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NEWS AND COMMENT

Scientific Manpower Employment: So Far, It Seems to Be Holding Up

How hard hit by the recession are scientists and engineers? The information now available indicates that they haven't been affected as adversely as other categories of workers. So far—and that "so far" is emphasized by almost everyone who follows scientific and engineering manpower trends—the impact of the current slump has been less severe for scientists and engineers than the big layoffs of the early 1970's. At the same time, there are reports of hard times for some specialties and for some age groups and also increasing signs that the cycle of surplus and shortage of technical manpower is going to continue.

A major caveat about the reasonably steady employment readings for professionals, obviously, is that the layoffs in the automobile industry and the coal strike could presage a further serious downtrend in the economy. During periods of recession since World War II, the percentage of unemployment among scientists and engineers has been consistently lower on a national basis than that of production workers, but that generalization has not been tested by economic dislocations of prewar dimensions.

Currently, demand is strong for engineering graduates entering the job market. This is also true for science graduates with degrees marketable in the energy sector, such as geology, geophysics, and materials science. Government hiring of engineers is up substantially. Much less encouraging are the prospects for middle-aged engineers and scientists with experience in industry now looking for jobs. And competition for faculty jobs in colleges and universities in most science and engineering disciplines is now so fierce that higher education can hardly be considered a major job market, at least for the time being.

One catch in attempting to appraise unemployment trends is the absence of national data on scientists and engineers in industry, where 70 percent of these professionals are employed. Between 1950 and 1970, the Labor Department's Bureau of Labor Statistics (BLS) carried out regular surveys on the employment of scientists and engineers in industry which, although imperfect, did provide an informative general picture of employment of professionals. Support for the surveys came from the National Science Foundation (NSF), which has a statutory responsibility for this sort of manpower data. In 1970 these surveys were discontinued because of plans for a new, comprehensive survey that would include other categories of industrial workers and involve cooperation with individual states in collecting and promulgating data. This super survey immediately ran into trouble with funding, data gathering, and arrangements with the states, and so far only a few pilot surveys have been produced. The upshot is that there are no hard data on employment of scientists and engineers during the recession of the early 1970's and, consequently, there is not much of a basis for judging the present situation. There are plans to carry out a survey of the employment of scientists and engineers in industry next year with NSF sponsoring and the Census Bureau carrying out the survey, but the interregnum has been, at the least, unfortunate.

If employment among scientists and engineers today appears relatively stable, the perspective of the past 5 years should be applied. Starting in 1969, thousands of scientists and engineers lost their jobs in what for these professionals was the worst economic reversal since World War II. The root cause was the cut in federal funding of a wide range of programs which employed scientists and engineers through government contracts. At the same time the general economy was suffering from a combination of stagnation and inflation. The aerospace industry was hit particularly hard, and the chemical industry also had problems that were reflected in the relatively high rate of unemployment for chemists and chemical engineers. One side effect of the shake-out of professionals was a drop of enrollments in engineering and the sciences in universities at both undergraduate and graduate levels.

Now as a consequence the number of degree holders entering the job market is down from previous years and competition to hire them is up. In shortage categories salaries have jumped this year, and the bidding for the ablest graduates is hot.

What seems to be hardening into a cyclical pattern is the interaction between employment and scientific and engineering enrollments which pro-

duces shortages of these professionals at a time when demand has recovered. This spurs enrollment and these graduates in turn emerge in time to be the next crop of superfluous scientists and engineers. The experience of geologists —who 8 years ago were a glut on the market and are now at a premium—is like a bad parody of manpower planning.

Some observers feel that life sciences will be the next discipline to peak at a poor time. Life science has been for the past few years the most rapidly growing scientific field, from the undergraduate to the doctoral level, and the universities and colleges have been expanding programs in life sciences and cranking out people to teach in them. One NSF study shows that, while graduate enrollment in the sciences generally declined 2 percent in 1973, in life sciences it was up 2.2 percent. Another NSF survey shows that the growth in the employment of life scientists in doctorate-granting institutions—about 5.1 percent—accounts for nearly all the growth of employment of scientists and engineers of these institutions in 1974. This at a time when the present and future market for employment of life science graduates seems anything but bullish.

What happened to employment in the early 1970's is indicated by figures the College Placement Council, Inc., keeps on graduates entering the job market. In 1969, only 0.8 percent of engineering graduates, including those with advanced degrees, were unemployed. In 1970 it was 2.4 percent and in 1971, 3.3 percent. By 1972 the percentage of unemployed was down to 1.8 percent and dropping. This year, despite persisting soft spots in disciplines such as aerospace engineering, demand is high. The council in August, in fact, predicted a 7 percent increase in engineering employment over a 12-month period.

Last year, according to the council, there were 43,429 bachelor's degrees, 17,152 master's, and 3,487 doctorates awarded in engineering. Succeeding classes are said to be smaller, but the decline in undergraduate enrollment has reportedly bottomed out, with freshman enrollment in engineering up an estimated 11 percent last year.

Information on the current employment situation from professional societies tends to be fragmentary. The American Chemical Society (ACS) is generally regarded as keeping the closest tabs on both employment status and salaries of its members. A 1 March survey based on a random sample of 20,000 ACS members (about a quarter of the total) showed 1.4 percent unemployed and seeking employment compared with 2.8 percent in 1971, 3.1 percent in 1972, and 1.7 percent in 1973. A survey of newly graduated chemical engineers in 1974 showed 1 percent of bachelor degree graduates unemployed compared to 2.4 percent in 1973. For graduates with a B.S. in chemistry, however, the picture was different. The percentage of unemployed chemists was 2.7 in 1973 compared to 3.9 this year.*

Government recruiting of engineers is up. This year an estimated 4300 engineers will be hired compared to 3400 last year. Sources in the Civil Service Commission, which keeps track of hiring throughout the federal government, say that the hiring levels for engineers approach those reached during the expansionary years of the middle 1960's. The pattern of hiring of professionals, however, is different. A decade ago the demand for scientists and engineers was about equal. Now the government is hiring about 3 engineers for every scientist.

"Pretty Grim" for Life Sciences

This year an estimated 1000 people with backgrounds in the physical sciences and mathematics will be hired, about the same number as last year. Prospects for job applicants in the life sciences is described as "pretty grim," with about 875 positions to be filled compared with 1000 last year. The government lumps together biologists and agricultural scientists in the same category. General biology is termed a "highly surplus field," while there are shortages in such specialties as soil science.

As for engineering specialties, government demand is pretty much "across the board" for civil, mechanical, electrical and electronic engineers, but aerospace engineers are still low on the federal shopping list. Competition with industry for engineers last year and this year has been sharp enough to have persuaded the government to restore a special premium pay provision for engineers that was discontinued during the period when engineers were in surplus.

The entrance level in government for most engineers with a B.S. is either GS-5 ($11,047 a year) or GS-7 ($11,924). For those holding an M.S. but with no professional engineering experience, the entrance level is GS-9 ($12,841). More than half of the engineers hired are in grades 5 through 9, the biggest group being made up of 7's. These are regarded as "trainee" jobs, and engineers who make a career of government service have solid long-term income prospects. A recent National Science Foundation (NSF) survey showed that the average annual salary of engineers in federal service in 1973 was $21,600. For scientists the figure was $20,200.

The demand for engineers is fairly widely distributed among agencies. NASA is no longer a major recruiter of engineers; its requirements this year are about 200. The Navy, on the other hand, which employs a sizable proportion of federal engineers, this year will take about a third of the total engineers hired. The Interior Department's Geological Survey and Bureau of Mines will both be adding generously to their complements of engineers with energy-related specialties.

In the sciences, the premium this year is also clearly on hiring of persons with backgrounds relevant to energy problems—geologists, geophysicists, and metallurgists. In the West, the Bureau of Land Management is hiring scientists who can help with its land leasing program. In geology and geophysics the demand is for applicants with doctorates, and recruiting is for jobs in the middle grades (GS-9 to GS-12). The base salary for a GS-12 is about $18,500 a year.

The quality of applicants for federal jobs is said to be generally high this year. Observers tend to attribute this rush to federal employment by graduates to the security of government jobs in a time of economic uncertainty. This security may be overestimated. A recent NSF survey showed that federal employment of scientists and engineers went down 3 percent (from 166,000 to 161,000) in 1973, with all major occupation groups showing some decline. But federal agencies do display great ingenuity in meeting job reduction orders—through retirements, reassignments, and other bureaucratic strategies —and somehow manage to minimize firing and keep on hiring.

Federal experience in recruiting provides hints about the state of the economy and the job market. Regional variations show up; for example, there are surplus applicants in the Northeast

* ACS officials note that survey questions may differ slightly from year to year, which may affect results to a small degree.

and shortages in the Midwest and South, particularly of engineers. But the employment situation for scientists and engineers in industry, where a large majority of them work, is beclouded.

The question of what happened to the casualties of the recession in the early 1970's bothers a lot of people. The aerospace industry has made a recovery, and some of the aerospace professionals laid off then have returned to work in the industry. What became of the displaced aerospace engineer who took up selling real estate or running the proverbial taco stand is not clear.

The American Institute of Aeronautics and Astronautics (AIAA), the leading aerospace professional organization, had a membership of 39,000, including 7000 students, before the slump. Membership reached a low of 22,000 (3200 students) and bottomed out last year. This year AIAA has 26,000 (3500 students) on the rolls.

AIAA officials say that the aerospace industry has had a comparatively smooth flight recently but that there have been reports of layoffs by McDonnell Douglas, Lockheed, and Martin Marietta, and that if the B-1 bomber program flags or the space shuttle project is attenuated much more, the effects on employment would be serious.

One basic lesson of the last decade is that government money—principally federal, but increasingly state and local—is a major variable in influencing employment of scientists and engineers. In the last decade there have been significant shifts in spending from military and space programs to urban, environmental, and transportation problems and, more recently, to energy projects. In the process, many professionals, particularly engineers, have found themselves to be obsolete or overpriced. Increasingly, companies have taken in young, recently graduated, relatively low-paid engineers figuratively through the front door, and pushed older, higher salaried engineers out through the back door.

This practice has been reinforced by another development. Government salaries in the last decade have risen rapidly while, at the same time, what the government pays contractors for research and analytical work has not risen proportionately. As a result, the government has been able to hire scientists, engineers, mathematicians, and economists who might previously have preferred to work for contractors. Because of inflation, a contractor working on a fixed-price federal contract with no provision allowing him to pass on rising costs, finds himself virtually compelled to substitute younger, cheaper professionals for higher salaried more experienced ones. This mechanism is representative of the submerged factors which are influencing employment of scientists and engineers.

The overriding question for scientists and engineers—as for everybody else these days—is whether the economy will come off the critical list and the threat of heavy unemployment will recede. Whether this happens or not, those concerned with professional manpower will continue to be faced with chronic problems—problems such as gathering adequate data and, more difficult and more important, modifying the Pavlovian responses which alternately generate too many and too few scientists and engineers for the jobs available.—JOHN WALSH

Minutes to Midnight for *Bulletin*?

Financial problems that have beset the *Bulletin of Atomic Scientists* for most of the magazine's 29-year life "have now reached the most critical point in its history," editor Samuel H. Day, Jr., reports in the *Bulletin*'s November issue. In an urgent appeal for funds, Day says the magazine needs donations or pledges of $41,000 to stay afloat past the end of this year and to carry out a mail campaign to build circulation.

By the third week in November the *Bulletin* had received commitments for $28,000, Day told *Science*. The December issue is on the presses, but publication in January is still in doubt.

The *Bulletin* is probably best known for the doomsday clock on its cover, its hands (currently set at 9 minutes to midnight) symbolizing the imminence of nuclear holocaust. Founded in 1945 by physicists Eugene Rabinowitch and Hyman H. Goldsmith, the magazine first circulated as a political affairs newsletter among scientists at the Chicago Metallurgical Laboratory. The *Bulletin* soon became an important forum for the project's leading scientists, as they sought passionately to turn nuclear energy to civilian control and to peaceful purposes. Among the magazine's original sponsors were J. Robert Oppenheimer, Albert Einstein, and Arthur H. Compton.

In 1965 historian Alice Kimball Smith wrote that the *Bulletin* was the "most enduring symbol" of the postwar political awakening of nuclear scientists. But its continued endurance now seems seriously in question.

In his editorial, editor Samuel Day says the *Bulletin*'s current problems are twofold. First, he says, inflationary pressures are driving up the cost of publication, especially for small magazines. At the same time, contributions that traditionally have provided the magazine with 15 to 20 percent of its revenues have fallen off. Day attributes this to general economic conditions and to a gradual attrition among a loyal but aging core of supporters. In addition, circulation has declined from a peak of around 27,000 in the late 1960's to about 18,000 now. Subscription revenue has fallen roughly in proportion.

The magazine's full-time staff now numbers four, including Day, who came to the *Bulletin* about a year ago. He formerly edited the *Inter-Mountain Observer*, a literate and feisty advocate newspaper that circulated mainly in Idaho until it succumbed last year to much the same kind of poverty that now afflicts the *Bulletin*.

Day nevertheless has great hopes for the *Bulletin*. Public debate on arms control and the peaceful uses of nuclear energy, the magazine's staple diet for nearly 30 years, is undergoing a revival. And Day says that recent promotional tests show an "immense hunger" for the kind of information and perspective the *Bulletin* can provide.

Beyond his immediate goal of keeping the *Bulletin* alive, however, he hopes to build a capital nest egg. "This has been a cliffhanging operation for so long," Day says. "People don't know from one month to the next whether they'll have a job. We want to put that beast to rest."—R.G.