# PROFESSIONAL RELATIONS BULLETIN

**Division of Professional Relations**
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**Washington, DC 20036**

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## FROM THE EDITOR . . .

### Report from Philadelphia

Several interesting discussions occurred at the ACS national meeting in Philadelphia in August. Two had to do with Council size and representation. There is a certain group who feel that continuing growth in Council size is a bad thing. As near as I can gather, the concerns have to do with costs (larger Councils mean more money for free coffee and doughnuts, as well as increased costs for mailings and reproduction of materials, and the like), and with Council "efficiency". The latter seems to mean that a smaller Council wouldn't "waste" as much time with discussion of issues.

I believe that those who propose limiting Council size, or reducing it (one proposal I heard of would reduce the Council by about one third) are not paying sufficient attention to the members' need for representation. Their view of useless discussion may be a misreading of an essential need for democratic discussion and a seeking of concensus. Anyway, there was a lively discussion of these issues at a Council Policy Committee subcommittee meeting on the subject, and further discussion at the Council meeting, with the result that a straw poll vote indicated that the vast majority of Councilors were not in favor of a smaller Council. I don't think this will end here, so keep tuned.

I also attended a meeting of the full Council Policy Committee to discuss our problems with a loss of one Councilor one year, and the inability to regain our second Councilor the next year, even after a very large increase in membership (cf. *Bulletin* No. 33 for earlier details). The discussion centered around the proper interpretation of a part of ACS Bylaw III. The appropriate part reads as follows:

"*(1) Divisions with fewer than 500 members shall each elect one Councilor. Divisions with more than 1200 members shall each elect four Councilors. Divisions of intermediate size shall share the remainder of the Councilors allotted to Divisions with the larger Divisions each electing three Councilors and the smaller Divisions each electing two Councilors.*

"*(2) The number of Councilors authorized for each Division for the ensuing calendar year shall be determined from the number of members of the Division . . . the Council Policy Committee shall change the minimum and maximum cut-off limits of 500 and 1200, respectively, if they become mathematically unworkable.*"

The last sentence is the key. The Bylaws require that Councilor representation from local sections be based on size. After the number of local section Councilors is determined, then the Constitution requires that one-fourth that number of additional Councilors be assigned to the Divisions, in accordance with the bylaws quoted above. Normal variations in size of individual Divisions, coupled with the occasional creation of new Divisions, as well as the quirks of local section Councilor determination, all affect the distribution of Councilors to the individual Divisions. In fact, two or three years ago, the numerical cutoffs specified in (2) above became unworkable, and the upper limit was raised to 1300. The following year, both limits were changed, to 600 and 1500, which is when we lost our second Councilor. We then worked hard and got our membership to well over 600, only to see the limit raised this year to 700 (the upper limit went to 1800).

It is my contention that the Councilors who voted for the bylaws listed above believed that any new limits set by CPC would remain in effect until they, in turn, became mathematically unworkable. In fact, CPC takes a different view. They look only at the numbers in the Bylaw, 500 and 1200. When those no longer work, they feel free to make whatever changes they prefer. In fact, the limits set last year—600 and 1500—*were* workable this year. The newer ones give a more even distribution of Councilors, but the Bylaw does not speak of anything other than mathematical workability, and that condition was still satisfied. In other words, we would have regained a Councilor if my more conservative interpretation of the Bylaws was adopted by CPC. After much discussion, the CPC in essence said that they believed the Bylaw interpretation they have been using is the correct one.

I believe CPC is aware of our concerns, but there is no guarantee that we will not meet the same problem again in the future. We are proceeding with proposing a Bylaw amendment to take care of the problem of instability, but for now, we still have only one Councilor. The only sure way to increase our effect is to increase our *membership* before the December 31 deadline.

In another area, the Council voted to increase the basic allotment to local sections, as well as modify the formula used for per capita payments to the local sections. Arguments were raised that several sections, particularly the smaller ones, were in trouble and needed more money, and that this change would increase the money to the smaller sections by a greater proportional amount than would go to the larger sections. After this passed, the Council then voted on another petition to raise the dues base by $2.00 to provide extra funds for the increased local section allotment. This passed, but it seems to be a sledgehammer approach to the problem. For example, 23% of your dues goes to *C&EN*, so 46 cents of this increase is earmarked for the magazine. In essence, because of a desire to increase money to local sections, *C&EN* gets a larger subsidy. Note that this increase in base (not to take effect this year) does not represent the final dues increase for 1986—the increased *base* may be increased further by Council in setting 1986 dues.

These are the kinds of problems we get into because of a relatively recent Board decision on how ACS programs are to be funded. In essence, they have taken all ACS activities—publications, public relations, professional relations, educational, etc.—and assigned each to a category—100% dues supported, partially dues supported, and those which receive no dues support. This sounds fine, until you realize we are playing a zero-sum game.

Many of the activities of the ACS in the professional relations area are in the 100% dues supported category, so that any attempt to increase these activities requires that other programs be cut back, or that dues be raised.

The ACS is a one hundred million dollar organization. Nine-tenths of the budget is related to Chemical Abstracts and other publishing activities. We have the tail wagging the dog!

### Anniversary Souvenir

The Philadelphia meeting also saw the introduction of a special T-shirt in honor of the tenth anniversary of this Division. It is blue, and exhibits the phrase, "Chemists Do It Professionally," along with the letters D-P-R contained in a suitable chemical structure. The shirts are available for $6.00, post paid, from Fred Owens. Send orders, with checks, to:

Dr. Fred Owens
480 Steamboat Drive
Southampton, PA 18966

Indicate sizes desired—small, medium, large, extra-large.

### Contents

The Division presented its first Henry A. Hill Award to past ACS president and long time professional relations advocate Alan Nixon in Philadelphia. Dr. Nixon's moving remarks are reprinted here. Also included are two more papers from our symposium on supply and demand of chemists, held at the St. Louis meeting earlier this year.

### Commercial

We need more members. Please use the membership forms printed in this issue, or copies thereof, and sign up all your co-workers. Only with a much larger membership can we be sure of regaining our lost Councilor. Besides, this is a friendly group. Bring in your friends.

—Dennis Chamot

# Remarks of Alan C. Nixon on the occasion of the presentation of the Henry Hill Award to him by the Professional Relations Division of the American Chemical Society August 27, 1984

*The Henry A. Hill Award was established this year, the tenth anniversary year of the Division of Professional Relations, to recognize outstanding achievement in the field of professional relations. It honors Henry Hill, distinguished chemist, past president of the American Chemical Society, and pioneer and long-time activist for increased professional relations activities within the ACS.*

*The first recipient of this award is Dr. Alan C. Nixon. Long active in professional relations activities in the ACS, he successfully achieved the presidency as a petition candidate. It can truly be said that his time in office, as well as the three year Board succession, made a real difference in permanently changing the character of the Society. After a lifetime of activity, and with the help of the extraordinary efforts of people like Henry Hill, Dr. Nixon has helped to steer the Society into acceptance of the importance of the* chemist *as well as chemistry. While never downgrading the importance of the Society's many technical and educational programs, he has been a leader in seeking to expand the activities of the ACS to deal directly with the other needs and interests of professional chemists. The fact that such activities are now regarded as routine is to a large extent the result of Dr. Nixon's unflagging efforts.*

*Printed below are the remarks Dr. Nixon made upon receiving the Henry Hill Award during the national ACS meeting in Philadelphia last August.*

**Henry A. Hill**
*ACS photo*

I feel that this is a historic occasion, not because I'm receiving this award, but because the Professional Relations Division is giving this award and—honoring Henry Hill. These two facts make this a unique and important award. I am not the first recipient of the Henry Hill Award; Henry Hill is, I'm just standing in for him. I'm very honored to do that.

Henry was a good friend of mine, he was a good friend to all chemists. He passionately believed that chemists were people worth working for, that chemists were contributing more to this nation and to this world than they were getting credit for.

Henry's life exemplified in a unique way the best aspects of this country and its worst. On the good side is the fact that he could and did overcome. On the bad side it represented a fact we should all be ashamed of. While we point the finger of shame at South Africa we forget that for almost 200 years this country treated its black citizens even worse than South Africa does. And this in the face of a Declaration of Independence that said that all men are created equal. Henry was not as badly off as millions of our black citizens were in the early days of this Republic but his career and his triumph over the conditions that he was born into are a remarkable tribute to our friend and to the best that this country stands for. And that is one reason why it is important that this award honor Henry Hill.

After graduating in 1936 from a small black college, Johnson C. Smith University of Charlotte, N.C., with, I'm sure, less than the best training in chemistry available in the land, Henry successfully got himself accepted by the Massachusetts Institute of Technology, a rather rare thing in those days, and established a brilliant record there, being awarded the Ph.D. in 1942 (they honored him with a D.Sc. in 1961). But in the face of that record and the great demand for chemists he was not able to get a job with any of the large chemical companies. For example, at Dupont, a management type told him they only hired blacks for manual labor. So, he went into business for himself, with some friends, as Atlantic Research Associates.

He was hired by Dewey & Almy in 1946, where he became a Research Supervisor leaving in 1952 to become Vice President of National Polychem and in 1961 leaving to start his own business, Riverside Labs, near Boston.

This sort of program, particularly establishing a successful business, is usually a full time job for anybody under the most favorable circumstances. But he still had the time, the energy and the idealism to involve himself enthusiastically in the governance of the American Chemical Society, which he joined in 1941, and selected the arena of professional relations and economic status as his battlefield. Forty years ago there weren't so many gladiators who were willing to step into that arena because the weapons that they had available were both dull and feeble. Henry followed the traditional route of getting involved in his local section, the Northeastern Section, serving as a councilor in 1960 and from 1962-73, becoming Chairman in 1963, and becoming an effective voice on the council floor and in the ranks of the Professional Relations and Status Committee (from '64-'69 as Secretary and then as Chairman).

While Henry and I did not always see eye to eye, as far as tactics and strategy were concerned, we were always united in the ultimate objective that we were both working for. Henry was an early supporter of the idea of having a Division of Professional Relations, he was an early supporter of Project SEED, he was an early supporter of the idea of having a Committee on Economic Status, so that in all these areas of the members' professional and economic interests Henry was there, always willing to contribute his time and his ideas. The progress that was made during these years toward the establishment of the Professional Employment Guidelines can be traced directly to his ideas and input.

When he was elected to the Board of Directors in 1971 again his desire was to promote the interests of the members of our society and particularly as far as the Board was concerned, to open up its operations to the light of day and draw away the veil that had been drawn around this mystery which was alleged to somehow be working in the interests of the members. One particular mystery which was cloaked in a mass of meaningless mathematics was the financial report of the Society. I'm not sure that he, or I, really achieved our objective there in making the financial report of the Society conform to the ideal that, "Every financial report should be intelligible to the average grandmother" but at least it was revealing enough so that I was able to discover that the Society had $2.7 million in non-interest bearing accounts. Henry was helpful in getting this situation rectified as was Bernie Friedman.

Of course, Henry's crowning and richly deserved final objective to become the first black president of the ACS was achieved in 1976 so that from every standpoint Henry was a sparkling example of a successful chemist. His presidency was marked by forward progress in the area of professional relations, the Division of Professional Relations attaining full status concident with his attaining the presidency—an appropriate conjunction. He was very supportive of the activities of the Committee on Chemistry & Public Affairs, and the Council of Scientific Society Presidents since he deeply felt the obligation of scientists to influence constructively the attitude and actions of government—a field to which he devoted a good deal of his own time and effort. It was unfortunate that his presidency was marred by a prolonged dispute generated by the Chairman of the Board of Directors but Henry overcame that, too, in typical fashion although I do think that it may have contributed to his untimely death in 1979.

His death grieved me very deeply because I felt very close to Henry. I felt a strong bond with him. We always enjoyed each other when we were together. We felt comfortable, we felt happy, we felt we were in communication without having to speak. There is nothing that anybody could have done for me which could touch me more deeply and make me more proud than to give me an award bearing the name of Henry Hill.

**Alan Nixon receiving first Henry Hill Award from ACS president Warren Niederhauser.**
*ACS photo*

# Effects of Federal Policy on Chemist Supply and Demand

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Certainly federal policies and sudden changes in federal policies—and even the lack of any federal policy at all in some cases—constitute important factors affecting the supply and demand of chemical scientists. Abrupt and major changes in policy at the federal level, or dramatic increases or decreases in funding for a new or existing program, can have a profund impact on our entire society, to say nothing of our educational institutions and industrial infrastructure.

However, there are two caveats that should be observed at this point. The first is that federal policies and programs are seldom so discriminating as to distinguish between physical sciences. Indeed, if this were not a meeting of the American Chemical Society, this symposium might be considering the effects of federal policies on the supply of, and demand for, scientists in the broadest context of the word: engineers, mathematicians and technicians.

If it were, I suspect that my remarks would be about the same. Thus, while we, as chemists and members of the American Chemical Society, have a special interest in—and responsibility to—our fellow professionals in the chemical sciences, we must, I think, when discussing federal policies and programs, be more catholic in our perspective. Federal policies that impact one scientific discipline—especially in the physical sciences—will generally impact on related disciplines.

This is not to say that all disciplines are funded equally. They are not—and almost certainly never will be. Studies in high energy physics, fusion research and nuclear research are examples of programs that by their nature require large, specialized, expensive facilities, and large teams of specialists. I should observe that chemistry research frequently requires large, sophisticated and expensive equipment, which must be provided. However, it is unrealistic to contemplate federal policies or programs designed simply to insure the supply of chemical scientists only, as compared to policies to help generate additional scientists, mathematicians, and engineers in all fields; or to increase the scientific literacy of the population in general.

The second caveat is that, when considering federal policies and programs, we should not allow ourselves to fall into the trap of thinking of the federal government as "something else—somewhere else."

While it is obvious that only the federal government can enact policies and programs for the entire country, and that there is no source of money adequate to fund many research programs except the federal treasury, still, the implementation of any successful policy or program that will significantly impact the supply of, or demand for (chemical) scientists must involve all levels of government: our educational institutions and industrial infrastructure, our professional and scientific societies and dozens of other groups, including the press and electronic media and the population of the country.

Federal policies are not created in a vacuum, and they are not implemented in a vacuum. They are generally the product of popular support for a concept, and most of them succeed only to the extent that they have public support and involvement at the local level.

It may be beneficial to recall some of the federal policies and programs that have impacted the supply and demand of scientists most heavily during recent history. At the end of World War II, we were already deep into a program of nuclear weapons production. This was dramatically expanded with the coming of the cold war in 1948. A large number of chemists were involved. For instance, the General Electric Company was the prime contractor at the Hanford Atomic Energy Facility where I was employed. G.E. was a major employer of chemists during this period, and a large number of them were involved in nuclear related programs.

Early in the 1950's the nuclear naval propulsion program came into being with its extraordinary demands for quality assurance. This was followed by the entire new generation of electronic systems based on solid state physics. The transitor was invented in 1948 and this led to a complete new arsenal of non-nuclear weapon systems, along with, of course, Pac-Man, color TV, Star-Wars movies and today's computers.

The 1950's brought the civilian nuclear power program with new fuel and new structural materials. It also saw the beginning of the space program: Apollo planetary research, communication satellites, earth resources satellites, weather satellites, military intelligence systems, space borne astronomy, and now the shuttle. The 1960's saw the beginnings of research on the liquid metal fast breeder reactor, magnetic and inertial confinement fusion and a new generation of very large facilities for high enery physics.

All of these programs were the products of deliberate policy changes at the national level. All of them had a tremendous impact on the demand for, and the supply of, chemical and other scientists.

One of the major pieces of legislation that has had the most impact on our society in the last 15 years was an act that came into being rather unobtrusively in 1969. It was the National Environmental Policy Act. A significant number of all the chemists in this country today are involved in one way or another in work flowing from that Act, and subsequent legal interpretations and expansions of it. In the 1970's came air and water pollution control laws and their subsequent amendments. From these came concern with acid rain and other pollution associated with the burning of fossil fuels. More recently a concern with the hazards of "toxic substances" has developed, and now we have laws attempting to respond to it. At the same time, the Federal Insecticide, Fungicide and Rodenticide Act, and a host of agricultural research programs have had their impact. Throughout this period there has been a growing concern with cancer and increased support of cancer research. Today, it is a major factor in funding chemistry research. New technologies in microbiology and biochemistry have led to a broad new spectrum of medical research. In the area of biotechnology we find interferon, modified enzymes, artificial sweeteners, orphan drugs and many advanced medicines.

Early in the 1970's I initiated a series of new programs through legislation involving solar enery, geothermal energy, alcohol fuels, synthetic fuels, waste recycling, photovoltaics, electric vehicles and a number of new energy conservation technologies. Attempts to manage these programs in a rational manner were swept aside by the enthusiasm of the Carter administration and the Congress of that period, and the programs were funded far beyond any rational research and development level. Many chemists found employment in energy R&D.

With the coming of the Reagan administration, much of this philosophy was completely reversed. Funding for "soft energy technologies" was dramatically cut back. In addition, the Reagan administration set out to eliminate support for science education within the National Science Foundation program. However, this was successfully resisted by the Congress, and the Reagan administration has now changed its position on that issue. The administration also abandoned the Clinch River Breeder Reactor Program, the Synthetic Fuels program and the Magnetic Fusion Act of 1980.

More recently the President has introduced the concept of "star wars"—advanced technology defensive systems against incoming missiles, and has dramatically increased defense spending and research and development funding associated with it. There are many other policy changes along the way—involving patents, copyrights, export controls, the role of the national laboratories (no policy at all?) and many more.

All five agencies—The National Institutes of Health (NIH), the National Science Foundation (NSF), the Department of Energy (DOE), the Department of Defense (DOD), and the National Aeronautics and Space Administration (NASA) demonstrate strong and consistent growth in basic research obligations, and in four instances that growth follows level or even declining real budgets in the four years preceding 1984.

Above all, I believe that it is critical to be aware of the need for consistency in all policy for science. By their nature, science and technology demand long-term planning and preparation, starting early in the educational process and extending into the maturing of young researchers and their integration into the research, academic, or industrial communities. Major facilities may take a decade to develop and may be used for decades more.

The planning cycles for the world of science and technology are far longer than the turnaround times in the political arena, and one of the most serious detriments of good science is what is called rollercoaster funding. Those of us who accept the responsibility for charting the course for government programs in science and technology must also accept the responsibility for clearly articulating—and sticking to—basic principles for guidance. I see this consistency as a major element of science policy, an element that I hope the Administration, Congress, the science community, and the public will be able to maintain in coming years.

There are several pieces of legislation before the Congress that could, if enacted into law, affect the supply and demand for scientists. These have originated in the Congress. One is H.R. 1310, which has been passed by the House and awaits action in the Senate. H.R. 1310 established national priorities in science and mathematics education, and encourages local and state participation through a combination of incentives and assistance. Subject to modification as the legislation process continues, H.R. 1310:

—Authorizes $250M for the next fiscal year to strengthen teacher skills and qualifications, and improve the quality of instruction.
—Authorizes $20M in scholarships for college or university upperclassmen who formally agree to teach in science, math and certain "critical" foreign languages. Two years teaching must be pledged for each school year of scholarship received.
—Authorizes $35M for each of the next two fiscal years for summer institutes and workshops to improve teacher skills. These programs would be administered partially by the Department of Education, and partially by the NSF.
—Authorizes $10M for improvement for post-secondary science, math and foreign language improvement (Not enough! Include community colleges) and $10M for research into more effective methods of teaching these subjects.
—Authorizes $100M in matching funds to help encourage science and engineering students pursue their studies through the doctoral level.

The Glenn-McCurdy bills (S.290 and H.R. 836) would provide tax credits to certain employers for releasing their employees who are qualified scientists, engineers, or mathematicians (and who are qualified as teachers) to teach, without pay, a limited number of hours each week in local schools. Glenn and McCurdy recognize one critical weakness in our existing education system: that it cannot be expected—with its present severe shortage of qualified science and mathematics teachers—to pull itself up by its own bootstraps. They also recognize that this country cannot wait for a generation or more for quality education; that we cannot wait that long to catch up with the rest of the industrialized world, and even with some of the developing nations.

There has been, I think, no other suggested plan that would break the existing condition in which unqualified teachers are passing on to uninspired students unacceptable attitudes toward an understanding of science and mathematics.

There is a third bill. On March 28, 1984, Congressman Don Fuqua, Chairman of the House Committee on Science and Technology, announced his support for H.R. 4475, "The High Technology Research and Scientific Education Act." According to Fuqua, H.R. 4475 is designed to stimulate innovation by U.S. high technology industries by clarifying the definition of qualified research and development (R&D) and by extending current tax incentives.

This legislation makes permanent the R&D tax credit which was enacted in 1981, but which expires next year. It also clarifies the definition of R&D activities which qualify for the tax credit in an effort to eliminate unintended use of the tax credit. It enhances current tax incentives for charitable contributions of scientific equipment to post-secondary schools. As we all know, many of the nation's colleges and universities currently are handicapped by inadequate or outdated equipment for both research and teaching. It expands the current tax credit for corporate funding of basic research conducted at our colleges and universities. The amount of privately funded university basic research, as opposed to applied research, has actually decreased over the last twenty years in the U.S. This provision of the bill should help reverse the trend.

In today's world it's almost impossible for Members of Congress to initiate and enact into law comprehensive programs to provide continuity of supply and demand among scientific professions. It is critically important that professional organizations such as the American Chemical Society assume the responsibility for leadership in such areas. We need "think-tanks for the future." We need close coordination between the ACS, congressional leaders and key members of the Administration.

Until we establish positive programs to dampen the effect of the wild swings in supply and demand, we will be victimized by them.

# EMPLOYMENT TRENDS IN CHEMISTRY AND CHEMICAL ENGINEERING: 1980–1984

John Robert Jones and Terrence R. Russell
Statistical Services
American Chemical Society, Washington, D.C.

Although chemists and chemical engineers still face a labor market far less hospitable than we would like, the 1984 news is essentially good. Opportunities aren't what we wish they were, but they are definitely better than they were a year ago.

Statistics about employment among chemists and chemical engineers are taken from two annual studies conducted by ACS Statistical Services. The first of these is a survey that gathers information from new graduates in chemistry and in chemical engineering, providing data on employment at this crucial step in their careers (ACSa 1980–1983). The other annual study, a survey of ACS members, gives us a reading of employment among experienced chemists (ACSb 1980–1983). Unfortunately, we do not have comparable data for experienced chemical engineers.

## Trends Among New PhD Recipients

The survey of new graduates tells where chemists and chemical engineers go after they complete a degree. First let us consider new PhDs in chemistry. Their employment market has several features that make it difficult to judge the actual demand for new PhDs. For bachelor's degree recipients, a good measure of demand is the percent unemployed. This measure does not tell so much about new doctoral chemists however, because PhDs have several devices that protect them from actual unemployment.

When times are tough, some new PhDs obtain jobs that otherwise might go to master's degree recipients. Others may avoid being unemployed PhDs by the simple device of postponing graduation and continuing to be graduate assistants for a while longer. Finally, doctoral recipients who would prefer permanent jobs sometimes settle instead for postdoctoral fellowship as a second choice.

The percentage of postdoctoral fellows provides a measure of how well the market absorbs new PhDs. Of course, a certain fraction take postdocs as their first choice because these fellowships provide the best opportunity to gain experience doing the particular kind of research they have chosen for their career. On the other hand, some who might otherwise prefer to obtain postdoctoral experience will be lured directly into industrial employment in extraordinarily good times. Despite these ambiguities we can roughly estimate what fraction of new PhDs consider the post-doc their first choice. Table 1 shows that during the past 11 years, postdoctoral fellows have been no less than about one-fourth of graduates. We may conclude that the "excess" greater than one-fourth is due to absence of opportunity for regular employment.

The moderate increases in that fraction in 1982 (when it went from 29% to 31%) and in 1983 (when it went further to 34%) suggest that times were getting tougher. As table 1 indicates, recent years have not been as bad as the middle 1970s, when about half of new PhDs took postdoctoral positions.

Trends in chemical engineering differ strikingly from those in chemistry. An employment market that was very hospitable to new ChEs during the late 1970's and early 1980's changed dramatically in 1983. Still, only one in eight of new doctoral ChEs took a postdoctoral fellowship indicating the relative lack of importance of the postdoctoral fellowship in ChE careers and continuing demand for PhD ChEs.

## Trends Among New B.S. Degree Recipients

Turning to bachelor's degree recipients, we look first at the fraction of new graduates who had not secured employment by the time they received our questionnaire a few weeks after graduation. In 1980, 22% of the new holders of chemistry bachelor's degrees who were looking for employment were unemployed at the time of the survey. Two years later that fraction had risen to 28%, and last year it climbed still further to 31%. If entry level employment is difficult to secure for the holder of a B.S. in chemistry, then what happens to the number of these graduates going to graduate school? Table 2 shows that as employment became increasingly hard to find, graduate school was the choice of an increasing fraction of chemistry bachelor degree recipients.

As among doctoral recipients, the experience of bachelor's degree recipients in chemical engineering contrasts sharply with that of chemists. Until 1982 more than 90% of ChE bachelor's graduates had secured a graduate stipend or employment by the time of graduation. Because of this demand and high starting salaries, a tremendous number of students responded by choosing ChE as their major. Shortly after, demand for petroleum products dropped, depressing the employment market in the industry. The result was that one-fourth of ChE graduates who were looking for employment were unemployed at the time of the 1982 survey and 40% were unemployed at the time of ther 1983 survey. Lack of opportunity for new chemical engineers with the bachelor's degree apparently led some to choose graduate school but it was a far smaller fraction than the B.S. chemists: 16% compared with 32% in chemistry.

**Table 1**

| | Post-Doctoral Fellows As a Percent of PhD Recipients (1) | | Total Number of PhD Recipients (2) | |
|---|---|---|---|---|
| | **Chemists** | **Chem. Engrs.** | **Chemists** | **Chem. Engrs.** |
| 1973 | 40% | 12% | 1872 | 397 |
| 1974 | 43 | 4 | 1823 | 400 |
| 1975 | 48 | 5 | 1822 | 346 |
| 1976 | 49 | 13 | 1621 | 308 |
| 1977 | 43 | 9 | 1568 | 291 |
| 1978 | 33 | 6 | 1521 | 259 |
| 1979 | 24 | 6 | 1516 | 304 |
| 1980 | 30 | 0 | 1545 | 284 |
| 1981 | 29 | 7 | 1622 | 300 |
| 1982 | 31 | 3 | 1708 | 311 |
| 1983 | 34 | 13 | 1680 (Est.) | 320 (Est.) |

(1) **Source:** ACS Starting Salary Surveys

(2) **Source:** National Center for Educational Statistics

## Trends Among Experienced Chemists

Statistics for unemployment among experienced chemists move in step with those for new graduates. Having remained at almost exactly 1% for three years, unemployment among ACS members increased in 1982 to 1.5% and increased further in 1983 to 2.2% (ACSb; 1982, 1983). The 1984 salary survey indicates that on March 1 unemployment among ACS members had decreased slightly to 1.7%.

Because unemployment is a greater problem for younger chemists who are seeking entry positions and older chemists who generally experience longer periods of unemployment than do recent graduates, we studied the age distribution of those ACS members who were unemployed on March 1 of this year and compared that distribution with data from three recent years (1980 to 1984: 1981 data were not available). These results are not exactly the same as those that appear in the published reports of previous surveys (ACSb 1980–1983). Those publications report findings for chemists separately while the preliminary results for 1984 consider all members together instead of separating chemists from chemical engineers.

The age distribution of unemployed ACS members appears in Table 3. Among unemployed bachelor's degree holders the fraction less than 30 years old increased between 1980 and 1984 (from 35% to 41% of the total) while the fraction in each of the older age groups decreased (the 30–50 year-olds from 35% to 30% and those older than 50 from 31% to 29%).

Among M.S. and PhD holders, those over 50 accounted for an increasing percent of the unemployed between 1980 and 1984: from 17% to 35% among master's degree holders and from 25% to 39% among PhDs. Among the unemployed PhDs, the fraction in mid-career also increased between 1980 and 1984 as the fraction less than 30 years old nearly disappeared (dropping from 29% to 2%).

These figures reflect the different nature of the B.S. and PhD employment markets. While entry level jobs are still the scarce ones for B.S. graduates, new PhDs are finding employment in the start-up of R&D activity caused by an improving economy and, as we saw above, they have options in postdoctoral education that are increasingly popular.

The problem for older chemists is not only that they are becoming an increasing percent of those unemployed, but the duration of unemployment for chemists over 50 has increased at every degree level. The duration of unemployment[1] is an indicator of its severity and, by looking at changes in the duration of unemployment for various groups (defined by level of education or by age), we can see how rapidly (or slowly) the employment market is changing in its demand for various types of workers. Among PhDs, on March 1, 1980 the median duration of unemployment was 7 to 8 months for all three age groups. In 1984, the duration of unemployment among PhDs showed no such uniformity across age groups. The older unemployed had been unemployed substantially longer, while duration of unemployment among those under 30 had dropped drastically from 8 months to 2 months.

The trends for older chemists were similar for B.S. and PhD holders, increasing from 3 months to 11 months for B.S. holders and from 3 months to 9 months for M.S. holders. Among mid-career B.S. holders the duration of unemployment decreased somewhat in 1982 and 1983, but in 1984 the figures climbed back to the 1980 level of 11 months.

### Table 2

**Unemployed Graduates As a Percent of Bachelor's Degree Recipients in the Labor Force**

| | Chemists | Chemical Engineers |
|---|---|---|
| 1980 | 22% | 6% |
| 1981 | 23 | 8 |
| 1982 | 28 | 26 |
| 1983 | 31 | 42 |

**Graduates in the Labor Force As a Percent of Bachlor's Degree Recipients**

| | Chemists | Chemical Engineers |
|---|---|---|
| 1980 | 44% | 84% |
| 1981 | 47 | 87 |
| 1982 | 46 | 86 |
| 1983 | 47 | 81 |

**Graduate Assistants and Fellows As a Percent of Bachelor's Degree Recipients**

| | Chemists | Chemical Engineers |
|---|---|---|
| 1980 | 28% | 12% |
| 1981 | 24 | 9 |
| 1982 | 26 | 10 |
| 1983 | 32 | 16 |

**Source:** ACS Starting Salary Survey

### Table 3

**Age Distribution of Unemployed Members by Highest Degree: 1980, 1982, 1983, 1984**

Note: Rows may not total 100% due to rounding error.

**B.S.**

| | Age 29 or Younger | Age 30–49 | Age 50 or Older |
|---|---|---|---|
| 1980 | 36.1% | 40.4% | 23.4% |
| 1982 | 30.0 | 42.9 | 27.1 |
| 1983 | 35.5 | 41.1 | 23.4 |
| 1984 | 41.3 | 30.2 | 17.1 |

**M.S.**

| | Age 29 or Younger | Age 30–49 | Age 50 or Older |
|---|---|---|---|
| 1980 | 38.5% | 42.3% | 19.2% |
| 1982 | 16.6 | 56.6 | 26.6 |
| 1983 | 13.8 | 48.3 | 37.9 |
| 1984 | 31.0 | 34.5 | 34.5 |

**PhD**

| | Age 29 or Younger | Age 30–49 | Age 50 or Older |
|---|---|---|---|
| 1980 | 5.0% | 55.0% | 40.0% |
| 1982 | 6.6 | 60.7 | 32.8 |
| 1983 | 5.3 | 59.6 | 35.1 |
| 1984 | 2.0 | 58.8 | 39.2 |

The continuing lack of entry-level jobs in industry shows itself in the increasing duration of unemployment among BS chemists younger than 30.

In summary, the 1984 survey data indicates that the worst effects of the "1980's recession" have passed, and the rate of unemployment has decreased. Two severe problems remain, however: some older chemists suffer very long periods of unemployment and many new college graduates cannot get started on their careers in a reasonable amount of time.

### REFERENCES

**1980–1983ACSa**
Starting Salaries 1983: Analysis of the American Chemical Society's Survey of Graduates in Chemistry and Chemical Engineering. Washington, D.C., American Chemical Society.

**1980–1983ACSb**
Salaries 1983: Analysis of the American Chemical Society of Salaries of Employment, Washington, D.C., American Chemical Society.

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Duration of unemployment presents some conceptual problems. In the ACS surveys, members who were unemployed on March 1 answered the question "How long have you been unemployed?" Of course, this answer does not tell us how long unemployment generally lasts. To answer that question one would have to ask people how long their spell of unemployment lasted *after* it has ended. Nevertheless, the data available do allow for some informative comparisons.

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