

Annual Report 1975-76

SCHOOL OF CHEMICAL SCIENCES

Biochemistry, Chemical Engineering, and Chemistry

December, 1976

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*Sections taken largely from reports of committee chairmen (or equivalent).

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Preface

My preoccupation last summer with the work of the NAS/NRC Panel on Atmospheric Chemistry, along with the fact that an annual report is no longer required by the University, led me to postpone my review and editing of the material presented herein. In fact, I almost opted not to. However, the task does give an overall view that is useful to me and which I wouldn't acquire as thoroughly without it. So it's a case of better late than never. In particular, the statistical information is necessary for planning purposes.

Although some of the contents are already dated by my delay in completing the report, there is much that is still timely and at least potentially of interest to many of our faculty and staff. I have incorporated and identified most of the reports submitted by the chairmen of various of our School and departmental committees, and distribution of this report may therefore serve to help keep our faculty and staff informed about our diverse activities.

December, 1976
Urbana, Illinois

H. S. Gutowsky
H. S. Gutowsky
Director

Highlights

Faculty and Staff - Professor H. R. Snyder, in organic chemistry, retired at the end of the fall semester (December 31, 1975) after 40 years as a member of the faculty.

Three assistant professors joined the faculty beginning with the 1976-77 academic year: Walter F. Mangel (biochemistry, a new position in SBMS), Mark A. Stadtherr (chemical engineering), and William G. Breiland (physical).

Four persons have been appointed to academic/professional positions during the year: Beata Boenig, Spectroscopist in the Molecular Spectroscopic Lab, January, 1976; Larry Brayton, Spectroscopist in the Mass Spectrometer Lab, November, 1975; Robert Larsen, Electronics Research Engineer in the Electronics Shop, August, 1976; and Eileen Duesler, Research Chemist (X-ray crystallographer), a new position to provide a crystal structure determination service, August, 1976.

Awards and special external recognition of our faculty during 1975-76 include the following: In biochemistry, H. E. Conrad was appointed as an Associate Member in the Center for Advanced Study; and Michael Glaser and Daniel R. Storm were recipients of five-year USPHS Career Development Awards. In chemistry, J. C. Bailar, Jr. was recognized as 'A Giant in Chemical Education' by that Division of the ACS and was named an honorary member by the Illinois State Academy of Science; T. L. Brown gave the Boomer Lectures at the University of Alberta; W. H. Flygare was awarded an honorary D.Sc. degree by his alma mater, St. Olaf College and was Centenary Lecturer of the Chemical Society, England; G. P. Haight, Jr. received a Chemistry Teacher Award of the Manufacturing Chemists Association; Jiri Jonas was appointed an Associate Member of the Center for Advanced Study; H. A. Laitinen received the Gold Medal of the Society of Organic Chemical Manufacturers Association for his environmental chemistry research; H. V. Malmstadt, the Fischer Award in Analytical Chemistry of the ACS, and Venable Lecturer at the University of North Carolina; and R. A. Marcus, a Humboldt Foundation Senior U. S. Scientist Award.

Students - Undergraduate enrollments (majors) in the biochemistry program continued to increase (now 183, from 165); and in addition, there was a sharp increase in chemical engineering enrollments for a second year in a row, now up to 297 from 233, including over 30 women. The increased enrollments in chemical engineering are straining the facilities and resources available to handle them. Graduate recruitment for 1976-77 admission was exceptionally good in chemistry (91) and the total graduate enrollment of the School will be over 430 in the fall.

Industrial recruitment of our graduates seems to have stabilized on an upward trend after large fluctuations in 1974-75. The job market continues to be brightest for chemical engineers; however, those few persons combining an M.B.A. with a baccalaureate degree in chemistry are in even greater demand. Starting salaries for women appear to be somewhat greater than those for men. In general, the placement of our graduates continues to be good compared with many disciplines; the choice of positions is not as great as it once was, but few are left without something.

Elijah Johnson, a graduate student in theoretical chemistry, received the first fellowship award (\$5,000) of the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers.

Instructional Program - The recent movement toward separation of lectures and laboratories into different courses reached its completion with the elimination of the laboratory part of Chem 103. Students in that course will normally take Chem 104 or 106 for laboratory experience. The foreign language requirements for the PhD in biochemistry, inorganic chemistry and analytical chemistry were reduced to a requirement of two years of college credit (no examination to be taken here) in French, German, or Russian.

In the general chemistry program, there is a great deal of effort underway to consolidate and improve upon the many changes recently made. During the year such activities included: comparative testing of students in videotape versus live lecture sections, completion and/or revision of videotapes, restructuring of laboratory work to take advantage of its separation from the lectures, major revision of placement and proficiency exams and related policies, and the start of a two-year schedule to convert Chem 100 as much as possible into a PLATO format to see if it is a cost-effective way to meet the needs of the students in the course.

Two steps were taken to address the fact that 75% or more of our chemistry graduates end up taking positions in industry without learning much in their programs about the nature of industrial careers. Peter Beak organized a special topics course, Chem 433, Research in Industry, given in the fall semester. Early in the course, Dr. J. K. Stille from the University of Iowa presented a series of ten lectures on the fundamentals of industrial and polymer chemistry. This was followed by eleven weekly lectures from industrial speakers active in chemical roles. The program attracted a good deal of interest among our students and staff and its beneficial effects were visible to industrial recruiters interviewing here near its end. The second step was the inauguration of a cooperative program with Monsanto Co. (St. Louis) for the summer employment of graduate students. Three entering graduate students participated in the 1976 summer, and it is hoped to extend the program to a larger number of students (and other companies) as well as to faculty next summer.

Efforts to encourage better teaching by faculty and TAs continued throughout the year. The ad hoc Committee on the Evaluation of Instruction administered our own CEQ's (devised by the Committee) to students in all sections of all courses and analyzed the results. Normative data of this sort are now required by the LAS College and the campus administration in the consideration of any faculty members for promotion. The Committee also selected two faculty, John M. Clark, Jr. and D. E. Applequist, and two TAs, Kenneth J. Christy and John A. Breese, for \$500 outstanding undergraduate teaching awards made by the School, with funds from Eastman Kodak Co. and DuPont Co.

Budgetary Problems - Financial concerns continued to become more acute. Fellowship and traineeship support of graduate students continued to drop. Outside support in constant dollars has leveled off. Enrollments for 1976-77 have gone back up again while those in the LAS College dropped 6% as a whole. The Chemistry Library has had to cut back on its acquisition of periodicals as well as of books. Operating costs of research services and laboratory remodeling have had to be charged to research grants. An historical analysis shows that since 1969-70, the School's fraction of the LAS budget has remained virtually constant while its fraction of the LAS instructional load has increased by 35%. If our fraction of the LAS budget had remained in proportion to our fraction of IUs, we would have \$1.4 million more in our state budget for 1976-77. We are getting screwed, and there's no enjoyment in it.

Alumni - Two of our alumni received Illini Achievement Awards of the Alumni Association at the May, 1976 commencement (out of three given!): Carl S. Marvel (PhD, 1920), a member of our faculty for 40 years and at the University of Arizona since 1961; Arthur W. Sloan (B.S., 1922), Founder and President of the Atlantic Research Corporation.

Five of our alumni and a former faculty member received major, annual national awards of the American Chemical Society: Daryl H. Busch (PhD, 1954) of Ohio State, the Award for Distinguished Service in the Advancement of Inorganic Chemistry; Lealyn B. Clapp (PhD, 1941) of Brown University, the Award in Chemical Education; Elias J. Corey (faculty member, 1951-59) of Harvard University, the Arthur C. Cope Award in Organic Chemistry; James S. Fritz (PhD, 1948) of Iowa State, the Award in Chromatography; Thurston E. Larson (B.S., 1932; PhD, 1937) of the Illinois State Water Survey, the Award in Pollution Control; John H. Sinfelt (PhD, 1954) of Exxon, the Award in Petroleum Chemistry. Including the ACS award to Howard Malmstadt, this gives a total of 7 out of the 24 major ACS awards made during the year which went to alumni and/or faculty of the School.

Two alumni received local ACS section awards: John R. McWhirter (B.S., 1959) of Union Carbide, the Jacob F. Schoellkopf Award of the Western New York Section; and Donald E. Woessner (PhD, 1957) of the Mobil Field Research Lab, the W. T. Doherty Award of the Dallas-Fort Worth Section. Eight alumni were the recipients of a variety of other awards.

I. Academic Appointments and Activities

A. Changes

1. Losses

Professor H. R. Snyder, in organic chemistry, retired at the end of the fall semester (December 31, 1975). Other losses in our regular (non-visiting) faculty and academic/professional staff effective during or at the end of the 1975-76 year include the following:

Chemical Engineering

Robert L. Sani, Associate Professor, to the University of Colorado, as Professor of Chemical Engineering and Fellow in the Cooperative Institute for Research in the Environmental Sciences, effective August 21, 1976.

Chemistry

E. Kent Barefield, Assistant Professor, to Georgia Institute of Technology, as Associate Professor, effective August 21, 1976.

School

Ronald W. Anderson, Director, Electronic Services to Balance Technology, Inc., Ann Arbor, Michigan, effective May 4, 1976.

Marilyn Lee Junst, Spectroscopist in the Spectroscopy Lab, married and left community, December 20, 1975.

Paul R. Matejcek, Spectroscopist in the Mass Spectroscopy Lab, to Varian Associates, in early fall, 1975.

2. Additions

Unless otherwise noted, the non-visiting staff additions given here are replacements for earlier losses. Faculty appointments were effective August 21, 1976; academic/professional appointments started as shown.

Biochemistry

Walter F. Mangel, Assistant Professor (new position in SBMS)

Married

Degrees: A.B., University of Illinois, 1963

Ph.D., University of Illinois, 1970

After completing his Ph.D. Dr. Mangel was awarded a 2-year National Institutes of Health Fellowship and worked at Cold Springs Harbor Laboratory in the areas of enzymology and nucleic acid biochemistry. In 1973 Dr. Mangel was a Dernham Senior Fellow in Oncology at the California Division of the American Cancer Society. In 1974 Dr. Mangel embarked on a year of study at the Imperial Cancer Research Institute in London, England.

Chemical Engineering

Mark A. Stadtherr, Assistant Professor

Single

Degrees: B.Ch.E., University of Minnesota, 1972

Ph.D., University of Wisconsin, 1976

Dr. Stadtherr's Ph.D. thesis was written under the direction of Professor Dale F. Rudd on the "Study of the Economic and Technological Structure of the Petrochemicals Industry".

Chemistry

William G. Breiland, Assistant Professor (physical)

Married

Degrees: B.S., University of New Mexico, 1969

Ph.D., University of California, Berkeley, 1975

In 1975-76 Dr. Breiland was a postdoc with the research group of Professor Aaron N. Block at Johns Hopkins University, constructing and using an infrared reflectance spectrometer. Dr. Breiland's Ph.D. thesis was written under the direction of Professor Charles B. Harris on the "Theoretical Models and Experimental Methods for Measuring Spin Coherence in the Excited States of Molecular Crystals".

School

Beata Boenig, Spectroscopist (Molec. Spectr.; January 19, 1976)

Single

Degrees: B.S., University of Illinois, 1976

Larry Brayton, Spectroscopist (Mass Spec. Lab; November 17, 1975)

Single

Mr. Brayton attended the University of Chicago and since 1973 was a Service Engineer with Varian MAT in Springfield, New Jersey.

Robert Larsen, Electronics Research Engineer (Electronics Shop, August 16, 1976)

Married

Degrees: B.S., Michigan State, 1959

M.S., Michigan Technological University, 1967

During the period 1959 to 1970 Mr. Larsen was an Associate Electrical Engineer at Argonne National Laboratories. From 1970 to 1976 he was with The Institute of Paper Chemistry at Appleton, Wisconsin.

Eileen N. Duesler, Research Chemist (X-Ray Crystallography; new position, August 21, 1976)

Married

Degrees: B.S., University of Hawaii, 1966

M.S., University of Hawaii, 1968

Ph.D., University of California at Berkeley, 1973

After completing her Ph.D. Dr. Duesler held postdoctoral fellowships at King's College (1973-74) and the Naval Research Lab (1975-76).

3. Promotions

Faculty promotions were effective beginning with the 1976-77 academic year.

Chemistry

Robert M. Coates (organic), Associate Professor to Professor
J. Douglas McDonald (physical), Assistant Professor to Associate
Professor

School

Charles J. Hawley, Electronics Research Engineer (ERE) to Senior ERE,
in charge of Electronics Shop, effective April, 1976.

B. Visiting Appointees

For 1976 Summer Session

Biochemistry

Bodner, George M., Visiting Lecturer from Assistant Professor,
Stephens College, Columbia, Missouri

Nicoli, Miriam Z., Visiting Lecturer, from Lecturer on Biology,
Harvard University

Chemistry

*Gaul, Margaretmary, Visiting Lecturer (general) from graduate
student, University of Illinois

Kieft, Richard L., Visiting Lecturer (analytical) from Assistant
Professor, Monmouth College, Monmouth, Illinois

Perlson, Bruce D., Visiting Lecturer (physical) from Research
Associate, University of Illinois

Perozzi, Edmund F., Visiting Assistant Professor from Teacher of
Chemistry, Southeastern Christian College, Winchester, Kentucky

For 1976-77 Academic Year

Biochemistry

Nicoli, Miriam Z., Visiting Assistant Professor, Sem. I, from
Lecturer on Biology, Harvard University

Chemical Engineering

*Lang, James J., Visiting Instructor, two-thirds time, second year of
a two-year appointment, graduate student, University of Illinois

*Sheintuch, Moshe, Visiting Instructor, two-thirds time, second year of two-year appointment, graduate student, University of Illinois

Chemistry

*Avery, James P., Visiting Lecturer, Sem. I (analytical), graduate student, University of Illinois

*Chabay, Ruth, Visiting Assistant Professor (general), from graduate student, University of Illinois, second year of two-year appointment

*Gaul, Margaretmary, Visiting Assistant Professor, Sem. I (organic), from graduate student, University of Illinois

*Hadley, Fred J., Visiting Assistant Professor (general), from graduate student, Rice University, first year of a two-year appointment

*Henrickson, Charles H., Visiting Lecturer (general), on leave from Associate Professor, Western Kentucky University

*Jorgenson, Andrew B., Visiting Assistant Professor (general), from graduate student, University of Illinois at Chicago Circle

*Reichgott, David W., Visiting Assistant Professor (inorganic), from graduate student, University of Washington

*Wood, Anne T., Visiting Assistant Professor (general), Sem. I, continuation of a two-year appointment

*These are fixed term appointees not on leave from other positions.

C. Leaves and Special Appointments for 1976-77 (unless otherwise indicated)

Biochemistry

Conrad, H. E., Semesters I and II, Associate Member, Center for Advanced Study

Chemistry

Jonas, Jiri, Semesters I and II, Associate Member, Center for Advanced Study

Secretst, D. H., March 1 - May 31, 1976 (not given in 1974-75 report), Visiting Scientist at Max-Planck Institute für Strömungsforschung, Göttingen

Yankwich, Peter E., In charge of administrator evaluation project of University (half-time)

D. Awards and Similar Recognition During 1975-76**Biochemistry**

Clark, John M., Jr.	Finalist, University of Illinois Outstanding Instructors Award
Glaser, Michael	USPHS Career Development Award, 1976-1981
Storm, Daniel R.	USPHS Career Development Award, 1976-1981

Chemistry

Bailar, J. C., Jr. (emeritus)	Recognized as "A Giant in Chemical Education" by the Division of Chemical Education of the ACS at the Centennial Meeting; named an honorary member, Illinois State Academy of Science
Brown, T. L.	Boomer Lectures, University of Alberta
Flygare, W. H.	Awarded D.Sc. Degree by St. Olaf College; Centenary Lecturer, The Chemical Society, England
Haight, G. P.	Chemistry Teacher Award of the Manufacturing Chemists Association
Hendrickson, D. N.	A. P. Sloan Research Fellowship, 1976-77
Laitinen, H. A. (emeritus)	Gold Medal of the Society of Organic Chemical Manufacturers Association
Malmstadt, H. V.	Fisher Award in Analytical Chemistry of the American Chemical Society; Venable Lecturer at University of North Carolina
Marcus, R. A.	Visiting Professor of Theoretical Chemistry and Professorial Fellow at University College, University of Oxford; Humboldt Foundation Senior U.S. Scientist Award

E. Invited Lectures and Meetings Attended

In addition to the items listed above, a great deal of other professional recognition has been accorded to our faculty. An important component is the giving of invited lectures at seminars, symposia, and colloquia held at other institutions or in connection with meetings of professional societies or groups. The table given below summarizes the extent of such activities. The names of our regular faculty are listed according to department, along with the numbers of invited lectures (Lec.) and also of meetings of professional societies attending (Attend.). Lectures and meetings outside the U.S. or Canada are given as a second digit, where appropriate and where known.

Biochemistry

<u>Name</u>	<u>Lect.</u>	<u>Attend.</u>
Baldwin, T. O.	1	-
Clark, J. M., Jr.	1	1
Conrad, H. E.	1	1
Glaser, M.	-	1
Gumport, R. I.	2	2
Gunsalus, I. C.	11,3	6,2
Hager, L. P.	3	4
Jonas, Ana	1	3
Mangel, W. F.	n.a.	n.a.
Nystrom, R. F.	-	-
Ordal, G. W.	1	1
†Shapiro, D. J.	3	5
Storm, D. R.	1	1
Switzer, R. L.	n.a.	n.a.
Uhlenbeck, Olke	2	2,1
Weber, Gregorio	n.a.	n.a.

Chemical Engineering

<u>Name</u>	<u>Lect.</u>	<u>Attend.</u>
†Alkire, R. C.	8	4
Drickamer, H. G.	2	2
Eckert, C. A.	5	3
†Hanratty, T. J.	4	3
Sani, R. L.	2	2
Schmitz, R. A.	3	2
Westwater, J. W.	2	3

n.a. -- not available

Chemistry

<u>Name</u>	<u>Lect.</u>	<u>Attend.</u>	<u>Name</u>	<u>Lect.</u>	<u>Attend.</u>
Applequist, D. E.	1	-	Leonard, N. J.	8,3	2,1
Bailar, J. C., Jr.	6,1	3,1	Malmstadt, H. V.	3,1	4
Barefield, E. K.	4	3	†Marcus, R. A.	1,19	3,5
Beak, Peter	14	3	Martin, J. C.	9	5
Belford, R. L.	-	2	McDonald, J. D.	1	-
Birks, J. W.	2	1	Melhado, Evan	n.a.	n.a.
Brown, T. L.	11	3	Nieman, T. A.	-	3
Chandler, David	7,1	2,1	Oldfield, Eric	1	-
Coates, R. M.	7	2	Paul, I. C.	1,1	1,2
Curtin, D. Y.	2	-	Pirkle, W. H.	2	1
Drago, R. S.	5	-	Rinehart, K. L.	4	3
†Evans, C. A., Jr.	5	4	Rogers, E. P.	2	2
†Faulkner, L. R.	2	4	Schmidt, P. G.	2	1
Flygare, W. H.	7,10	2	Schuster, G. B.	1	2
Gennis, R. B.	-	2	Secrest, D. H.	1,1	-
Gutowsky, H. S.	5	4	Shapley, J. R.	3	4
†Haight, G. P., Jr.	10,2	3,1	Smith, S. G.	6	1
†Hendrickson, D. N.	3	1	Snyder, H. R.	-	1
Hummel, J. P.	-	1	†Stucky, G. D.	5	4
Jonas, Jiri	10	4	Yankwich, P. E.	3	3
Katzenellenbogen, J.	5	5,1	Yardley, J. T.	-	1,2
Kaufmann, K. J.	2	2			

†These individuals also organized and chaired a symposium or similar event.

F. Other Professional Activities

Two other types of professional activities are summarized in the table given below. The first (Ed. Bd.) of these is service on the editorial boards of journals and other science-related periodicals. The second (Prof.) is membership on the wide variety of advisory panels and committees for professional societies, federal and state agencies and for other institutions; included in this category is service as an officer of a professional society. The numbers of such activities are listed for each faculty member, insofar as they are known.

Biochemistry

<u>Name</u>	<u>Ed. Bd.</u>	<u>Prof.</u>
Conrad, H. E.	-	1
Glaser, Michael	-	4
Gunsalus, I. C.	5	9
Hager, J. P.	2	1
Jonas, Ana	-	2
Nystrom, R. F.	1	-

Chemical Engineering

<u>Name</u>	<u>Ed. Bd.</u>	<u>Prof.</u>
Alkire, R. C.	1	9
Drickamer, H. G.	2	3
Eckert, C. A.	1	-
Hanratty, T. J.	1	2
Sani, R. L.	-	1
Schmitz, R. A.	-	1
Westwater, J. W.	3	4

Chemistry

<u>Name</u>	<u>Ed. Bd.</u>	<u>Prof.</u>	<u>Name</u>	<u>Ed. Bd.</u>	<u>Prof.</u>
Appelquist, D. E.	1	-	Katzenellenbogen, J.	-	1
Bailar, J. C., Jr.	6	1	Leonard, N. J.	2	2
Belford, R. L.	1	-	Malmstadt, H. V.	-	1
Brown, T. L.	2	3	Marcus, R. A.	1	4
Chandler, David	1	-	Martin, J. C.	1	2
Coates, R. M.	1	1	Nieman, T. A.	-	1
Curtin, D. Y.	-	1	Paul, I. C.	1	1
Faulkner, L. R.	1	-	Rinehart, K. L.	3	2
Flygare, W. H.	5	4	Rogers, E. P.	-	2
Gutowsky, H. S.	1	11	Snyder, H. R.	2	-
Haight, G. P., Jr.	2	5	Stucky, G. D.	1	1
Jonas, Jiri	1	-	Yankwich, P. E.	-	3

II. Undergraduate Programs

A. Registration During 1975-76

Given in the table below is a summary, by class, of the number of undergraduate students enrolled in each of the two specialized curricula and in the several programs for S&L majors in the School. The numbers given are averages of the fall and spring enrollments.

	<u>Fr.</u>	<u>So.</u>	<u>Jr.</u>	<u>Sr.</u>	<u>Total</u>
<u>Biochemistry</u>					
32-14&44-06 (majors)	23	9	19	28	79
32-16&46-06 (premeds)	<u>41</u>	<u>24</u>	<u>19</u>	<u>20</u>	<u>104</u>
Totals	64	33	38	48	183
 <u>Chemical Engineering</u>					
32-06 (curriculum)	104	69	66	58	297
 <u>Chemistry</u>					
32-07 (curriculum)	29	29	36	47	141
32-14&44-07 (majors)	14	11	10	18	53
32-16&46-07 (premeds)	45	30	31	22	128
32-18-07 (prelaw)	2	1	0	1	4
32-71 (teaching)	<u>1</u>	<u>1</u>	<u>3</u>	<u>4</u>	<u>9</u>
Totals	91	72	80	92	335

B. Five-Year Enrollment Trends

Comparisons of total registrations by semester in the several major types of undergraduate programs are given below for the past five years. The increase of S&L majors in biochemistry, starting with their inception in 1970-71, has continued. However, this year it is a "real" increase, rather than a shift from the chemistry S&L majors which previously included biochemistry. In addition, there was a sharp increase in chemical engineering enrollments for a second year in a row, again in all four classes, but especially for freshmen. The totals for the School are up accordingly.

<u>Sem.</u>	<u>1971-72</u>	<u>1972-73</u>	<u>1973-74</u>	<u>1974-75</u>	<u>1975-76</u>
<u>Biochemistry - S&L Majors</u>					
I	72	100	134	165	196
II	81	104	137	168	168
 <u>Chemical Engineering - Curriculum</u>					
I	176	160	159	233	322
II	142	152	150	223	280
 <u>Chemistry - Curriculum</u>					
I	160	151	169	147	145
II	134	144	153	131	135

<u>Sem.</u>	<u>1971-72</u>	<u>1972-73</u>	<u>1973-74</u>	<u>1974-75</u>	<u>1975-76</u>	
		<u>Chemistry - S&L Majors</u>				
I	248	292	221	210	207	
II	214	246	173	186	174	
		<u>Totals - All Undergraduate Programs</u>				
I	656	703	683	755	870	
II	571	646	613	708	757	

C. Degrees Granted over the Five-Year Period 1971-76

Degrees granted in the various types of undergraduate programs during the past five years are summarized below. After a sharp increase from a total of a hundred degrees per year in 1969-70 and earlier, to 150 in 1972-75 there now appears to have started another turn upward, due largely to an increase in the degrees in chemical engineering.

<u>No.</u>	<u>1971-72</u>	<u>1972-73</u>	<u>1973-74</u>	<u>1974-75</u>	<u>1975-76</u>	
		<u>Biochemistry - BA and BS Degrees in the S&L Majors</u>				
Aug.	2	2	2	2	0	
Jan.	3	4	1	2	3	
May	<u>10</u>	<u>17</u>	<u>30</u>	<u>34</u>	<u>31</u>	
	15	23	33	38	34	
		<u>Chemical Engineering - BS Degrees in Curriculum</u>				
Aug.	2	0	2	2	2	
Oct.	0	0	0	1	0	
Jan.	10	5	5	7	19	
May	<u>17</u>	<u>30</u>	<u>28</u>	<u>27</u>	<u>30</u>	
	29	35	35	37	51	
		<u>Chemistry - BS Degrees in Curriculum</u>				
Aug.	1	1	1	4	2	
Oct.	0	0	0	2	0	
Jan.	3	4	4	2	4	
May	<u>12</u>	<u>21</u>	<u>36</u>	<u>20</u>	<u>28</u>	
	16	26	41	28	34	
		<u>Chemistry - BA and BS Degrees in All S&L Majors</u>				
Aug.	2	10	2	7	6	
Oct.	0	3	0	0	2	
Jan.	17	10	8	7	5	
May	<u>45</u>	<u>45</u>	<u>28</u>	<u>32</u>	<u>33</u>	
	64	68	38	46	46	
		<u>Totals - All Undergraduate Programs</u>				
Aug.	7	13	7	15	10	
Oct.	0	3	0	3	2	
Jan.	33	23	18	18	31	
May	<u>84</u>	<u>113</u>	<u>122</u>	<u>113</u>	<u>122</u>	
	124	152	147	149	165	

D. Undergraduate Scholarships and Awards*

For the 1976-77 academic year, seven \$500 scholarships were awarded by the School to freshmen entering the University, and planning a professional career in one of the chemical sciences. Of these, two are in chemical engineering and five in chemistry with five being funded from the income of the Roger Adams Fund, one from the Lou Audrieth Fund, and one by a grant from Monsanto.

The Agnes Sloan Larson Awards, in the amount of \$200 each, were presented on February 26, 1976, before the Chemistry 108 class to the five sophomore students whose academic work during their freshman year was most outstanding:

Joel R. Garbow
Paul S. Hummel
Henry A. Kroner
Gary R. Pineless
Gary G. Shull

During the Spring Semester, a number of undergraduate awards based on academic excellence were announced. These are summarized below:

Algernon D. Gorman Prize -	Paul A. Olson
Reynold C. Fuson Award -	Daniel C. Duan
Worth H. Rodebush Award -	Cynthia J. Baits Mark A. Stanish
Kendall Award -	Charles F. Huber
Merck Award -	Charles F. Huber James L. Barbour John T. Schousboe
Am. Inst. of Chemists Award -	Cynthia J. Baits Michael E. Hanley Mark A. Stanish
Alpha Chi Sigma Plaque -	No award
Donald E. Eisele Memorial Award -	Philip L. Bateman
AIChE Scholarship Award -	Thomas Wittrig
Freshmen CRC Handbook Award	Louise H. Allen
Illinois Institute of Chemists Award -	Mark A. Stanish
Harvey H. Jordon Award (Engr. Coll.) -	Mark A. Stanish
Phi Lambda Upsilon Scholarship Cup -	Joel R. Garbow Paul S. Hummel Henry A. Kroner Gary A. Peltz
Elliott R. Alexander Award -	Gary R. Pineless

*Taken largely from report of committee chairman (D. N. Hendrickson)

The following donors supplied scholarships in Chemical Engineering for undergraduate students:

Air Products and Chemicals
Alcoa Foundation
Chrysler Corporation
Marathon Oil Company
Monsanto Company
Standard Oil of California (Chevron Research)
Universal Oil Products Foundation

E. Undergraduate Advising in Chemistry*

The advising committee and the advising office (Ms. Arsons, with the help of Ms. Eriksen and Ms. Seibold) assisted 300 new students to enroll during the summer of 1975 and assisted 302 and 202 students to advance-enroll in the first and second semesters, respectively. Many inquiries (by letter, telephone, and personal visit) by prospective students were handled and several tours of facilities and class visits were arranged for prospective students. The advising office built up a substantial file of catalogs and brochures both on graduate programs in chemical sciences and on undergraduate programs at other Illinois institutions of higher education. The latter is most extensively used by students planning a summer course or odd semester at a different location. During the year with the help of the School's Systems Group, computer files and a program were established to maintain academic records on chemistry undergraduates and to rank the students each semester. The detailed registration summaries compiled each semester for distribution to advisers are now prepared by printout from the computer files; the incidence of errors has decreased considerably.

The advising office and chairman of the advising committee have maintained a close working relationship with the LAS College office, the General Curriculum office, and the Office of Admissions and Records and have acted as liaison for a great many items of business between these offices and the School. During the year the chemistry curriculum and chemistry majors program sheets and the descriptive brochure on SOCS programs were completely rewritten. In a substantial cooperative effort with the freshman chemistry staff, the placement and proficiency examinations and policies for new freshmen have received extensive study and, as a result, a thorough revision. We expect that this revision will greatly improve the placement of new students into the freshman-sophomore chemistry courses. Finally, we are glad to report that the combination of advice given by members of this committee and systematic program checks done in the advising office appears to have been highly successful. The LAS college tells us although there have been many serious cases of seniors in special curricula finding themselves in difficulty because of incorrect advising or information, none of the cases have come from this department.

*From report of committee chairman (R. L. Belford).

III. Graduate Programs

A. Enrollment Trends and Degrees Granted

Graduate enrollment data for the fall semester of the past five years are summarized below according to the department and area of specialization. Spring semester totals are also given. Students registered in absentia are included, of whom there are now only two or three. It is seen that the total graduate enrollment continues to be virtually constant, although compensating changes are visible in some areas.

Total Graduate Enrollments by Department and Area*

<u>Dept. -Area</u>	<u>1971-72</u>	<u>1972-73</u>	<u>1973-74</u>	<u>1974-75</u>	<u>1975-76</u>
Biochemistry	57	69	70	68	75
Chem. Engr.	47	52	52	59	51
Analyt.	38	36	50	53	51
Biophysical	5	6	4	4	4
Inorg.	52	58	60	65	63
Org.	104	101	96	83	82
Phys.	77	70	67	63	67
Ch. Phys.	16	15	12	13	8
Undecided	9	5	8	4	9
T. of Ch.	3	3	2	3	1
Chemistry	<u>304</u>	<u>294</u>	<u>299</u>	<u>288</u>	<u>285</u>
Semester I	408	415	421	415	411
Semester II	385	398	402	403	393

*It is estimated that the total number of graduate students in the School will be about 430 this fall.

The numbers of degrees granted this year are very similar to last year and probably reflect a steady-state total of 65+10 PhD's after the all-time high for 1969-70 (107) and the sharp drop in the succeeding year.

Summary by Department of Advanced Degrees Granted

	<u>1971-72</u>	<u>1972-73</u>	<u>1973-74</u>	<u>1974-75</u>	<u>1975-76</u>
Biochemistry					
MS	16	17	16	14	7
PhD	2	14	6	8	4
Chemical Engr.					
MS	13	16	14	12	15
PhD	9	6	7	7	9
Chemistry					
MS	53	34	29	26	29
*PhD	44	37	58	59	56
Total					
MS	82	67	59	52	51
PhD	55	57	71	74	69

*PhD degrees in chemical physics are included here.

B. Graduate Student Recruitment and Admissions

Biochemistry - In the 1975-76 recruiting year 265 inquiries were received, slightly more than the 245 received last year. The number of completed applications was 65, 11 more than last year. Of these applications 5 were for admission for the MS degree program, and all of these students have accepted admission to the graduate program without financial support. Of the 60 completed applications for the PhD program, 37 were made offers and 13 (35%) have accepted. This is down from the 63% acceptance rate of a year ago. The average GPA of the entering students is 4.76, as compared to 4.47 for the last year's class.

Chemistry - The number of domestic inquiries about graduate work received this year (573) was up by 10% from the remarkably constant number (500+15) during the previous four years. The numbers of foreign inquiries (44 encouraged, 202 discouraged) was about the same as the past two years. The number of completed applications was up for the second year in a row, 295 compared with 267 and 227 in 1974-75 and 1973-74 respectively. Offers were also up, to 180 versus 163 and 139, and the acceptance rate was back at a better level, 48% versus 40 and 54%. The favorable acceptance rate combined with the increased number of applications to give the largest number of incoming students (87 for the fall of 1976) that we have had in ten years.† The increased acceptance rate probably reflects a strong effort on our part to make our stipends more competitive in comparison to other departments often chosen by our applicants, and also more active involvement of a number of faculty in the recruiting efforts. Nonetheless, the fraction of our top fellowship offers (F-1) that was accepted (26%) is not as high as one would like.

A continuing trend that warrants comment is the increasing fraction of applicants that visits the Department before deciding whether or not to accept our offer (37% this year versus 31% last year). The fraction of those visiting who accept is consistently larger (63%, 59%) than the fraction of those not visiting who accept (40%, 31%), but it's not at all clear whether this is because of the visit or because those who visit are those already most likely to accept. In any case, many departments are encouraging visitation by top candidates and paying some or all of the travel expenses. The costs in faculty time are probably greater than the travel itself. We have been suggesting visits only to the top (F-1) applicants, for whom we pay part of the travel costs; however, if other applicants express an interest in visiting we have done our best to make suitable arrangements for them.

School - Students entering in June and August, 1976, and the totals for each of the four years preceding are summarized in the table below for the School as a whole. Overall, the quality of those applying and accepting seemed to be up to the high standards of the past several years. In chemistry the 4.62 GPA average of accepted offers compares favorably with GPAs in 1975-69 of 4.62, 4.54, 4.60, 4.61, 4.60, and 4.54, respectively.

† These statistics are for those offered and accepting some form of financial support. In addition, 3 foreign students who arranged for their own support and 1 unsupported student enrolled. We very seldom have had more than 1 or 2 of these in the past.

Graduate Student Acceptance of Admission Offers*

<u>Dept. -Area</u>	<u>1972-73</u>	<u>1973-74</u>	<u>1974-75</u>	<u>1975-76</u>	<u>1976-77*</u>
Biochemistry	20	27	18	24	18
Chemical Engr.	17	15	24	9	17
Analyt.	7	14	13	9	10
Inorg.	12	12	13	7	15
Org.	22	21	16	22	35
Phys.	14	12	21	19	17
Ch. Phys.	-	2	4	2	3
Undecided	6	11	6	8	9
T. of Ch.	-	-	1	1	2
Chemistry	<u>61</u>	<u>72</u>	<u>74</u>	<u>68</u>	<u>91</u>
Total	98	114	116	101	126

*The 1972-76 figures are actual enrollments, including students entering in February. The 1976-77 data do not include January admissions of which there were 3 this past year. Biophysical students are listed under physical, organic and biochemistry.

The affirmative action aspects of our graduate recruiting are described in Sec. VI.A. In addition, a conscious effort is being continued to reduce the numbers of foreign students admitted; this is because the employment opportunities for foreign students remain scarce. Of the new students receiving financial support from us (117), only 6 are foreign nationals, a level comparable with the last two years and a several-fold factor below the national average.

C. Fellowship and Traineeship Support

1. Fellowship and Traineeship Support - These nonassistantship appointments were held by 114 graduate students this year. As shown by the summary below, this represents a continued drop in fellowship type support for our most outstanding students, from a high of 197 in 1967-68. Many of the earlier federal graduate student support programs (NDEA, NSF and NIH) have either been cut back sharply or eliminated. The drop this year is due to a drop in the number of industrial fellowships, largely because of a drop in acceptance rates by new students during the preceding recruiting season (1974-75).

For the fifth year in a row most unrestricted, industrial grant-in-aid funds were committed for student support to offset the impact of the reductions in federal funding. However, the number of such fellowships was down in chemistry, largely due to a drop in acceptance rate attributable to the stipends offered being too low for students entering in 1975-76. A synopsis of the numbers of students supported by the various programs is given in the table below for the past five years.

<u>Type of Appointment</u>	<u>1971-72</u>	<u>1972-73</u>	<u>1973-74</u>	<u>1974-75</u>	<u>1975-76</u>
NDEA Traineeship	4	3	2	0	0
Natl. Science Foundation					
National Fellow	13	10	8	11	6
Trainee	11	7	4	1	3
U. S. Public Health Serv.					
National Fellow	3	1	0	0	0
Trainee	<u>43</u>	<u>53</u>	<u>52</u>	<u>44</u>	<u>49</u>
	74	74	66	56	58
Institutional Fellowships					
University	24	19	24	21	19
Industrial - Dept.	37	38	39	48	33
Other	<u>3</u>	<u>5</u>	<u>4</u>	<u>0</u>	<u>4</u>
Total	138	136	133	125	114

The distribution of these appointments among the three departments in 1975-76 is given in the next table.

<u>Department</u>	<u>NSF</u>	<u>NIH</u>	<u>Univ.</u>	<u>Indust.</u>	<u>Total</u>
Biochemistry	1	30	2	0	33
Chemical Engr.	3	0	1	9	13
Chemistry	<u>5</u>	<u>19</u>	<u>16</u>	<u>24</u>	<u>64</u>
	9	49	19	33	110

2. Industrial Support - A synopsis is given below, by department, of the industrial donors who have made grants during 1975-76, to support graduate fellowships and/or research. The list does not include the smaller undergraduate scholarship grants listed in II.D. The amounts received total about \$85,000 for chemical engineering and \$100,000 for chemistry, compared with \$55,000 and \$115,000 respectively for the preceding year. Most of these funds are being used for graduate fellowships; however, \$20,000 of the chemical engineering funds were for a young faculty grant, assigned to Mark Stadtherr.

Biochemistry

None

Chemical Engineering

- *Amoco Foundation
- *Atlantic Richfield Foundation
- *Consejo Nacional de Ciencia y Tecnologia
- *Dow Chemical Company
- DuPont Company (Young Faculty Grant)
- *Eastman Kodak Company
- *Exxon Educational Foundation
- Gulf Oil Foundation
- *Granite City Steel Company
- 3M Company
- Phillips Petroleum Company
- *Shell Companies Foundation
- *Standard Oil of California
- *Texaco, Inc.
- *Union Carbide Corporation

Chemistry

American Cyanamid	*Lubrizol
*DOW	*Mobil Oil
DuPont (G in A)	Monsanto (undergrad)
*Eli Lilly & Co.	*Proctor & Gamble
Exxon Education Foundation	Rohm & Haas
*General Electric Co.	Sherwin Williams (seminars)
Hercules	*Union Carbide
	Uniroyal

*These grants are made specifically for graduate fellowships.

D. Postdoctorates

Given below is a five-year synopsis of the numbers of postdoctorates in each department of the School. The numbers fluctuate appreciably during the year as individuals come and go almost at random, so the figures given are the total numbers appointed at some time during each year. There appears to be a downward trend during the past two years.

<u>Department</u>	<u>1971-72</u>	<u>1972-73</u>	<u>1973-74</u>	<u>1974-75</u>	<u>1975-76</u>
Biochemistry	26	20	26	16	16
Chemical Engr.	1	1	2	2	1
Chemistry	<u>49</u>	<u>54</u>	<u>58</u>	<u>52</u>	<u>44</u>
Total	76	75	86	70	61

E. Special Lectures and Seminars

A number and variety of activities related to the graduate research programs of the School took place during the year. They are enumerated below, starting with the three name lectureships sponsored by the School, the John C. Bailar, Ada Doisy and W. A. Noyes lectures.

1. John C. Bailar, Jr., Lecture - The fourth lecturer in this series was Professor E. L. Muettterties of Cornell University, who presented two lectures, "Metal Cluster Catalysis" and "New Dvelopments in Catalysis" on March 2 and 3, 1976.
2. Ada Doisy Lectures in Biochemistry - The fifth annual lectures were held a little late this year, because of scheduling difficulties. In fact, the lecture wasn't given until October 13, 1976. The speaker was Dr. Louis LeLoir, Institute d'Investigations Bioquimicus, Buenos Aires, Argentina, who lectured on "The Role of Lipid Carriers in Polysaccharide Biosynthesis".
3. W. A. Noyes Lecture - This lectureship of many years' standing is sponsored by the local chapter of Phi Lambda Upsilon, the chemistry honor society, with financial assistance from the income of the Fuson Fund. This year's lecture was given on March 25, 1976 by Professor C. "Speed" Marvel on "My 65 Years in Chemistry". Now at the University of Arizona, Tucson, "Speed" was on our organic faculty for 41 years; he "retired" to Arizona in 1961.
4. Sherwin-Williams Seminars - This year is the first of a third three-year grant from the Sherwin-Williams Co. which sponsors our "Seminars in Chemistry Series".

Because of an exceptionally large number of seminars in 1974-75, due to scheduling problems with prominent speakers, only one set of seminars was presented as follows:

Theoretical Organometallic Chemistry

Roald Hoffman, Professor of Chemistry, Cornell University

8 June 1976 "The Bonding Capabilities of Transition
Metal Carbonyl Fragments"

9 June 1976 "Structure and Chemistry of Bis(cyclopenta-
dianyl) ML_n Complexes"

10 June 1976 "The Factors Influencing Metal-Metal
Bonding"

5. Alpha Chi Sigma Krug Lecture - This annual lectureship is sponsored by the AX house, with funds from a bequest by a former member (Louis G. Krug, B.S., Chem. Engr., 1917). The second lecture was given on April 30, 1976 by Professor Henry Eyring of the University of Utah who spoke on "Cancer, Mutation, and Aging".

6. Wednesday Night at the Lab - These popular lectures were instituted by Professor K. L. Rinehart, W. O. McClure and a group of graduate students during the days of student activism, to improve public understanding of chemistry and chemists. After several years the initial impetus wore off and for some time the lectures were "dropped". However, several graduate students reactivated the idea in 1974-75 when two such lectures were presented and three more were given this year, with the help of funds from the DuPont Co. grant-in-aid to the Chemistry Department, as follows:

Paul Meakin, E. I. DuPont, 8 October 1975, "The Effects of Halocarbons on Atmospheric Ozone"

A. D. Webb, University of California at Davis, 5 November 1975, "The Chemistry of Winemaking"

Frank Colton, G. D. Searle Co., 3 December 1975, "The Development of the Pill"

7. Visiting Speakers in Seminars - In addition to the special events summarized above, we continued to have a large number and rich variety of visiting speakers in our several graduate seminar programs as well as several sponsored by one or another of the departments of the School and/or by the local section of the American Chemical Society. They come from a broad cross-section of educational, industrial, and governmental organizations in the U.S. and abroad; many are distinguished scientists who are international authorities in their areas. Others are current or recent PhD's being interviewed for faculty positions.

During the past year there were about a hundred of such seminars by visiting speakers, fourteen presented by visitors from other countries, distributed among the areas as follows, where the first digit gives the numbers of talks by U.S. visitors and the second, by foreign visitors: Biochemistry (17), Chemical Engineering (13, 2), and in Chemistry--Analytical (6), Inorganic (15,3), Organic (14,3), and Physical (18,6).

F. Special Awards to Graduate Students

In addition to the various more usual forms of fellowship and traineeship support summarized in Sec. III.3, two of our graduate students received awards which may merit individual notice. The first graduate fellowship award of the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (\$5,000 from Proctor and Gamble) was awarded for 1976-76 to Elijah Johnson, from Penn State, who is finishing his PhD thesis with David Chandler. The ACS Division of Analytical Chemistry awarded a \$1,000 summer fellowship to James P. Avery, a student of Howie Malmstadt.

IV. Instructional Program

A. Curricular Matters

1. Courses and Curricula Committee* - The foreign language requirements for the PhD in biochemistry, inorganic chemistry, and analytical chemistry were reduced to a requirement of two years of college credit (no examination to be taken here) in French, German, or Russian.

The recent movement toward separation of lectures and laboratories into different courses reached its completion with the elimination of the laboratory part of Chem 103. Students in that course will normally take Chem 104 or 106 for laboratory experience.

Another recent movement has been toward increasing the credit in old courses to reflect more accurately the work required. This year the credits in Chem 342, Chem 344, and ChE 373 were increased from 3 to 4 semester hours each (3/4 to 1 unit), and that in Chem 448 from 3/4 unit to 1 unit. Course outline changes were made where appropriate.

Two of our courses are being crosslisted elsewhere. Chem 245 will be crosslisted as Ceramic Engineering 245, and will probably be taught by that department eventually. Chem 440 is being crosslisted as Biophysics 440.

Revised course outlines have been submitted and approved for ChE 261 and 370.

2. General Chemistry Program[†] - Course development activities continued at a high level in the General Chemistry program. In Chem 100, a course of PLATO lessons is being authored by Ruth Chabay (on a two year appointment from LAS funds); it will be tested and completed in 1976-77. The objective is to replace as much of the traditional instruction as possible with PLATO lessons, to see if the latter can be made "cost-effective". Also, in order to depress enrollments somewhat, credit for Chem 100 has been restricted to those who did not take high school chemistry or who fail the placement test. An experiment with the Keller Plan is being constructed.

Production, evaluation, and improvement of the videotapes used in Chem 101 and 102 continued. The first round of TV tapes for Chem 102X will be finished for fall classes and there was further production of Chem 101 TV tapes. Professors Cohn and Wood made a comparative test of student performance in live versus TV taught sections, which tended to confirm a previous finding of better performance on examinations by students taught in the TV format. Professors Haight and Brown plan a further test in the fall of 1976. During 1975-76 a close working relationship with the Office of Institutional Resources Measurements Division was established through Cohn, Wood and John Enger of that Division. Methods for evaluating testing procedures and comparing effectiveness of teaching techniques are being developed--but typically, all three of the people above left in June.

* Report by committee chairman (D. E. Applequist).

† Adapted from a report by G. P. Haight, Jr.

The developing teaching program for the service courses appears to be in the process of paying off--both in an improved system for teaching our own courses and in the impact on college chemistry teaching elsewhere. Papers at national and regional meetings are becoming a regular staff activity and several ACS section meetings have sought a speaker from this program. Work is in progress to make the TV teaching system a marketable commodity by removing copyright restrictions to the use of tapes elsewhere. Discussions with community colleges have been initiated to see if their programs for transfer students might be tied more closely to ours by the TV system.

The separated laboratory courses (Chem 104, 105, and 106) were installed this year largely through the efforts of Professor Sarapu. Immediate improvement in lab performance and student acceptance has resulted from the separation into distinct courses. The two credit Chem 104 option was not accepted well by off-term students who will take it next fall. This decision was made before the course was given. However, we have found our pedagogical reasons for offering 104 to be well founded, and ways of making it acceptable to engineers and biologists are being explored. Using summer term as a vehicle, we are exploring the use of graduate students as primary instructors in the lab courses. A new lab manual will be published next year, with a comprehensive teacher's guide including statistics on how the experiments were performed.

In the Chem 107-10 curriculum sequence, the score on the placement exam necessary to qualify for Chem 107 was doubled from 15 to 30 as a result of our experience with the course the previous year. This produced a smaller class (200 compared to 300 in 1974-75) with a smaller drop rate and fewer failures. We believe this practice should be continued. Reorganization of material to permit easy transition of fading Chem 107 students to Chem 102 has been undertaken. The courses were taught in a traditional mode and were generally well-received by the students. Treatments of symmetry and nuclear magnetic resonance were included in them as an experiment and the students seemed enthusiastic about them. The Chem 109-110 laboratory courses were completely revamped for 1975-76. A large number of new experiments were introduced and the overall organization changed so that quantitative analysis is done in Chem 109, and qualitative analysis and other experiments (kinetics, synthesis and analysis of a coordination compound, analysis for trace amounts of F^- in water, etc.) are done in Chem 110.

Considerable effort was devoted to advising and placement. A thorough analysis of the current placement exam was made, and correlations between placement exam score and performance in general chemistry were examined. Particular attention was paid to the performance in general chemistry of students who came in with AP credit, or who were advised on the basis of their placement exam score to enroll directly in Chem 109 or Chem 102. These data will help us better advise future incoming freshmen.

A new general chemistry proficiency exam has been designed to be given to all incoming freshmen who score over 35 on the chemistry placement exam, and for others who wish to take it. This exam should provide sufficient information to decide on a student's proficiency in the material in Chem 101, 102, 107 and 108. This exam will provide valuable additional information for use in advising the students, and eliminates the need for the incoming student to choose the specific course in which he wants to attempt to gain proficiency credit. The latter has often been a problem due to the inexperience of the incoming student.

A survey was taken of high school chemistry courses, what they teach and how it is taught, as well as why students having had high school chemistry still must take Chem 100 on arriving here. Also, students were surveyed after one semester of chemistry with us to see whether their perceptions of their high school chemistry course were the same as those of their teachers.

3. Chem 433, Research in Industry - During the 1975 Fall Semester, the Department of Chemistry offered a course which was designed to give an overview of industrial careers in the chemical business. A large majority of our graduate students end up in industry, with little or no exposure to what industry is all about. The purpose of this course was to help remedy this deficiency. The course was offered as a special topics course, Chem 433, Research in Industry, largely through the initiative and efforts of Peter Beak. It consistently attracted audiences of 75 or so, from throughout the School. The course was structured to expose students to a broad spectrum of opinions and attitudes about industrial chemical research. This included the definition of research goals, choice of research problems, economic boundary conditions and desirable individual skills. Early in the course a series of ten lectures was presented by Dr. J. K. Stille of the University of Iowa on the fundamentals of industrial and polymer chemistry.

Thereafter a presentation was made each week by other speakers who are active in industrial research and hold positions ranging from laboratory chemists to senior vice-presidents in their organizations. The guest participants represented a number of companies which recruit chemical science graduates on campus each year. Following each lecture, the speaker was available to talk informally with interested students and staff. The speakers and their topics are listed below:

<u>H. F. Wilson</u> (Rohm & Haas)	"An Overview of Chemical Industry"
<u>B. H. Heise</u> (Union Carbide)	"Economic Boundary Conditions in Industrial Research-Cost Analysis and Marketing"
<u>J. W. Ermantrout</u> (Dow Chemical)	"Research on Chemical Processes"
<u>Dale McCown</u> (3M Company)	"Syntheses of Fluorocarbons: Alternate Syntheses and Scale-Up"
<u>B. B. Molloy</u> (Lilly Research Labs)	"Drug Design, Syntheses and Testing"
<u>K. W. Ratts</u> (Monsanto)	"Chemical Research and Agricultural Products"
<u>T. K. Dykstra</u> (Eastman Kodak Co.)	"Synthetic Substitutes for a Complex Natural Polymer"
<u>D. S. Acker</u> (E. I. DuPont)	"The Chemistry of Fibers: Developing a Successful Fiber"
<u>J. P. Nelson</u> (Amoco)	"Petrochemical Research Catalyst Conversions"

L. C. Cessna
(Hercules)

"Polymers and Materials Research"

L. E. Miller
(Lubrizol)

"Opportunities for Chemists in Industry"

Peter Beak

Summary

4. Cooperative Employment Program with the Monsanto Company - This summer the School of Chemical Sciences and the Monsanto Company have begun a cooperative employment program in which graduate students in the School are employed in the company's main research labs in St. Louis during the summer. The purpose of the program is to make students more fully aware of what industrial research is like. In the summer of 1976 there were three participants, all of whom are students beginning graduate work here this fall. Future plans call for exploring the possibility of faculty as well as continued student involvement in the program.

B. Overall Registration

Comparisons of total instructional units, and, separately, of those in General Chemistry are given below on a semester basis for the 1971-76 period. The main point to note is that enrollments have dropped off after two years of 10%/year increases in 1972-74. The dropping off is largely due to stabilization of total campus enrollments plus reversal of the super-saturated student trend to pre-med programs.

<u>Semester</u>	<u>1971-72</u>	<u>1972-73</u>	<u>1973-74</u>	<u>1974-75</u>	<u>1975-76</u>
<u>Total Instructional Units in All Courses*</u>					
I	22,903	25,198	27,295	26,520	24,955
II	20,775	23,214	25,252	24,116	24,631
Total	43,678	48,412	52,547	50,636	49,586
<u>Instructional Units in General Chemistry</u>					
I	10,112	11,103	11,974	12,174	10,426
II	9,154	10,531	11,420	11,249	11,497
Total	19,266	21,634	23,394	23,423	21,923

* An instructional unit is a student semester credit hour or equivalent (one graduate unit equals four semester hours).

C. Teaching Loads

The drop-off in enrollments during 1974-76, after the sharp increases for 1972-74, has enabled some recovery from the excessive teaching loads for TAs in the two-year earlier period of increased enrollments. This may be seen in the following table which lists the FTE TAs we've used in each semester for the past five years, and gives the ratio of IUs to them.

<u>Semester</u>	<u>1971-72</u>	<u>1972-73</u>	<u>1973-74</u>	<u>1974-75</u>	<u>1975-76</u>
<u>Graduate Teaching Assistants Employed</u>					
I	90.07	92.65	97.31	101.75	92.10
II	<u>79.22</u>	<u>83.90</u>	<u>88.95</u>	<u>88.17</u>	<u>94.19</u>
Average	84.64	88.27	93.13	94.96	93.14
<u>Ratio of Total Instructional Units to FTE Teaching Assistants</u>					
I	254	272	281	261	271
II	<u>262</u>	<u>277</u>	<u>283</u>	<u>274</u>	<u>262</u>
Average	258	275	282	267	267

The ratios of instructional units to FTE TAs do not allow explicitly for changes in faculty size; however, the latter have been small compared with registration changes and with changes in FTE TAs. Therefore, the ratios are a valid indicator of the amount of instruction delivered by faculty and also by TAs in the School, over the period.

The projections for 1976-77 suggest a slight increase (2%) in TA needs, compared with this year. However, the funds budgeted are inadequate, and added funds will be sought; if funds are not available enrollments will be curtailed.

D. Teaching Evaluation*

During 1975-76 the ad hoc Committee on Evaluation of Instruction administered at the close of each semester the SOCS Evaluation of Instruction forms to students in every section of every course. No changes in the administration process were made during the year (which may account for the nearly complete returns). Beginning with the return of average results to instructors for the Fall Semester, instructors were provided with comparison information for each form used; this information consisted of the most applicable aggregate (sometimes all courses using that form, sometimes all courses at a similar level using that form) of results. No changes are contemplated in the content of the forms for 1976-77. It is hoped that the processing can be speeded up.

The Committee served for a second year as the nucleus of the SOCS Committee to select faculty and TA nominees for the campus-wide excellence in teaching award, and also for the four \$500 outstanding undergraduate teaching awards made by the School, with funds provided by the Eastman Kodak Co. and the DuPont Co. John M. Clark was a faculty finalist in the campus competition; he and Douglas E. Applequist received the two School faculty awards for Excellence in Teaching. Teaching assistants Kenneth J. Christy and John A. Breese were the graduate student recipients of School awards.

*Taken in large part from reports submitted by P. E. Yankwich, Chairman of the ad hoc Committee.

V. Services and Facilities

A. Chemistry Library*

The library has faced continuing budget problems which have made it necessary to cut both its collection and to some extent other services. Some restoration of funds late in the year prevented the cuts from being as serious as was first anticipated. Because of the restorations the situation is still not so critical that journals important to faculty cannot be provided either in the Chemistry Library or in one of the departmental libraries nearby. A cut-back in hours has resulted from a variety of causes including difficulty in finding personnel willing and able to serve during holidays.

The Chemistry Library is open 106 hours per week for the use of faculty, staff and students of the School. Staffing the library during vacations and interim periods with non-academic and student help continues to be a difficult problem which affects the service we are able to give our patrons during these times. Hours are 8 am to midnight Monday through Friday, 9 am to midnight on Saturday, and 1 pm to midnight on Sunday.

The collection of 42,034 volumes consists mainly of journals and other serial publications. A total of 1,020 titles are currently being received, an increase of 26 titles over last year. To meet the budget, the library serials department has asked the departmental libraries to decrease their periodical subscriptions by 25% and their continuations by 20%. We are making every effort to maintain the excellence of the collection in spite of this forced cut in the budget. The library is currently receiving microfiche which provides supplementary information to articles appearing in some ACS journals.

During the first eleven months of this fiscal year, the total circulation was 11,581, a decrease of 1.3% from last year. Because the Chemistry Library is used primarily for research, most of the collection consists of journals, reference books and reserve books. Since these are used primarily in the library, the heavy use of these volumes is not reflected in the circulation statistics. The seat count which is taken hourly also shows a decrease this year, probably due to overcrowding and discouragement during time of peak use (10 am, 2-3 pm, 8-9 pm). At any one time, the library can seat only 6.3% of the students and faculty of the School of Chemical Sciences, a condition which reflects our urgent need for more space.

During November, 1975, the Xerox 1000 Copier was replaced by a more efficient Xerox 4000 Copier; and since then (through June, 1976) 113,443 copies have been made. Together with the totals for the old machine, 140,003 copies have been made--an increase of 2.7% over last year. Another indication of the strength and completeness of the collection is the great number of requests from outside sources for photocopies of library materials.

*Section prepared by Ruth Power, the librarian.

B. Placement Office

The industrial employment picture during 1975-76 brightened somewhat from the previous year, at least it was not subject to as many on-again, off-again changes as we had in the previous year. In the fall recruiting schedule, 135 representatives of 92 companies interviewed job candidates here; there were only 6 cancellations. For the spring, there were 108 recruiters from 79 companies, with 18 cancellations.

The employment rate for chemical engineers who are U.S. citizens continues to be excellent. The decrease in traditional jobs in chemical companies has been overbalanced by the creation of new jobs concerned with pollution control and energy sources. The number of offers per job candidate in chemical engineering continued to be about twice that of biochemists and chemists; nonetheless, virtually all of the latter ended up finding suitable employment. A noteworthy point is that several of the graduate students in chemistry have opted to take an M.B.A. degree rather than an M.S. in chemistry. The industrial interest in the M.B.A. is significantly higher than in the M.S.; at least the average monthly salary offered to the former was \$1,426 compared to \$1,233 for the latter!

Once again the Placement Office and Phi Lambda Upsilon co-sponsored two pre-recruiting workshops to acquaint students with the interview process. We were privileged to have several guest participants from various industries share their experiences and advice for the benefit of our students. We have found that our workshops held prior to the fall and spring recruiting periods greatly assist our chemical science students in preparation for interviewing.

In general, student interest in interviewing with employers was high during both recruiting periods. (However, there was either an undersupply of BS chemical engineers or an overabundance of recruiters for them!) On Monday mornings when new schedule sheets were released, students would often be lined up at the office door. To reduce such problems, a quota system was established to insure that every candidate was able to interview at least a few companies selected from those of most interest, without having to get in line in the middle of Sunday night!

Our survey of this year's baccalaureate graduates indicates that their future plans favor employment somewhat more (60/165) than last year (43/149). The data for 1975-76 are as follows:

<u>Baccalaureate Graduates</u>	<u>Chem. Curric.</u>	<u>Science & Letters*</u>	<u>Chem. Engr.</u>
Employed	12	13	35
Graduate/Professional School	17	52	14
No Information	1	4	1
Seeking Employment	4	11	0
Military Service	<u>0</u>	<u>0</u>	<u>1</u>
Totals	34	80	51

*Includes biochemistry and chemistry graduates.

Plans of chemists, biochemists, and chemical engineers completing the PhD degree requirements during 1975-76 are as follows:

<u>PhD Graduates</u>	<u>Chem.*</u>	<u>Biochem.*</u>	<u>Chem. Engr.*</u>
Industrial/Government Employment	22	1	7
Academic Employment	6	0	0
Postdoctoral Research	19	3	2
Foreign, Returning Home or Still Looking	<u>4</u>	<u>0</u>	<u>1</u>
Totals	51	4	10

*Figures include those who worked through our Placement Office (65 out of 69).

The information listed below on monthly industrial salaries accepted by our graduates indicates generally that salaries are up in proportion to inflation (~ 10%). There is considerable variability in the increases for different categories, in part because of the small sample sizes; however, the chemical engineering salaries appear to average a larger increase than the others. It is also of interest to compare the offers to men and women BS graduates, for whom the numbers are perhaps large enough (20 and 15 respectively) to give statistically significant averages. In any case, the average monthly salary offered to the men is \$980 while that to the women is \$1,100. Similar differentials apply to the other degree categories.

<u>BS Graduates:</u>	<u>Salary Range</u>	<u>Salary Average</u>
Chemistry Curriculum	\$1175 - \$ 834	\$1038
Science & Letters Curriculum	1183 - 716	986
Chemical Engineering	1350 - 875	1252
<u>MS Graduates:</u>		
Chemistry	\$1300 - \$1191	\$1259
Chemical Engineering	1480 - 1350	1406
<u>PhD Graduates:</u>		
Chemistry	\$1825 - \$1433	\$1597
Chemical Engineering	1917 - 1625	1778

Six PhD chemists accepted academic employment. Salaries ranged from \$1500 to \$1140 per month for nine months with the average being \$1358.

Plans for the 55 postdoctoral people who had contact with this office during 1975-76 (given below) are very similar to those for 1974-75.

Plans for 1975-1976 Postdoctorates

<u>Dep't.</u>	<u>No.</u>	<u>Indus./ Gov't.</u>	<u>Acad. Emplmt.</u>	<u>Post- doc</u>	<u>No Info.</u>	<u>Looking</u>	<u>Stay UI</u>
Biochemistry	16	0	0	1	5	2	8
Chem. Engr.	1	0	0	0	0	0	1
Chemistry	38	5	2	1	10	7	13

The monthly salary average for the postdoctoral chemists who accepted industrial employment was \$1559, while the salary reported for one of the two academic positions was \$1422 per month for nine months; both of these are about the same as last year (in current \$).

C. Shops and Service Facilities*

During this past year we instituted a new policy regarding user charges for out-of-pocket operation costs of service facilities. This move was made necessary by the ever-increasing pressure on the budget derived from appropriated funds. After extensive discussions, an explicit charge plan was put into effect in each facility. So far these plans seem to be working smoothly; no strongly negative reactions have been felt.

This was also a year for evaluations. The Service Facilities Committee asked the assistance of four ad hoc committees of faculty in evaluating the electronics shop, the molecular spectroscopy lab, the mass spectrometry lab and the machine shop. The evaluations of the first two of these facilities have been completed. The other two evaluations, begun more recently, are still in progress. The evaluations so far completed have been very helpful in calling attention to areas that need improvement, and also in identifying the strong features and particular characteristics of each facility in terms of use patterns and so forth.

The proposal for departmental research equipment submitted to the National Science Foundation last fall requested proton nmr equipment to replace obsolete and worn out equipment. We were fortunate to receive a substantial grant. Two new proton-fluorine nmr spectrometers are presently on order.

D. Safety Activities†

The Safety Committee held no formal meetings during the year. There were two regular chem clean-ups on October 2, 1975 and April 8, 1976, in which the usual 25-30 drums of waste chemicals were packaged and disposed of. The student members of the organic safety committee, who as usual carried out the work of identifying and packaging the materials, deserve our thanks for their effort. In addition, a special chemical clean-up was organized to dispose of toxic, pyrophoric, explosive, and unknown materials. These were taken to the South Farm during February and incinerated.

On the invitation of Jim Glaze of the Division of Environmental Health and Safety, several members of the committee viewed a 22 minute safety movie made by Fischer Scientific entitled "28 gm of Prevention". Since the film seemed to be an effective introduction to safety in the chemical laboratory, it is to be shown in the teaching assistant orientation program this fall.

Eye wash stations were introduced in the General Chemistry Laboratories in the Chemistry Annex by the simple and inexpensive expedient of turning one of two faucets in the sinks upwards and placing an aerator on top. This clever idea was conceived and implemented by Carl Alexander, the plumber, and is already credited with averting an eye injury in an acid splash accident this spring.

*Report of the committee chairman, T. L. Brown.

†Report of Safety Committee Chairman, R. M. Coates.

A review of the accidental injury reports filed during the year indicates that there were three accidents of a sufficiently serious nature to mention individually. The first occurred in the machine shop when Gerald Phillips had the tip of a finger cut off when it became caught in the belt of a drill press on February 6, 1976.

On March 3, 1976 in the Chem 404 laboratory in the Chem Annex a tube containing dimethylphenylphosphinate ($C_6H_5P(OCH_3)_2$) exploded while it was being sealed under vacuum by Steven Suib. He received cuts from flying glass and chemical burns from the splattered contents. John Ziegler, a student, and Dennis Sepelak, a teaching assistant, also received minor cuts in this incident. The cause of the explosion appears to have been condensation of oxygen in the tube from the liquid nitrogen cooling bath. Professor Shapley, the instructor of the course, has stated that this type of accident could probably be avoided by use of a dry ice cooling bath and ensuring that a good vacuum is obtained before sealing.

The third incident occurred on July 2 when a bottle of 40% peracetic acid broke while being labeled by Robert Ellis, a research assistant in biochemistry. The contents spilled upon his forearms and right thigh and resulted in serious chemical burns. Christian Debrunner, working in the same laboratory, received minor burns from the splattered chemical. The actual cause of the breakage remains unclear.

Fortunately there seem to have been no serious consequences from these accidents and the injured appear to have fully recovered. A summary of all the reported accidents is given below:

i. Cuts, bruises, and other minor injuries	32
ii. Chemical burns and accidents	
caustic solutions	3
acidic solutions	4
nickel carbonyl	1
phenyl arsenic dichloride	1
miscellaneous	4
Total	<u>13</u>
Total reported accidents	45

E. Building and Space

During 1975-76 a total of 38 remodeling and renovation projects were financed from School funds. These totaled about \$45,000 which is about \$11,000 less than in 1974-75 and about \$25,000 less than the level preceding that. The major projects last year were the completion of the renovation of the lab bench tops in the Chem 134 lab (\$8,000) and lighting improvements in the crane bay and other Chemical Engineering areas (\$12,000).

With the retirement of Dick Lytle at the end of August, 1975, Cope Hubert became responsible for maintenance and remodeling throughout the School, assuming Dick's duties in addition to his own past responsibilities in Noyes Lab and Chem Annex. Except for some early problems when Cope was on vacation, this arrangement has generally worked out well. The vacation problem seems to be under control now since arrangements have been made for Frank Palmer to assume some of the responsibilities during those periods.

VI. Administration

A. Affirmative Action Program*

In our recruitment of minority graduate students this year, we contacted 33 predominantly black schools by letter and by telephone. Two schools were visited this year--Jackson State and Alabama A and M. The visits were made by Mr. Payne, Mr. Williamson, and Drs. Katzellenbogen and Stucky. Nine of the majority of the other schools contacted both by letter and phone either did not wish to be visited this year or did not have candidates. A number of schools did suggest visitations in future years. The attractiveness of the health-related professions to science majors in these schools continues to severely hamper our ability to attract qualified applicants into careers in the chemical sciences. We received a total of three applications from black minority students. However, only one of these students was admitted for the 1977 academic year and he did not accept the appointment offered.

Our recruitment program has been relatively successful in the past, as evidenced by the fact that it has been used as a model by the Minority Affairs Office of the University and by other departments on campus. Visitation of the schools and particularly the interactions with the faculty in these schools does appear to be important and will continue during the coming school year. Any help that the alumni can give in this direction would also be greatly appreciated. In addition, we hope to improve the effectiveness in the future of the invited lectures and scientific trips of our faculty in recruiting students from the minority schools that we have visited in the past.

The recruitment of women graduate students continued this year. Three years ago, there were only five accepted from some 22 offers; a year ago, 13/33; and, this year, 18/36. About 20% of the graduate admissions in chemistry over the last two years have been women, which is above the national average.

The number of women students in chemical engineering is increasing. In 1975-76 two seniors were women. Twenty-nine freshmen were women. These figures represent a fantastic increase for chemical engineering, as does the fact that two of the graduate students are women. The number of minority members seems to have leveled off. Two seniors are black, the same as a year ago.

B. Financial Support

1. State Support - For several years the annual report has included comments about one feature or another of the state budget that has presented problems. This year's report is no exception. The intense inflationary squeeze on operating expenses reported for the past six years continued in 1975-76, and led to the institution of service charges against research grants (mentioned in Sec. V.C.) for use of the School's shops and service laboratories. It was a case of either cutting back essential general research functions by \$100,000 per year or transferring the charges to research grants and hoping that the latter could "absorb" the levy. The net effect is of course a reduction in the total amount of research being

*Taken largely from a report by the chairman of the School's affirmative action committee, G. D. Stucky.

performed; the transfer of charges simply displaced the cut from one place to another.

Some relief is being provided for 1976-77. The operating budget (wages and expenses) is being increased by about \$50,000 after remaining static at \$580,000 for five years in a row. Also, LAS is "giving back" 4% of the 5% allotment that it has been receiving from the ICR (indirect cost recovery) funds on the School's grants and contracts. This amounts to about \$40,000, which will also help. Although these measures have the right sign for a change, they are at most a small fraction of the deficiencies that have accumulated. In an effort to demonstrate the magnitude of the latter to the LAS College and to the Campus administration, an historical analysis has been developed, starting with 1969-70, of the instructional demands being made upon the School and of the state funds provided to meet those demands, projected through 1976-77. The basic data, in terms of instructional units and dollars, are given in the next table, for the School and for the LAS college as a whole. These figures have been checked with LAS and the differences reconciled; thus, they are "official".

Interpretation of the data is more subjective. For example, the ratio of \$ to IUs for LAS as a whole has lagged behind inflation. Thus, LAS has been "squeezed" along with our School. Nonetheless, it appears that SOCS has fared much worse than the College as a whole. This may be seen in Fig. 1, where the School's budget and IUs are plotted as a fraction of the College totals. The School's fraction of the budget has remained relatively flat, while its fraction of the IUs has increased nearly 35% over the nine-year period. This is shown in the normalized version of Fig. 2, where the fractions for each year have been divided by the fractions for 1969-70. If the School's fraction of the LAS budget had increased in direct proportion to its fraction of the IUs, our state budget for 1976-77 would be \$1.4 million larger!

1969-1977
Budgetary and Enrollment Trends in SOCS and LAS
(1 December 1976)

Exhibit I--Budgetary Data^a

<u>Year</u>	<u>SOCS^b</u>	<u>LAS Total^c</u>	<u>% of LAS</u>	<u>% Change^d</u>
1969-70	2,954,545	18,742,954	15.76	
1970-71	3,237,057	20,958,675	15.44	-2.03
1971-72	3,195,054	20,908,798	15.28	-1.04
1972-73	3,328,321	22,377,004	14.87	-2.68
1973-74	3,555,245	23,108,930	15.38	+3.43
1974-75	3,728,162	24,498,085	15.22	-1.04
1975-76	4,024,385	26,266,452	15.32	+0.66
1976-77	4,165,119	26,810,805	15.54	+1.44
			Net change	-1.40

^aExcludes summer session budget. ^bIncludes Radioisotope Lab. ^cIncludes SOCS, LAS administration, Museum, and all other units in LAS. ^dThis is change in SOCS % referred to its % for previous year.

Exhibit II--Enrollment Data (IU's)^a

<u>Year</u>	<u>SOCS</u>	<u>LAS Total</u>	<u>% of LAS</u>	<u>% Change</u>
1969-70	43,066	511,901	8.40	
1970-71	45,089	531,997	8.48	+0.95
1971-72	43,679	489,610	8.92	+5.19
1972-73	48,411	518,716	9.33	+4.60
1973-74	52,544	530,689	9.90	+6.11
1974-75	50,640	507,196	9.98	+0.81
1975-76	49,586	483,526	10.25	+2.71
1976-77	50,943 ^b	453,838 ^b	11.22	+9.46
			Net change	+33.57

^aCombined data for spring and fall semesters, individual figures for which are given below (except for 1969-70). ^bThe actual IU's for the fall semester plus those projected for the spring by assuming that the spring/fall ratio will be the same as in 1975-76.

<u>Year</u>	<u>SOCS</u>		<u>LAS Total</u>	
	<u>Fall</u>	<u>Spring</u>	<u>Fall</u>	<u>Spring</u>
1969-70	23,300	19,766		
1970-71	24,037	21,052	278,234	253,763
1971-72	22,903	20,776	253,825	235,785
1972-73	25,198	23,213	269,850	248,866
1973-74	27,295	25,249	276,741	253,948
1974-75	26,524	24,116	269,493	237,703
1975-76	24,957	24,629	257,792	225,734
1976-77	25,640	(25,303) ^b	241,951	(211,887) ^b

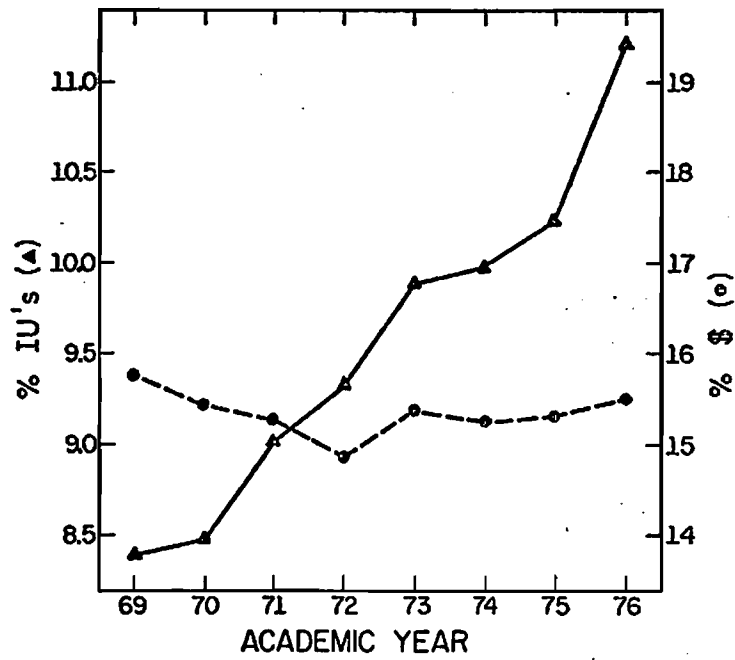


Fig. 1. The SOCS percentage of the LAS College's instructional units (IU's) and state budget (\$)

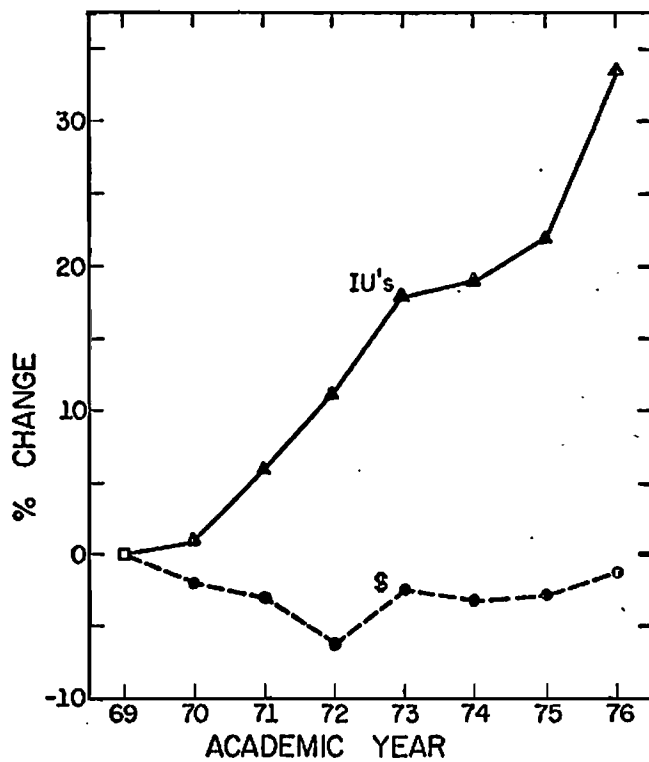


Fig. 2. The change in the SOCS's fraction of the LAS instructional units (IU's) and state budget (\$), referred to the fractions for 1969-70.

2. Outside Support - For a second year in a row, federal and non-state funding was up a modest amount (6%) which is less than inflation for a year. These two years follow several years of net increases by a few percent per year in constant dollars, as may be seen in the synopsis for the six-year period, 1970-76. The distribution of funding sources and the number of grants were relatively unchanged from 1974-75.

SOURCES OF OUTSIDE RESEARCH SUPPORT EXPENDITURES
SIX YEAR SYNOPSIS**

	<u>1970-71</u>	<u>1971-72</u>	<u>1972-73</u>	<u>1973-74*</u>	<u>1974-75</u>	<u>1975-76</u>
NIH Research Grants	1,079	1,162	1,372	1,660	1,686	2,036
NIH Training Grants	274	230	279	208	272	323
NIH Postdoctoral Allowances	3	6	4	4	-	-
TOTAL NIH	<u>1,356</u>	<u>1,398</u>	<u>1,655</u>	<u>1,872</u>	<u>1,958</u>	<u>2,359</u>
Environmental Protection	-	-	80	52	65	-
National Science Foundation	819	1,019	1,126	1,303	1,364	1,426
Materials Research Lab (ERDA)	223	80	88	78	77	67
Materials Research Lab (NSF)	219	288	179	129	175	130
Materials Research Lab (AF)	-	-	-	119	78	46
Army Research Office	54	54	60	75	57	20
Office of Naval Research	45	29	31	27	48	23
Air Force OSR	-	1	15	28	22	29
Department of Agriculture	12	-	-	-	-	-
Department of Interior	23	35	10	-	-	-
TOTAL U.S. GOVERNMENT	<u>2,750</u>	<u>2,904</u>	<u>3,243</u>	<u>3,683</u>	<u>3,844</u>	<u>4,100</u>
Grants from Private Sources	168	204	219	214	232	314
Graduate Research Board	<u>105</u>	<u>233</u>	<u>113</u>	<u>194</u>	<u>193</u>	<u>110</u>
GRAND TOTAL	<u><u>3,023</u></u>	<u><u>3,341</u></u>	<u><u>3,575</u></u>	<u><u>4,091</u></u>	<u><u>4,269</u></u>	<u><u>4,524</u></u>

NOTES:

The data are given in thousands of dollars.

* This column has been revised to correct errors in the report for 1973-74.

** Projections based on first 10 months' actual expenditures.

C. Operations of the Business Office

The major, long-term budgetary problems presented graphically in Figs. 1 and 2 have placed continued demands and stresses upon the administration of the departments and the School, and especially upon the School's Business Office. Difficult decisions have had to be made and unpleasant choices had to be carried out. More detailed and more accurate data about and more careful "policing" of our finances have been essential to our fiscal survival with a minimum of adverse effects upon the quality of our instruction and research. In connection with these needs, the Business Office has initiated and/or carried out a number of studies that have enabled us to survive with less state funding. An example is the restructuring of our storeroom operations over the past five years or so, which has enabled us to reduce (by attrition) the number of storekeepers from 21 in 1970-71 to 16 (including a learner) in 1976-77, for an annual savings in salaries of about

\$60,000 (in current dollars). Moreover, it has enabled us to keep much better track of storeroom withdrawals and the funding thereof, matters probably of greater fiscal importance than the savings in salaries.

In turn, as part of a continuing program of self evaluation of School activities (see Sec. V.C regarding evaluation of service facilities) a general review and study was made in 1975-76 of the SOCS Business Office operations by an ad hoc committee with Professor J. W. Westwater as chairman. The committee made an in-depth study that included two questionnaires of users, the provision of much data on operations by Larry Hess and personnel of the office, and some comparisons with other business offices of similar size and function on this campus or elsewhere. The report includes many details that can't be adequately summarized here. However, a copy of the report is available for inspection in my (HSG) office if you are interested. A significant conclusion is that "on the whole, the Business Office has been very successful in meeting these goals", i.e., those assigned to it.

Other conclusions led to several recommendations for improvement of services to and better communications with users. The most significant of these seems to me to be related to the handling of our School's non-academic personnel matters with the campus Non-academic Personnel Office. These include referrals for hiring, disciplinary and performance problems, reclassifications, promotions, affirmative action, internal or external transfers, and budgetary aspects. In the past, when there was an Assistant to the Director or the equivalent (W. R. Lowstuter, and Ed Cavanaugh before him), he shared with the Business Manager the responsibility for the more sensitive issues. Since then, the Director has assigned most of these responsibilities (except a few crisis cases) to the Business Manager. However, to quote from the report, "It is not widely understood (within the School) that numerous regulations outside the control of SCS, limit the choice of decisions on personnel matters." On the other hand, Toby Kahr (Director of the Non-academic Office) is quoted as saying "Larry is a gifted negotiator...(a) real pusher...He'll push the rules and regulations as far as he can." "I believe that if you didn't have a guy that aggressive in SOCS, you'd be in real trouble." Clearly there is a communications gap within our School and efforts (such as this commentary, or a greater involvement of the faculty in handling non-academic "policy-type" problems) should be made to bridge it.

Another area of concern is the cost effectiveness of the office. After several years of free access to a Burroughs computer in Civil Engineering, we had to start paying (~ \$10,000/year) for computer usage a couple of years ago. The report suggested that "This may not be the optimum or even a stable arrangement." Since then arrangements have been worked out to transfer the data processing to the University ADP system (without charge to us, but with transfer and access problems). Also, steps have been taken to separate the operating budget of the Business Office from other School-level costs, and provide a mechanism for reviewing it periodically. Finally, a more detailed study was recommended of the Systems Group and its functions and a committee chaired by T. L. Brown has been appointed to do so early in calendar 1977.

VII. Alumni*

The School of Chemical Sciences was fortunate in that a goodly number of its alumni, faculty and former faculty received awards or other special recognitions during this academic year. The awards that have come to our attention are listed below, grouped according to the type of award.

University of Illinois Awards

Carl S. Marvel (PhD, 1920), a member of our faculty until 1961 and now Professor of Chemistry at the University of Arizona, was selected by the Alumni Association for an Illini Achievement Award. He was also honored by being selected to give the 1976 William Albert Noyes Lecture on our campus.

Arthur W. Sloan (BS, 1922), Founder and President of the Atlantic Research Corporation, was also given an Illini Achievement Award by the Alumni Association. Only three such awards are given each year, and the School of Chemical Sciences was honored with two of them this year.

Arthur Sloan has donated \$1,000 a year to us for many years to fund the Agnes Sloan Larson Awards to chemistry students with outstanding scholastic records during their freshman year (Sec. II.D). It was a pleasure to have him visit the campus, and also to have Speed back. A coffee hour was held for both of them in the Roger Adams Lab. Speed didn't even have to use his two-headed coin to get his coffee free!

National Awards of the American Chemical Society

Daryle H. Busch (PhD, 1954), Professor of Chemistry at Ohio State University, received the Award for Distinguished Service in the Advancement of Inorganic Chemistry, sponsored by Mallinckrodt, Inc. Dr. Busch also received the Edward W. Morley Medal of the Cleveland Section of the ACS.

Leallyn B. Clapp (PhD, 1941), Newport Rogers Professor at Brown University, received the Award in Chemical Education, sponsored by the Scientific Apparatus Manufacturers Association.

Elias J. Corey, a member of the staff from 1951 to 1959, Professor of Chemistry at Harvard University, received the Arthur C. Cope Award in Organic Chemistry.

James S. Fritz (PhD, 1948), Professor of Chemistry at Iowa State University, was granted the Award in Chromatography, sponsored by Supelco, Inc.

Thurston E. Larson (BS, 1932; PhD, 1937), Assistant Chief of the Illinois State Water Survey and Professor of Sanitary Engineering on the Urbana Campus, received the Award in Pollution Control, sponsored by the Monsanto Company.

John H. Sinfelt (PhD, 1954) of the Exxon Research and Engineering Laboratory, was chosen to receive the Award in Petroleum Chemistry. He also received the Professional Progress Award of the American Institute of Chemical Engineers.

* Adapted from the report of J. C. Bailar, Jr., Chairman of the Alumni Affairs Committee.

Awards Sponsored by ACS Divisions or Local Sections

John R. McWhirter (BS, 1959), a General Manager with Union Carbide at Westport, Connecticut received the Jacob F. Schoellkopf Award of the Western New York Section of the ACS.

Donald E. Woessner (PhD, 1957) of the Mobil Field Research Laboratory in Dallas, has received the W. T. Doherty Award of the Dallas-Fort Worth Section of the ACS for his research achievements.

Awards Sponsored by Other Agencies

William J. Bailey (PhD, 1946), Professor of Chemistry at the University of Maryland, was awarded the Honor Scroll of the Washington Chapter of the American Institute of Chemists.

Dr. J. C. Cowan (PhD, 1938), Adjunct Professor of Chemistry at Bradley University, was selected by the Association Francaise pour l'Etude des Corps Gras as the non-French citizen to receive the Chevrueil Medal for outstanding contributions to better understanding of the chemistry of fats and oils.

Roy Fukuto, who was a postdoctoral Research Associate at Illinois in 1950-51, and is now Professor of Entomology and Chemistry at the University of California (Riverside), was given the Burdick and Jackson International Award in Pesticide Chemistry. Both O. Z. Burdick and W. G. Jackson are Illinois alumni (MS, 1929, and PhD, 1945, respectively).

Corwin H. Hansch (BS, 1940), Carnegie Professor at Pomona College, received the first Smissman-Bristol Award in Medicinal Chemistry. The late Dr. Smissman, for whom the award is named, received his BS degree at Illinois in 1948.

Alan S. Hay (PhD, 1955), Manager of the Chemical Laboratory at the General Electric Research and Development Center in Schenectady, New York, was selected to receive the 1975 International Award in Plastics Science and Engineering of the Society of Plastics Engineers.

Dean F. Martin, a member of our staff from 1959 to 1964, now Professor of Chemistry and Adjunct Professor of Biology at the University of South Florida, received the Florida Award for his work on the "Red Tide".

Klaus D. Timmerhouse (PhD, 1952) was elected President of the American Institute of Chemical Engineers.

Fay V. Tooley (MS, 1936, PhD, 1939), Emeritus Professor of Glass Technology in the Department of Ceramic Engineering at the University of Illinois, has received the 1976 Toledo Glass and Ceramic Award from the Northwest Ohio Section of the American Ceramic Society.