

STATUS REPORT
CHEMICAL ENGINEERING

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

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GENERAL NEWS

Our most noteworthy faculty award this year went to Keith Wisecarver. Keith is the recipient of this year's Kermit E. Brown Award for Teaching Excellence which is given to one faculty member in the College of Engineering and Natural Sciences nominated by the students of the college for teaching excellence. Congratulations to Keith!

Undergraduate lab improvements continue. This is the first year students have run the new packed column experiment in ChE 4013 lab. The packed column is a 6" diameter glass column with 4 feet of packing. Water flows down from the top and air is forced up. Students are able to control all column operations from the new Honeywell control system, and they measure pressure drop across the column and can observe flooding phenomena. Because the column is glass, students can see what's going on inside and this is a great training exercise. Other experiments including double pipe heat exchanger, air cooled heat exchanger, and the pipe friction factor experiments have been brought on line.

Daniel Crunkleton got off to a good start this year teaming up Christi Patton and some others in the College of Engineering and Natural Sciences in the Challenge X competition. Challenge X is a program funded by General Motors and the Department of Energy geared toward University research on alternative fuel cars. The University of Tulsa's team submitted a winning proposal for the competition. We are looking forward to great things from Christi and Daniel working in this program.

This year also saw completion of Kerry Sublette's able and persistent efforts to build a research station at the Tallgrass Prairie. Kerry had a vision and put together a team of donors to accomplish this, then worked tirelessly to see the job done. The dedication ceremony was held in May. I got a first-hand view of the new facility, and it is marvelous. We look forward to many years of fruitful research work.

The University of Tulsa stole the show at the ASEE Midwest Regional meeting. Laura Ford won the best paper competition and Frank Manning walked off with the service award. On the student award front, Michael Deshazer (currently a sophomore in our department) was named one of the University's Top Ten Freshmen. Congratulations to all!

Undergraduate enrollment is still a concern and we have worked hard to try to turn it around. We stayed about even this year and hope to improve next year. We do not expect very many graduates this year, so if we have a marginally successful recruiting year, we should do better than stay even. However, we continue to work toward 25 new students every year.

Also, congratulations are due to Wayne Rumley who was added to the Engineering and Natural Sciences Hall of Fam last spring. Well deserved honor, Wayne!

FACULTY ACTIVITIES

Daniel Crunkleton taught Thermodynamics (ES3053) and graduate Fluid Mechanics (CHE7003) in Fall 2004. In Spring 2005, he and will teach Heat Transfer (ES3073), and co-teach Senior Lab II (CHE4013) and the Challenge X seminar (ES3861).

On the research front, Daniel is advising a graduate student, Qin Zhili, who is working on a PhD thesis to fabricate and characterize new materials for use in Solid Oxide Fuel Cells. Additionally, he has supervised two undergraduate students who are conducting preliminary experiments to engineer nanoscaled solid electrolyte materials. He has submitted several research proposals over the previous year, including one to the Petroleum Research Fund to continue study of Solid Oxide Fuel Cells and another to add a fuel cell laboratory to the CHE Unit Operations Laboratory.

During the summer, he conducted an exchange visit at the *Laboratoire d'Informatique pour la Mécanique et les Sciences de l'Ingénieur* (LIMSI) at the *Université de Paris - Paris Sud*. As part of this exchange, I worked in the laboratory of Prof. Gérard Labrosse, a professor of Physics, and implemented several future collaborative research endeavors in the Fluid Mechanics subject area. As a result of the time spent working on this project, a manuscript entitled "A Numerical Study of Flow and Thermal Field in Tilted Rayleigh-Bénard Convection" was accepted for publication in *International Communications in Heat and Mass Transfer*. He plans a similar exchange for Summer 2005.

Finally, Daniel is co-advising the *Challenge X: Crossover to Sustainable Mobility* competitions with Christi Patton in ChE, John Henshaw in ME, Robert Strattan and Doug Jussaume in EE, and Rose Gamble in CS. TU was one of 17 universities selected to participate in this competition, where our students will design and build the next-generation hybrid-electric vehicle. As a result of our participation in Challenge X, sponsors have donated some extremely powerful software and hardware to TU students.

Laura Ford taught Engineering Science Fluid Mechanics (ES 3003) and graduate Heat and Mass Transfer (ChE 7043) last spring. This fall she is co-teaching Unit Operations Lab and teaching Surface Science, a graduate-level special topics course.

Laura is advising Pravin Utekar, who is working with the ultra-high vacuum chamber funded by the National Science Foundation and TU. The NSF has funded a three year grant for studies in the ultra-high vacuum chamber. Shailendra Singh is co-advised by Dr. Sublette on a brine spill bioremediation project. Laura is also the chemical engineering advisor for several graduate students working under faculty in other departments.

The University of Tulsa hosted the regional AIChE conference this spring. Over 100 students from 10 different universities attended. Our team placed second in the regional Chem-E-Car Competition. The students qualified to race in the national Chem-E-Car Competition in November in Austin.

The second 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! Drs. Patton and Ford made a presentation at the regional American Association for Engineering Education meeting in September about the high school Chem-E-Car Competition. Nearly half of the students who have participated in the competition and graduated from high school have expressed interest in TU, and the participants apply and enroll at higher rates than their graduating classes. Data on recruitment to chemical engineering is too limited to evaluate. This paper won the Best Paper Award of the regional meeting.

Kraemer Luks is working on fundamental classical thermodynamics problems in the area of phase equilibrium computations. A paper entitled "Non-ideal Solution Limitations to the Use of Quadrature in Some Differential Phase Equilibrium Computations", coauthored with graduate student Robert Holderman, appeared recently in the ACS journal I&EC Research.

Professor Luks is currently studying problems on the:

- Solid-fluid phase equilibria in binary mixtures of widely diverse solutes and solvents: He and graduate student Kimberly Carter have recently completed a computational study of the important system methane + carbon dioxide. The results will be submitted for publication shortly;
- Limitations to pseudoization in complex compositional solid-fluid equilibrium systems: A follow-up study to the Holderman-Luks paper cited above is underway, and hopefully will be completed this calendar year;
- Thermodynamic phase space topography of n-phase azeotropy.

Professor Luks is currently teaching ES3003, "Fluid Mechanics" and ChE3063, "Equilibrium Thermodynamics".

Frank Manning taught or co-taught 7 courses (3 courses in the fall, 3 in the spring and 1 in the summer) during the calendar year, September 2003 – August 2004. 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, 2004. He also serves as the College's campus representative. Frank received the Midwest Section American Society for Engineering Education Outstanding Service Award at their annual meeting this year.

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 to focus on teaching and community outreach while also advising a team of students in an automotive design project. In 2004 she has taught 6 courses. During the Spring semester she taught ChE 1013 (Introduction to Chemical Engineering Problem Solving), ChE 2003 (Principles of Chemical Engineering) and ChE 4113 (Process Control). This Fall she is teaching ChE 1002 (Introduction to Chemical Engineering), ChE 4063 (Reactor Design) and ES 3073 (Heat Transfer). The ChE 1013 course was revised for 2004 to include a strong focus on programming with Visual Basic for Excel. That change benefits the students by allowing us to incorporate these programming skills in upper level courses and by expanding their curriculum to better focus on process control. One measure of the initial success is that a freshman found a summer internship based on her ability to do VBA-Excel programming.

Christi continues as advisor to the departmental honor society which was formally chartered into Omega Chi Epsilon in April, 2004. She also has returned to the position of SWE advisor this year. Working with these organizations and other local organizations, she has expanded the K-12 community outreach programs for the department and college. The

Brownie Science and Math Workshop was held March 27 and again on October 23 and is always fully subscribed. In January, TU and the local SWE chapter will host a badge day for older Girl Scouts. November 12 – 13 the student SWE section will host a lock-in for high school Juniors and Seniors. The ChallengeX project also is busy with outreach activities in public schools. The focus of these presentations is the future of transportation with an emphasis on fuel cells. Once again, she and Laura Ford hosted the high school Chem-E car competition in May. This event will be repeated in May 2005. Early inquiries indicate that interest in this event continues to grow.

Christi has been very busy this year as advisor (along with Daniel Crunkleton and others from ME and EE departments) to the ChallengeX team. ChallengeX is the premier national competition for automobile design. This three-year competition will provide us with an opportunity to participate in hands-on research and development with leading-edge automotive propulsion, fuels, materials, and emissions-control technologies. The team has completed simulations of the Chevy Equinox using Matlab-based software donated by the competition sponsors and is currently running simulations with the planned modifications to the vehicle. Year 1 of the competition focuses on simulations and developing the control system. The last two years of this competition will see the students physically making the necessary modifications to meet our team goals. This has proven to be an excellent opportunity for our students to work with an interdisciplinary team on a major design project.

Geoffrey Price's, class schedule last year was ChE 7033 Reaction Kinetics (the core graduate class) for fall, ChE 4013 Lab last spring, and ES 3073 Heat Transfer over the summer. He is currently teaching ChE 7033 again this semester and is scheduled to teach ChE lab again next spring. He is always on call to help out with the Honeywell system for lab and is working on implementation of new experiments.

Geof was invited out to ConocoPhillips in Bartlesville in summer of 2003 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 interested in funding research at TU. This visit culminated in ConocoPhillips awarding \$20,000 for a graduate fellowship for a student working in catalysis and this fellowship has gone to Amit Gujar, a PhD student working in Geof's labs who is nearing completion of his PhD studies. ConocoPhillips has also expressed an interest in providing further funds and equipment for future research work in automotive emission catalysis.

Geof's NSF grant on Zeolite Based Automotive Emission Catalysts expired last year, and the General Motors matching grant expires at the end of 2004. 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 is currently under consideration at NSF.

Geof was asked to write a review paper on solid-state ion-exchange of zeolites which was presented at the ACS meeting last Fall, and a book containing the written review article has been assimilated and will be published in the near future. Another paper and presentation have also appeared recently.

Kerry Sublette organized and chaired the 11th International Petroleum Environmental Conference held in October 2004 in Albuquerque, NM attended by over 300 industry, regulatory, and academic professionals. As usual five TU students were provided

scholarships to the conference and several presented posters or oral papers. 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 \$8.1 million in federal funding through the VA/HUD Appropriations Bill, \$800,000 in matching state funding, and \$2 million in competitive grants. FY05 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 is generating 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" propant 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 was completed in May 2004 on a 7000-ft² research and education building featuring two laboratories, two classrooms, a specimen collection room, library and conference room, two offices, and a student commons area. An existing structure has also been renovated as residential housing. Thus far, over \$2.4 million has been raised for this project. Fundraising is continuing to provide additional operation and maintenance endowments.

Keith Wisecarver taught Natural Gas Plant Design and Chemical Engineering Plant Design (with Frank Manning) as well as Chemical Engineering Lab I (with Laura Ford) and Chemical Engineering Lab II (with Geof Price). He was honored for his teaching efforts with the 2004 Kermit E. Brown Outstanding Teacher Award.

Keith is continuing work on the Fundamentals of Delayed Coking JIP, which is now entering its sixth year. The project has 10 members, including the DOE, and we are looking at hopefully adding several new members this year. More information on this project can be found on the Tulsa University Delayed Coking Project website, www.tudcp.utulsa.edu. In addition to the Delayed Coking project, Keith has become involved with another new Joint Industry Project, the Hydrate Flow Performance JIP, which looks at gas hydrate formation and prevention in multiphase flow lines. The project is currently supporting a Masters student in the Department of Chemical Engineering. Keith is also advising three PhD students and two Masters students on the Delayed Coking project, and graduated three Masters students (Aashit Shah, Ashok Pushpalayari, and Kay Akinmade) in the past year.

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, 2004:

NAME	CURRENT POSITION
Amrella Saeed	Graduating December, 2003
Deidra Roberts	Graduating December, 2003
Mansoor Al-Marri	Graduating May, 2004
Joey Kovar	Graduating May, 2004
Joe McManus	Graduating May, 2004

Undergraduate enrollment in the Department of Chemical Engineering continues to decline but improvements look very promising. We have 2 fewer students this year than last; our prior year's decline was 3. 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 16 for 2003/04 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-five 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 and this is a source of concern, but the number of international students is at a 13 year high. The Middle East still dominates the countries of origin among international students accounting for 70% of those students.

Table 3 shows the distribution of jobs for the December 2003 through December 2004 graduates. All of students who have shown interest in employment have been employed. Most are 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	16
2004-05	14	12	14	12	--	52	

Figure 1. Chemical Engineering Undergraduate Enrollment

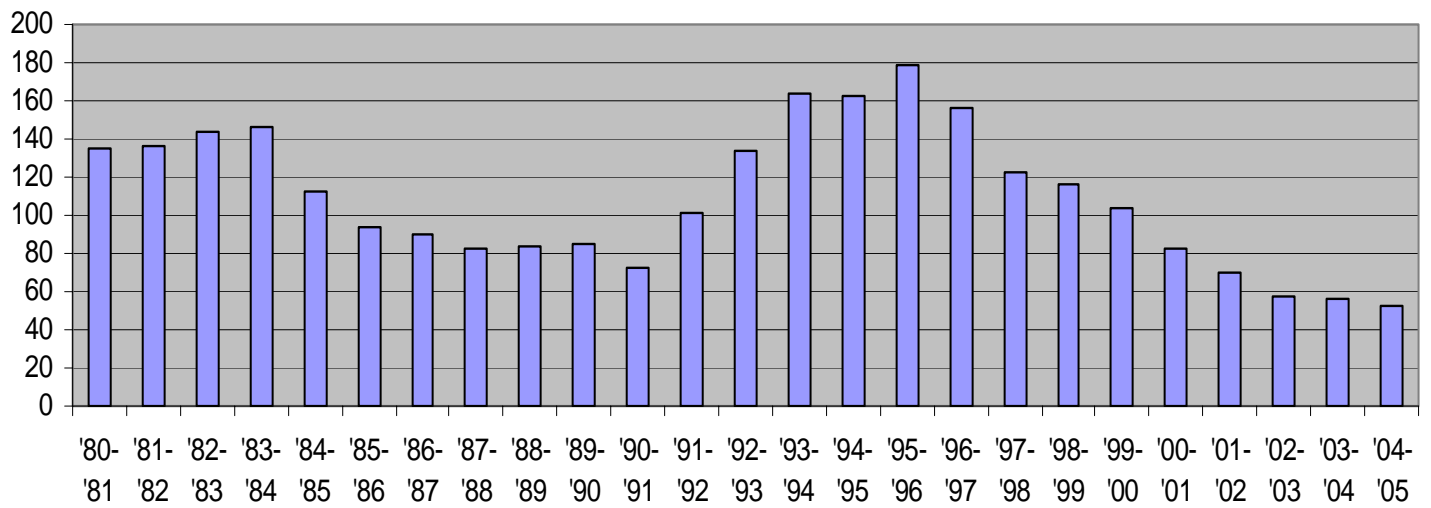


Figure 2. Chemical Engineering B.S. Degrees

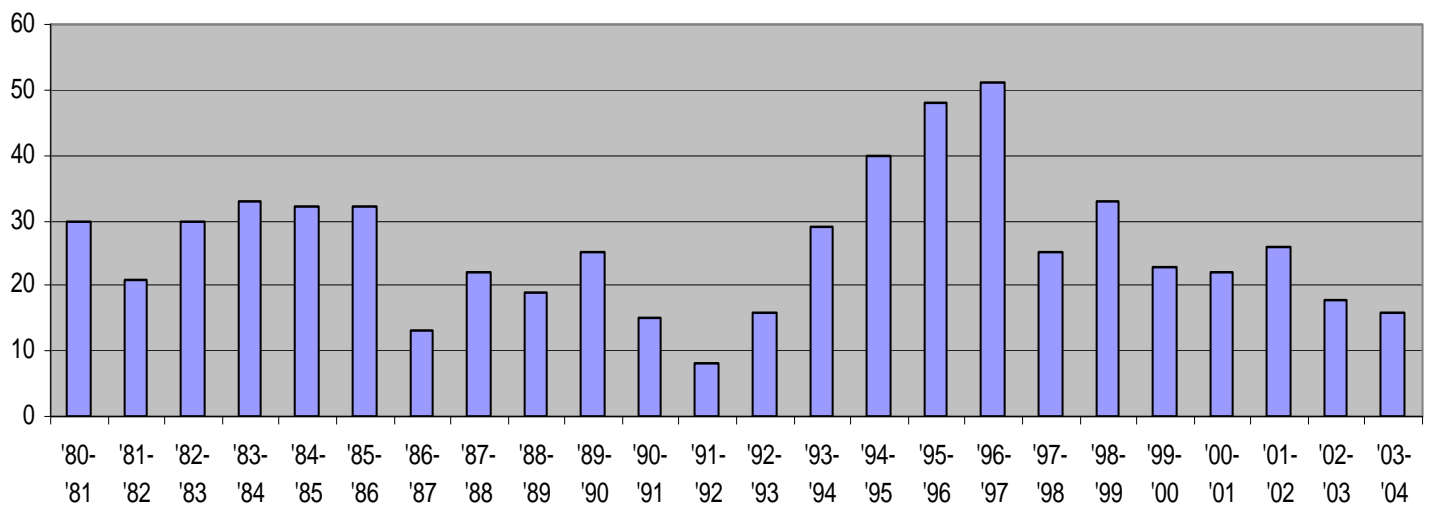


TABLE 2. Undergraduate Student Demographics

<u>Year</u>	<u>Class</u>	<u>Men</u>	<u>Women</u>	<u>International</u>	<u>Total</u>
2004-05	Fr	14	0	4	14
	So	7	5	5	12
	Jr	11	3	3	14
	Sr	<u>9</u>	<u>3</u>	<u>8</u>	<u>12</u>
	Total	41	11	20	52

International Students

	Fr	So	Jr	Sr	Total
Angola		1			1
Germany			1		1
Indonesia	1				1
Iran				1	1
Malaysia			1		1
Qatar	1	2	1		4
Saudi Arabia	1				1
United Arab Emirates	1			5	6
Venezuela				2	2
Vietnam		2			2
Total	4	5	3	8	20

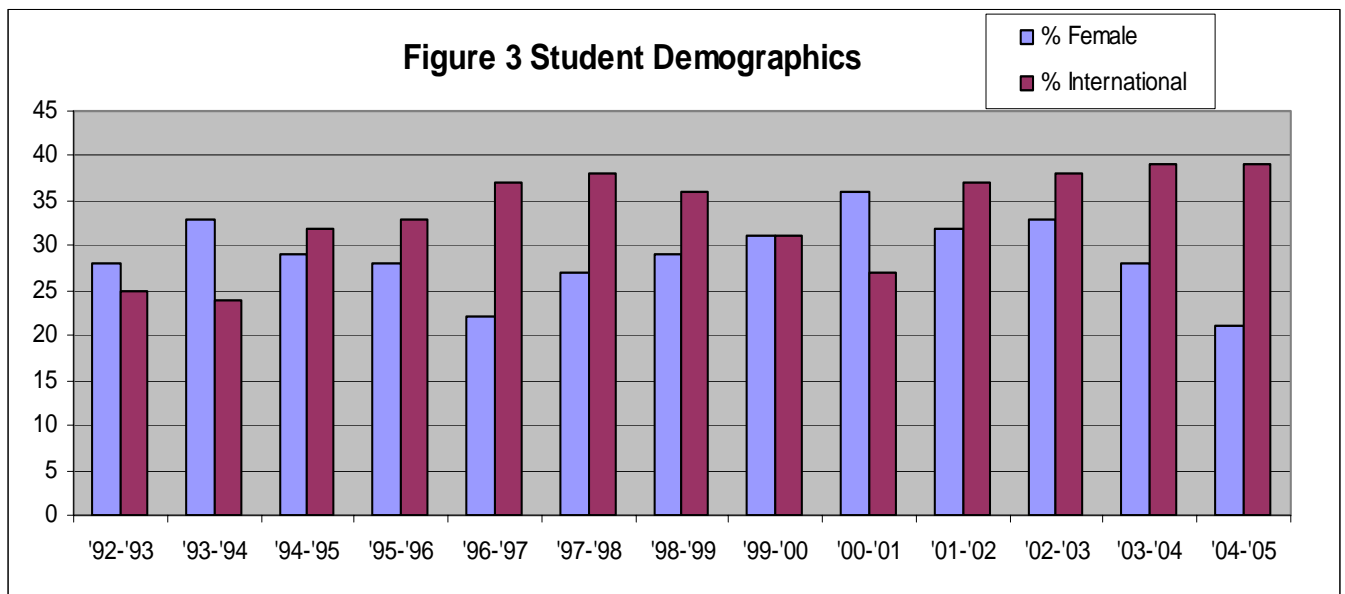


TABLE 3. August 2003 – August 2004 Chemical Engineering B.S. Graduates

NAME	GRAD. DATE	CURRENT PLANS
Al-Gethami, Mesfer	May 2004	
Al-Hosani, Ameen	May 2004	
Al-Marri, Mansoor	May 2004	
Al-Rawahi, Said	May 2004	Schlumberger - Malaysia
Gilbert, Tom	May 2004	Noria – Sioux City, IA
Horn, Susan	Dec. 2003	Ecostar Satellite, LLC – Cleveland, OK
Huang, Amy	Dec. 2003	The Benham Group – Tulsa, OK
Kovar, Joey	May 2004	Sunoco – Tulsa, OK
Lansdown, Meredith	May 2004	Coffeyville Resources – Coffeyville, KS
LeCompte, Joey	May 2004	
McManus, Joe	May 2004	Hughes Baker Centrilift - Wyoming
Roberts, Deidra	Dec. 2003	Tulsa Community College – Tulsa, OK
Roberts, Emily	May 2004	IPEC – University of Tulsa
Saeed, Amrellah	Dec. 2003	Graduate School – University of Tulsa
Shaban, Naji	May 2004	Procter & Gamble – Saudi Arabia
Shafer, Chris	May 2004	Centrilift – Tulsa, OK

TABLE 4. Current Chemical Engineering Seniors

NAME	GRAD DATE
Al-Dhahri, Abdulla	Spring 2005
Al-Mansoori, Khalid	Fall 2005
Al-Mansoori, Saeed	Spring 2005
Al-Marzouqi, Hasan	Spring 2005
Al-Neaimi, Mubarak	Spring 2005
Bishop, Christina	Spring 2005
Brown, Remi	Fall 2004
Clagg, Beth	Spring 2006
Estrada, Miguel	Spring 2005
McVey, Adrienne	Spring 2005
Salemiyan, Abdelabbas	Spring 2005

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 up one student this year. Those who joined us since the last status report include two PhD students from China, seven students from India and one student from China seeking their Masters degrees. 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. The good news for our next semester is that graduate teaching assistantships will go to \$10,000 for Master students and \$11,000 for PhD students. This raise was certainly needed and still needs to be increased.

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	9	0
2004-05	28	2	17	13	30		

* Includes M.E. students

**TABLE 6. 2003-04 Chemical Engineering
Masters and Ph.D. graduates**

M.E. Degree

Abdulahadi Al-Safran
Robert Holderman
Larry Stapley

M.S. Degree

Marjorie Boone
Rohit Deshpande
Saumya Kothari
Atul Kumar
Aashit Shah
Amisha Shrimanker

Ph.D. Degree

TABLE 7. Nature of Graduate Student Body

	Full Time	Part Time	Masters	PhD	Male	Female	International
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%
2004-05	97%	3%	58%	42%	78%	22%	90%

RESEARCH

Research in the department decreased somewhat from last year, as shown in Table 9.

A major decrease was in the DOE part of the delayed coking project, another significant drop was in indoor air quality. Nonetheless, we have had a good year in funding.

**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
2003-04	\$2,692,365

*Numbers based on the University of Tulsa Office of Research 2003-2004 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, 2004 *

P.I.	Source	Title	Amount
<i>Daniel Crunkleton Christi Patton John Henshaw Robert Strattan Doug Jaussame Rosanne Gamble</i>	General Motors	Challenge X: Crossover to Sustainable Mobility	\$10,000
<i>Pat Hall Nancy Felts Kerry Sublette</i>	Department of Energy, National Petroleum Technology Office	10 th Annual International Petroleum Environmental Conference	\$24,999
<i>Laura Ford</i>	National Science Foundation	UHV Studies of Metals Dry-etching with β - diketones, Year 1 of 3	\$65,335
<i>Richard Shaughnessy</i>	Environmental Protection Agency	Tools for Schools Implementation Project, Region 9	\$57,060
<i>Richard Shaughnessy</i>	Environmental Protection Agency	Tools for Schools Implementation Project, Region 6	\$38,020
<i>Richard Shaughnessy</i>	Environmental Protection Agency	Tools for Schools Implementation Project, Region 8	\$45,000
<i>Kerry Sublette</i>	British Petroleum Environmental Technology	Bioactive Absorbents for t-Butyl Alcohol	\$15,000
<i>Kerry Sublette</i>	University of Arkansas	Integrated Petroleum Environmental Consortium (IPEC), Administrative Services, (IPEC Match)	\$38,388
<i>Kerry Sublette</i>	University of Tennessee	Identifying the Signature of Natural Attenuation of MTBE in Groundwater Using Molecular Methods and Bug Traps, (IPEC Match)	\$9,565
<i>Kerry Sublette</i>	University of Tennessee	Identifying the Signature of Natural Attenuation of Microbial Ecology of Hydrocarbon Contaminated Groundwater Using Molecular Methods and Bug Traps, (IPEC Match)	\$9,565
<i>Kerry Sublette</i>	Oklahoma State University	Effective Stormwater and Sediment Control During Pipeline Construction Using a New Filter Fence Concept, (IPEC Match)	\$154,630
<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)	\$217,271
<i>Kerry Sublette</i>	ConocoPhillips	Use of Earthworms to Accelerate the Restoration of Oil and Brine Impacted Sites (Prime: Environmental Protection Agency) IPEC match	\$3,750
<i>Kerry Sublette</i>	Chevron Texaco Energy Research & Technology Co., Environmental Unit	Use of Earthworms to Accelerate the Restoration of Oil and Brine Impacted Sites (Prime: Environmental Protection Agency), IPEC match	\$25,000
TOTAL			\$713,583

*Numbers based on the University of Tulsa Office of Research 2003-2004 Annual Report

GRANTS AND CONTRACTS *CONTINUED* THROUGH MAY, 2004

<i>P.I.</i>	Source	Title	Amount
<i>Keith Wisecarver</i> Michael Volk	Various Companies	Fundamentals of Delayed Coking	\$280,000
<i>Keith Wisecarver</i> Michael Volk	Baker Petrolite	Tulsa University Fundamentals of Delayed Coking Joint Industry Project (DOE match)	\$80,000
<i>Keith Wisecarver</i> Michael Volk	Embassy of the State of Kuwait	Tulsa University Fundamentals of Delayed Coking Joint Industry Project (DOE match)	\$59,982
<i>Kerry Sublette</i>	Environmental Protection Agency, National Center for Environmental Research and Quality Assurance	Integrated Petroleum Environmental Consortium, Year 5 (IPEC)	\$1,218,800
<i>Keith Wisecarver</i> Mike Volk	Department of Energy	Tulsa University Fundamentals of Delayed Coking Joint Industry Project, Year 2 of 3	\$340,000
TOTAL			\$1,978,782

*Numbers based on the University of Tulsa Office of Research 2003-2004 Annual Report

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

PENDING GRANTS AS OF MAY 2004*

P.I.	Source	Title	Amount
<i>Laura Ford</i>	National Science Foundation	Kinetics of Dry-etching Nickel-iron Alloys and γ -alumina-supported Platinum	\$299,988
<i>Laura Ford</i>	Integrated Petroleum Environmental Consortium	Remediation of Brine Spills with Hay (Prime: EPA) Years 3 & 4	\$76,440
<i>Geoffrey Price</i>	National Science Foundation	Novel Methods for Ion-Exchange of Zeolites	\$228,839
<i>Richard Shaughnessy</i>	U.S. Environmental Protection Agency	Tools for Schools Implementation Project Region 6	\$39,000
<i>Richard Shaughnessy</i>	U.S. Environmental Protection Agency	Asthma Project	\$30,000
<i>Richard Shaughnessy</i>	U.S. Environmental Protection Agency	Tools for Schools Implementation Project Region 4	\$50,000
<i>Richard Shaughnessy</i>	U.S. Environmental Protection Agency	Tools for Schools Implementation Project Region 9	\$20,000
<i>Kerry Sublette</i>	Integrated Petroleum Environmental Consortium (IPEC)	Control of BTEX Contamination in Groundwater with Anaerobic Culture Immobilized on Bio-Sep Beads (Prime: Environmental Protection Agency)	\$69,240
<i>Kerry Sublette</i>	Integrated Petroleum Environmental Consortium (IPEC)	Pig for natural Gas Pipelines Capable of Mapping Pipelines and Dispensing Corrosion Inhibitor in Designated Areas (Prime: Environmental Protection Agency)	\$129,125
<i>Kerry Sublette</i>	Composite Engineers	Pig for natural Gas Pipelines Capable of Mapping Pipelines and Dispensing Corrosion Inhibitor in Designated Areas, IPEC match	\$133,000
<i>Kerry Sublette</i>	Integrated Petroleum Environmental Consortium (IPEC)	Assessing Biodegradation Potential Using InSitu Microcosms and ^{13}C -labeled Hydrocarbons (Prime: Environmental Protection Agency) pre-proposal	\$32,875
<i>Kerry Sublette</i>	Microbial Insights	Assessing Biodegradation Potential Using InSitu Microcosms and ^{13}C -labeled Hydrocarbons IPEC match pre-proposal	\$12,000
<i>Kerry Sublette</i>	Integrated Petroleum Environmental Consortium (IPEC)	Developing a Low-cost Approach to Remediation of Historic Brine Scars (Prime: Environmental Protection Agency) pre-proposal	\$67,712
<i>Kerry Sublette</i>	Various Companies	Developing a Low-cost Approach to Remediation of Historic Brine Scars IPEC match pre-proposal	\$25,320
<i>Kerry Sublette</i>	Integrated Petroleum Environmental Consortium (IPEC)	Toward Improved Monitoring and Control of Microbiologically Influenced Corrosion (Prime: Environmental Protection Agency) pre-proposal	\$52,485
<i>Kerry Sublette</i>	Integrated Petroleum Environmental Consortium (IPEC)	Toward Improved Monitoring and Control of Microbiologically Influenced IPEC match pre-proposal	\$3,210
<i>Kerry Sublette</i>	Integrated Petroleum Environmental Consortium (IPEC)	Nematodes as Ecological Indicators of Soil Ecosystem Restoration at E&P Sites (Prime: Environmental Protection Agency) pre-proposal	\$53,256
<i>Kerry Sublette</i>	Integrated Petroleum Environmental Consortium (IPEC)	Toward Improved Monitoring and Control of Microbiologically Influenced IPEC match pre-proposal	\$14,000
<i>Kerry Sublette</i>	Integrated Petroleum Environmental	Analysis of MTBE and TBA Biodegradation Potential and Remediation of MTBE and TBA	\$183,891

	Consortium (IPEC)	contaminated Aquifers using a New Generation of Bio-Sep (Prime: Environmental Protection Agency) pre-proposal	
<i>Kerry Sublette</i>	Various Companies	Analysis of MTBE and TBA Biodegradation Potential and Remediation of MTBE and TBA contaminated Aquifers using a New Generation of Bio-Sep IPEC match pre-proposal	\$39,705
<i>Kerry Sublette</i>	ConocoPhillips	Microbial Treatment of Mixed Waste Gases Containing Hydrogen Sulfide and Sulfur Dioxide	\$437,915
<i>Kerry Sublette</i>	Environmental Protection Agency	Integrated Petroleum Environment Consortium (IPEC), Year 6	\$871,900
<i>Kerry Sublette</i>	National Science Foundation, Industry/University Cooperative Research Centers	Collaborative Research: Linking Biodegradation Processes to Specific Microbial Populations in Aquifer Communities	\$87,228
TOTAL			\$2,957,129

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

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