students has been our major focus since then.

Table 1 shows enrollment figures over the past twenty-four years. Figures 1 and 2 show how chemical engineering enrollments and B.S. degrees have changed over the years.

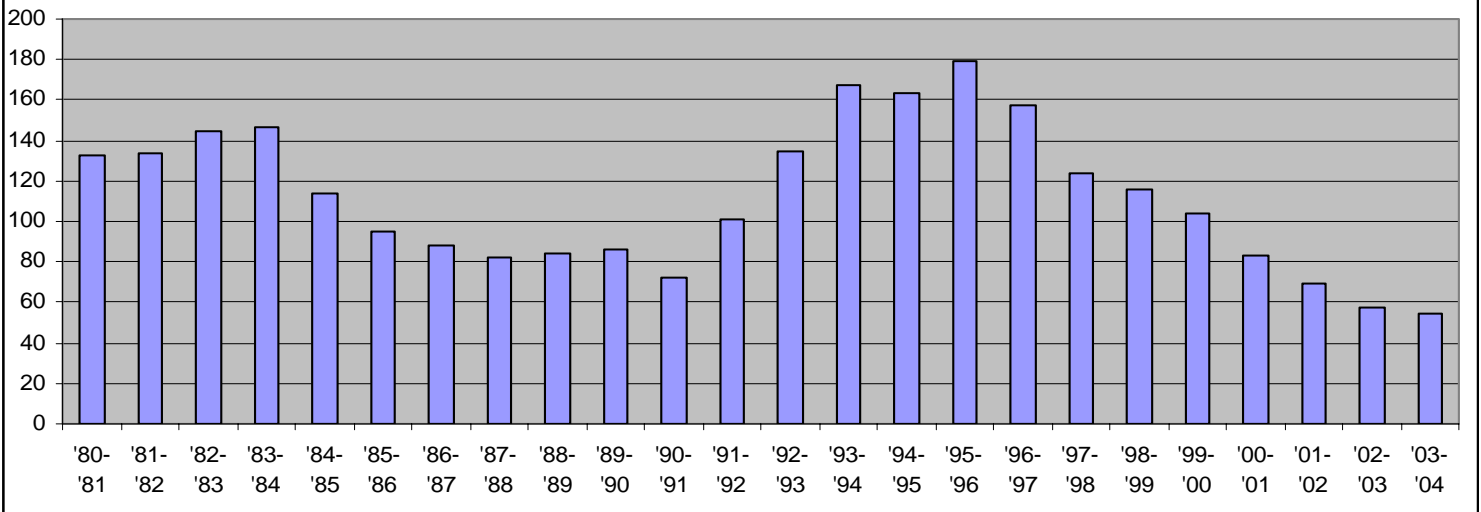
Table 2 shows the demographics of the undergraduate student body. Female students and international students as percentages of the total for recent years are shown in Figure 3. The number of female students continues to decline, but the number of international students is at a 12 year high. The Middle East still dominates the countries of origin among international students accounting for 71% of those students. The great majority of international students are male (95%); there are two female students from Vietnam and one female student from Malaysia.

Table 3 shows the distribution of jobs for the December 2002 through December 2003 graduates. It was only a fair year for employment for our students, but as you know the economy as a whole is down. As in the past, the majority of job offers were in energy-related fields.

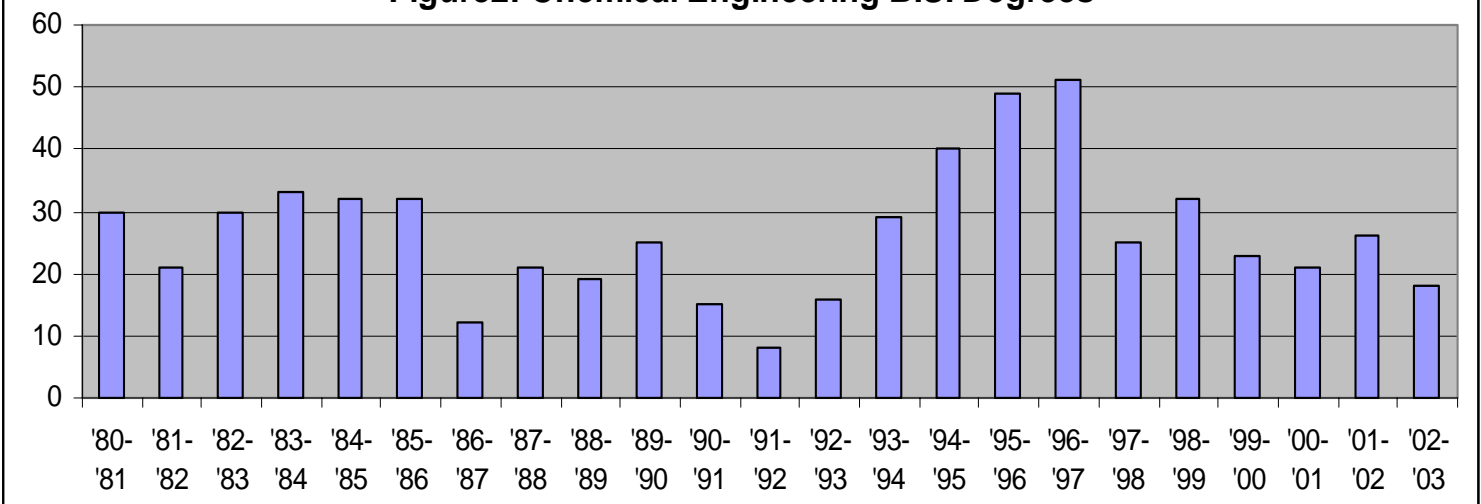
**TABLE 1. Recent Undergraduate Enrollment Data at Census Date**

<u>Year</u>	<u>ENROLLMENTS</u>						<u>B.S.Degrees</u>
	<u>Fr</u>	<u>Soph</u>	<u>Jr</u>	<u>Sr</u>	<u>PT</u>	<u>Total</u>	
1980-81	31	36	24	32	10	133	30
1981-82	24	43	34	24	13	134	21
1982-83	32	36	44	32	12	145	30
1983-84	32	34	32	45	13	147	33
1984-85	24	33	27	30	7	114	32
1985-86	25	24	18	28	7	95	32
1986-87	21	33	17	16	1	88	13
1987-88	16	21	18	27	1	82	21
1988-89	20	23	15	26	0	84	19
1989-90	25	17	15	29	4	86	25
1990-91	19	20	17	16	3	72	15
1991-92	38	33	20	10	1	101	8
1992-93	38	41	34	22	0	135	16
1993-94	43	35	51	36	2	167	28
1994-95	38	38	32	54	1	163	40
1995-96	44	34	46	52	3	179	49
1996-97	24	44	30	59	--	157	51
1997-98	32	18	41	33	--	124	25
1998-99	27	26	20	43	--	116	32
1999-00	25	25	25	29	--	104	23
2000-01	23	17	21	22	--	83	21
2001-02	15	12	15	27	--	69	26
2002-03	17	9	12	19	--	57	18
2003-04	17	12	9	16	--	54	

**Figure1. Chemical Engineering Undergraduate Enrollment**



**Figure2: Chemical Engineering B.S. Degrees**

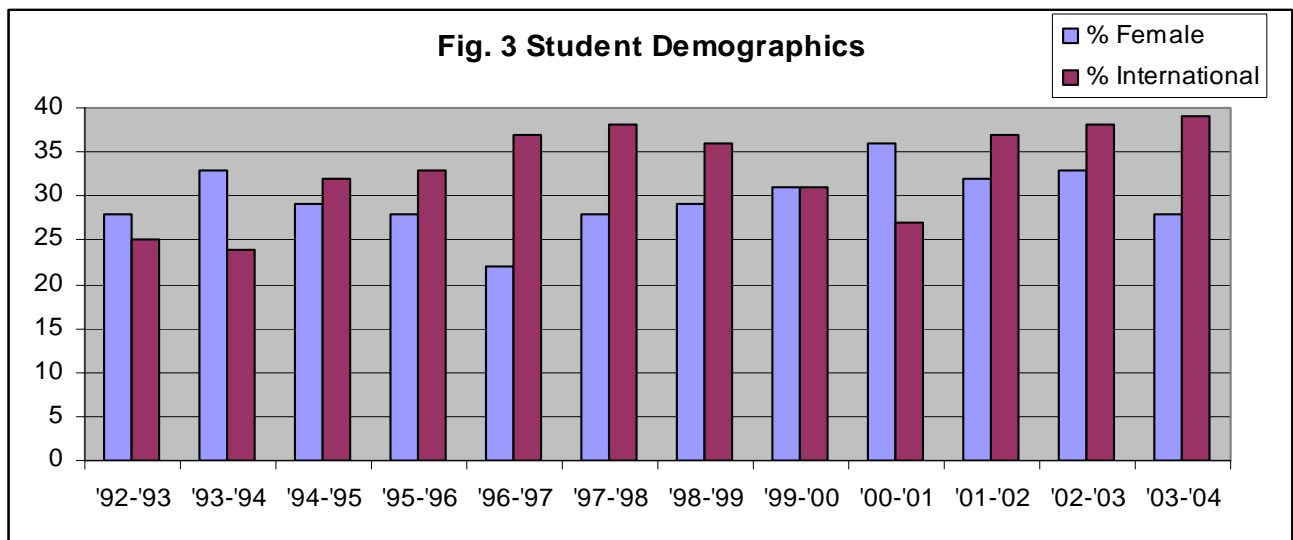


**TABLE 2. Undergraduate Student Demographics**

<u>Year</u>	<u>Class</u>	<u>Men</u>	<u>Women</u>	<u>International</u>	<u>Total</u>
2003-04	Fr	12	5	6	17
	So	9	3	3	12
	Jr	8	1	7	9
	Sr	<u>10</u>	<u>6</u>	<u>5</u>	<u>16</u>
	<b>Total</b>	<b>39</b>	<b>15</b>	<b>21</b>	<b>54</b>

**International Students**

	<b>Fr</b>	<b>So</b>	<b>Jr</b>	<b>Sr</b>	<b>Total</b>
Angola	1			1	2
Ethiopia				1	1
Iran	1				1
Jordan				1	1
Malaysia		1			1
Oman				1	1
Qatar	2		1		3
Saudi Arabia			1		1
United Arab Emirates		2	3	1	6
Venezuela			2		2
Vietnam	2				2
<b>Total</b>	<b>6</b>	<b>3</b>	<b>7</b>	<b>5</b>	<b>21</b>



**TABLE 3. December 2002 – December 2003 Chemical Engineering B.S. Graduates**

<b>NAME</b>	<b>GRAD. DATE</b>	<b>CURRENT PLANS</b>
Calvert, Errol	Dec. '02	Ozark Fluorine Specialties, Tulsa, OK
Martin, Khadija	Dec. '02	Unknown
Adams, Lula	May '03	Visteon, Tulsa, OK
Al-Baloushi, Bader	May '03	Adnco, United Arab Emirates
Al-Ghaferi, Saeed	May '03	Adnco, United Arab Emirates
Al-Ibrahim, Mohammed	May '03	Aramco, Saudi Arabia
Al-Meer, Abdulaziz	May '03	Qatar Petroleum, Qatar
Baker, Misha	May '03	BP – Houston, TX
Bin-Ghaith, Ahmad	May '03	Aramco, Saudi Arabia
Gime, Aires	May '03	SonAngol, Angola
Guidroz, Christina	May '03	Education – St. Louis, MO
Oneal, Derrick	May '03	ExxonMobil – Houston, TX
Richardson, Carrie	May '03	
Scott, Jason	May '03	Smithco, Tulsa, Oklahoma
Wilson, Mark	May '03	Denver, Colorado

**TABLE 4. Current Chemical Engineering Seniors**

<b>NAME</b>	<b>GRAD DATE</b>
Al-Rawahi, Said	Dec. '03
Dos-Santos, Bernardino	Dec. '03
Gilbert, Thomas	Dec. '03
Horn, Susan	Dec. '03
Huang, Amy	Dec. '03
Roberts, Deidra	Dec. '03
Said, Amrellah	Dec. '03
Gime, Aires	May '04
Kovar, Joey	May '04
Lansdown, Meredith	May '04
LeCompte, Joey	May '04
McManus, Joe	May '04
McVey, Adrienne	May '04
Roberts, Emily	May '04
Shaban, Naji	May '04
Shafer, Chris	May '04
Al-Hosani, Abdulla	Undeclared

## GRADUATE PROGRAM

Geoffrey Price continued as Graduate Program Director this year with Keith Wisecarver's assistance in determining suitability for admittance and in matching funding with students. Kraemer Luks has continued the duties of administering the PhD Qualifying Exam. Graduate enrollment this year is down slightly. Those who joined us since the last status report include two U.S. trained PhD students, one from Norway the other from Nigeria. One Indian PhD student, Masters degree students from Bolivia, India, Venezuela, and Saudia Arabia. The enrollment figures are shown in Table 5, while Table 6 lists the recent Masters graduates and Ph.D. graduates. Table 7 shows the graduate student demographics for recent years. Table 8 gives the graduate student enrollment at the university's census date.

One problem that we encountered with respect to recruiting efforts was a difficulty in getting visas for Chinese students. Part of the problem was the SARS epidemic, but we also ran into a funding problem in that the total financial package offered to these students in the form of a teaching assistantship was insufficient for immigration purposes to qualify the students for a visa. This difficulty basically manifests itself as the teaching assistantships are so low; they are unable to fully support a student. This difficulty is currently being discussed at the college level.

**TABLE 5. Recent Graduate Enrollment Data**

<u>Year</u>	<u>Fall Enrollment</u>					<u>Graduates</u>	
	<u>Full-Time</u>	<u>Part-Time</u>	<u>MS*</u>	<u>PhD</u>	<u>Total</u>	<u>Masters</u>	<u>PhD</u>
1981-82	16	12	20	8	28	9	2
1982-83	19	14	26	7	33	8	3
1983-84	24	9	22	11	33	14	2
1984-85	31	9	25	15	40	9	3
1985-86	26	6	21	11	32	11	2
1986-87	24	7	19	12	31	8	3
1987-88	19	6	11	14	25	3	4
1988-89	21	9	19	11	30	5	1
1989-90	19	6	16	9	25	7	1
1990-91	23	4	18	9	27	2	4
1991-92	27	3	18	12	30	8	1
1992-93	35	6	26	15	41	7	4
1993-94	40	7	33	14	47	8	4
1994-95	33	8	29	12	41	11	4
1995-96	33	4	24	13	37	12	4
1996-97	25	2	16	10	27	4	2
1997-98	22	1	17	6	23	5	1
1998-99	21	1	16	6	22	6	0
1999-00	22	3	16	9	25	5	0
2000-01	24	2	17	8	25	5	0
2001-02	28	4	27	5	32	10	2
2002-03	29	4	27	6	33	11	0
2003-04	26	3	20	9	29		

\* Includes M.E. students

**TABLE 6. 2002-03 Chemical Engineering  
Masters and Ph.D. graduates**

M.S. Degree

Afonsa, Zola  
Al-Alloush, Saeed  
Al-Aqeel, Mohammed  
Al-Hashmi, Abdul-Aziz  
Al-Ghamdi, Fahad  
Baabdullah, Abdullah  
Carter, Kimberly  
Mehta, Chintan  
Robles, Marco  
Schimelpfenig, Kurt  
Vullum, Fride

Ph.D. Degree

**TABLE 7. Nature of Graduate Student Body**

	<b>Full Time</b>	<b>Part Time</b>	<b>Masters</b>	<b>PhD</b>	<b>Male</b>	<b>Female</b>	<b>International</b>
1995-96	89%	11%	65%	35%	84%	16%	81%
1996-97	89%	11%	63%	37%	81%	19%	70%
1997-98	96%	4%	74%	26%	87%	13%	70%
1998-99	91%	9%	73%	27%	95%	5%	73%
1999-00	88%	12%	64%	36%	80%	20%	72%
2000-01	92%	8%	68%	32%	80%	20%	72%
2001-02	88%	12%	84%	16%	72%	28%	69%
2002-03	88%	12%	82%	18%	79%	21%	73%
2003-04	90%	10%	69%	31%	79%	21%	73%

## RESEARCH

Research in the department increased significantly from last year, as shown in Table 9.

Table 10 lists the new and continued external grants for the department. 'New' grants were up by almost \$551,500, and 'continued' grants increased by approximately \$585,500.

Table 11 lists 'pending' contracts as of May, 2003. These figures are *not* included in the Total Research Dollars in Table 9. The pending contracts would add a nice sum if the majority are funded.

**TABLE 9. External Funding  
Department of Chemical Engineering\***

<u>Year</u>	<u>Research Dollars</u>
1985-86	\$407,806
1986-87	\$142,419
1987-88	\$524,708
1988-89	\$558,449
1989-90	\$806,088
1990-91	\$927,225
1991-92	\$1,158,767
1992-93	\$1,036,617
1993-94	\$859,285
1994-95	\$816,841
1995-96	\$698,085
1996-97	\$1,080,404
1997-98	\$1,031,216
1998-99	\$3,526,292
1999-00	\$2,977,733
2000-01	\$2,039,684
2001-02	\$2,125,337
2002-03	\$3,262,267

\*Numbers based on the University of Tulsa Office of Research 2002-2003 Annual Report, which includes new and continued contracts. Does *not* include pending contracts.

**TABLE 10. Funded Research Projects  
Department of Chemical Engineering**

**NEW GRANTS AWARDED THROUGH MAY, 2003 \***

<b>P.I.</b>	<b>Source</b>	<b>Title</b>	<b>Amount</b>
<i>Laura Ford</i>	National Science Foundation	Acquisition of an Ultra-High Chamber for Etching Studies and Student Training, Year 1 of 2	\$70,003
<i>Pat Hall Nancy Felts Kerry Sublette</i>	Department of Energy, National Petroleum Technology Office	9 <sup>th</sup> Annual IPEC Conference – <i>Redistribution of Funds</i>	\$27,000
<i>Richard Shaughnessy</i>	Collins & Aikman	Pilot Study of Flooring Products and Associated Impact on Indoor Air Quality	\$67,908
<i>Richard Shaughnessy</i>	Environmental Protection Agency	Tools for Schools Implementation Project, Region 4	\$50,000
<i>Richard Shaughnessy</i>	Hoffman & Baron, LLP	Evaluation of Hamilton Beach TrueAir Air Cleaner & Holmes Odor Grabber Air Filter	\$30,000
<i>Richard Shaughnessy</i>	Environmental Protection Agency	Tools for Schools Implementation Project, Region 6	\$37,000
<i>Richard Shaughnessy</i>	Department of Housing & Urban Development	Environmental Assessment Tools to Address Multiple Health in Low-Income Minority Homes	\$233,333
<i>Kerry Sublette</i>	Bechtel BWXT Idaho, LLC	Development of Smart Propanol Technology for Hydraulic Fracturing (Prime: DOE, Idaho National Engineering & Environment Laboratory), Year 1	\$114,448
<i>Kerry Sublette Laura Ford</i>	Integrated Petroleum Environmental Consortium	Identifying the Signature of the Natural Attenuation of MTBE in Groundwater Using Molecular Methods and “Bug Traps” <i>Redistribution of Funds</i> , Year 1	\$148,887
<i>Kerry Sublette Laura Ford</i>	Microbial Insights	Identifying the Signature of the natural Attenuation of MTBE in Groundwater Using Molecular Methods And “Bug Traps” (IPEC Match), Year 1	\$30,000
<i>Kerry Sublette Laura Ford</i>	British Petroleum	Identifying the Signature of the natural Attenuation of MTBE in Groundwater Using Molecular Methods And “Bug Traps” (IPEC Match), Year 1	\$30,000
<i>Kerry Sublette Laura Ford</i>	University of Tennessee	Identifying the Signature of the natural Attenuation of MTBE in Groundwater Using Molecular Methods And “Bug Traps” (IPEC Match), Year 1	\$18,334
<i>Kerry Sublette Laura Ford</i>	Integrated Petroleum Environmental Consortium	Identifying the Signature of Natural Attenuation in the Microbial Ecology of Hydrocarbon Contaminated Groundwater Using Molecular Methods and “Bug Traps” (Prime: EPA), Year 1	\$147,303
<i>Kerry Sublette Laura Ford</i>	Microbial Insights	Identifying the Signature of the natural Attenuation of MTBE in Groundwater Using Molecular Methods And “Bug Traps” (IPEC Match), Year 1	\$30,000
<i>Kerry Sublette Laura Ford</i>	British Petroleum	Identifying the Signature of the natural Attenuation of MTBE in Groundwater Using Molecular Methods And “Bug Traps” (IPEC Match), Year 1	\$30,000
<i>Kerry Sublette Laura Ford</i>	University of Tennessee	Identifying the Signature of the natural Attenuation of MTBE in Groundwater Using Molecular Methods And “Bug Traps” (IPEC Match), Year 1	\$18,334
<b>TOTAL</b>			<b>\$1,082,550</b>

\*Numbers based on the University of Tulsa Office of Research 2002-2003 Annual Report

**GRANTS AND CONTRACTS *CONTINUED* THROUGH MAY, 2003**

<b><i>P.I.</i></b>	<b>Source</b>	<b>Title</b>	<b>Amount</b>
<i>Laura Ford</i>	National Science Foundation	Acquisition of an Ultra-High Vacuum Chamber for Etching Studies & Student Training, Year 2 of 2	\$70,000
<i>Laura Ford</i> <i>Kerry Sublette</i>	Integrated Petroleum Environmental Consortium	Remediation of Brine Spills with Hay (Prime: U.S. EPA) <i>Redistribution of Funds</i> , Year 2	\$35,314
<i>Richard Shaughnessy</i>	Environmental Protection Agency	Tools for Schools Implementation Project, Region 8	\$30,000
<i>Chuck Sheppard</i> <i>Keith Wisecarver</i> <i>Michael Volk</i>	Various Companies	Fundamentals of Delayed Coking	\$400,000
<i>Kerry Sublette</i>	Department of Energy	Risk Reduction and Soil Ecosystem Restoration in an Active Oil-Producing Area in an Ecologically Sensitive Setting, (IPEC Collaboration) Year 3 of 3	\$270,776
<i>Kerry Sublette</i>	University of Arkansas	Risk Reduction and Soil Ecosystem Restoration in an Active Oil-Producing Area in an Ecologically Sensitive Setting, (IPEC Collaboration) Year 3 of 3	\$14,483
<i>Kerry Sublette</i>	University of Oklahoma	Risk Reduction and Soil Ecosystem Restoration in an Active Oil-Producing Area in an Ecologically Sensitive Setting, (IPEC Collaboration) Year 3 of 3	\$18,777
<i>Kerry Sublette</i>	Oklahoma State University	Risk Reduction and Soil Ecosystem Restoration in an Active Oil-Producing Area in an Ecologically Sensitive Setting, Year 3 of 3	\$6,966
<i>Kerry Sublette</i>	Oklahoma state Regents for Higher Education	Integrated Petroleum Environmental Consortium, Year 3 (EPA Match)	\$50,000
<i>Kerry Sublette</i>	Environmental Protection Agency, National Center for Environmental Research and Quality Assurance	Integrated Petroleum Environmental Consortium, Year 4 (IPEC)	\$729,600
<i>Kerry Sublette</i>	University of Arkansas	Integrated Petroleum Environmental Consortium (IPEC) Match	\$48,343
<i>Kerry Sublette</i>	University of Oklahoma	Integrated Petroleum Environmental Consortium (IPEC) Match I	\$48,933
<i>Kerry Sublette</i>	University of Oklahoma	Integrated Petroleum Environmental Consortium (IPEC) Match	\$116,525
<i>Keith Wisecarver</i> <i>Mike Volk</i>	Department of Energy	Tulsa University Fundamentals of Delayed Coking Joint Industry Project, Year 4	\$340,000
<b>TOTAL</b>			<b>\$2,179,717</b>

\*Numbers based on the University of Tulsa Office of Research 2002-2003 Annual Report



**TABLE 11. Pending Research Projects  
Department of Chemical Engineering**

**PENDING GRANTS AS OF MAY 2003\***

<b>P.I.</b>	<b>Source</b>	<b>Title</b>	<b>Amount</b>
<i>Richard Shaughnessy</i>	U.S. Environmental Protection Agency	Tools for Schools Implementation Project Region 6	\$50,400
<i>Richard Shaughnessy</i>	U.S. Environmental Protection Agency	Tools for Schools Implementation Project Region 9-Fresno	\$57,060
<i>Kerry Sublette</i>	Integrated Petroleum Environmental Consortium (IPEC)	Use of Earthworms to Accelerate the Restoration of Oil and Brine Impacted Sites (Prime: Environmental Protection Agency)	\$404,250
<i>Kerry Sublette</i>	Department of Energy/Natural and Accelerated Bioremediation Research	Enhancing Microbial Communities to Maximize Immobilization for Subsequent Recovery on Solid-phase Surfaces	\$1,184,906
<i>Kerry Sublette</i>	University of Oklahoma	Specialty Microbial Inocula for Environmental Engineering Applications (Prime: National Science Foundation)	\$57,887
<i>Kerry Sublette</i>	University of Tennessee	Fascicle Cost-Effective Monitoring of the Removal of Enteric Pathogens and Pharmaceutically Active Pollutants Essential for Direct Reuse of Potable Water (Prime: National Water Research Institute)	\$11,526
<i>Kerry Sublette</i>	Environmental Protection Agency	Integrated Petroleum Environmental Consortium (IPEC)	\$1,218,750
<i>Ram Mohan Ovaيدا Shoham Keith Wisecarver Leslie Thompson Brenton McLaury Luis Gomez Shoubo Wang</i>	National Science Foundation, Industry/University Cooperative Research Centers	Collaborative Research: Operational Proposal for I/UCRC on Multiphase Transport Phenomena	\$330,000
<i>Ram Mohan Ovaيدا Shoham Keith Wisecarver Leslie Thompson Brenton McLaury Luis Gomez Shoubo Wang</i>	Various Companies	Collaborative Research: Operational Proposal for I/UCRC on a Multiphase Transport Phenomena	\$1,350,000
<b>TOTAL</b>			<b>\$4,664,779</b>

\*Numbers *not* included in Table 9, External Funding. These are for informational purposes only.

Table 12. 2002-03 ChE Advisory Board Members

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