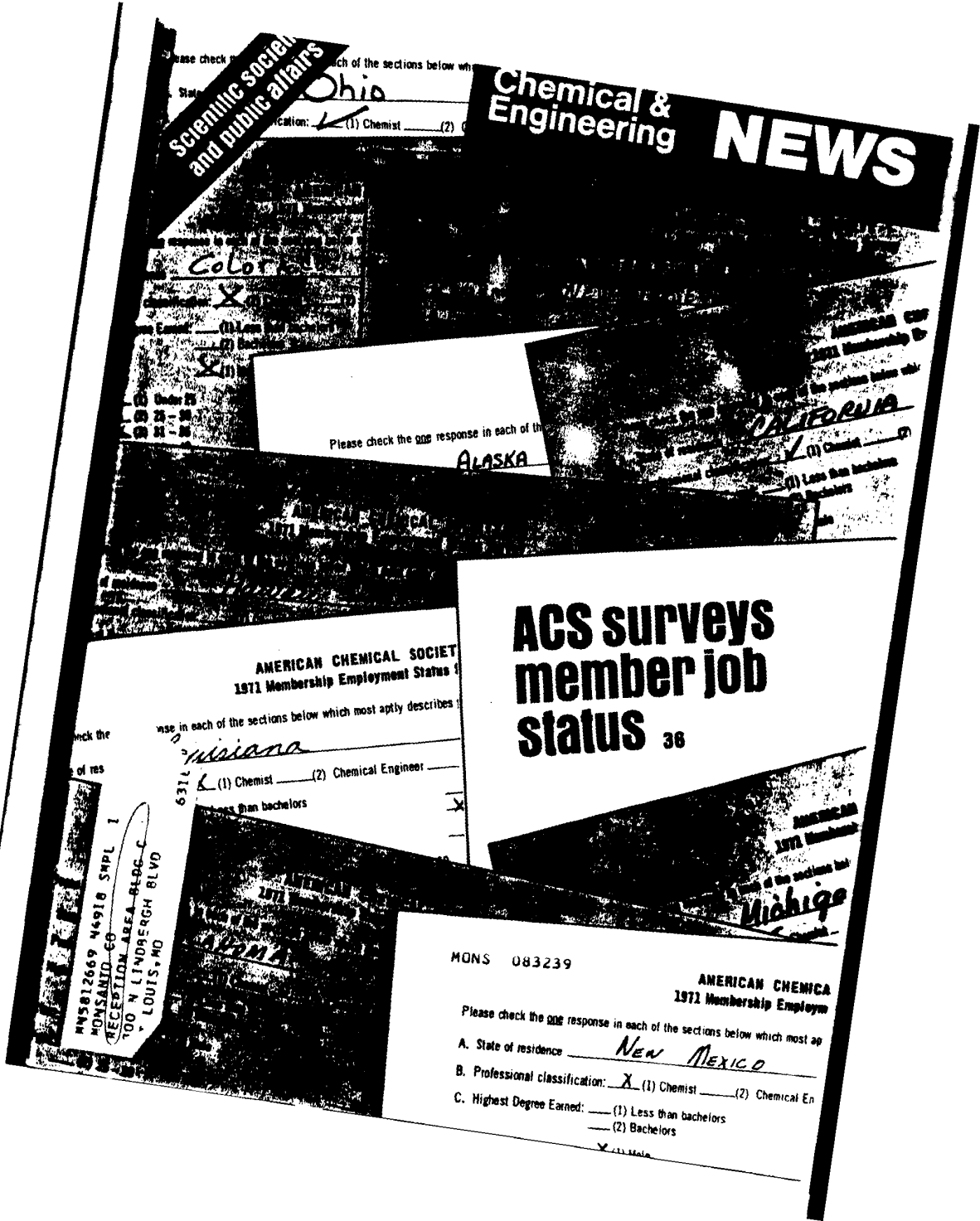
Scientific societies and public affairs
Chemical & Engineering NEWS
ACS surveys member job status 36
AMERICAN CHEMICAL SOCIETY
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MONS 083239
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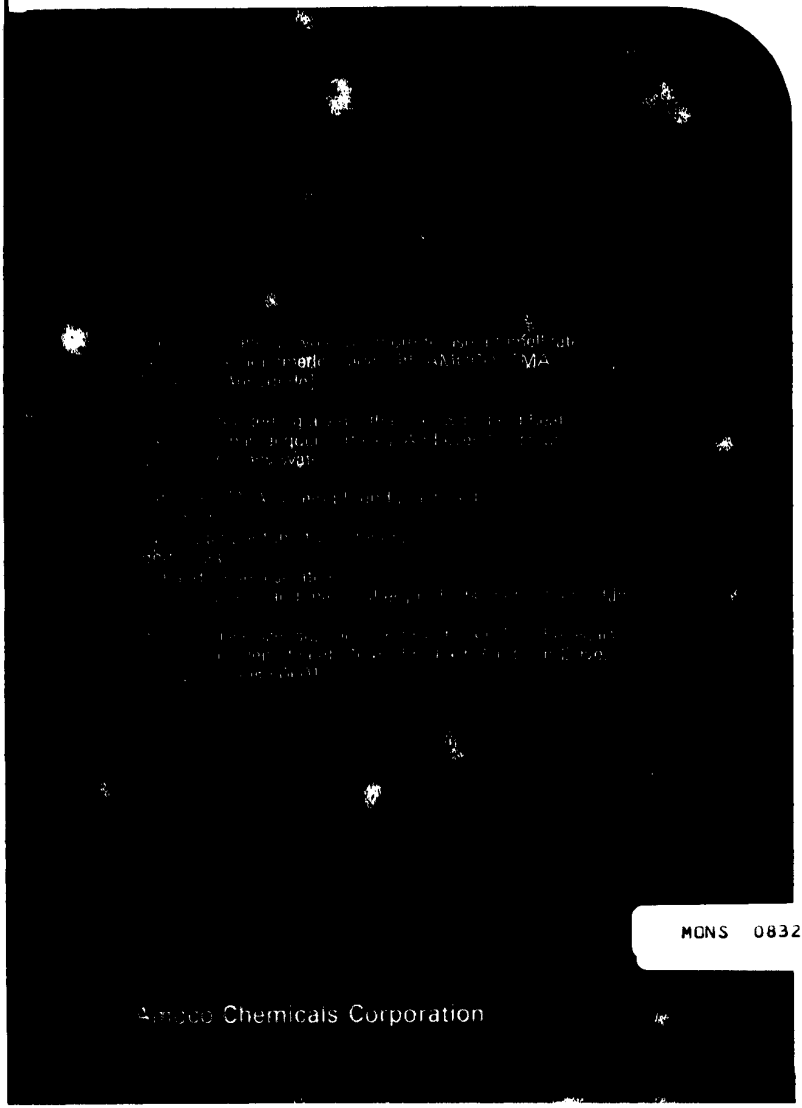

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Editorial

A white hat for industry

Industry has so often been pictured a black-hatted villain (sometimes rightly, often unfairly) that it's pleasant to take note of a white hat for a change. We take this opportunity to doff our hat to Monsanto and symbolically to all those other members of the chemical industry that have moved to set their environmental house in order before being forced to do so. What we're talking about is Monsanto's voluntary curb of sale of polychlorinated biphenyl compounds (PCB's), both in the U.S. and, more recently, in the U.K., for noncontrollable uses.

A bit of background might be in order. PCB's, discovered late in the last century, have proved useful as plasticizers in adhesives and paints and as components in electrical and hydraulic fluids, where they lend fire resistance. In Britain and North America, Monsanto has been sole producer. Several years ago the company became aware that these compounds are toxic and quite persistent. PCB residues have been found in British fresh-water, fish-eating birds, and in feathers collected as long ago as 1940.

Confronted with initial evidence and gathering data of its own, Monsanto became convinced of the ecological danger and accordingly banned sales for noncontrollable uses (plasticizer) while continuing sale for controllable uses (heat-transfer medium in closed systems). Total sales involved could be on the order of $25 million.

Our basic information, which we have confirmed, comes from an article by Jon Tinker in the April 1 issue of *New Scientist and Science*. He notes:

"Such action, taken without any overt government pressure, is almost certainly unique. In one sense, Monsanto's move may be seen as a desperate throw to retain at least part of a lucrative market which might otherwise be entirely lost. Indeed, the company makes no effort to deny that it believes the partial PCB ban to be in its own long-term interests. But this cannot be allowed to obscure the unprecedented nature of [acceptance of charges before guilt has been scientifically proved]."

We think Tinker puts it very nicely. According to Tinker, Monsanto admits that altruism is not the sole basis for its decision, that other reasons also came into play. Thus, better voluntary action now than force later on; a partial ban on noncontrollable uses may preserve the market for controllable applications; for Monsanto, which wants to sell pollution control technology, better to have clean skirts; and finally, Monsanto, sole producer in the two largest PCB markets, needn't worry overmuch about loss of sales to competitors.

Like Tinker, though, we see no reason to downgrade Monsanto's overall motives. All in all, we'd say that the company has acted in an altogether enlightened way, nicely balancing questions of public and private (its own) good. And we think other firms would do well to study this case history. Too often, when accused of environmental wrongdoing, industry has dug its heels in, stubbornly denying any sin and then only belatedly to make amends. From either altruistic or cynical standpoint, it would seem better to take the high road, admit to any problems, and make corrections. Will other PCB makers—Bayer in Germany, Prodelec in France, Flix in Spain, others elsewhere—follow suit?

Patrick P. McCurdy

C&EN EDITORIALS REPRESENT ONLY THE VIEWS OF THE AUTHOR AND AIM AT TRIGGERING INTELLIGENT DISCUSSION.

Contents

Chemical & Engineering News
May 3, 1971
Volume 49, Number 18

Letters
5 Layoff problems

Chemical World This Week
7 Changing NAS
8 Fifty new members
8 Clue to cancer
8 NLRB in academia
9 Detergents ruling
10 CPI productivity
10 Trade with China

Industry/Business
11 Concentrates
12 C&EN executive profile

International
17 Concentrates

Government
19 Concentrates
21 U.S. monitors waterways

Science
23 Concentrates
24 Radiochemical errors

Education
26 Academic-industrial gap

Technology
27 Concentrates
28 Wool technique
29 Fast-breeder reactors

Feature
30 Scientific societies

ACS News/People
36 ACS jobless survey

Newscripts
48 Huskies' livers

MONS 083243

Chemical and Engineering News

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Letters

Professional responsibility

SIRS: I have read with some interest and considerable shock your Feb. 8 editorial. If Mr. Petkas had sufficient persuasive arguments to sway your opinion to the extent that you are willing to put your approval in print, you certainly owe it to your readership to pass such persuasive arguments along. In your editorial I do not find them.

You state that "anonymity will be discouraged," but immediately negate this since "confidences will be respected to forestall reprisal." No matter how you qualify it, an individual participating in this system becomes an informer on his company. Any professional or other employee who takes his salary from a company has an ethical responsibility and allegiance to that company. If he strongly disagrees with their policy of how his work is being used, and has a moral conviction about it, he should make his views known within the company, and if a tenable arrangement cannot be worked out he should leave the company's employ. I can see no basis of morality in a stand less than this. To object to the manner in which his talents are being used, and still accept a salary from the company on the basis that he can quietly tell some outside agency his beef and thus salve his conscience, is as unethical an outlook as I have ever heard.

I do feel there is a lack of moral cohesiveness among professionals. However, it is ridiculous to suggest that a valid solution to this problem includes a conscience cop-out via squealing to a dissociated agency which has enjoyed a favorable but perhaps unwarranted voice with the press. Such problems should be attacked within the various professional societies where the peculiarities of the particular professional discipline can be approximately evaluated.

One is prone to wonder about the self-serving aspects of Mr. Nader's proposal. Are not professionals who go to his clearinghouse being victimized to enhance Mr. Nader and his associates? Just how would the anonymity be assured? How would the clearinghouse screen out the crank and vengeful complaints?

Mr. McCurdy, if there are any real arguments for professionals degrading their moral attitudes toward their business obligations I would be interested in hearing them in more detail than you have provided in your editorial.

Roger G. Cook

Hightstown, N.J.

SIRS: The shock expressed in recent letters to the idea of Clearinghouse for Professional Responsibility (C&EN, March 15, page 5, "Professionalism") overlooks in its idealism the fact that "whistle-blowers" or even "boat-rockers" frequently find themselves unable to get another good job, whether their departure from their previous employer was voluntary or involuntary.

As long as scientists are primarily in the position of being required to give exclusive loyalty to one employer—a condition which would seem to remove them from the ranks of truly "professional" people whether they admit it or not—it is hard to claim that CPR is unethical; more likely it is the most ethical way of handling the problem of corporate irresponsibility when it arises, without concomitant retaliation.

Persons using CPR are not thereby prohibited from resigning their positions—on the other hand, it will in many cases be only a few people within a corporation who are involved in unethical practices, in which case the individual may prefer to work to change the corporation rather then resign.

The Clearinghouse for Professional Responsibility would be both unethical and unsuccessful if it did not take reports simply as leads upon which to base its own investigation of the problem, so that no "accusations" were made unless hard data were collected. In the process of data collection, there might well be much information which the complaining employee would be ethically required to keep confidential.

Under such circumstances, corporations which know themselves to be honest and ethical will have nothing to fear, yet there will be implicit pressure upon all corporations to act responsibly in all things. The alternative to CPR would be unionization and adoption of professionally oriented grievance procedures, or performance of a similar function by ACS.

Edward R. Thornton.
Professor of Chemistry, University of Pennsylvania, Philadelphia

The problem of layoffs

SIRS: Is your March 15 editorial intended to provoke reader response, or do you really mean it? You suggest that the layoff system is barbaric, that the Japanese and others don't, and that the solution to the core of the problem is for employers to take a more enlightened approach to costing—by which you seem to mean keep idle employees on the payroll and pass the cost along to the customer.

Your reference to another article in the same issue indicates that the largest part of the problem lies with scientists and engineers displaced from the aerospace and defense industries. And then finally the "logical" conclusion is revealed: paternalism! for *"the protection that people need and demand."*

I am sickened and even ashamed to be a member of a professional organization which would admit either to the desirability of this conclusion or to the rigor of the facts and arguments leading to that conclusion.

In the order made, I suggest first that your argument that layoffs are uncivilized and barbaric is deliberately pejorative. *A classic debating technique maybe, but* not the sort of analytic objectivity I would expect from a scientist. I think it would be more accurate to describe layoffs as an element of our economic system—simply a fact of life which above all we all knew existed long before we accepted our first jobs. To have forgotten or overlooked this fact is no excuse or reason for eventual surprise, particularly by highly educated professionals for *whom planning and thinking ahead about* action-and-consequences should be second nature.

You next argue that "the Japanese certainly don't" practice layoffs. True enough, but that isolated fact is an incomplete observation which I trust was not deliberate. I think it would have been only fair to add that Japanese workers, including scientists and engineers, pay very dearly for their job security in the form of pay scales which are very much lower relative to the Japanese GNP than

MONS 083244

is the case in this country. Japanese wages are only about 60% of GNP, which allows industry and government there a very much larger fraction of the economic pie for re-investment in new job-creating industries than is the case here. In this country, labor extracts and claims something like 85% of the economic pie in the form of wages and direct payments from government. Not much left over for re-investment to create new jobs, is there?

Next you suggested that employers should tide employees over periods of recession by setting up a sinking fund out of profits or by incorporating the added cost into product prices. Well now, I ask you—what do you think the aerospace and defense industries have been doing off and on for the past 20-odd years if not that? How many times have we heard that these firms included costs of holding their technical staffs together through slack periods between government contracts in their bids for new work? This was given as the reason for the apparent high cost of most procurement contracts, or as the reason for making an award to high bidding firms which had nearly exhausted their "sinking fund" and were in danger of having to lay off large portions of their highly skilled technical staff which had been so laboriously recruited.

In further response to your "sinking fund" suggestion I should like to ask: Why do you suppose aerospace and defense firms paid generally higher wages than private industry for comparable talent? Twenty-five years ago one of my professors provided the answer when he warned us about the risks of accepting our first jobs with a defense contractor. He suggested that the salary premium which we would be offered (and were, several times in fact, during the ensuing years) should be considered equivalent to the premium we would have to pay to obtain an unemployment insurance policy. Most of us realized that we probably wouldn't set up our own "sinking funds" with the pay premium, or considered the premium too small to compensate for the risk and so we accepted employment in private industry at lower average scales. In short, we sacrificed a short-term gain for a longer-term advantage; we were provident as was the ant in the fable about the ant and the grasshopper.

In conclusion, I submit that neither the facts nor the events of the past 25 years support a logical conclusion that a case for paternalism has been demonstrated. Ethical, moral, or social beliefs would seem the only possible bases for that argument. These subjects are much too profound for adequate discussion in a letter to the editor, but in any such dialogue I would surely include consideration of the question: To what extent is any educated and presumably intelligent professional responsible for the reasonably foreseeable personal consequences of his own decisions?

Thomas C. Cattrall, Jr.

Huntington, N.Y.

SIRS: Re the March 15 C&EN editorial on "Let's lay off the layoff," the author misses the point. It isn't the cure that should be criticized, it is the cause. We've had year after year when Congress has done everything possible to fund wasteful programs that have built up manpower into huge spending machines. The huge organizations were one outcome —still another was the psychology that proclaimed that any harebrained scheme would make money.

The Congress that set the stage for faster growth and spent money for any sort of project—there is the culprit. Somebody always will get hurt when that sort of thing goes on too long. Blame Congress for overexpanding; praise the people who *try* to get the train back on the track—it takes guts to use your head in such unpopular sort of endeavors.

T. S. McDonald

Dallas, Tex.

P.S. An unemployed person—janitor or Ph.D., is sad—but the shakedown had to come—we were going too fast with too little solid thinking as to where it would lead. We'll have it again if we reinflate too fast and too long.

SIRS: Your March 15 editorial speaks in terms of humanitarianism and I hope yours is not a lonely voice, for the sake of our dignity and well-being as people as well as scientists.

J. E. Sabadell

Chemical Engineering Department, Princeton University, Princeton, N.J.

SIRS: Cheers for your editorial of March 15. I'd like to add just a footnote to your tale of corporate and national disgrace.

After a drastic cutback in R&D technical personnel in 1970 the company for which I used to work listed itself in your Career Opportunities edition last week. Ironic and cynical, but I'll bet it's typical corporate personnel thinking.

Saul Kaye

Evanston, Ill.

SIRS: Your March 15 editorial is well addressed to a very important question facing the nation today—that of unemployment, specifically the unemployment of talented scientists. However, your solution—the setting "up of a sinking fund to tide employees over periods of recession" paid for by "incorporating (the cost) into the product price" to pay for the sinking fund—is a very naive solution. The price of any product is determined by the forces prevalent in the market place and not by any altruistic programs.

The only solution to unemployment of scientists and others is a vigorous economy capable of sustaining full employment. ACS should lend its full support to the attainment of full employment even with any attendant cost of inflation. Anyone unemployed, threatened with unemployment, or concerned about people will prefer inflation to a recession. A degree of inflation is the cost of full employment.

R. G. Cunningham

Shaker Heights, Ohio

SIRS: Your editorial of March 15 is certainly rife with common sense. Our capitalist system, as fruitful as it is, has one major flaw: the often cruel treatment of our scientists and engineers (as well as many other professions) at the hands of profit-obsessed management. The "blue-collar" class of several decades ago was exposed to such dehumanization and was forced to unionize for protection. Your quotation from a dean of engineering, "Engineers are not going to stand for it," may be a cryptic prophetic statement.

If a company is really in a financial bind, there are ways to reduce costs. Restrictions on business travel, salary increments, equipment purchase, overtime, even periodic no-pay holidays would naturally be unpopular, but certainly more palatable than being suddenly unemployed.

An important question top management does not or will not consider is this: What is the money value lost because of the severe attenuation of the morale and dedication of those who must watch their colleagues being severed?

Peter Szap

Toms River, N.J.

Soybean derivatives

SIRS: It was indeed interesting to note the most recent good news about our old friend the soybean (C&EN, March 1, page 17). Now sitosterol derived from soybeans has been found instrumental in lowering cholesterol, this time by 35% the amount contained in hen's eggs. Previously, medical nutritionists have highly praised lecithin—another soybean product —as an important agent in lowering blood stream cholesterol and keeping cholesterol from being deposited as fatty plaques in the arteries.

Another important use of soybean derivatives has been in certain prepared infant formulas, so-called hypoallergenic substitutes for the usual cow's milk formulas detrimental to many human babies. Why should this particular use be so terribly important to us scientists? It is becoming evident that the crucial determining factor in many disease states is the malformation or even nonformation in some individuals of the particular enzyme system needed to effectively resist an invading viral or bacterial enzyme system, to prevent the invader from becoming part of the host's body cells and thus able to misdirect genetic information (C&EN, Feb. 8, page 47, "Scientists try to link cancer enzyme and virus").

Likewise in many allergic states the missing factor appears to be the exact enzyme system needed to metabolize in the correct biochemical sequence the otherwise offending proteins or other aggravating food substances. Such "missing enzyme" defects are thought to be genetic and are obviously hereditary in many families (C&EN, Feb. 22, page 42, "The Chemical Innovators: Roscoe O. Brady"). Unfortunately for the afflicted individual, an initial food protein allergy often appears to extend later to include unusual sensitivity to other types of protein antagonists ranging from moderate suffering, as hay fever and sinus problems, to much more severe. Witness the high incidence of childhood leukemia victims with a history of infant allergic indications.

Consider, however, that already certain recognized enzyme deficiency states (for example, celiac disease and the PKN syndrome), even though genetic in origin, can be circumvented if discovered in time and the proper diet instituted in life. I submit that even given the present state of our knowledge of enzymic chemistry, we can now confidently call attention and provide valuable information about the one area I believe contains the greatest potential for improving human health in general. We now have the knowledge to prevent many allergies and much of mental retardation and chronic disease conditions from developing at all by promoting vastly more thoughtful and intelligent methods than at present for feed-

MONS 083245

ing infant human beings during the nine months preceding and following birth. Recent discoveries in enzyme chemistry greatly strengthen my belief by illustrating again the profound differences between enzymes in embryonic and fetal tissues and those of later stages of development (C&EN, Feb. 8, page 48).

Vigorous preventive nutrition during pregnancy might avert much mental retardation, congenital heart defects, and cerebral palsy if enough necessary vitamins and other enzymes, enough to counteract any poor genetic prognosis, were incorporated in the prenatal maternal diet. Vitamin E and certain other known vitamins in much larger amounts than now commonly given may prevent mongolism from developing and deter other destructive enzyme systems like German measles virus from wreaking havoc on rapidly differentiating embryonic cells.

For children born with suspected genetic enzyme deficiencies, what can we suggest? We know body cells of newborn infants continue to differentiate and multiply very rapidly during the first nine months, the immunologically innocent period of infancy. It would appear that certain enzymes meant to be protective against bacteria and viruses, as well as other important nervous muscular and digestive system enzymes, are intended by nature to be formed or completed in humans during this critical first postnatal year. A serious biochemical error or omission this early in life leads to chronic metabolic troubles.

Tragically for some persons, the "right" enzymes never have the chance to form correctly during this crucial period because their individual genetic requirements absolutely necessitate factors found mostly in human milk. Even worse, it seems fairly clear that certain biochemical factors in cow's milk (like factors in wheat and egg albumin) can be actually antagonistic during the first year to the proper formation of important human enzyme systems. Soybean and strained meat formulas do not appear to contain such protein enzyme antagonists.

As a mother who is also a scientist I deplore the ignorance of pediatricians who glibly assure that cow's milk formulas will properly nourish human babies. This without any knowledge of a particular baby's requirements, especially whether or not the baby might be genetically deficient in certain enzyme factors and may need special dietary help. Perhaps if we persist with reasoned scientific evidence, together we can do something really great to reduce the high toll in human misery now caused by such widespread ignorance of basic enzyme chemistry.

Maryann Murray Kiesel

Chester, N.J.

More on caveat emptor

SIRS: The C&EN issue of March 1 opened with an editorial entitled "Caveat emptor—1971." Mr. McCurdy directed his attention to U.S. manufacturers and then, via hypothetical questions, proceeded to dispense McCurdian philosophy. I suggest that he subject this latest bit of philosophy to a little introspection. Mr. McCurdy says that "caveat emptor has little place in today's business world." If this is so, what of C&EN?

What responsibility does the staff of C&EN have to the ACS membership? What are Mr. McCurdy's responsibilities? Who has the responsibility of seeing that we, the members of ACS, get some chemical and engineering news?

If the content and format of C&EN are the responsibility of the editor, then I propose that he direct his attention to same. My disappointment with the contents and the format of C&EN increases with each succeeding issue. Each issue appears to be less relevant to the practicing chemist or engineer than the previous issue. Each issue appears to become more relevant to the individual whose feet are propped on a desk than to the one whose feet also touch the plant or laboratory floor.

Examine the 38 pages of the March 1 issue or the 46 pages of the Jan. 11 issue. How much is devoted to advertisement, to ACS ads, to miscellaneous items, to science, to political news? How much of the news is relevant to the industrial chemist? And please do not lose sight of the fact that industrial chemists also read daily newspapers and magazines. I have no objection to C&EN reporting on the science/government interface, but I do question its order of current priorities.

If "caveat emptor has little place in today's business world," as Mr. McCurdy states, why should it have a greater place in the academic world or in the world of C&EN?

Walter T. Koch

Havertown, Pa.

SIRS: Re your March 1 editorial, I would like to pose Question 4: Should a U.S. manufacturer use—or be permitted to use—imported drugs and food additives produced in foreign facilities which are not inspected and approved by FDA when the same products, *domestically produced,* are FDA-controlled for the protection of the U.S. consumer?

This is the other side of the coin you are inspecting and may, therefore, be out of order. But it does relate to a double standard of morality which is the point, and the adequate protection of the public which is the issue.

G. F. Schlaudecker

Group V.P.-Chemical, Sherwin-Williams Co., Cleveland, Ohio

"Project Bridge"

SIRS: For the past eight years I have been a member of ACS. Reading the editorials and articles in C&EN, I have watched with amusement as your inane prattle has waxed and waned about chemical "professionalism," the lack of communication by chemists concerning the value of chemistry to society, the need for chemists to bridge disciplines, etc. I would like to make some comments about these topics.

First, chemistry is a job, not a profession. For some, it is a well-paid, highly skilled job. But it is nontheless just a job. True professionals are not viewed, nor are they they allowed to view themselves, as an exploitable and disposable resource—ask any attorney, physician, or dentist. We cannot expect, and will not get, bright creative young minds to remain in a "profession" in which they are subject to the whims of forces far beyond their control and are often considered as sheep to be shorn. Unless abrupt changes are made soon concerning the well-being of the individual chemist, ACS will have the distinction of only standing sentinel over a rapidly drying reservoir of talent.

Second, I know the value of chemistry to society. But then I have specialized in this field for the past 10 years. How can we possibly hope to communicate the value of chemistry to a general society, when we are doing such a poor job with our own chemists? Less than half of the chemists eligible for membership in ACS ever join. And of those 110,000 present members, how many ever participate in local ACS activities, or even bother to vote in ACS national elections? —less than one third? And with today's society primarily interested in the immediate "buck," how can ACS expect chemists to personally involve themselves in a communication effort with nonscientific society, the effects of which may not be apparent for a generation?

Third, I am personally interested in chemists gaining the ability to bridge disciplines. Our C&EN "Career Opportunities" issue of March 1969 repeated the familiar theme: Chemists should develop other specialities. Chemistry needed generalists, not specialists. The lack of chemists in government and other key positions was underscored. *Ad infinitum, ad nauseam!* Well, what has ACS done to encourage chemists to gain these backgrounds in other fields? Exactly nothing!

Why doesn't ACS put its money where its mouth is? At this point in time we do not need more chemists. We already have too many overqualified, superspecialized Ph.D.'s in chemistry. If cross-disciplinary people are so vitally needed, create them! Can some of those PRF and general funds of ACS be diverted to grants, scholarships, and loans to encourage chemists to actively pursue a real profession—law, medicine, dentistry, business? I recommend that ACS start a "Project Retread" or "Project Bridge" if you must have a better euphemism. And get ready for a deluge of applications!

Why do so few chemists return to college to study another discipline? Because initially they are penalized economically for making the change. And, I assure you, financing the education is the critical issue. The return to the poverty level of a student is never pleasant, especially if one has the responsibilities of a family. Moreover, scholarship funds in the professional schools have always been limited. And if the chemist has been working for some time, he is farther penalized when he has been financially responsible. That is, he has been able to acquire some equity in a house, life insurance, bonds, furniture, a savings account—all tangible assets which immediately disqualify him from the primary requirement for most scholarships—financial need. He cannot, in good conscience, plead "absolute poverty" because he didn't choose to squander his income on color TV sets, unnecessary vacations, needless entertaining, and the like.

I have yet to meet a chemist who believes that his graduate training was a pleasant experience, who is content with his "profession," and who has not considered a career change if even minimal readjustment funds were available. A very few chemists will make the change and continue their education in a bridging field, regardless of the initial financial sacrifice. In fact, I know of one student who earned a Ph.D. in chemistry from MIT who is now studying full-time at a local law school. He is required to work half-time, as a technician, to take

Continued on page 42

MONS 083246

The Top Stories

Collective bargaining agents for professors add new slant to faculty-administration relations **8**

Productivity and unit costs don't attest to economic recovery of the chemical industry **10**

C&EN surveys the backgrounds of top executives of 15 large U.S. chemical companies **12**

Corps of Engineers begins permit program for licensing discharges into waterways **21**

Users of radiochemicals become wary of compounds' purity and identity as given on labels **24**

Lectures at University of Massachusetts bridge gap between school and industry **26**

Glow discharge process developed by USDA heightens wool's resistance to shrinkage **28**

Scientific societies, long concerned mainly with their own disciplines, are now edging into the realm of public affairs **30**

1971 ACS job status survey reveals average unemployment rate of 2.7%, Pacific region unemployment rate 4.4% **36**

NAS AIMS AT SOCIAL ISSUES

The National Academy of Sciences moved last week to improve its ability to deal with the broader social aspects of scientific questions that come within its purview. Meeting in the new Hugh L. Dryden Auditorium in Washington, D.C., for extended sessions lasting one and a half days, academy members voted to expand the academy by about 300 members over the next five years to include members from clinical research and the social and behavioral sciences.

On another matter that also reflects the academy's increased willingness to consider social issues, the members cautiously encouraged research on genetic aspects of human behavior—which includes the question of intelligence as a function of race, raised persistently at academy meetings since 1966 by NAS member William Shockley. The annual business meeting was closed to the public but NAS president Philip Handler made an unusual effort to meet twice with the press.

The academy presently has 900 members, including 50 elected last week. Under the amended bylaws, a maximum of 75 members will be elected next year, 100 in 1973, and then a decreasing number until 1977 when 60 new members will be elected and the total membership will level out at about 1200 members. Of the 75 to be chosen next year, 12 will be medical scientists—including clinical medicine for the first time—and 13 will be social or behavioral scientists.



NAS president Philip Handler

The expanded membership is "the symbol of our intention to become usefully engaged" in the problems of U.S. society at large, Dr. Handler says. The expansion is also a recognition that clinical research and research in social and behavioral fields are becoming increasingly scientific, he adds.

The expansion does not, however, come to grips with the matter of the advanced average age of NAS members—a source of criticism from within and without the academy. In fact, the expansion may tend to bring in older members from the backlog of distinguished workers in new fields, Dr. Handler admits. But NAS members are "generally conscious" of the need to bring in younger members, he says.

NAS members approved only one of three recommendations from the *ad hoc* committee on genetic factors in human performance, chaired by NAS council member Kingsley Davis. The approved recommendation: "exploration of means for closer cooperation among those concerned with research and training in psychology, education, be-

Ed Laureiro



Ralph Nader

havioral genetics, and neurobiology." The rejected recommendations asked for an examination of educational implications of human behavioral genetics and for establishment of an academy working group to study the feasibility of a long-range study of interactions of genetic and environmental factors in human development.

As the academy moves more openly into matters of public—and political—interest, it is coming under increasing scrutiny. Philip M. Boffey has resigned from the staff of *Science* magazine to conduct a nine-month study of NAS for Ralph Nader's Center for the Study of Responsive Law. The book-length report that will likely be the result of the study will cover several broad questions, Mr. Boffey says. Among them: How and where does NAS exert influence on public affairs? How good is its advice? And what do its client federal agencies do with the advice?

Expands membership scope

The National Academy of Sciences may be about to expand the scope of its membership, but this year's 50 new members include a solid representation of 21 scientists from chemistry and chemically related fields, such as molecular biology and geophysics. Seventeen of the new members are ACS members.

Academic scientists among the new members include Philip P. Cohen, University of Wisconsin; Mildred Cohen, University of Pennsylvania; Josef Fried, University of Chicago; Luigi C. Gorini, Harvard; Harry B. Gray, Caltech; Ernest M. Grunwald, Brandeis; Aric J. Haagen-Smit, Caltech; Norman Hackerman, Rice; William P. Jencks, Brandeis; Michael Kasha, Florida State; Irving M. London, Alfred Einstein College of Medicine; Frederic M. Richards, Yale; Oliver Smithies, Wisconsin; and Gerald J. Wasserburg, Caltech.

Industrial scientists include Arthur M. Bueche, General Electric; Vladimir Haensel, Universal Oil Products; Earl L. Muetterties and William D. Phillips, Du Pont; and Sidney Udenfriend, Roche Institute of Molecular Biology.

Two other new academy members are 1970 Nobel Prize winner Julius Axelrod, of the National Institute of Mental Health, and Cleveland Clinic Foundation director emeritus Irvine H. Page.

BIOCHEMISTRY:

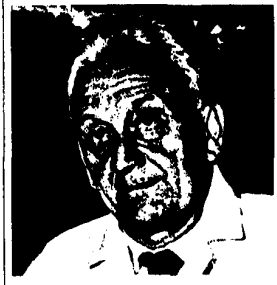
Regulating cell division

Although scientific sessions at last week's annual meeting of the National Academy of Sciences were cut back to make way for extended business meetings, there was still room for two papers from Dr. Albert Szent-Györgyi's group at the Institute for Muscle Research, Marine Biological Laboratory, Woods Hole, Mass. The scientists —Dr. Szent-Györgyi, Dr. Laszlo G. Együd, and Dr. J. A. McLaughlin— disclosed results in support of their theory of how cell division is regulated: Cells become cancerous when the regulation fails.

For a number of years, Dr. Szent-Györgyi and his colleagues have pursued the idea that cell division is prevented by the donor-acceptor interaction of an electrophilic chemical with cellular nucleophiles —perhaps sulfhydryl groups. The scientists have speculated that a glyoxal—a compound with a terminal aldehyde group and an adjacent ketone function—might fill the role of the endogenous electrophile. Methylglyoxal is the simplest example. They also have noted that cells contain a glyoxalase system of two enzymes that convert glyoxals to α-hydroxycarboxylic acids. Activation of the glyoxalase system might act in the regulation of cell division by decreasing the concentration of glyoxal and thus making cell division possible.

Dr. Szent-Györgyi and his colleagues have now found in animal tissues a natural glyoxal with a molecular weight between 500 and 1000. An extract from mouse or calf liver injected in mice suppresses tumor growth.

Tumor growth is also suppressed when the scientists inject the keto-alcohol produced by the reaction of methylglyoxal with maleimide. They think that maleimide protects the glyoxal from reaction with the glyoxalase system until the derivative arrives at the tumor cells. There, enzymes may split the keto-alcohol to produce methylglyoxal.



Albert Szent-Györgyi

LABOR RELATIONS:

Professors organize

Increasing activities on campus of the National Labor Relations Board and of the American Association of University Professors are profoundly affecting the traditional atmosphere of faculty-administration relations. For the first time, NLRB has extended its jurisdiction to all employees of private nonprofit schools. And AAUP, in reversing its earlier nonbargaining stance, is openly seeking certification as a collective bargaining agent on campus.

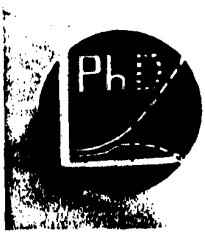
NLRB last month ruled against Long Island University's administration in ordering elections to be held before May 20 to certify a collective bargaining agent for faculty at two of three campuses. Vying for bargaining agent in the forthcoming election are the United Federation of College Teachers (UFCT) and AAUP at the university's Zeckendorf campus, Brooklyn, N.Y. UFCT runs unopposed at the C. W. Post College campus at Brookville, N.Y. And no agent has filed for election at Long Island's Southampton, N.Y., campus.

Briefs are due today at NLRB in a dustup that AAUP is having with Fordham University, New York City, over eligibility of faculty to bargain collectively. At Monmouth College, West Long Branch, N.J., the Faculty Association of Monmouth College (FAMCO) has been negotiating a first contract with the administration since FAMCO won certification in February in an election under NLRB jurisdiction.

Until 1970, NLRB had not established jurisdiction over faculties at private schools, and public college professors were covered under state public employee laws. In 1951 NLRB declined jurisdiction over faculty at Columbia University. Last summer, however, the board accepted jurisdiction over library employees of Cornell University in a door-opening decision. Last November the board exercised its rule-making function to extend jurisdiction to all employees of non-

MONS 083248

C&EN: Madeleine Pollinger



Physicists publicize plight

At the American Physical Society meeting last week in Washington, D.C., several hundred of the 2200 attendees were wearing buttons sold by graduate students concerned about the unemployment situation of physicists. The button, based on work of Dr. Allan Cartter, chancellor of New York University, shows that projected supply of physicists will far outstrip demand through the 1980's.

profit schools whose annual income is more than $1 million. Monmouth College and FAMCO proceeded amicably under NLRB jurisdiction.

AAUP has only recently turned to petitioning certification as a collective bargaining agent. The association now joins the National Education Association and the American Federation of Teachers in a three-way rivalry for allegiances of college professors. AAUP has mostly been active in setting salary standards and defending academic freedom and tenure. The ultimate weapon in its armory has been the threat of censure. At recent annual meetings the association has flirted increasingly with the idea of becoming a bargaining agent, culminating in its entry in several elections on college and university campuses in the past year.

So far, though, only about two dozen four-year colleges and universities have elected bargaining agents. Petitions from putative agents are pending with several other four-year schools, however. In today's shaky employment situation in many areas of science-related work, the experience gained in developing collective bargaining machinery in academia will be of keen interest not only to chemistry professors, but also to chemists and chemical engineers throughout all fields in industry and government.

POLLUTION:

Delay detergent labeling

Nixon Administration officials have asked the Federal Trade Commission to delay a decision on the agency's proposal to require a pollution warning in advertising and on packages of phosphate-based detergents. The Administration wants the delay at least until it has time to fully develop legislative and administrative proposals aimed at limiting the use of phosphates in detergents. In any event, an FTC decision is probably months away.

The Administration's proposals will likely be completed before the FTC reconvenes hearings on labeling in mid-June, Russell Train, chairman of the Council on Environmental Quality, said in a statement read by an aide at FTC hearings last week. At present, Mr. Train said, prospects for major reductions of phosphates in detergents must be tempered by caution in accepting substitutes with hazardous or unknown health characteristics. It's just this sort of caution, he says, that is being exercised with NTA—"a promising substitute for phosphates."

Jesse L. Steinfeld, the U.S. Surgeon General, told the FTC commissioners that he, too, is concerned about the health and environmental impact of alternatives to phosphates. He warned that tests indicate that some currently used substitutes for phosphates are clearly toxic or caustic and pose serious accident hazards, especially to children.

Industry representatives took a dim view of FTC's proposed rule, which includes a requirement to "prominently" list all of a detergent's ingredients on the package. Industry spokesmen argue among other things that the proposed labeling and advertising could prompt housewives to switch away from phosphate detergents, and that removal of phosphates from sewage by waste treatment is the way to go.

Howard Morgens, president of Procter & Gamble, for instance, commented that "no legislation or trade rule can speed" the finding of a replacement for phosphates. Frederick A. Gilbert, an FMC vice president, included an endorsement of federal legislation requiring premarket testing of potentially toxic substances. And Monsanto, in a submitted statement, takes FTC to task on the legality of the agency's proposed rule making.

C&EN: Madeleine Pollinger



Radical science group protests war

Among nearly 200,000 people who marched on April 24 in Washington, D.C., to protest the war in Vietnam was a contingent of Scientists and Engineers for Social and Political Action (SESPA), a radical science group whose motto is "Science for the People." SESPA, with some 19 branches from Berkeley to Boston, was also active at the American Physical Society annual spring meeting last week, circulating petitions against the Vietnam war in general and Presidential Science Adviser Edward E. David, Jr., in particular. Dr. David spoke at the APS banquet on government efforts to employ unemployed physicists.

MONS 083249

Spokesmen for some environmental and consumer action groups staunchly back the proposal—some say it doesn't go far enough—while others argue that there are safe nonphosphate detergents now on the market. William H. Rogers, Jr., of the University of Washington school of law, for instance, speaking for the Environmental Defense Fund—whose petition to FTC along with one from Rep. Henry Reuss (D.-Wis.) helped persuade FTC to issue the rule in the first place—argues among other things that the industry's objections to the rule are "wholly without basis in science or law" and castigates the industry for dragging its feet in developing and using phosphate substitutes.

CPI:

Productivity stays low

If an economic recovery is now under way for the chemical industry and the rest of U.S. manufacturing *industries, it is not boldly signaled* by the present state of productivity and unit costs. The rise in productivity through March from a year before was about 5% for the chemical industry and 3% for all manufacturing. These figures compare with a 9% compound annual growth of chemical productivity through most of the 1960's and a 3% average annual rise in productivity of all manufacturing during that time.

Worse than this, unit labor costs—a key determinant of profits —pushed up again last winter as the relentless pace of wage and benefit increases kept ahead of production. Although unit costs in the chemical industry relaxed a bit from the momentary height during the first month of the auto strike last fall (C&EN, Nov. 30, 1970, page 16), chemical industry unit costs are still more than they were a year ago. Preliminary employment, weekly earnings, and production figures for March of this year indicate that chemical industry unit costs are about 2% more than they were in spring 1970.

For all manufacturing industries in the U.S., the unit costs picture is worse. March preliminary data show these costs surging back to the extraordinary level of last September. At that time, the sharp drop in production due to the Detroit shutdown threw unit costs up 4%. Manufacturing unit costs in March rose about 3% from 1970.

The factors that make up chemical productivity—production and total man-hours—reveal that the productivity rise hinged largely on a cut in man-hours by chemical companies. While production stayed in its recent narrow range, man-hours have dropped 3% during the past 12 months.

Employment cuts, however, could still not stem the tide of total compensation. Although production employment in the chemical industry has dropped more than 3% from last spring, average weekly earnings have gone up more than 6%.

Thus, unit labor costs in chemical companies continue their unaccustomed upward march. These costs had actually fallen 22% from the late 1950's to 1966 and then had risen very slowly, about 1% per year, through 1969.

Even with recent price rises in the chemical industry, the current upswing in unit labor costs augurs ill for profits. Only a sharp rise in *production in coming months* and more assists from prices can ease the situation for both management and layoff-wary employees.

CHINA:

Trade speculation

Very shortly, perhaps this month, President Nixon will put an end to a lot of speculation by disclosing the list of nonstrategic products that U.S. companies will be allowed to export to mainland China under a general export license. The list is expected to be similar, although probably more limiting, than the one that governs exports to eastern European countries. He also will designate the items that can be imported directly from China.

These notices will be the most important of a series of steps that the Administration has taken to ease tensions between the U.S. and mainland China and to relax the 20-year-old embargo that has kept U.S. companies from selling to a country that has almost 700 million people within its borders.

The thaw began in December 1969 when the Administration said that foreign subsidiaries of U.S. companies could export to China on the same basis as they are allowed to export to East bloc countries. Until then, foreign affiliates were subject to the same China embargo to which their U.S. parents are.

The most recent bridge-building effort came last month, following the most famous table tennis game in history (C&EN, April 26, page 10). President Nixon said that the U.S. would expedite visas for Chinese visitors, relax U.S. currency controls so that China could use dollars, permit U.S. oil companies to provide fuel for ships and planes serving China, and allow U.S. ships and planes to carry Chinese cargo between non-Chinese ports.

An initial burst of enthusiasm from businessmen and from Congressmen followed these announcements. Estimates of U.S. export potential to China range from $250 million to $700 million by 1980.

Now, however, sober realism is beginning to set in. These estimates, even if they are accurate, represent a very small piece of change to a country whose total exports last year were $43 billion.

More important, U.S. willingness to sell and China's willingness to buy are two different things. So far, China *hasn't responded* to the U.S. initiative and may be in no hurry to do so. If it does come, the response may be in the form of an invitation to U.S. companies to participate in this fall's Canton (Kwangchow) Trade Fair.

Politics will help shape future U.S.-Chinese trade relations, but there are also economic factors that will tend to put a ceiling on U.S. exports to China. China has a limited amount of foreign exchange and is careful about how she spends it. Like other Communist countries, China prefers to pay for imports with exports and there's not too much that China makes that the U.S. needs. Textiles and shoes are possibilities, but the U.S. already has import problems with these.

China could be a market for U.S. chemicals, but other western countries have a big jump on this market. Of the estimated $290 million worth of chemicals that China imported in 1969, $244 million, or 85%, came from Japan and western Europe. Most of the imports were organic chemicals; others were fertilizers, plastics, and dyes.

If U.S. chemical companies are able to tap the Chinese market, they may prefer to do so through foreign subsidiaries, as some of them already are doing. That way, their sales will be less conspicuous to the American public, many of whom look with disfavor on doing business with a country they consider "the enemy."

MONS 083250

INDUSTRY/ BUSINESS CONCENTRATES

Unemployment bottoms out

The downturn in demand for professionals may have bottomed out, says Deutsch, Shea & Evans, a New York City manpower advertising agency. DS&E's engineer/-scientist demand index has risen from 35.2 in December to 43.1 in February (1961=100), but remains well below the 82.7 reading for February 1970. Meanwhile, the Engineers Joint Council, with National Science Foundation backing, will survey 100,000 members of engineering societies this month to determine the extent of unemployment. (ACS survey, page 36.) ■

Sandia cuts back

Sandia Laboratories will reduce the work force at its Albuquerque, N.M., and Livermore, Calif., facilities by an additional 300 people before mid-1972. Many workers may leave the AEC prime contractor under a voluntary resignation scheme in which an employee who resigns gets a layoff allowance based on his length of employment. Initiated last year, the scheme accounts for 430 of 590 earlier terminations. The across-the-board staff reductions reflect cuts in AEC funding and inflationary pressures on what money is available. ■

Fiber shipments pick up

The recovery of domestic man-made fiber producers picked up more speed in March. According to the latest statistics from the Textile Economics Bureau, fiber shipments during the month were 16% higher than in March 1970. The increase is the largest since the 17% gain posted in October 1968, when the industry was still recovering from its 1966–67 doldrums. Shipments for the first quarter are up 8% from 1970's first-quarter level. ■

Chemical earnings down

Basic chemical company earnings continued to trail those of other industry sectors in the first quarter of this year. Essentially complete returns now put chemical earnings down 11% from the first quarter of 1970. Sales were up 1%. Meanwhile, the oil industry continued the recovery started late last year with a 10% earnings gain over the year-earlier level on an 11% sales gain. Drug companies posted an average 10% year-to-year sales gain in the first quarter, but the industry's earnings rose an unusually low 1%. ■

Air bags for Allied

Allied Chemical Co. has earmarked about half its capital spending in the next three years for expansion of its energy and automotive products businesses. Chairman John T. Connor expects 1971 spending to reach $139 million, the same level as in 1970. Among Allied's new projects is a pilot production plant to manufacture an air cushion restraint system for automobiles. The firm has no definite commitments, but many auto makers have requested quotations for the entire air cushion system or for component parts. ■

Carbide supports Du Pont

Union Carbide supports Du Pont's application for a foreign trade subzone at La Porte, Tex. A letter from the firm's regional vice president Morse R. Dial, Jr., to the Foreign Trade Zones Board says that such zones can provide an effective means of keeping U.S. manufacturers competitive when less expensive raw materials from other countries are restricted from free entry. Du Pont wants the subzone for access to duty-free fluorspar for a 75,000 ton-per-year hydrofluoric acid plant. ■

Combination drugs

Drug consumers will pay 59% more for prescriptions if combination drugs are banned by FDA, according to a study sponsored by the Pharmaceutical Manufacturers Association and conducted by R. A. Gosselin and Co. The $443 million cost increase was based on 1969 figures. Another PMA study, by Lee-Mendota Research, shows that 78% of U.S. physicians would prescribe another combination drug or write multiple prescriptions, which would also increase the cost to patients. ■

New olefin fiber

The first entry of an olefin fiber into the large, knit apparel market will be made by Herculon polypropylene yarn, a product of Hercules, Inc. The bicomponent yarn, produced from polypropylene fibers of two different molecular weights, develops a three-dimensional, helical, irreversible crimp when immersed in boiling water or steam, or when heated. This crimp, resulting from differential shrinkage of the two polymer segments, simulates crimp of natural fibers and contributes to improved bulk and resilience, Hercules says. ■

Pollution firms merge

Research-Cottrell, Inc., is entering the automobile pollution control field by acquisition of Oxy-Catalyst, Inc., a firm active in the development of catalysts for control of auto emissions. The two firms have agreed in principle to exchange 0.3638 share of Research-Cottrell stock for each of the 824,-616 outstanding shares of Oxy-Catalyst. Research-Cottrell specializes in systems for control of particulate and gaseous pollutants and in waste water and solid waste management. ■

MONS 083251

Profile of the top chemical executive

C&EN survey of executives from 15 chemical firms shows that most are from Northeast, worked for their company 20 years or more

This is supposedly the age of youth, of women's lib, of equal opportunities, and of a growing internationalism. If this is indeed the case today, then the management of the nation's chemical companies is just not with it. A C&EN survey of the personal backgrounds of the top executives of 15 large chemical companies in this country reveals this profile:

- They have a median age of 54.5 years, and 95% are 45 or older.
- They have been with their present companies for a median of 25 years.
- They are all men.
- As far as C&EN can ascertain they are all Caucasian.
- And 7% of them are foreign born.

Hardly an avant-garde-sounding group in this "age of Aquarius." And a closer look reveals that a disproportionately large number of them were born and educated in the northeastern part of the country; that about 90% of them are college graduates, including 20% from Ivy League schools; that about 40% of them have graduate degrees; that about 80% of them are now suburban dwellers; that almost all of them are married; and that those who are married have an average of 2.8 children.

Most CPI executives were born and educated in the Northeast

	BIRTHPLACE[a]	SCHOOL[a]	POPULATION[b]
	Per cent[c,d]	Per cent[c,e]	Per cent[c]
Northeast	55	58	33
Midwest	23	24	32
South	13	14	26
Mountain	4.5	2	3
Pacific	4.5	2	6
Foreign	7[f]	3.5[f]	

a Location of undergraduate school attended. b Distribution of U.S. population during the period when most of the executives in the survey were born. c Per cent of U.S. portion of sample. d Sample size 145. e Sample size 172. f Per cent of total sample.

In preparing this survey C&EN asked 20 companies to provide official biographies on their very top management group—essentially executives who are also directors and/or senior officers. The 15 companies that complied with a total of 190 biographies are Air Products and Chemicals, Akzona, Allied Chemical, American Cyanamid, Celanese, Chemetron, Dow Chemical, Du Pont, Ethyl, W. R. Grace, Hercules, International Minerals & Chemical, Monsanto, Reichhold Chemicals, and Union Carbide.

Some of the biographies, which are the only source of information for this survey, are surprisingly short on basic statistics. For instance, 40% of them do not give the executive's age. However, data are available from the biographies on at least 50% of the 190-man sample for all of the parameters looked into by C&EN. In most cases data are available on 70% or more.

Native born. Birthplace data are available on 145 of the men in the survey. Only 10 of the 145 are foreign born. And 55% of the native born are from the Northeast—an area that contained only 33% of the total U.S. population in the 1910's and 1920's when most of them were born. This overrepresentation is largely made up by an underrepresentation of southerners. Only 13% of the executives are from the South—an area that accounted for 26% of the total population in 1920. The Midwest is also underrepresented—supplying only 23% of the executives from 32% of the population.

This northeastern orientation tends to make the executives city boys. For instance, 11% of them were born in New York City. And a total of 28% were born in the nation's 20 largest cities—cities that made up only 17% of the total population 50 years ago. However, 32% of them were born in small towns of less than 10,000 population and in rural areas.

The pattern of the location of the undergraduate schools attended by the executives tends to follow the birthplace pattern. But apparently the attraction of the Ivy League has something to do with bringing the Northeast's share up another three notches to 58%. The most popular school is Yale, attended by nine of the 172 on whom data are available. Harvard and Princeton attracted eight each and Purdue six. The Ivy League attracted a total of 33, the Big Ten universities 23. Only six of the 172 received their undergraduate education in foreign schools.

This dominance of the Northeast persists for the graduate training received by the executives. About 40% of them have one or more advanced degrees and 57% of these were earned in northeastern schools. In this case Harvard is the clear favorite, with no less than 17 out of the total 79. Massachusetts Institute of Technology comes in second with only four. Harvard's total of 17 includes 11 at the business school and five at the law

Most chemical executives majored in chemistry, engineering . . .

Undergraduate major	Per cent[a]
Chemical engineering	27%
Chemistry	25
Liberal arts	17
Other engineering	15
Business administration	7
Other business subjects	7
Law	2

a Sample size 138.

. . . while business, law dominated their graduate-level education

Graduate major	Per cent[a]
Chemistry	31%
Business administration	30
Law	25
Chemical and other engineering	7
Economics	4
Mathematics	1
Philosophy	1
Medical science	1

a Sample size 75.

MONS 083252

95% of chemical executives are 45 or older . . .

Age	Per cent[a]
35 to 39	1%
40 to 44	4
45 to 49	16
50 to 54	29
55 to 59	26
60 to 64	20
65 and older	4

[a] Sample size 114.

. . . and 64% have worked 20 years or more for their firms

Years of service with company	Per cent[a]
less than 5	10%
5 to 9	8
10 to 14	8
15 to 19	10
20 to 24	12
25 to 29	19
30 to 34	17
35 to 39	14
40 or more	2

[a] Sample size 182.

school. Also, at least another dozen executives have attended advanced management programs at Harvard.

Data are available on the undergraduate majors of 138 of the men in the survey. Twenty-five per cent of these majored in chemistry, 27% in chemical engineering, and 15% in other forms of engineering. Chemistry more than holds its own at the graduate level, claiming 30% of the 75 on whom data are available. But chemical and other engineering drops to only 7%. And law, business administration, and other business-related subjects move up from 16% of the undergraduate majors to 59% of the graduate degrees.

Faithful service. The survey also clearly brings out that the major route to the top of the executive ladder in the chemical industry is still via long and faithful service with one company. The bright young man is not unknown, neither is job-hopping—but they are still the exception at the very top management levels.

Only one of the 114 executives on whom age data are available is in his thirties. Only four more are younger than 45; 55% of them are in their fifties and 24% in their sixties. Their average age is 54.5.

Data are available on the length of service of 182 of the men in the survey. More than half of them, 52%, have 25 years or more with their present employer, 64% have 20 years or more, and 74% have 15 years or more. Those with less than five years of service—or those who essentially were hired directly into their present position—make up 10% of the total.

Although it usually takes a long time to make it to the top of the executive ladder at a chemical company, the survey indicates that things are quite fluid within the executive suite. Data are available on how long 180 of the executives have been in their present positions. No less than 41% of them have held their jobs for less than three years, 15% for less than a year. The median is three years and the average is 3.6. Ninety-seven per cent have been in their present jobs for 10 years or less. There is one notable exception to all of this—a man who founded his company 46 years ago and who is still its board chairman and chief executive officer.

Prestige suburbs. Data are available on the homes of 122 of the men covered by the survey. Only eight of these live in New York City. Another 13 live in other major cities, including Wilmington, Del. But 99 of them, or 81%, live in suburban or fringe suburban/rural areas. The high-prestige suburbs—such as Scarsdale in New York; Manhasset on Long Island; Darien, Greenwich, and Stamford in Connecticut; Short Hills and Morristown in New Jersey; and Greenville in Delaware—are all represented.

But of the 122 on whom home data are available only two live abroad—one in Montreal and one in Paris. This is in line with the generally low foreign influence in chemical industry executive suites. Many major chemical companies are beginning to think of themselves as multinational organizations. And foreign business accounts for 30% of total sales in several cases. But in spite of all this, only 7% of the men covered by the survey were born outside the U.S., and even some of these were born of U.S. parents. Only 3.5% of the total received their undergraduate training overseas and only 4% of those with advanced degrees earned them at foreign schools.

The early work experience of the executives covered by the survey was mostly centered on the scientific, production, sales, and financial areas. About 35% of them started in laboratory, either in research and development or in a plant lab. This is not a surprising figure considering that 52% of them have undergraduate degrees in either chemistry or chemical engineering. Production and operating experience and exposure to sales and marketing each show up in the early business careers of about one third of the men. And 37% have financial and legal experience.

The survey clearly shows the complete absence of U.S. career military men from chemical executive ranks. Only one of the 190 men covered had a full military career before joining his company. And this was with the Canadian military.

Marital status. Data are available on the marital status of 123 of the men in the survey. And all 123 are married. Sixty-seven of the biographies give no data on marital status. There is apparently an industrywide taboo against spelling out if an executive is single, divorced, or a widower. Such terms appear on none of the 190 biographies. Hence it is not possible from the biographies to get an exact fix on the total number that are married because some of the 67 are probably married, also. The 123 that are married have a total of 338 children, for an average of 2.8 each. Three is the median number.

For those who are interested in the stars and such, the signs of the zodiac have little to do with predestining a man to an executive career in the chemical industry. The actual birth date is available on 95 of the 190 in the survey, for an apparent average of about eight for each of the 12 signs. Libra, Scorpio, and Pisces lead with 10 each. Sagittarius and Aquarius trail with four and five, respectively.

Lab production, sales are executive training grounds

Business activity	Per cent[a]
Laboratory work	35%
Production	34
Sales and marketing	32
Financial	27
Engineering	11
Legal	10
Industrial, press, and labor relations	4
International	2
Military	1

[a] Per cent of executives with experience in these activities prior to assuming major managerial function. Adds up to more than 100% as many executives were exposed to more than one activity. Sample size 150.

MONS 083253

can you do with these Moly chemicals?

Molybdenum Tetrachloride
Molybdenum Dioxydichloride
Molybdenum (III) Acetylacetonate
Molybdenum Tetrachloride Dipyridine
Molybdenum Oxytrichloride
Molybdenum Oxytetrachloride
Ammonium 5-Molybdocobaltate (III)
Ammonium 6-Molybdocobaltate (III)
Ammonium 6-Molybdocoluminate (III)
Ammonium 6-Molybdochromate (III)
Ammonium 6-Molybdonickelate (II)
Molybdenyl Bis-Acetylacetonate
Molybdenum (VI) Oxalate
Ammonium 6-Molybdonickelate (IV)
Ammonium 6-Molybdoferrate (III)
12-Molybdophosphoric Acid
12-Molybdosilicic Acid
Sodium 12-Molybdosilicate
Molybdenum Trichloride
Molybdenum Trichloride Dibenzoate
Molybdenum Naphthenate (Type 1)



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Industry This Week in Brief

CORPORATE

Commonwealth Oil Refining Co., Inc. (Corco), San Juan, P.R., is restructuring its organization. Company has eliminated several divisions and departments, consolidating their functions with those of other departments. Because of economic problems, about 80 of Corco's 1700 employees have been laid off, mainly in offices in San Juan and Penuelas, P.R., and in New York City.

Rietz Manufacturing Co., Santa Rosa, Calif., has been acquired by **Berwind Corp.,** Philadelphia, and becomes part of Berwind's process equipment group. Rietz, which has annual sales of about $5 million, makes size reduction, mixing, heat exchange, dewatering, and drying equipment for process industries. It has facilities in West Chester, Pa., and Anaheim, Calif., as well as in Santa Rosa.

Scientific Ecology, Inc., has been formed in Paramus, N.J., to provide systems approach to pollution control. Services offered by new company include design, engineering, construction, manufacturing, financing, and operation of facilities to process wastes, as well as for conversion of sea water to potable water. Scientific Ecology will draw upon resources of **Burns and Roe Construction Corp.** in Paramus, **Leaveslev Industries,** Houston, Tex., **Sovereign Construction Co.,** Fort Lee, N.J., and **Edward A. Sargent Associates,** Kearny, N.J.

INTERNATIONAL

Merger of French companies **Pechiney and Ugine-Kuhlmann** became effective in April with share exchange equal to eight Ugine-Kuhlmann shares for nine Pechiney shares. Merger, announced last year (C&EN, Sept. 28, 1970, page 15), creates France's largest industrial group with combined sales of about $2.7 billion in 1970. About 30% of new group's activities is in aluminum, 21% in copper, 21% in chemicals, 13% in steel and ferroalloys.

Continental Copper & Steel Industries, Inc., New York City, is building 400 ton-per-day contact sulfuric acid plant at Sagasca, Tarapaca, Chile. Design and construction contract has been awarded **Pan American Consulting International, Ltd.,** Freeport, Bahamas. Pan American's design and engineering is based on **Monsanto Enviro-Chem Systems, Inc.'s** vanadium catalyst process to reduce sulfur dioxide emissions. Completion is scheduled for third quarter this year.

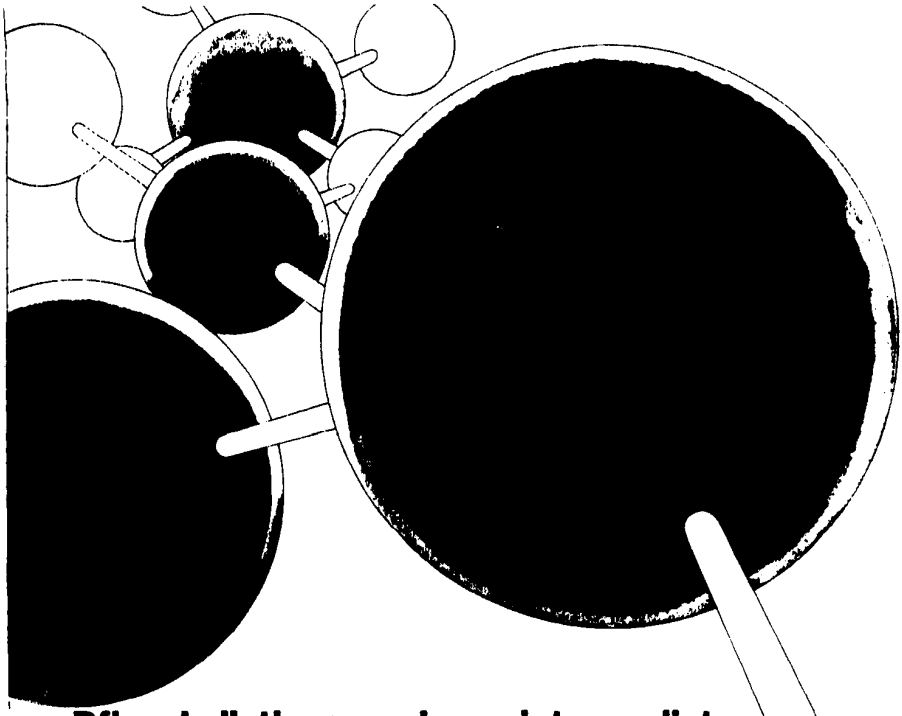
Sales of U.K.'s **Rio Tinto-Zinc Corp., Ltd.,** topped $1 billion last year. Metals and chemicals group, which owns **U.S. Borax and Chemical Corp.,** hiked sales 30% to $1.05 billion and lifted profits to $57 million from $51 million, rise of about 17%. Most major U.K. chemical companies last year recorded drops in profits (C&EN, March 29, page 25). RTZ's costs rose substantially last year, climbing 33% to $861 million. Company recently closed one of its U.K. zinc plants and laid off 800 workers because of "serious economic conditions."

Hitachi, Ltd., Japan, has made 513 of its U.S. patents available for licensee arrangements. Among 13 patents covering equipment for chemical industry are those including apparatus for thermal cracking of hydrocarbons; apparatus for biaxially stretching film material; process and apparatus for low-boiling gas mixtures; and method and apparatus for cryogenic separation of coke oven gas.

Maschinenfabrik Hennecke, GmbH, Leverkusen, West Germany, subsidiary of **Farbenfabriken Bayer, A.G.,** will supply equipment and know-how for polyurethane foam components facility to be built at Ishevsk, U.S.S.R. Plant will produce some 24 polyurethane foam components to be used in the Russian Moskvitsch automobile; annual capacity will be 7.2 million pieces.

Electric Reduction Co. of Canada, Ltd., has opened new sodium chlorate cell line at its North Vancouver factory. Fifth cell line increases capacity of **Albright & Wilson, Ltd.,** subsidiary more than 25%

MONS 083254



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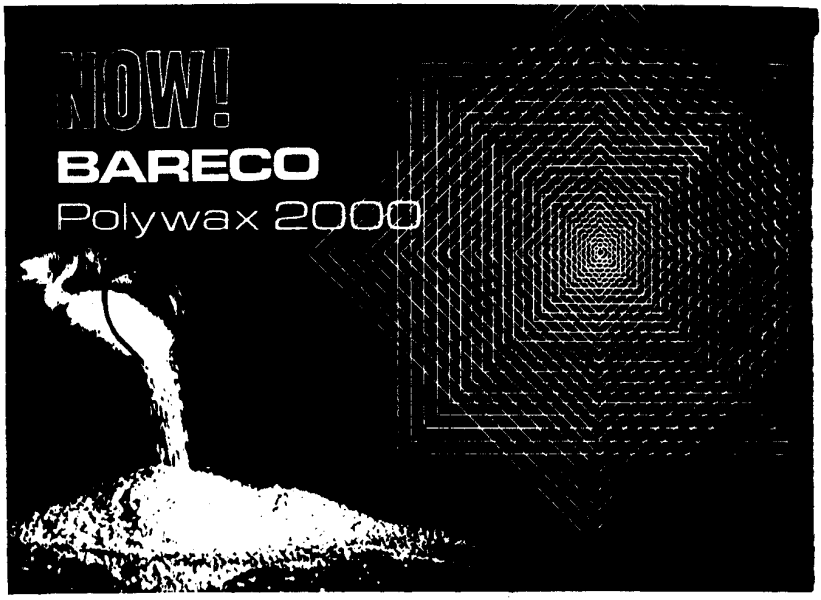

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Molecular Weight Distribution, Mw/Mn.	1.3
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Viscosity, Brookfield, cps, @ 300° F., ASTM D-2669	34
Needle Penetration, @ 77° F., ASTM D-1321	0.5
Needle Penetration, @ 180° F., ASTM D-1321	3.5
Color, Saybolt, ASTM D-156	16
Acid Number, mg KOH/g of wax, ASTM D-664	0
Saponification No., mg KOH/g of wax, ASTM D-94	0
Coefficient of Friction, ASTM D-2534	0.187
Odor, ASTM D-1833	0

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MONS 083256

INTERNATIONAL CONCENTRATES

Algerian trade problem

The present crude oil crisis between France and Algeria will likely affect chemical trade between the two countries, a French government spokesman tells C&EN. Once again Algeria may look for chemical suppliers in East European countries, he adds. Although French imports of Algerian chemicals are very small, Algeria imports some $72 million worth of chemicals from France. Algeria accounts for about 3% of total French exports of chemicals and for 25% of France's exports of chemicals to the franc zone. ■

Investment squeeze

The West German chemical industry must limit its investments in 1971, says Dr. Rolf Sammet, president of Farbwerke Hoechst. This year the West German chemical industry will reduce its total planned investment by 30% compared to 1970, thus saving about $410 million. Dr. Sammet, who recently warned that Hoechst may cut its 1971 dividend sharply, also predicts that growth in sales of the West German chemical industry in 1971 may not even match that of last year—a modest 6.8%. ■

DSM earnings down

Net earnings of Netherland's DSM fell 25.9% last year to $22.5 million. Consolidated sales in 1970, however, rose 14.8% to $374 million. DSM invested some $70.6 million in 1970, up about 56% over 1969, and will invest about the same amount in 1971. Among DSM's major projects are a 500,000 metric-ton-per-year ammonia plant now in startup at Geleen, a 300,000 metric-ton ethylene facility to go on stream by year's end, and a 200,000 metric-ton vinyl chloride plant at Tessenderloo. ■

Bomb Mount Etna?

Scientists want to bomb the Mount Etna volcano in Sicily. The bombing, proposed by French volcanologist Haroun Tazieff, would reroute the rivers of lava which are flowing southeastward and endangering a major geothermal research center. The recent eruption of Etna, which started a few weeks ago, is the worst in the past 20 years. Lava, smoke, and ashes have already destroyed the laboratory's overhead cable car system. The bombing would tear holes in the east side of several craters to send the lava flow eastward instead of southeastward. ■

Japanese methanol . . .

The Mitsubishi Industrial combine will consolidate its position in methanol production in Japan through merger this autumn of Mitsubishi Edogawa Chemical Co. with Japan Gas-Chemical, largest independent methanol producer in Japan and already supplier to Mitsubishi Edogawa's formaldehyde production. The new firm also will hold 85% equity in Keshima Methanol, a five-way joint venture that will put an 800 metric-ton-a-day methanol unit on stream in 1972. ■

. . . via multiventures

The Mitsui and Sumitomo combines are taking the cooperative route in building large-scale methanol facilities (C&EN, May 12, 1969, page 40). Sumitomo Chemical Co. owns 50% of a joint venture whose recently completed 800 metric-ton-a-day unit will supply methanol to 10 parent firms in proportion to their equities. A similar, seven-way venture, 50% owned by Mitsui Toatsu Chemicals, will bring a 1000 metric-ton-a-day plant on stream later this year. Japan Gas-Chemical is also a minor shareholder in both these ventures. ■

Giant gas plant

Chemical Construction Corp., New York City, has signed a $300 million contract with Sonatrach, Algeria's state-owned oil and gas firm, to build a giant gas liquefaction plant at Arzew, Algeria. Construction of the plant—the largest in the world, Sonatrach tells C&EN—will start next year and will require four years. The plant will liquefy some 10 billion cubic meters per year of natural gas to be transported by tankers for El Paso Natural Gas Co. and distributed on the East Coast of the U.S. ■

Yugoslav venture

France's Pechiney-Saint-Gobain and Yugoslavia's OKIS (Organsko Kemijska Industrija Skopje) have launched a joint venture, called Violeta, to make vinyl chloride in Yugoslavia. Violeta will build a 50,000 metric-ton-per-year vinyl chloride plant at Skopje. The plant will go on stream by 1973. Pechiney-Saint-Gobain will contribute about $375,000 to the $3 million project. Vinyl chloride will be polymerized on site by OKIS. ■

Adhesives in France

West Germany's Badische Anilin-& Soda-Fabrik and the French firm Azote et Produits Chimiques (APC) will build a plant to produce urea-formaldehyde adhesives in Toulouse, France. The 60,000 metric-ton-per-year facility is expected to go on stream at the end of 1972. It will operate as a joint venture of BASF and APC under the name Collee et Résines Adhésives du Midi (Corem). Methanol and urea for the plant will be supplied from APC plants in southwest France. APC is a subsidiary of Entreprise Minière et Chimique, France's largest state-owned chemical firm. ■

MONS 083257

Tape Recordings

Chicago ACS Meeting Sessions

[ ] **"Organic Chemistry—Recent Advances"**
(excerpts from Morris S. Kharasch Memorial Symposium)

Dr. F. R. Mayo: Additions of Halogen Acids and Sulfhydryl Compounds of Unsaturated Compounds
Dr. C. Walling: Additions of C-H and C-Halogen Bonds to Olefins
Dr. R. R. Hiatt: Reactions of Organic Peroxides
Dr. E. K. Fields & Dr. S. Meyerson: Organic Radical Reactions in the Liquid and Gas Phases
Dr. G. A. Russell: Radical Substitution Reactions
Dr. H. C. Brown: The Reactive Paraffins
(Full Half-Day Session—Unedited)

[ ] **"How To Succeed In Business By Really Trying"**
Dr. D'Ianni; Dr. Guthmann; Dr. Mariella; Dr. Jonnard; Dr. McSweeny
(Full Half-Day Session—Unedited)

[ ] **"Public Policy Aspects of Education in Chemistry"** (Full Half-Day Session—Complete, Unedited)

[ ] **"Symposium on International Conference on Education in Chemistry"** (Full Half-Day Session—Complete, Unedited, *plus* copy of the Preliminary Report on the Snowmass-at-Aspen Conference)

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The Search for Significance—Parts I & II

[ ] **Dr. Glenn Seaborg**
The Atomic World of Glenn Seaborg
Dr. George Wald
Vision, Night Blindness, & Professor Wald

[ ] **Dr. Linus Pauling**
The Committed Scientist
Dr. Jacob Bronowski
Science and Man

[ ] **Dr. John Richards**
Molecules Meeting Molecules
Dr. Raymond Davis
The Noutrinos of the Sun

[ ] **Dr. R. E. Dickerson**
An Evolving Engine
Dr. Russell Doolittle
Chemical Evolution

[ ] **Dr. G. Staal & Dr. J. Siddall**
New Weapons Against Insects
Dr. Wendell Roelofs
Moths, Drugs, & Pheromones

[ ] **Dr. B. Eastlund & Dr. W. Gough**
The Fusion Torch
Dr. James Guillet
The Impermanent Plastic

[ ] **Dr. Neil Bartlett**
Lively Xenon
Dr. Mark Ptashne
The Repressor Hunt

[ ] **Dr. William Prinz**
The New Prospectors
Dr. Jack Mendelsohn
A Sober Look at Alcoholism

[ ] **Dr. David Pressman**
Probing the Active Site
Dr. Oliver Smithies
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MONS 083258

GOVERNMENT CONCENTRATES

Investment tax credit

Industry has nothing to gain by deferring new-equipment purchases in the belief that the 7% investment tax credit—which was dropped in 1969—will be reinstated, Treasury Secretary John Connally tells the U.S. Chamber of Commerce. One reason, he says, is that the Administration has no intention of recommending that Congress reinstate the investment tax credit "at this time." And even if Congress did restore the investment credit, he adds, he has been assured that it would be retroactive to at least April 1. ■

Ant control resumed

After a favorable court ruling, the Department of Agriculture has resumed its fire ant control program in the southeastern U.S. Some 7 million acres will be treated with Mirex bait. The Environmental Defense Fund had sought a preliminary injunction to halt the program, but a federal judge denied the request. Judge Oliver Gasch concluded that "the use of Mirex at the proposed dosage will cause no excessive or irreversible impact on the environment." ■

Quarantine dropped

The National Aeronautics and Space Administration has discontinued quarantine for astronauts, spacecraft, and lunar materials for the remaining three Apollo flights. Dr. George M. Low, NASA acting administrator, says the agency has concluded from an analysis of Apollos 11, 12, and 14 that lunar materials contain no hazard to man, animals, or plants. Last year an earlier NASA plan to drop the quarantine was scuttled at the urging of a National Academy of Sciences Space Science Board committee. ■

NAS role reaffirmed

The National Academy of Sciences has reaffirmed its role as adviser to the Federal Government on classified matters, which include industrial trade secrets as well as national defense. University of Chicago geneticist Richard C. Lewontin's motion to halt the academy's engagement in activities that lead to classified reports was defeated at last year's annual meeting and effectively tabled this year when the meeting adjourned. Dr. Lewontin has submitted his resignation to the academy. ■

Ocean dumping

Contending that it would not be feasible to ban all ocean dumping in U.S. waters at once, the Administration has asked Congress for authority for strict controls on what may be thrown away at sea. Testifying before the Senate Subcommittee on Oceans and Atmosphere, Environmental Protection Agency administrator William D. Ruckelshaus said that in some instances waste disposal methods that are less damaging to the environment than ocean dumping are not immediately available. ■

Consumer information

The Government is stepping up its consumer information efforts. The Office of Consumer Affairs, headed by Virginia Knauer, has begun publishing a newsletter ("Consumer News") on the consumer activities of federal departments and agencies. The Federal Government has also released an Index of Consumer Product Information and says that it will soon identify by brand name products it buys that also are available to consumers. ■

Environmental labs

Formation of national environmental laboratories (NELS) has been strongly supported at the opening of hearings by the Senate Subcommittee on Air and Water Pollution. Dr. Alvin M. Weinberg, head of the Oak Ridge National Laboratory, testified in support of S. 1113 creating NELS. The environment, he says, because of its complexity, requires an entity that has the power to look at questions broadly without pressure from particular government or private agencies. ■

New AEC contractor

The Atomic Energy Commission is entering into negotiations with Aerojet-General and Allied Chemical for operation of facilities at AEC's National Reactor Testing Station in Idaho. The current contract with Idaho Nuclear Corp. expires June 30 and the firm does not wish to continue as the operating contractor. AEC will negotiate with Aerojet, the majority stockholder and managing partner of Idaho Nuclear, for the prime contractor role. The Idaho chemical processing plant would be the responsibility of Allied as a subcontractor to Aerojet. ■

Cooperation in MHD

The U.S. and West Germany have agreed to cooperate in the field of magnetohydrodynamic electric power generation. Under the agreement, cooperation between the two countries may include exchange of information and of scientific and technical personnel, periodic meetings of scientific and technical personnel, and cooperation on scientific projects. MHD has the potential to help meet the growing demand for energy with minimum adverse effects on the environment. ■

MONS 083259

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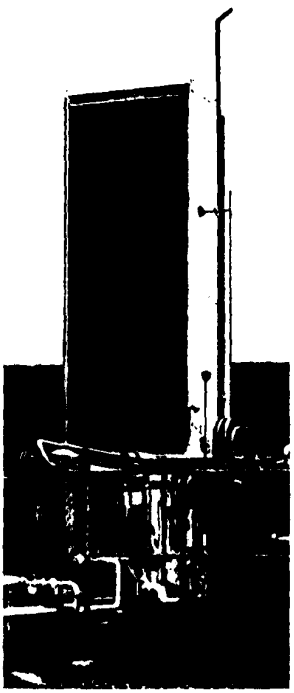

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MONS 083260

U.S. monitors discharges into inland waterways

Army Corps of Engineers, using Refuse Act of 1899, starts permit program to license discharge sources, cleanse rivers and streams

A 72-year-old law, liberally interpreted by the courts and applied by an unlikely agency for water pollution control, may well do more to clean up the nation's waterways than many a more recent law passed by Congress. The Refuse Act of 1899 prohibits discharges—except in liquid form from public streets and sewers—into any U.S. navigable waters or their tributaries without a permit from the Army Corps of Engineers. Thus armed, the corps is instituting a Refuse Act permit program that will require all industrial dischargers to apply for a permit by July 1.

Estimates of the number of discharge sources in the U.S. run from a low of 40,000 to as many as 100,000. In addition, some 1000 new sources come into existence each year.

The corps will process permits, but the appropriate state and interstate agencies will have to certify that a discharge meets applicable water quality standards. Facilities existing as of April 3, 1970, will have until April 3, 1973, to get state certification.

Review. The Environmental Protection Agency will also review permits on a spot-check basis for water quality considerations. EPA thus will have veto power over permits. And the Departments of Interior and Commerce will review applications for the impact of discharges on fish, wildlife, and environmental values other than water quality.

Hailed as "the single most important step to improve water quality this country has yet taken," by Russell Train, chairman of the Council on Environmental Quality, the permit program is expected to achieve a number of goals. One of these goals is to provide the first methodical inventory of what industry is putting into the nation's waterways.

An important change from the past, according to EPA administrator William D. Ruckelshaus, is that the burden of ensuring compliance with water quality standards is no longer wholly on states and the Federal Government. Now, industry must tell what effluents it is discharging and what its problems are.

Another benefit of the program is that it provides a systematic, orderly means of obtaining compliance with water quality standards. The enforcement mechanism is swifter, more comprehensive, and more streamlined than that available under the Federal Water Pollution Control Act.

Before the Refuse Act permit program, the states and the Federal Government could only react to acts that had already been committed. Now, however, the program gives states the authority and responsibility to monitor what is and what will be dumped into its rivers. States won't have to wait until a plant is built to decide whether it meets water quality standards. Before a major investment is made in a new plant, the plant will have to be certified, according to a corps spokesman. Besides providing a vehicle to monitor what is being discharged into streams, the program thus forces industry to take a hard look at its future discharges.

Environmentalists have criticized the program, contending that it merely provides a license to pollute. But Mr. Ruckelshaus emphasizes that the program should not be construed in this fashion. "In all cases," he says, "a discharger will be required to meet applicable water quality standards or face swift enforcement action."

Three courses of action are open to the corps in approving permits. If there is no treatment or inadequate treatment and the firm is not meeting its implementation schedule under applicable water quality standards, the permit request will be denied.

If there is no treatment or the treatment is inadequate, but the firm is meeting its implementation schedule, the corps has the power to grant an interim permit. This permit provides for frequent and periodic review to ensure that the permit holder is continuing to meet his schedule.



Discharges will be allowed only with a permit from the Army Corps of Engineers

If a state or interstate agency certifies that the applicant is currently meeting water quality standards, the corps will issue a final permit valid for a fixed period up to five years. All such permits will require continued compliance with applicable water quality standards and periodic reports on activities subject to the permit. In the event that water quality standards are revised, a new permit based on the new standards will be required.

EPA will refer to and encourage states to use effluent guidelines when judging whether to certify a plant. The agency is now developing guidelines that will define the industrial equivalent of secondary treatment as well as the best available level of treatment for major industries. Guidelines are being developed by EPA for

MONS 083261

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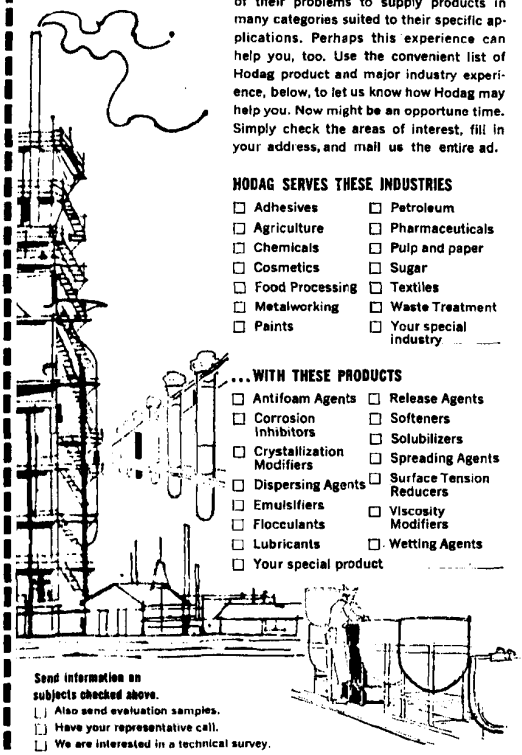

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Identification. Applicants for a permit will be required to furnish information to identify fully the character of the discharge or deposit and the monitoring devices and procedures which will be used. Data sought on a form prepared by the corps include pH, temperature, color, odor, specific conductance, and chemical composition in terms of 53 listed chemical parameters. Biological parameters are also covered.

Filling out the form will involve a tremendous technical analysis workload, according to Howard Brown, technical secretary for the Manufacturing Chemists Association water resources committee. He says that the cost will be substantial and thinks that some laboratories will have to let contracts for studies to provide some of the information.

Disclosure of trade secrets is also a worry of MCA. Mr. Brown admits that the final rules for permits provide less reason for concern about disclosure of trade secrets, but he says that some industries could still be sensitive. A lot depends on how the district Corps of Engineers office interprets and enforces the rules.

The application and supporting documents will be made public unless the permit holder can convince the Government that disclosure would divulge trade secrets. A public hearing may also be held on permits if controversy arises over a particular application.

Scrutiny. Public scrutiny of the documents is expected to lead to a major role in the permit process for environmental organizations. Such groups could enter into the public hearings phase of a permit application or take legal action against the Government if they felt that permit stipulations weren't tough enough.

Both the corps and EPA are gearing up for the permit program by expanding their staffs. The corps intends to add 400 people to process applications and monitor discharges and EPA expects to add 150 people to its staff for reviewing permits.

A potential bottleneck in the approval of permit applications may lie at the state level, however. The onrush of applications is expected to burden the already understaffed water pollution agencies. Moreover, some states do not yet have approved water quality standards.

MONS 083262

SCIENCE/ EDUCATION CONCENTRATES

Lunar erosion

The moon's surface is being slowly but steadily eroded at a rate of one to a few atom layers per year, Dr. Robert L. Fleischer of General Electric's research and development center said at last week's meeting of the American Physical Society in Washington, D.C. The rate of erosion—by micrometeorites, cosmic rays, and sputtering—has been determined by the density of tracks of solar cosmic rays in a glass filter retrieved by Apollo 12 astronauts from the Surveyor III television camera. ■

Lunar fertilizer

Five grams of irradiated lunar fines will be placed around lettuce plants at Texas A&M University in an effort to find why growth of some plants is enhanced when lunar material is added to the soil. The material, obtained by Apollo 11 astronauts, will be irradiated in Texas A&M's nuclear reactor. After two weeks of growth, the lettuce will be tested for incorporation of any radioactive material in the plant tissues, says Dr. Paul S. Baur, Jr., of North Texas State University, who is a visiting scientist at NASA's Manned Spacecraft Center. ■

Forbidden antibodies

Scientists at the University of Wisconsin medical school have linked the muscular fatigue syndrome myasthenia gravis to the presence of a "forbidden" antibody. The Madison, Wis.-based team, headed by Dr. Steven E. Kornguth and Dr. Raymond W. M. Chun, finds that the antibody—not yet isolated—acts by attacking a protein present in neurons that carry signals from the brain to activate muscles. Such forbidden antibodies apparently exist in a number of nervous disorders, Dr. Kornguth adds. ■

Genetic screening

A pilot project for what may be the first large-scale genetic screening program in the U.S. will begin this week in the Washington, D.C.-Baltimore, Md., area. Carriers of the fatal Tay-Sachs disease—in which absence of the enzyme hexosamidase-A causes accumulation of a sphingolipid in the brain of infants—will be sought among some 60,000 married couples of child-bearing age who are of East European Jewish origin. Blood tests, to be conducted by John F. Kennedy Institute, will identify carriers by a 50% reduced activity of the enzyme. ■

Virus evidence

Discovery of an enzyme in Australia antigen, isolated from the serum of patients with transmissible hepatitis, gives more evidence for presence of virus in hepatitis, the enzyme's discoverer, Dr. Shalom Z. Hirschman, of Mount Sinai School of Medicine, says. Speaking before the microbiology section of the New York Academy of Sciences, Dr. Hirschman said the discovery opens up a new field of study in the biochemistry of hepatitis and should facilitate development of a hepatitis vaccine. ■

Supports improved

Physical properties of siliceous supports for gas chromatography can be improved by special detergent washes, holding at temperature, and treatment with dilute hydrofluoric acid or ammonium hydrogen fluoride, Dr. R. D. Schwartz of Pennzoil United, Inc., told the 50th meeting of the Gulf Spectroscopic Group in Lake Charles, La. Other improvements of metal oxide and salt supports can be made by solvation followed by solvent removal by special methods. ■

Increasing protein

A method to increase the protein content of plants may eventually result from research at Berkeley's Lawrence Radiation Laboratory. Dr. James A. Bassham told last week's meeting of the National Academy of Sciences in Washington, D.C., that ammonium ions added to the environment of Chlorella pyrenoidosa algae or isolated spinach chloroplasts stimulate protein synthesis by activating the enzyme pyruvate kinase on the pathway to amino acid synthesis and deactivating sucrose phosphate synthetase on the pathway to synthesis of sugars. ■

Single-food diets

Weanling rats can survive and grow on a diet consisting entirely of eggs, Dr. Roger J. Williams told the National Academy of Sciences meeting. Eggs were the only food providing normal development among common foods, including enriched bread and breakfast cereals, fed singly to rats in studies by Dr. Williams, Dr. James D. Heffley, and Dr. Charles W. Bode at Clayton Foundation Biochemical Institute, University of Texas, Austin. ■

Cancer detection

The firefly luciferase assay for adenosine triphosphate (ATP) may be used to quickly detect cancer in cells or to detect viral infection in two related processes patented by Emmett W. Chappelle, Goddard Space Flight Center, Greenbelt, Md., and Dr. Gilbert V. Levin, president of Biospherics, Inc., Rockville, Md. In experiments which are still preliminary, Mr. Chappelle points out, cancer cells exhibited lower ATP concentrations than did normal cells. Higher-than-normal ATP levels are found in tissue cultures inoculated with a virus material. ■

MONS 083263

Suppliers' errors beset radiochemicals users

Purity and identity that don't match labels add to other problems troubling users of tagged compounds

Buyers of radioactive chemicals will have to get used to testing incoming shipments to ensure that contents of bottles match descriptions on bottle labels, says Edward J. Merrill of Warner-Lambert Research Institute, Morris Plains, N.J. Senior scientist Merrill and Warner-Lambert's director of analytical and physical chemistry, Arnold D. Lewis, have surveyed 300 radiochemical shipments to the company over eight years and have discovered errors in 10 instances. Mr. Merrill described their findings and recommendations to Metrochem 71, a joint meeting of the New York, North Jersey, and Puerto Rico Sections of the American Chemical Society, held last week in San Juan.

The survey is the most thoroughgoing analysis to date of problems that a growing number of radiochemicals users feel they have with suppliers of the compounds. Users feel they cannot be certain of chemical purity, identity and activity of isotope tags in compounds, and even chemical identity of the compounds they've purchased. Contaminated outer surfaces of packages are another complaint.

Liabilities. Erroneous labeling is only one of several problems confronting users of radiochemicals, however. Radiochemicals are inherently unstable. Purity also suffers because of the lack of standards for preparation of radiochemicals and for measurement of their radioactivities. Confusion arises when users lump liabilities inherent in tagged compounds together with mislabeled bottles to prove suppliers' "incompetence."

Letters to the editor of *Science* and remarks made in meeting presentations have focused scientists' attention on mislabeled bottles during the past year. Coming months will see much more official attention given to problems with radiochemicals.

This June, Dr. John C. Leak of International Chemical & Nuclear Corp., Irvine, Calif., will present a supplier company's view of quality control for this exacting market to an American Society of Biological Chemists meeting in San Francisco. Turning for the first time to problems in radiochemicals, the National Academy of Science's National Research Council will insert a note on the subject in the edition of the academy's authoritative "Specifications and Criteria for Biochemical Compounds" appearing later this year. At the 1972 ACS spring meeting in Boston, Mass., Dr. Gerald Goldstein of Oak Ridge National Laboratory, Oak Ridge, Tenn., will chair a symposium on biological compound specifications. The symposium will include discussion of customer-seller difficulties, Dr. Goldstein says.

Errors. In the Warner-Lambert study reported by Mr. Merrill at Metrochem 71, 10 cases of clear error appeared among 300 shipments, for an incidence of 3.3%. He cites as an example of chemical impurity a sample of chloroacetic acid-^{14}C that showed two acidic spots when scanned visually by thin-layer chromatography after the plate was treated with bromcresol green. The same chromatogram showed three spots when scanned for radioactivity. The spot corresponding to chloroacetic acid contained only 25% of the radioactivity on the plate.

A compound described as cyclopentanol-1-^{14}C was found to be tagged with tritium as well, Mr. Merrill says. An order of 8 millicuries of rubidium-86 chloride was filled with a shipment of 4 millicuries. (Radiochemical quantities are usually quoted in millicuries—the amount of substance decaying at 3.7×10^7 disintegrations per second.)

Mr. Merrill recommends quality control procedures that use a minimum of sample and that allow sample recovery. To verify chemical identity, Warner-Lambert uses melting point determinations, ultraviolet spectra (2-mg. samples), micro-infrared spectra (0.1-mg. samples), microtitrations (25-mg. samples), and various chromatographic techniques, depending on sample size available. A liquid scintillation counter and a multichannel analyzer, singly or interfaced, help determine total radioactivity, identify isotope tags, and detect an isotope in a compound supposedly tagged with another.

The Warner-Lambert study also indicates that buyers must beware of opening damaged shipments in low-background counting rooms. Wiping the outside of a bottle and counting the wiping tissue detects radioactive contamination that might ruin a low-background area. Mr. Merrill cites a vial of estrone-6,7-^{3}H whose screw cap had worked loose, and 15% of the benzene-methanol solution had spilled into the packaging.

Suppliers. Buyers who have complained publicly have cited details of errors but have not named suppliers. This has not pleased either other scientists or supplier companies. Scientists would like to know supposedly "good" from "bad" companies. Companies want to get names and details on record, so they can reply in defense. The industry has no trade association to speak for it, as do radiopharmaceutical manufacturers. Until Mr. Merrill disclosed the re-



Arnold Lewis (left) and Edward Merrill found 10 mistakes in 300 shipments

MONS 083264

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sults of the Warner-Lambert survey in San Juan, buyers had no information on frequency of bottle labeling errors.

The U.S. Atomic Energy Commission estimates the market in tagged chemicals at $14 million in 1970, and $16 million in 1971. C&EN contacted the five largest among 25 companies listed by AEC as producers of radiochemicals.

The five companies described meticulous programs of quality control. Periodic reanalysis of compounds in stock by several methods is routine, with time elapsed between retesting gaged by company experience with compound stability. Buyers may contact suppliers for details on stabilities and batch histories. Companies catalog and analyze buyer complaints by type, to run down sources of error. Suppliers investigate buyer complaints and refund money if defects are found. Companies recommend checks by customers on all incoming shipments to avoid lost time and money in experiments.

The conclusion is that users with specific requirements must analyze radiochemicals and correspond with suppliers to determine presence of impurities that might inactivate enzymes or otherwise spoil sensitive experiments. Yet when all difficulties intrinsic to handling radiochemicals are considered, there still remains a 3.3% residue of bottle labeling and packaging errors in the Warner-Lambert study. Defensive quality control is good for an organization with a large volume of shipments from radiochemical suppliers, but the problem is acute for a scientist whose purchases are few and small.

Improvement. Mr. Merrill sees some improvement in quality control by supplier companies over the past year, as evidenced by increased numbers of brochures published on quality control. Nevertheless, users will have to continue to sort out the three problems of bottle mislabeling, short shelf lives of certain tagged chemicals, and use of standard materials for measurement of radioactivity. New, strict standards for radiochemicals manufacture and activity measurement will alleviate two of the problems in coming years. But bottle mislabeling is not amenable to solution by rules. Mr. Merrill's solution is defensive quality control. Supplier companies contacted by C&EN say that in view of the importance of their clients' work, they agree.

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MONS 083265

Lectures bridge academic-industrial gap

Speakers at University of Massachusetts introduce students to chemistry as it is practiced in industry

Many college chemistry students have little idea of what industrial chemists do. But students at the University of Massachusetts in Amherst are getting a feel of what industrial chemistry is all about from a lecture series called "Chemistry in Action."

Organized last fall by chemistry professor Sidney Siggia, the lecture series is an attempt to reach across the academic-industrial interface. "Because of my industrial background (he was head of analytical research and services at Olin Corp.'s research laboratory in New Haven, Conn., before coming to the University of Massachusetts), many students come to me for orientation when they are seeking employment," Dr. Siggia explains. "They ask questions such as: 'What types of jobs exist in industry?' and 'What type of a job might best suit me?' I felt that it would be helpful to present a series of lectures describing chemical activities outside the universities. As a pilot lecture, I asked Dr. W. E. 'Butch' Hanford, vice president for research at Olin Corp., to speak to our students on 'Chemistry in the 70's and Beyond.' The talk was so enthusiastically received that a full lecture series was organized."



Dr. Sidney Siggia

Relationship. The lecture topics were selected to explore the role of chemistry and chemists in modern society and technology and to indicate the relationship of the chemistry taught in school to the chemistry practiced in the field. The lectures give the student some idea of the broad spectrum of chemical areas that are available to him as a career.

"In the universities, we accent the scientific aspects of the field," Dr. Siggia says. "The student sees little of the applied aspects or of the areas on the fringes of chemistry—namely, chemical law, sales, management, chemical information handling, and the like."

Through the lecture series, it is hoped that the student will become better able to orient his personal qualifications to the needs of the field. The lectures acquaint the student with direct job opportunities in diverse areas and introduce people to whom the student might write for information on specific areas.

Twenty-four lectures in addition to Dr. Hanford's were scheduled for 1970–71. The topics range across applied chemistry from the isolation of metallic elements from their ores (Dr. W. D. Peterson, associate director of Olin's metallurgical research center, New Haven, Conn.) to the chemistry and formulation of cosmetics (Dr. Edward Levy and Dr. C. E. Eden, Gillette Co., Boston, Mass.). Painting other sides of the industrial picture, Dr. John Flagg, director of American Cyanamid's research laboratory in Stamford, Conn., talked about chemical management, and Dr. Thomas O'Day, patent counsel at Olin Corp., discussed law and chemistry.

One and one half hours are allowed for the talks and discussions. The lectures are open to undergraduates, graduate students, and faculty. In general, one lecture has been scheduled per week. In addition to people from the University of Massachusetts, students from other colleges in the Amherst area and even from the University of Connecticut at Storrs have attended the lectures. Occasionally, students from local high schools have also been present.



Dr. W. E. Hanford

Rapt. Olin's Dr. Hanford is quite enthusiastic about the "Chemistry in Action" series. "When Sid introduces a speaker he doesn't give the usual introduction lifted from 'American Men of Science,' " Dr. Hanford says. "Instead, he tells the audience the actual scientific accomplishments of the speaker. He captures the rapt attention of the audience, and the speaker then tells it like it is. I have received letters from many students asking for more information and asking questions about job opportunities in industry."

In general, student response has been very good, Dr. Siggia says, and several of the speakers have told him that students have contacted them. The series will be repeated next year, with possibly more emphasis on selected topics to be determined by a questionnaire that will be submitted to the students.

MONS 083266

TECHNOLOGY CONCENTRATES

Biological insecticide

Registration of Abbott Laboratories' Dipel, a biologically produced insecticide, has been granted by the federal Environmental Protection Agency (EPA) for use on lettuce, cabbage, and other leafy vegetables. Dipel is a mixture including a simple sugar, spores, and a crystalline endotoxin, produced in a fermentation solution containing Bacillus thuringiensis. Abbott says that Dipel controls leaf-chewing larvae with 70 to 100% effectiveness, without harming other animal life, and can be used up to harvest day, unlike "hard" chemical insecticides. Abbott will soon request registration of Dipel for other crops. ■

Cabbage looper control

Another biological pest control agent, a variant of the Bacillus popilliae microorganism, will soon undergo field tests of its efficiency in destroying larvae of soybean and cabbage loopers. Negotiations are under way for large-scale production of the pathogenic microorganism using a process developed by Dr. V. R. Srinivasan, Louisiana State University (U.S. Patent 3,503,851). ■

Wave tank

A huge wave tank to simulate ocean conditions for testing oil spill control equipment is being designed and built by Engineers, Inc., Newark, N.J., under a $2 million contract with EPA. Project manager Anthony Mauriello tells C&EN that the tank will be 750 feet long, 65 feet wide, and 12 feet high, permitting simulation of 2-foot waves and 6-knot currents. The tank will be on shore, near the mouth of Raritan Bay, N.J. Engineers, Inc., will also build a 65-foot-long tank for EPA to test effects of cleanup agents and oil on marine life. ■

Soft contact lenses

Two more hydrophilic, soft plastic contact lenses will try for Food and Drug Administration (FDA) approval following approval of Bausch & Lomb's Soflens (C&EN, March 29, page 8). Union Corp. said last week that it plans to file a New Drug Application for a hydrophilic soft plastic lens of unique but undisclosed composition. And late last month, Griffin Laboratories applied for FDA approval of its lens, made of an unrevealed copolymer. ■

Separation of aromatics

France's Agence Nationale de Valorisation de la Recherche (ANVAR) is offering a new process for separating aromatics contained in petroleum reforming or cracking streams. Developed by the Centre National de la Recherche Scientifique, Nancy, the process is based on selective ionization of aromatics. ANVAR says the method is particularly suited for separating p-xylene from m-xylene, separating C_8 aromatics, and separating ethylbenzene from p-xylene. ■

Wire-insulating polymers

A family of peroxide-cross-linkable, flame-resistant compounds for insulating electrical wire and cable has been developed by chemists at U.S. Industrial Chemical Co. laboratories in Cincinnati, Ohio. Lamont Hagan, Gerard Kuckro, and George Lorand disclosed details of their work on the compounds at the ACS Division of Rubber Chemistry meeting last week in Miami Beach, Fla. Based on polyethylene or copolymers of ethylene and vinyl acetate, the compounds can provide flame resistance without emitting corrosive fumes and heavy smoke. ■

Car emission testing

Tests will begin in mid-May in Washington, D.C., of exhaust emissions (carbon monoxide, hydrocarbons, and nitrogen oxides) from 1970- and 1971-model cars, part of a national surveillance program, sponsored by the Air Pollution Control Office, EPA, to determine what happens to pollution characteristics of 3500 representative vehicles under consumer use. Conducted by Automotive Environmental Systems, Inc., San Bernardino, Calif., and Olson Laboratories, Inc., Dearborn, Mich., the tests are already under way in five other cities on cars volunteered by their owners. Results are expected in the fall. ■

Coal dust monitoring

Bendix Corp.'s filter division, Madison Heights, Mich., has begun production of a cassette-type filter to be worn by coal miners on their shirts for measurement of coal dust levels in mines. Based on a microporous polyvinyl chloride membrane with pores small enough to retain respirable coal dust particles (1 to 5 microns), the filters will quantitatively monitor mine environments and help prevent pneumoconiosis, a lung disease caused by inhaling mineral particles. ■

Graphite fiber composites

The cost of graphite fiber epoxy advanced composites can be significantly reduced by using graphite fiber broadcloth, according to Hitco Materials division, an Armco Steel Corp. subsidiary. Hitco says it has a process in an advanced development stage which can make carbon or graphite fiber broadcloth in 32- to 42-inch widths, starting from polyacrylonitrile or rayon fibers. ■

MONS 083267

Glow discharge lessens wool's shrinkage

What happens to fibers during treatment in USDA-developed process isn't clear but may involve free radicals

Most people have lived through the irritating experience of having put a woolen garment through the wash only to have it come out a fraction of its original size. Indeed, wool's inherent tendency to shrink has been a major factor behind the dramatic rise in sales of nonshrinking synthetic fibers at wool's expense. Now, a novel treating process under development at the U.S. Department of Agriculture's Western Regional Research Laboratory in Albany, Calif., greatly lessens this principal disadvantage of wool, and should strengthen wool's competitive position in the market place.

Involved is the passage of yarn through a low-temperature radio frequency (RF) glow discharge. This fairly simple operation heightens wool's resistance to what is known in the fabric trade as felting shrinkage. In addition, there is a noticeable gain in both abrasion resistance and yarn strength without any apparent change in the knitting and weaving characteristics of the yarn, nor in the hand, or feel, of the woolen product. Moreover, the effects seem permanent.

Precisely what happens to the wool fiber structure during exposure to an RF glow discharge still isn't clear, admits Dr. Attila E. Pavlath, who is directing the project. Treated and untreated yarn, he points out, are indistinguishable under the scanning electron microscope.

Cross-linking. One possibility, he conjectures, is that the effect may be the result of partial cross-linking reactions occurring on the fiber surface because of the creation of free radicals. This would help explain why the wool is suitable for chemical grafting at the time of the treatment, Dr. Pavlath told attendees at the Fiber Society's technical conference in Waynesboro, Va. But glow discharge neither affects the yarn's dyeability nor improves retention of dye applied after the operation—"an indication that surface free radicals created by plasma activation do not survive long afterward."

Dr. Pavlath, with coworkers Richard F. Slater and Kay Lee, has devised a simple reactor for studying continuous glow discharge treatment of yarn. Capillary tubing, connected to the glow discharge chamber and through which the yarn is threaded, maintains the pressure within the discharge chamber at about 3 torr—a satisfactory level for generating and maintaining the glow discharge, provided the relation between tube bore and yarn diameter is carefully selected. Residence time of the yarn in the reactor chamber is varied by changing the speed of the takeup reel.

The USDA scientists have examined the influence of a variety of conditions on the properties of the irradiated yarn and the shrink-proofing of items knitted from it. Temperature variation, for instance, has little effect apart from the danger of scorching or burning the yarn should it become too hot. Nor is the nature of the gas a key factor. Results are much the same whether residual air, oxygen, nitrogen, hydrogen, helium or carbon dioxide is used. The latter phenomenon leads Dr. Pavlath to think that the changes in the wool properties are induced by electrons in the plasma rather than by excited molecular species.

Important. But RF power and the residence time of the yarn in the glow discharge region are important factors. At a discharge power of 10 watts, the area shrinkage of a knitted fabric is 16.5% when residence time is 0.4 second, 12% when residence time is one second. At 30 watts, shrinkage is 9.5% for a 0.5-second residence time, 6.7% after one second. Indeed, zero shrinkage is achieved when RF power is 50 watts and residence time is slightly greater than a second. These figures contrast sharply with the 44.5% area shrinkage that a control fabric, similarly knitted from untreated yarn, undergoes when subjected to a 75-minute, hot-water wash test in a domestic machine along with knitted, RF-exposed wool.

Dr. Pavlath sees important advantages to the glow discharge technique for shrink-proofing wool compared to conventional chemical treatment methods, many of which cause undesirable effects such as losses in yarn strength and changes in fabric hand. One possible criticism that a textile engineer might level at the method, he admits, is that the throughput time of the yarn, at least in the present state of the technique's development, might be rated slow for an industrial operation. Offsetting such a criticism, Dr. Pavlath points out, is the fact that multiple strands can be drawn through the discharge simultaneously.

As part of the ongoing development program, Dr. Pavlath and coworker Merle M. Millerd are looking into the possibility of chemically treating wool to make it soil resistant at the same time that it is being shrink-proofed. It might be possible, for instance, to use the glow discharge to induce grafting of atoms or groups onto the fiber surface.



C&EN: Jerrold A. O'Sullivan

USDA's Attila E. Pavlath

MONS 083268

All parties must get moving on fast-breeder development



Authorities in recent months have been goading the Federal Government and private parties involved in nuclear power to speed up what they see as the languorous pace of fast-breeder reactor development—particularly the liquid metal-cooled fast breeder (LMFBR), most immediately promising of the fast-breeder concepts. Their arguments are persuasive.

Last week at the annual meeting of the National Academy of Sciences, Manson Benedict, professor of nuclear engineering and head of the department at MIT, urged a speedup: "Many U.S. reactor engineers, including myself, believe that the technology of the LMFBR is sufficiently advanced to justify starting construction of at least one demonstration plant here and now. . . ." He urged Congress, the Atomic Energy Commission, and the Office of Management and Budget to agree on a national program and together with manufacturers and power companies to agree on an equable plan for funding construction.

Last November, Chauncey Starr, dean of the school of engineering and applied science at the University of California, Los Angeles, was equally adamant: "The time to take the initiative for an energetic push toward our target of abundant and clean power—through the fast breeder—is now, before we face an energy crisis." He noted that "national program financing must involve a joint industry, utility, and government arrangement."

Dr. Benedict and Dr. Starr are alarmed by what they see as the result of a slow LMFBR development program—rapid depletion of low-cost uranium reserves and rapid ascendancy of European nuclear technology over that of the U.S.

The argument concerning reserves centers on the fact that currently commercial light-water reactors use only the rare ^{235}U isotope, whereas breeders also make use of the abundant ^{238}U isotope. Dr. Benedict projects that uranium concentrates consumed by 2000, if light-water reactors are used solely, will total 1.6 million tons. By that time the price will have risen to more than $15 per pound from the $8.00 per pound at which uranium is currently recoverable. Electricity from light-water reactors will have become uneconomical. And all of the U.S.'s currently estimated resources of low-cost uranium will have been exhausted in less than 30 years.

The argument concerning competition is simply put. The U.S. and several other countries have operated experimental-size breeders, the U.S. as long ago as 1951. The U.S. has no demonstration plants authorized. However, the U.K. in 1972 and France in 1973 are each scheduled to operate a 250-Mw(e). breeder. The Soviet Union is scheduled to operate a 150-Mw(e). breeder in 1971 and a 600-Mw(e). unit during 1973–75. Germany is about to authorize construction of a 300-Mw(e). breeder and Japan and Italy are making rapid progress.

The U.S.'s fast-breeder development program seems to be accelerating. AEC considers it the high-priority program. It has increased its budget for LMFBR development from $85 million to $103 million in fiscal year 1972 and has established advisory committees to help determine industry's role in financing a demonstration plant. But is the acceleration fast enough? Considering the long time lags inherent in nuclear reactor development, top speed on the LMFBR by all parties concerned can come none too soon.

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MONS 083269

A C&EN Feature

K. M. Reese

Scientific societies and public affairs

Scientific and engineering societies for many years have fostered research, published papers, and sponsored meetings without great regard for the world beyond their particular disciplines. It is true that scientists and engineers, alone and severally, have been speaking out on issues of public policy since World War II. But only in the past decade or so have the learned societies themselves edged into the realm of public affairs.

The ranking member of the movement is the National Academy of Sciences and its Committee on Science and Public Policy (COSPUP). Since COSPUP was formed, in January 1962, it has released 13 major studies designed primarily for use by those who plan and implement federal policy in science. At the six-year-old National Academy of Engineering, the focal point is the Committee on Public Engineering Policy (COPEP). COPEP's efforts to date include a major study of technology assessment.

The American Association for the Advancement of Science formed its Committee on Science in the Promotion of Human Welfare in 1958. The committee has produced a book on air pollution and reports on other public issues. ACS set up its Committee on Chemistry and Public Affairs (CCPA) in 1965. Among CCPA's efforts is a book on environmental chemistry.

Action of varying intensity in public affairs is under way in other learned bodies that have formed committees for the purpose. Among them: the American Institute of Chemical Engineers, the American Institute of Aeronautics and Astronautics, the American Institute of Physics, the American Physical Society, and the American Society of Civil Engineers.

Motivating forces. The societies' motivation is clear. Federal support of research and development, though still massive, has been cut back selectively. Growing numbers of people view with distaste a science and technology that seems to them to produce mainly weapons and frivolous consumer products, polluting the air and water along the way. Such trends threaten the well-being of scientists and engineers and, in certain respects, the well-being of the nation and the world. The societies must fight them or adapt to them—sometimes both. To do so effectively, they must make themselves a strong and credible voice, heeded not only in government, but in other quarters of a pluralistic society.

Self-interest, then, is the driving force behind the scientific and engineering societies' efforts in public affairs. In another time and context, economist Adam Smith made the point accurately if somewhat harshly: "People of the same trade seldom meet together, even for merriment and diversion, but that the conversation ends in a conspiracy against the public or in some contrivance to raise prices."

The learned bodies do have a mandate to work for the public good. Under the law, almost all scientific and engineering societies are "charitable" organizations. As such they receive certain tax benefits and are expected in return to contribute to the public weal in the manner best suited to their capabilities. In their public affairs activities, to be sure, the kind of charity the societies have chiefly in mind is the kind that begins at home. Their approach to this goal nevertheless differs fundamentally from that of, say, a trade union. Broadly, the learned society tends to seek its reward more by supplying public service than by applying economic or political pressure.

Over the years, of course, many scientific and engineering societies have worked in varying degree on questions of public policy. They have worked particularly aggressively on issues such as the professional exemption provisions of the Taft-Hartley law and the establishment of NSF. On the whole, however, the societies have undertaken such efforts only when invited to do so or when their members' interests were threatened so clearly and directly as to compel them to take the initiative. The main difference today is that the traditional bodies are beginning to seek out the issues and the areas in which they might serve and to step in without waiting to be asked.

Certainly there is no lack of issues. Dr. Dael Wolfle of the University of Washington, who retired in 1970 as Executive Officer of AAAS, has classified them in three broad groups:

- Issues that concern science or engineering itself or a branch thereof: scientific manpower, education, and other matters that coincide closely with the interest of a given society.
- Issues of public welfare that include a large technical component: pollution control, birth control, and similar problems on which a society and its members can comment by virtue of their special knowledge.
- Issues of public welfare that fall outside the technical competence of the given society: A notable example is the war in Vietnam.

In dealing with such questions, scientific and engineering societies have several options. They can develop and publish objective analyses of major problems. They can adopt or oppose a particular position in Congressional testimony, in dealings with federal agencies, by news release, or in other ways. Societies or their members can form new groups specifically to cope with one or more special issues. All of these options are exercised from time to time by societies and special-purpose groups of scientists and engineers. Among the traditional societies, however, the leaders of the current movement are noted at least in part for their efforts at objective analyses of major problems in public policy that fall within their technical competence.

Government need. Scientific and engineering societies have found active encouragement in government. The contention there is that the failure of societies to involve themselves in the legislative process creates an imbalance in the flow of information to Congress. Those who have pushed this view include former Rep. Emilio Q. Daddario (D.-Conn.). Until last fall, Rep. Daddario was chairman of the Subcommittee on Science, Research, and Development of the House Committee on Science and Astronautics. (He left Congress to run for governor of Connecticut and lost.)

The executive branch of government also has uses for the types of work that the societies are peculiarly capable of doing. Cooperation between

MONS 083270

federal agencies and scientific and engineering societies in fact has long been common. For some years the American Society of Mechanical Engineers has worked with the Atomic Energy Commission in developing standards and codes for reactor components. The Joint Technical Advisory Council of the Institute of Electrical and Electronics Engineers and the Electronic Industries Association served as a focal point for initial study of the technical program needed on the uses of the increasingly crowded radio spectrum. In mid-1968, as a result of this work, JTAC published the 1200-page "Spectrum Engineering—the Key to Progress."

Tax problems. In their behavior vis-à-vis government, the scientific and engineering societies have been strongly inhibited by fear of jeopardizing their tax status under subsection 501(c)(3) of the Internal Revenue Code. This subsection exempts qualified organizations from federal income tax. Also, under subsection 170(c)(2) of the code, donations to nearly all 501(c)(3) organizations are deductible by the donor for federal income tax purposes. Legally, moreover, a 501(c)(3) organization is a "charitable" organization. On this basis, a society often can obtain exemption from a variety of taxes—federal, state, and local—in addition to federal income tax.

The key restriction on 501(c)(3) groups is that they can devote "no substantial part" of their activities to influencing legislation. The Internal Revenue Service defines "substantial" as "a question of fact in each situation." The results of legal action in the past suggest that it is considered to be at least 5%.

When IRS revoked the 501(c)(3) status of the Sierra Club, in 1966, it said, ". . . we have concluded that as a substantial part of your activities you have been attempting to influence legislation. . . ." The club has since qualified under subsection 501(c)(4) of the Internal Revenue Code, which covers "social welfare" organizations. It remains exempt from federal income tax, but loses other tax benefits. In return, the club obtains the right to attempt to influence legislation.

In February 1970, the National Education Association switched from 501(c)(3) status to 501(c)(6), which exempts business leagues and similar groups, including some professional associations, from federal income tax. NEA had concluded, in consultation with IRS, that it could not retain the tax status of a "charitable" organization and continue to pursue certain of its activities, such as lobbying and collective bargaining.



Chairman Harvey Brooks, right, presides at meeting of NSF's Committee on Science and Public Policy. COSPUP has released 13 major studies since 1963.

In any event, many scientific and engineering societies tend to treat their 501(c)(3) tax status with a caution that Rep. Daddario and others believe is excessive. A Washington attorney, an expert in the field, agrees: "Many of these people," he says, "have no idea what they could safely accomplish if they went about it properly."

In the *Oregon Law Review* for April 1969, Thomas Jorling of the Senate Committee on Public Works proposed certain revisions to the Internal Revenue Code. They were designed to put "nonprofit organizations and trade or business organizations on an equal footing before the federal income tax law" in terms of legislative and related activity. An amendment generally incorporating Mr. Jorling's proposals was introduced by Sen. John Sherman Cooper (R.-Ky.) in October 1969. In the end, the amendment dropped from sight in the maneuvering that developed over the Tax Reform Act of 1969.

Some societies, meanwhile, have acted on the belief that, without endangering their tax status, they can contribute to the development of public policy. The first step, say those who have worked at the task, is to establish identity. This can be a problem in Congress. Its members rarely are from the world of science and engineering, and they are immersed in special-interest groups of every description. With identity established, however, the 501(c)(3) organization acquires almost automatically the mantle of credibility. The presumption is not that scientists and engineers are incapable of bias and self-serving. It is, rather, that the learned bodies, when they choose to do so, can set up a mechanism that effectively and objectively taps the intellectual resources represented by their memberships. This is not to say that the job is easy. "It's an excruciating process," says Claude Crowley, director of administration for the American Institute of Mining, Metallurgical, and Petroleum Engineers.

ACS experience. In November 1965, the President's Science Advisory Committee published "Restoring the Qual

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The Society for Social Responsibility in Science was formed in 1946 and has some 600 members. Its general aim is to induce scientists and engineers to use their skills for constructive ends. One member, zoologist E. W. Pfeiffer, U. of Montana, introduced the resolution that started the Vietnam defoliant struggle in AAAS. In March 1969, sponsored by SSRS, Dr. Pfeiffer and zoologist G. H. Orians, U. of Washington, spent two weeks in Vietnam studying the ecological effects of the defoliation chemicals used there. Their report has since appeared in *Science* (May 1, 1970, page 544).

MONS 083271

ity of Our Environment." Members of ACS whose work dealt with the environment were chagrined by what they saw as insufficient emphasis on chemistry in that publication. Representatives of the Society's newly formed Committee on Chemistry and Public Affairs and the ACS Division of Water, Air, and Waste Chemistry decided to undertake a chemically oriented critique of the study (known as the Tukey report, after John Tukey of Princeton, chairman of the committee that put it together). ACS representatives met with officials of the White House Office of Science and Technology and reported "general and enthusiastic endorsement" of the proposed project.

The work was undertaken by a four-man subcommittee of the Committee on Chemistry and Public Affairs and a task force of some 25 scientists selected by the Division of Water, Air, and Waste Chemistry. The first step was a two-day workshop in August 1966. There followed almost three years of dogged if intermittent work, marked by head knocking, bruised egos, and other predictable difficulties.

The group had in fact undertaken a very considerable effort. Along the way the original concept, a chemical critique of the Tukey report, was abandoned in favor of a chemically oriented study of environmental improvement that would stand on its own. The audience was to be legislators, administrators, educators, and others who deal with environmental problems, but who may not be experts in any of the subject matter.

The document was published in September 1969 with the title, "Cleaning Our Environment: The Chemical Basis for Action." The 250-page paperback contained 73 recommendations (C&EN, Sept. 8, 1969, page 58). Some 20,000 copies were mailed, free, to the specified audience as well as to the subscribers of the Society's monthly magazine *Environmental Science & Technology*. ACS also was prepared to sell the book, at $2.75. Through March 1971, to the surprise of all concerned, nearly 30,000 copies of the book had been sold.

Producing an objective analysis of a major public issue clearly is difficult, and scientific and engineering societies thus far have published only a handful of them. ACS, in addition to its report on environmental improvement, is at work on a study of the function of chemistry in the U.S. economy. AAAS in 1965 published "Air Conservation," written by a commission of atmospheric scientists, economists, and specialists on resource utilization. The IEEE/EIA study on the radio spectrum is another example. The National Academy of Engineering in 1969 published "A Study of Technology Assessment," which was prepared for the House Committee on Science and Astronautics.

NAS prolific. By far the most prolific has been the National Academy of Sciences and its Committee on Science and Public Policy. Since 1962, COSPUP has published analyses of the status and prospects of eight disciplines: Ground-based astronomy, computer sciences, chemistry, physics, plant sciences, mathematical sciences, the behavioral and social sciences, and last year the massive "Biology and the Future of Man," a study of the life sciences. COSPUP also has been responsible for five special reports on somewhat broader issues. Among the most recent was a study of technology assessment. As in the case of the NAE study of the subject, COSPUP's study was done for the House Committee on Science and Astronautics.

The studies that COSPUP does on its own initiative go, typically, to the President's Science Advisory Committee, which forwards them with a critique to the interagency Federal Council for Science and Technology. The council considers the reports in the context of agency programs and the realities of the federal budget and returns its comments to the science advisory committee. The chairman of that committee, Dr. Edward E. David, Jr., also heads the White House Office of Science and Technology and is science adviser to the President. Thus COSPUP recommendations are heard at the focal point for science in the executive branch.

The few NAS-style studies done by others have been handled on an *ad hoc* basis. ACS presented its study of the environment formally to the Office of Science and Technology, with whom the Society had discussed the project at the outset. Later, ACS people met twice with the President's Science Advisory Committee to examine the report's 73 recommendations. The result is a 20-page supplement, published early this year, that contains 26 recommendations distilled and updated from the original 73.

The IEEE/EIA Joint Technical Advisory Council presented its study on the radio spectrum to the White House Office of Telecommunications Management (now the Office of Telecommunications Policy) and the Federal Communications Commission. The initial reaction was the inauguration of further studies.

Results intangible. In assessing the results produced by such studies, it may not be enough to determine whether their recommendations are implemented or not. The effects may be less tangible than that. The codification of the thinking of experts on a balanced basis in digestible form can in itself serve a useful purpose. The specific fiscal recommendations of the COSPUP studies of scientific disciplines are their least important part, says Harvey Brooks, chairman of COSPUP and Dean of Engineering and Applied Physics at Harvard. The scientists who make the fiscal recommendations are not normally in a position to consider the exigencies of the federal budget. They are, however, in a position to spell out, in terms of scientific consequences, how federal support of research might best be distributed among the disciplines.

One of the COSPUP studies was "Chemistry: Opportunities and Needs," published in November 1965 and also called the Westheimer Report, after Frank Westheimer of Harvard who headed the group that put it together (C&EN, Nov. 29, 1965, page 72). The study codified the thinking of the nation's leading chemists on the trends and future of their discipline. It argued, for example, that the traditional subdivision of chemistry into organic, inorganic, and the like was out of date. Instead it proposed subdivisions such as synthesis, chemical dynamics, and theoretical chemistry. The report recommended that NSF set up a program of instrumentation

The Federation of American Scientists was set up in 1946 to campaign for civilian control of nuclear energy. FAS, based in Washington, D.C., has some 2000 members, and publishes a newsletter. The federation is "concerned with the impact of science on national and international affairs" and employs registered lobbyists to press its views. FAS has campaigned against the ABM and MIRV missile systems, against chemical and biological welfare, for freer travel for scientists, and against the delivery of nuclear weapons to NATO, to name a few issues.

The Scientists' Institute for Public Information, in New York City, was formed in 1963 to support and integrate the work of local groups modeled after the Committee for Environmental Information, in St. Louis. CEI was founded in 1958 by a group whose best-known spokesman has been biologist Barry Commoner.

CEI's monthly magazine, *Environment* (formerly *Scientist and Citizen*), has been adopted by the Scientists' Institute for Public Information as its official publication. *Environment* is the major informational activity of both CEI and the institute.

MONS 083272

grants to chemistry departments, in addition to research grants to individual chemists.

Overall, the Westheimer Report argued that "the expanding horizons of *chemistry* are *limited* . . . by inadequate financing of basic research. . . ." It called for increased public and private support of basic research in chemistry on the grounds that it would pay dividends not just to chemists, but to the public at large.

NSF did reorganize its chemical section along lines similar to the subdivisions recommended by the Westheimer Report. The foundation did not make the change in direct response to the report, however, but to reflect existing concepts that found expression in the report. *Departmental* grants for chemical instrumentation were a line item in NSF's budget for fiscal 1965 and thus preceded the publication of the Westheimer recommendation. The foundation, moreover, had been bootlegging funds for such grants before it set up a formal program. The Westheimer recommendation did, however, help to increase the size of the program.

In federal support for research, chemistry did fare somewhat better after the Westheimer Report came out, but the report was only one of a number of reasons. The fiscal effects of the report in any case have been obscured in part by the subsequent leveling off and decline in federal research support. It can be argued, however, that chemistry would be worse off than it is today if the Westheimer Report had not been done.

Like the COSPUP report on chemistry, the ACS report on environmental improvement codified existing concepts rather than propounding new ones. Its recommendations thus seem more likely to contribute to specific actions in an intangible way than to stimulate new actions independently of the myriad other forces in the complex field of environmental control.

The direct contribution of the *IEEE/EIA study of spectrum engineering* also is difficult to measure. Among other actions, however, FCC in 1970 had assigned manpower and let contracts for a pilot project designed to test the spectrum engineering concept under operating conditions.

Restricting factors. One of several constraints on the learned societies' efforts in public affairs is, not surprisingly, money. NAS has relied heavily on NSF. NSF bore almost all of the costs of four of the NAS disciplinary studies and part of the costs of the other four as the table indicates. The eight studies cost a total of about $1.3 million.

ACS contributed $50,000 of the $60,000 that NAS spent on its chemistry study. ACS spent roughly $70,000 on its environmental study (part of this total will be recovered by sales of the book). The Society will spend at least $50,000 on its forthcoming study of chemistry in the U.S. economy, but it has in addition a grant of just under $100,000 from NSF.

The 4000-member Ecological Society of America relied on NSF for the $86,900 cost of its study of the need for a national institute of ecology. The study, published in April 1970, was done under contract by Peat, Marwick, and Mitchell Co. [Early this year, as a result of the study, the Inter-American Institute of Ecology filed incorporation papers in Washington, D.C. (C&EN, Feb. 1, page 40).]

The financial constraint can have a secondary effect. Some will regard as incestuous, for example, a situation in which NSF supports studies by NAS that recommend increased support for research when much of the support would be supplied by NSF itself. The same could be said of ACS's support of the NAS study of chemistry. The criticism was summed up broadly by physicist Martin Perl of Stanford University in *New Scientist*, April 9, 1970, page 63: "Some doubts have arisen as to the wisdom of having a Scientific Establishment with the triple roles of scientific advisor, lobbyist for federal funds for science, and overseer of how those funds should be distributed."

In a somewhat narrower context, COSPUP's Harvey Brooks says the problem of multiple roles is "insoluble." An "objective" study of chemistry by chemists, he says, is *"ipso facto* suspect." At the same time, only chemists can explain chemistry. When the choice is between knowledge and neutrality, Dr. Brooks contends, "one must choose knowledge every time." The multiple-role problem must be eased, insofar as is possible, by the mechanism set up to pursue the project at hand.

Scientific and engineering societies today are facing another constraint in their public affairs activities: pressure to foster directly the economic well-being of the individual member. The question is whether the societies can involve themselves very heavily in the economic status of their members and retain their traditional aura of credibility. Some say yes, others say no. W. H. Wisely, Executive Secretary of the American Society of Civil Engineers, wrote in April 1969: "Can a professional society move to fill the [economic] void that now exists without itself becoming a trade union . . . I think it very definitely can. . . . Professionalism in engineering can survive only in a realistic and equitable economic environment."

An example of the conflict that can arise occurred early last year when ACS appealed to its members for funds for its Project SEED (Subcommittee on the Education and Employment of the Disadvantaged). Wrote one ACS member: ". . . when well-trained chemists are struggling to find or keep reasonably well-paid jobs, the Society now asks me to help them recruit more chemists from the ranks of the 'disadvantaged.' . . . I will not contribute . . . and bitterly resent the use of my dues money for such solicitations. . . ."

Still another constraint on the public affairs activities of a learned society is its stated reason for existence. The individual scientist can be as active as he wishes in public and political affairs, but his learned society as a rule was formed to perform quite different functions. Such a body can publicize facts and information, but in adopting positions on public issues it must make clear who is speaking: A majority of the members? Some active fraction of the members? The board of directors? Scientific and engineering societies are not by nature democratic organizations, although they may elect various of their officials by democratic processes. "If an issue can be resolved by voting, it isn't a scientific issue," according to Don K. Price, a past president of AAAS.

AAAS has been struggling with such an issue, the use of defoliants in Vietnam, since mid-1966. The case is the subject of a technology assessment study by the science policy research division of the Legislative Reference Service in the Library of Congress. One of the study's observations is that, ". . . any issue on which there are both difficult scientific questions and intense political feeling is unlikely to be resolved in the great forum of discussion that the annual meetings of the AAAS produce."

The problem was not restricted to annual meetings. In late 1967, provost David R. Goddard of the University of Pennsylvania was named chairman of a new AAAS committee on environmental alteration that was to consider first the use of chemical and biological agents in Vietnam. Dr. Goddard resigned a few weeks later. His letter of resignation read in part: "One might think that professional scientists would not expect the committee to reach conclusions before it has received scientific evidence, but this is clearly not the case. The correspondence reaching my desk, and

MONS 083273

the telephone calls—many of them from very distinguished scientists—indicate that many people have prejudged the issue. . . ."

AAAS eventually did sponsor a study of the effects of the military uses of herbicides. The study team spent five weeks in South Vietnam last summer and reported its preliminary findings at the association's annual meeting in December (*Science*, Jan. 8, page 43). The AAAS team did not assess the military usefulness of herbicides in Vietnam, but it did find "extremely serious harm" to the land and to civilians deprived of food. Overall the issue remains, predictably, a maze of "difficult scientific questions and intense political feeling. . . ."

Currents of political activism have been evident also in the American Physical Society. An early move was an amendment to the APS constitution proposed by physicist Charles Schwartz of the University of California, Berkeley. The Schwartz amendment would have allowed APS members to vote on resolutions on "any matter of concern to the society." Some 55% of the society's 25,000 members voted on the amendment, defeating it by almost three to one. In February 1969, the APS council received a petition, signed by 550 members, asking that a new division on physics and society be created. In April 1969, APS decided against a new division and formed instead its Committee for Problems of Physics and Society.

The supercharged approach of at least some fractions in some learned societies contrasts sharply with the relatively conservative attitude of some other bodies. One instance is the American Institute of Mining, Metallurgical, and Petroleum Engineers and its position on the outer limit of national sovereignty over sea bed resources. In drafting the position, AIME's National Affairs Committee had tried "not to recommend a political position but to bring out the relevance of scientific and technological factors to any consideration of political boundary determinations." AIME's board of directors adopted the resulting position in October 1969, but with the proviso that it would be "used only if the institute is asked for a position on the continental shelf controversy."

The learned societies on occasion set up special bodies to work with government. Engineers Joint Council, a federation of 38 engineering societies, maintains the National Engineers Register under contract with NSF. Also part of EJC is the Engineering Manpower Commission, whose function is "to serve as a focus for action on national technological manpower problems." Analogous to EMC is the Scientific Manpower Commission, which has 11 constituent societies. SMC serves as a focus for manpower problems common to the scientific disciplines. SMC and EMC maintain close liaison and develop joint programs in areas of mutual concern.

Scientific and engineering societies work at public affairs at the state and local level, too. ACS's Project SEED has stimulated some 30 ACS local sections to start education and employment programs for the disadvantaged. The National Society of Professional Engineers sponsored the first of several regional public affairs involvement workshops in May 1970 at Georgia Tech. NSPE, a professional rather than a scientific and educational society, is aiming for 100 community involvement pilot projects in 1970-71. Local sections of half a dozen engineering societies operate Project JUMP (Joint Urban Manpower Program) in New York City in cooperation with the Vocational Foundation, Inc. The project provides engineering offices with trained paraprofessionals drawn from among minority groups. The South Texas section of AIChE about three years ago began to work on local pollution problems. The work has since been taken up by a number of other AIChE sections.

Further action. Besides the several established programs in public affairs, further action is evident among scientific and engineering societies.

Ronald Smelt, 1969 president of the American Institute of Aeronautics and Astronautics, wrote in his annual report that, "In 1963 we had virtually no interface with social problems." The institute has recognized since that it "should concern itself more aggres-

Costs of disciplinary studies—COSPUP

Study	Report published	Cost[a]	Source of support
Ground-Based Astronomy: A Ten-Year Program	1964	$ 27,500	NSF
Chemistry: Opportunities and Needs	1965	60,000	ACS ($50,000) NSF ($10,000)
Digital Computer Needs in Colleges and Universities	1966	80,000	NSF
Physics: Survey and Outlook	1966	55,000	NSF
The Plant Sciences: Now and in the Coming Decade	1966	28,000	NSF
The Mathematical Sciences: A Report	1968	163,000	NSF ($120,000)[b]
The Behavioral and Social Sciences (outlook and needs)	1969	400,000	NSF ($160,000) NIH ($160,000) Russell Sage Foundation ($50,000)
The Life Sciences[c]	1970	500,000	NSF ($124,000) NIH ($328,500) Smithsonian ($25,000)

a This does not reflect the additional money provided from the COSPUP general funds (largely NSF) for the preliminary discussions of feasibility and reviewing of the drafts of the reports. b Mathematical societies and private sources provided $40,000. c The panel reports were published, 1970, by Oxford University Press under the title, Biology and the Future of Man.

Scientists and Engineers for Social and Political Action is among the newer special-purpose groups. The organization aims to provide a loosely organized "radical caucus." It works mostly among scientists and engineers at the local level. SESPA was formed early in 1969 by a group of physicists that includes Charles Schwartz, the originator of the Schwartz amendment to the constitution of the American Physical Society.

Last December at the AAAS meeting, SESPA circulated an indictment of the U.S. scientific establishment and was otherwise active (C&EN, Jan. 11, page 18).

MONS 083274

sively with the factors that inhibit aerospace research and not content itself with being merely a passive communications medium for the profession." A step in this direction will be the AIAA meeting at Key Biscayne, Fla., in June. The meeting grew out of proposals by the Federal Aviation Administration that AIAA take part in the FAA consultative planning process. FAA will underwrite the Key Biscayne meeting, which will be based on technology assessment papers by AIAA committees.

The American Society of Mechanical Engineers held a Goals Conference in January 1970 to explore what kind of organization ASME should be in the future. One of the 14 decided-upon goals is:

"To develop procedures for establishing an ASME position on public issues to which engineering views are relevant, and for expressing such views by the Society's officers or other duly authorized spokesmen."

Small working parties were organized last December to plan implementation of the goals, says director of planning E. H. Walton.

In 1967, the American Institute of Physics set up its Committee on Physics and Society "to advise it on the problems at the interface with society." Two such problems were the military draft and the shrinkage in federal research funds. The committee has developed statistics that define the impact of these factors on the physics community and is concentrating currently on the employment situation in physics and on examining the nature of Ph.D. education.

AIP is a group of seven autonomous societies. The largest of these is the American Physical Society, which in 1969 formed its Committee for Problems of Physics and Society. The 20-man committee has put much of its effort into special-interest sessions at APS meetings. The topics have been diverse: environmental problems, simulation and display of urban growth patterns, job opportunities for physicists, and defense policy as it involves the ABM and MIRV missile systems. The APS committee also concerns itself with federal support of physics research.

AIChE established its Government Programs Advisory Committee in 1965. Among the committee's responsibilities is to advise on and coordinate AIChE actions in public affairs and develop appropriate programs. GPAC has arranged symposiums at AIChE national meetings on topics such as post-Apollo NASA programs, the role of chemical engineers in government, and public engineering policy. In 1969, a GPAC subcommittee worked with the U.S. Department of Transportation on a systems analysis of packaging and intermodal transport of hazardous substances. The Government Programs Advisory Committee also had arranged a major cooperative study program with a federal agency, but it was dropped about mid-1970 owing to unrelated factors inside the agency.

The American Society of Civil Engineers' Task Committee on Society Objectives reaffirmed in 1963 that one of ASCE's aims is "participating in the legislative and policy aspects of government to the extent that the public interest is served." ASCE has written to the President on topics such as increasing funds for construction under federal public works programs. On request, it has submitted statements to Congressional committees studying issues such as transportation needs, urban renewal, and research in water resources development.

Nontraditional activities. Over the years, some scientists and engineers have seen a need, for whatever reason, for public affairs vehicles other than their established societies. The result has been the emergence of relatively small groups that work outside the traditional boundaries. Among these groups is the Federation of American Scientists, set up in 1946 to campaign for civilian control of nuclear energy. The Society for Social Responsibility in Science was formed in 1949 to induce scientists and engineers to use their skills for constructive ends. Scientists and Engineers for Social and Political Action was formed early in 1969 by a group of radical physicists.

Scientists and engineers also have formed a few public affairs organizations whose main function is communication to the public. One of these is the *Bulletin of the Atomic Scientists*, founded initially to awaken the public to the implications of nuclear energy. Another is the Committee for Environmental Information, now part of the Scientists' Institute for Public Information. CEI was founded in 1958 to inform the general public on issues of public policy with high scientific content.

Although some organizations of scientists and engineers have achieved relatively high public visibility, it is apparent that the traditional learned societies have by no means fully probed the role they might play in public affairs. It is likely that at least the larger of them will grow more aggressive in their approach to public issues. The main pressure for change derives from the strong vein of science and technology that runs through so many public problems today, including some whose handling has not enhanced the reputations of scientists and engineers. For scientific and educational societies to stand mute in such an environment would seem to be opposed both to their own interest and to the public interest.

Whatever course the societies elect to pursue in public affairs, their strength lies in the intellectual resources they can tap and their long-established status as scientific and educational organizations. On this basis, the logical course would be for the technical societies to work as scientists and engineers and educators —suppliers of facts, information, and objective analyses for both the government and the public.

Bulletin of the Atomic Scientists was founded in 1945 by Hyman G. Goldsmith and Eugene Rabinowitch, the current editor-in-chief. It has a circulation of 21,000 and is published 10 times a year.

The *Bulletin*, brainchild of scientists at the Chicago laboratories of the Manhattan Project, aimed initially to awaken the public to the implications of nuclear energy. The publication's content has since ranged widely. Its scope today is reflected in its change of name, in February 1970, to *Science and Public Affairs* (Bulletin of the Atomic Scientists).

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MONS 083275

ACS job status survey finds 2.7% unemployment rate

Nearly 5% of members employed part-time, temporarily, or subprofessionally; more surveys planned

For other news of special interest to ACS members, see:

"Chemistry in Action" lectures 28
Scientific societies 30

Final analysis of the 1971 ACS Employment Status Survey reveals that 2.7% of the members who responded were unemployed as of March 1, 1971. More than 27,000 members responded to the questionnaire, which was sent to 44,885 randomly selected chemists and chemical engineers in the U.S. The survey was carried out in late February under the direction of Dr. John F. Suttle, acting head of the Department of Professional Relations and Manpower Studies (C&EN, Feb. 22, page 50). The survey was prompted by widespread speculation on the extent of unemployment and by a lack of statistics substantiating claims of large unemployment rates among chemists and chemical engineers.

"Fewer surveys and more action on your part would be appreciated."

A supplemental employment status survey of 5235 chemists and chemical engineers who terminated their ACS membership at the end of 1970 reveals that 7% of the 1892 respondents were unemployed. The supplemental survey findings, coupled with the principal survey findings, bring the net unemployment rate for responding chemists and chemical engineers from 2.7% to 3%.

Another 2.4% of the respondents in the major survey indicate that they are employed outside the fields of chemistry or chemical engineering or are working subprofessionally (in the field of chemistry but in a job that does not fully use education and/or training). Other categories with which the questionnaire dealt show that 1.2% of responding members are temporarily employed or anticipating a change in job status; 1% are employed part-time in the field of chemistry; 1.6% are in academic postdoctoral positions; and 2.6% are retired or not seeking employment. The largest proportion of responding members, 88.2%, is employed full time in chemistry.

Jobless rate of members responding[a] is 2.7%

	Number	Per cent
Full-time employment	24,105	88.2%
Unemployed	731	2.7
Temporarily employed	326	1.2
Part-time employment	286	1.0
Subprofessional employment	667	2.4
Postdoctoral	442	1.6
Retired	698	2.6
No report	70	0.3
TOTAL RESPONSE	**27,325**	**100.0%**

[a] 44,885 members were surveyed.

Implications. The implications of the 2.7% unemployment rate considered by itself are difficult to assess since the Society has never before undertaken a comparable comprehensive employment status survey. Dr. Suttle points out, however, that the 1971 survey will serve as a base line by which future surveys will be used in an effort to gage supply/demand factors. The Office of Manpower studies plans to conduct interim employment status surveys, the next one within the year.

There is a limited number of statistics to which the ACS findings can be compared. The ACS unemployment rate, for example, is lower than the unemployment rate of 3.4% for all professional and technical workers determined for March (latest month available) by the Bureau of Labor Statistics.

The ACS unemployment rate is higher, however, than the 1.4% unemployment rate of chemists determined a year ago by the National Science Foundation in its 1970 survey of scientific and technical personnel. NSF is currently surveying the employment status of more than 300,000 scientists, including chemists.

The 2.7% unemployment rate for ACS members is also higher than the unemployment rate of chemical engineers determined by the American Institute of Chemical Engineers in a survey of one quarter of its 31,288 members in early January. In the AIChE survey, 1.7% of the 5032 chemical engineers who responded were unemployed; however, in some parts of the country, AIChE found that the unemployment rate of chemical engineers was as high as 3.3%. The AIChE survey correlates closely with ACS's findings on the geographical distribution of unemployed members.

Geographic. Confirming unofficial impressions, the ACS survey shows that the unemployment rate of members is highest in the Pacific region (California, Washington, Oregon, Alaska, Hawaii), particularly in California. The unemployment rate in the Pacific region is 4.4% compared to the national average of 2.7%. (In the AIChE survey, the unemployment rate for the same region was 3%.) The 4.4% rate is followed by 3.6% for the New England States (Maine, Vermont, New Hampshire, Rhode Island, Massachusetts, Connecticut), 2.9% for the West North Central States (North Dakota, South Dakota, Nebraska, Minnesota, Kansas, Iowa, Missouri) and 2.8% for the West South Central States (Texas, Oklahoma, Louisiana, Arkansas). The remaining geographical divisions have rates that are less than the 2.7% national level. The lowest unemployment rate, 2%, is in the East South Central area (Kentucky, Tennessee, Alabama, Mississippi).

The largest proportion of all unemployed members reporting, 26%, is from Middle Atlantic States (Pennsylvania, New York, New Jersey, Delaware). This is followed by the Pacific States, 17.4%; the East North Central States (Michigan, Wisconsin, Illinois, Indiana, Ohio), 16.8%; and the South Atlantic States (Maryland, Virginia, North Carolina, South Carolina, Florida, Georgia), 11.8%. The lowest proportion of unemployed members, 2.6%, is in the East South Central region.

Age. The median age range of those members who are unemployed is the same as that of all members participating in the survey—41 to 45 years. Members under the age of 25, however, have the largest unemployment rate of all age groups, 7%. The next highest unemployment rate, 3.1%, is for the members in the 26 to 30 age bracket. The lowest unemployment rate, 2.2%, is for members more than 60 years old. The average rate for members between the ages of 31 and 60 is 2.5%.

"ACS should discontinue . . . encouraging young people to enter the profession."

The ACS survey further indicates that women chemists have an unemployment rate of 6.3%, whereas men have an unemployment rate of 2.4%. However, the Department of Professional Relations and Manpower Studies points out that the "normal" balance of unemployment between the sexes is not known. The Society plans to obtain such data in future surveys, Dr. Suttle says.

Classification. The unemployment rate is highest, 3%, among members who were formerly employed in industry and among those who were self-employed, 2.7%. The unemployment rate

MONS 083276

employed in educational institutions, 1.5%, and by the Government, 1.5%. Members formerly employed by nonprofit institutions have an unemployment rate of 2.3%.

Members whose major work activity was research and development are most affected by unemployment, with a rate of 3.1%. R&D chemists constitute 46.3% of the questionnaire responses and account for 54.4% of all those members who are unemployed. Members involved in marketing and production are also hard hit, with an unemployment rate of 3%. Appearing to be considerably less affected than those in other job activities are members in teaching, with an unemployment rate of 1.1%.

Funding. Members whose jobs are or were supported by nongovernment profit-oriented funds account for nearly half of those responding as well as half of the total number of people who are unemployed. But the unemployment rate for this category is at the national average of 2.7%. Members who work or have worked in government defense-supported programs show a 4.3% unemployment rate, one of the highest unemployment figures in the survey.

Examination of the unemployed member group by academic degree shows that bachelor's and master's degree holders are harder hit than doctorates. Those members with a B.S. have a 3.2% unemployment rate, M.S., 3.1%, and Ph.D., 2.1%. Chemical engineers at all degree levels have a 2.9% unemployment rate.

"Be wise, unionize."

• • •

"ACS is in danger of degenerating into a labor union."

Comments. About 400 of the 27,325 people who returned questionnaires wrote comments to the Society. As of March 1, 75% of those writing were employed, 17% were unemployed.

The comments encompass several major complaint areas. About 13% of the members decry layoff policies and procedures and "forced" early retirements. Many current and former members sent information regarding layoffs that can now be investigated by the Office of Professional Relations in instances where the person submitted his name and address.

Nearly 25% of those writing comments complain that the Society should be doing more for its members in the areas of job security, pension plans, and programs to aid unemployed chemists. Although the Society has been criticized frequently for not taking a more outspoken stand for the professional interests of its members, the attention of ACS toward professional matters has increased greatly over the past few years (C&EN, Nov. 9, 1970, page 63).

A number of people call for ACS to direct more of its efforts to unionlike activities, including collective bargaining. Still others demand that ACS become more like the American Medical Association and limit the number of chemists coming into the job market.

Some members chide the Society for being responsible for the current alleged surplus of chemists and chemical engineers. One of the major assignments of the Office of Manpower Studies will be to develop supply/demand and utilization projections for chemists and chemical engineers.

	Total sample	Per cent of sample	Unemployed	Per cent of total unemployment	Per cent unemployed
Industry	16,725	61.2%	506	69.2%	3.0%
Education	6,000	22.0	89	12.2	1.5
Government	2,596	9.5	40	5.5	1.5
Nonprofit	836	3.1	19	2.6	2.3
Self-employed	412	1.5	11	1.5	2.7
Other	360	1.3	24	3.3	6.7
No report	396	1.4	42	5.7	10.6
TOTAL RESPONSE	**27,325**	**100.0%**	**731**	**100.0%**	

Extrapolation. Based on 1970 estimates of the Bureau of Labor Statistics (BLS), the Department of Professional Relations and Manpower Studies has extrapolated its findings for all chemists and chemical engineers in the U.S. BLS places the number of chemists at 136,000 and the number of chemical engineers at 50,000 in 1970, for total chemical scientist/engineer population of 186,000. Based on the 2.7% unemployment rate determined by ACS, about 5000 chemists and chemical engineers are estimated to be currently jobless. Dr. Suttle points out that the number of jobless chemists and chemical engineers reported in the ACS survey does not necessarily accurately reflect the full extent of the currently depressed employment situation in the profession because the questionnaire did not take into account those members who may have experienced long or short periods of unemployment prior to receipt of the questionnaire. Consideration should also be given to those reporting temporary employment in the survey (1.2%), those subprofessionally employed (2.4%), those employed part-time (1%), and those currently holding postdoctoral positions (1.6%). These groups could account for an additional 12,000 potentially unemployed people in terms of the entire U.S. chemical manpower. If half of these 12,000 people became unemployed, as many as 11,000 new positions could be needed in the near future, Dr. Suttle says.

The 1971 graduating class in the U.S. in the chemical sciences (chemistry, chemical engineering, biochemistry) on all degree levels will number about 22,000, of whom half will probably enter the labor market. Thus, the number of jobs needed for chemical manpower could be as high as 22,000, Dr. Suttle says, more than twice the number of jobs available in a normal year.

Referring to the number of jobs needed, Dr. Frederick T. Wall, ACS Executive Director, says, "It is clear that if anywhere near this number of new jobs is to be created in the immediate future, we will need marked stimulus of the nation's economy and temporary employment support from the Federal Government. In this connection, ACS President Calvin recently wrote to Presidential Science Adviser Edward E. David, Jr. [C&EN, March 29, page 8] offering two suggestions that encompassed the objective of conserving and improving the national resources represented by our present body of highly trained and motivated scientists and engineers while providing skilled manpower to attack research and development problems of special interest to the nation. Dr. Calvin's and others' suggestions, administrative or legislative, should be carefully examined and vigorously pursued by all segments of the chemical profession."

"... when I needed you, where were you?"

Free copies of the full Employment Status Survey Report are available on request from the ACS Department of Professional Relations and Manpower Studies, 1155—16th St., N.W., Washington, D.C. 20036.

R&D chemists are most affected by unemployment

	Total sample	Per cent of sample	Unemployed	Per cent of total unemployment	Per cent unemployed
R&D	12,665	46.3%	398	54.4%	3.1%
Management	4,743	17.3	88	12.0	1.9
Marketing and production	1,935	7.1	59	8.1	3.0
Teaching	4,391	16.0	47	6.4	1.1
Other	2,067	7.5	67	9.2	3.2
No report	1,596	5.8	72	9.9	4.5
TOTAL RESPONSE	**27,325**	**100.0%**	**731**	**100.0%**	

MONS 083277

ACS and NAE citations



Pecsok



Cornell



Pigford



Gornowski

Dr. Robert L. Pecsok became the 11th recipient of the ACS Southern California Section's Richard C. Tolman Medal at the April meeting. He was honored for his contributions in analytical chemistry, especially in polarography and chromatography; for his stimulating and inspiring teaching; for his leadership in transmitting the theory and application of gas chromatographic techniques to practicing chemists; for his creativity in developing chemistry and chemical technology curriculums; and for his dedicated service to the chemical profession. He has been vice chairman of the UCLA department of chemistry. . . .

Dr. Ruth E. Cornell has received the first Science Education Award of the ACS Delaware Section. She is supervisor of science for schools in Wilmington. The award consists of $400 and a scroll. Dr. Cornell was cited for her "numerous contributions to science education in the State of Delaware, and for her generous participation" in the activities of the Delaware Section education committee for more than 25 years. She will retire at the end of this school year. . . .

Dr. Robert L. Pigford, professor of chemical engineering at University of California, Berkeley, has been elected a member of the National Academy of Engineering. He was cited for "his contributions to the thermodynamics and kinetic bases for the theory, understanding, and design of industrial phase-exchange units such as distillation columns, gas absorbers, and solvent extractors." He has been at Berkeley since 1966 and previously had taught at University of Delaware, University of Wisconsin, and Cambridge University. . . .

Dr. Edward J. Gornowski, executive v.p. of Esso Research & Engineering, has been elected a member of the National Academy of Engineering. He was cited for his contributions in petroleum processing and accomplishments in managing the development and application of new technologies. . . .

Industry

Dr. Werner Baumgarten joins Hoffmann-La Roche, Inc., Nutley, N.J., as senior information scientist . . . **Dr. William C. Bedoit, Jr.**, named marketing manager of process equipment division at Martin Sweets Co., Louisville . . . **Joseph J. Buasian** appointed technical director for commercial and industrial division of Crown-Metro, Inc., Providence, R. I. . . . New personnel at Kodak research laboratories, Rochester, N.Y.: **Alton L. Chitty**, chemist; **Dr. Ralph H. Young**, senior chemist . . . **Dr. Kirtland P. Clark** joins LeBlanc Research Corp., East Greenwich, R.I., as a research chemist . . . **James E. Comstock** named sales engineer in metal finishing chemicals department at Lubrizol Corp., St. Louis . . . **Dr. James G. Davidson** joins applications services department of color systems division, Kollmorgen Corp., Attleboro, Mass. . . . **John C. deBelle** named product manager, pulp and paper chemicals for Canada at Virginia Chemicals, Inc. . . . **W. N. Donachy** of American Meter Co. named president of Natural Gas Processors Suppliers Association. **John Biegel** and **A. B. Richert** named v.p.'s; and **Ben K. Rector**, treasurer . . . **Dr. Thomas C. Farrar** named research and technical director for analytical instrument division of JEOL USA, Inc., Cranford, N.J. . . . **Dr. H. Gerhard Flint**, manager of corporate development at Great Salt Lake Minerals & Chemicals Corp., Ogden, Utah, named v.p. and manager of research and corporate development. **Dr. Ulrich Neltzel** returns to Salzdetfurth, A.G., a co-owner of GSL, as manager of operations of the potassium sulfate plant in Heringern, Germany . . . **Dr. Richard S. Gordon**, general manager of the company's new enterprise division, named chief scientist at Monsanto . . . **R. L. Grandy**, manager of Enjay Chemical plant, Baytown, Tex., named acting v.p.-manufacturing. **W. J. Sheridan, Jr.**, who has been v.p.-manufacturing and corporate relations, on special assignment to coordinate and develop Enjay's plans for environmental management . . . **Pierre H. Hawner** promoted to development project director in chemical process section at Reynolds Metals Co., Richmond, Va. **W. Page Andres** promoted to general director of packaging research division . . . **Edward D. Henze** joins Chemplex Co., Rolling Meadows, Ill., as senior research engineer in polymer development . . . **Edward L. Kelley** named assistant manager for industrial division of Keleo Co., Chicago . . . **A. J. Klomparens** named assistant general sales manager at Dow Chemical. **J. W. Everson** moves to corporate product department on a project assignment. **E. C. Staehling** named director of manufacturing for Dow Chemical Europe, S.A. . . . **C. S. Letcher** named Polywax product manager for Bareco division of Petrolite Corp., Tulsa . . . **Dr. Thomas C. MacAvoy** elected president of Corning Glass Works, Corning, N.Y. Succeeds **R. Lee Waterman**, now honorary vice chairman of the board and company consultant. **Dr. William H. Armistead** and **James R. Houghton** elected vice chairmen of the board; **Allen W. Dawson**, executive v.p. The following were named v.p.'s: **Paul T. Clark**, staff; **William J. Bradshaw**, industrial relations; **Richard Dulude**, technical products; **F. Philip Hunt**, lighting products; **Joseph C. Littleton**, science products division; and **Conrad R. Stemski**, consumer products . . . **Dr. John S. Magee** promoted to director of cracking catalyst research department of Davison Chemical, Clarksville, Md. . . . **Theodore P. Malinowski** named director of marketing for Alcolac, Inc., Baltimore . . . **Eddins W. McNeely** named v.p.-refining for U.S., at Texaco, Inc., Houston. **Ray Powell** named v.p. for special assignments, and **James A. Hulme**, general manager of refining department-international . . . **George P. Milljus** named manager of materials section, **Robert J. Allison**, economics section; and **George A. Snyder**, technical analysis section at Dravo Corp., Pittsburgh . . . **Dr. R. Nalpawer** named senior research chemist in research department of Givaudan Corp. **Peter J. Porcaro** named group leader . . . **Ray E. Olsen** and **Dr. Werner Glass** named senior engineering associates at Esso Research & Engineering, Florham Park, N.J. **Frank W. Henrikson** named a section head; and **Edward J. Wickson** and **Dr. Edward J. Longosz**, senior research associates . . . **Paul N. Richardson** appointed senior research chemist at Du Pont's plastics department, Wilmington . . . **R. Kenneth Rogers** named South Atlantic area marketing manager at Tanatex Chemical Co., Raleigh, N.C. . . . **Raymond W. Schneider** joins Hooker Chemical's Durez division as field sales representative, Kansas City, Mo. . . . **F. John Seeba** named manager of PPG Industries plant, Guayanilla, P.R. . . . **Dr. Edward Segel** promoted to v.p.-technical director at United States Brewers Association, Washington, D.C. . . . **Ike Sheinbaum** joins Ben Holt Co., Pasadena, Calif., as senior project engineer . . . **Jack R. Siegelbaum** named president of Jersey State Chemical Co., Haledon, N.J. . . . **Wyman L. Taylor** named v.p. and general manager of Stauffer Chemical's plastics division . . . **Floyd D. Trischler** promoted to manager of eastern operations for Materials Systems Corp., Escondido, Calif. . . . **Robert L. Webb** named general manager of newly formed terpene and aromatics division at Union Camp Corp., Wayne, N.J. . . . **Howard L. Young** named president and **E. Alan Custer**, v.p. of American Zinc Sales Co.

Appointments

Dr. Melvin Calvin appointed the following to represent the Society at special functions:

Dr. Charles D. Holland, Texas A&M Section, at the inauguration of Jack Kenny Williams as president of Texas A&M University on April 16, College Station, Tex.

Dr. Joseph C. Dacons, chairman of the Washington Section, at the inauguration of Paul Gordon Buchanan as president of Dunbarton College of Holy Cross on April 24, Washington, D.C.

Dr. Jack H. Lunsford, Texas A&M Section, at the inauguration of Elliott Toulmin Bowers as president of Sam Houston State University on April 27, Huntsville, Tex.

Samuel J. Martinez, chairman of the Tulsa Section, at the inauguration of Robert E. Collier as president of Northeastern State College on May 6, Tahlequah, Okla.

MONS 083278

5th Great Lakes Regional meeting

The 5th Great Lakes Regional Meeting of ACS will be held June 10–11 at Bradley University, Peoria, Ill. The program includes 131 papers, 51 of which will be given in seven symposiums; biomembranes and transport mechanisms, industrial carbohydrates, objectives and content of introductory chemistry, bioengineering aspects of waste treatment, waste management processes, spectroscopic solutions to chemical problems, and mycotoxins of agricultural importance. General sessions will cover analytical, environmental, inorganic, organic, and physical chemistry; biochemistry, chemical education, and computers in chemistry.

Dr. Harold M. McNair of VPI and Dr. Walter R. Supina of Supelco, Inc., will present a one-day short course on Column Selection in Gas Chromatography on Wednesday, June 9. Theoretical and practical steps in GLC including column material, length, diameter, solid support, per cent liquid phase, and effects of different columns and parameters will be discussed. Registrants should have some experience with GLC. Deadline for enrollment (limited to 50) is May 15.

Special features of the meeting include an exhibit of instruments, equipment, and books; a mixer on Wednesday evening; dinner on Thursday evening aboard an excursion boat touring the Illinois River; tours of local industries and the USDA lab; and a ladies program.

Abstracts of papers to be presented will be distributed free to registrants at the meeting or they may be ordered afterward for $2.00.

Employer guidelines, layoffs, insurance programs, and the chemists' economic status are some of the topics to be discussed by Dr. Raymond P. Mariella, chairman of the Council Committee on Professional Relations, at a professional relations workshop to be held Friday, June 11, at 9:30 A.M. in the Olin Hall conference room. The program will feature a review of the committee's activities, followed by a discussion period. All registrants are invited to attend and exchange ideas on matters of professional interest.

Dr. J. M. VanLanen of Hiram Walker & Sons is general chairman of the meeting; Dr. K. E. Kolb of Bradley University, program chairman.

Advance registration (deadline May 15) is encouraged; it will be $1.00 less than on-site registration. Fees for advance registration are: ACS members, $9.00, nonmembers, $12; students, $3.00; one-day session, $6.00; and GLC short course, $35 in addition to registration fee for the meeting. Send check, payable to the 5th Great Lakes Regional Meeting, ACS, to Dr. W. A. Mukatis, Dept. of Chemistry, Bradley University, Peoria, Ill. 61606.

ANALYTICAL CHEMISTRY

FRIDAY, JUNE 11

General. T. F. Cummings, Presiding

9:30—1. The Chelation Properties and Analytical Applications of Some Hydroxy Derivatives of 1,10-Phenanthroline. Alfred A. Schilt, Wayne E. Dunbar.

9:55—2. A Polyester Acetal As a Polar, Stationary Phase for Gas Chromatography at Subambient to Moderate Temperatures. W. E. Nolf, E. H. Pryde, E. Selke, J. C. Cowan.

10:15—3. Polarographic and Potentiostatic Reduction of N-Bromobenzamides in Aprotic Solvents. Robert C. Duty, Dan Drinks.

10:35—4. Analysis of Human Tissues for Cadmium, Iron, Magnesium, and Zinc by Atomic Absorption. Gayle E. Marks, Carl E. Moore, Eugene L. Kanabrocki.

11:00—5. EDTA Content of Cation Exchange Resin. Sarah Jo Allen, T. F. Cummings.

11:15—6. Reaction of Pyrophosphate at the Lead Dioxide Electrode Surface-Adsorption Characteristics. T. A. Berger, C. O. Huber.

11:35—7. A Bulbito Ion-Selective Electrode-Application and Evaluation. C. O. Huber, M. C. Baur.

BIOCHEMISTRY

THURSDAY, JUNE 10

General. R. F. Anderson, Presiding

2:00—8. Reductive Ozonolysis in the IMRA for Fatty Acid Structure Determination. A. E. Johnston, H. J. Dutton.

2:20—9. The Comparative Specificity of Porcine Elastase and Chymotrypsin: Effect of Fatty Acid Chain Length in a Series of Nitrophenyl Esters. T. H. Marshall, Ay Akgun.

2:40—10. Occurrence of Cis-8-Hexadecenoic Acid As the Major Component of Thunbergia Alata Seed Oil. G. F. Spencer, R. Kleiman, R. W. Miller, F. R. Earle.

3:05—11. Gel Chromatographic Evidence for a Noniron Binding Site in Hemerythrin. Ayyagari L. Rao, S. Karaszlos-Nagy.

3:20—12. Isolation, Purification and Chemical Characterization of Smooth and Rough Strains of Salmonella Lipopolysaccharide—Radiochemical Approach in Lipopolysaccharide Structure Studies. C. H. Hsu, J. M. Ryan, H. E. Conrad.

3:35—13. Lipogenin and Fatty Acid Biosynthesis. Paul B. Wieser, Maurice V. L'Heureux.

FRIDAY, JUNE 11

Symposium on Biomembranes. L. E. Hokin, Presiding

9:10—14. Sugar and Amino Acid Transport Mechanisms in Isolated Bacterial Membrane Vesicles. H. R. Kaback, E. M. Barnes, Jr., A. S. Gordon, F. J. Lombardi and Grace K. Kerwar

9:50—15. Structure, Function and Biogenesis of Sarcoplasmic Reticulum Membranes. Anthony Martonosi

10:40—16. The Active Transport of Sodium and Potassium Ions Across Cell Membranes. R. L. Post.

11:30—17. Membrane Transport Proteins of Escherichia coli. Dale L. Oxender.

MEN & MOLECULES

A radio series presented by the American Chemical Society

May 7

Complete Corn

Dr. Edwin T. Mertz
Purdue University

See "Men and Molecules" listings beginning in C&EN, Jan. 25, page 52 for stations broadcasting in your area. Each week C&EN announces the "Men and Molecules" program to be released the following Friday. Call your local station to find out about specific programs.

General. M. E. Slodki, Presiding

1:30—18. Concanavalin A As a Probe of Phosphomannan Molecular Structure. M. E. Slodki, R. M. Ward and J. A. Bouncy.

1:50—19. The Effects of Methimazone, Azide and Colchicine on Polymorphonuclear (PMN) Leukocyte-Induced Germination of Spores of Clostridium Botulinum. Jon S. Suzuki, A. Benedik and N. Grecz.

2:10—20. Carbohydrate Transport by Agrobacterium tumefaciens. Larry O. Arthur.

2:30—21. The Effect of Exogenous Methionine and Aspartate on Pantothenate Incorporated into an Auxotrophic Agrobacterium. Tsuneo Kaneshiro.

2:50—22. Isolation of Uric Acid and Detection of Xanthine Oxidase from Bovine Thyroid Glands. A. G. Fischer and H. Lee.

3:05—23. Growth of Xanthomonas Campestris is not simply Nutrient-Limited. R. A. Moreins and P. Rogovin.

3:25—24. Rotenone and Deguelin in Tephrosia vogelii at Seven Stages of Maturity. J. W. Hagemann, N. E. Dalfer, F. R. Earle and J. J. Higgins.

CARBOHYDRATES

THURSDAY, JUNE 10

Symposium on Industrial Utilization of Carbohydrates. S. A. Watson, Presiding

9:00—Introductory Remarks. S. A. Watson

9:05—26. Characteristics and Industrial Applications of Amylases. John T. Garbutt.

9:30—26. A Review of the Newer Methods of Analyzing for Oligosaccharides. C. E. Ltnt. Jr.

10:05—27. Applications of Starch Hydrolyzate Products. E. C. Snyder.

11:00—28. Carbohydrates in Paper Technology. John W. Swanson.

11:30—29. Microbial Polysaccharides, New Industrial Hydrocolloids Produced from Dextrose. Paul R. Watson and Allene Jeanes.

J. E. Hodge, Presiding

2:00—30. Starch Graft Polymers. II. Preparation of Graft Polymers Containing Acrylamide and Acrylic Acid and Evaluations as Textile Print Paste Thickeners. Duane A. Jones and Lyle F. Elmquist.

2:20—31. Effect of Structure on Properties of Hydrolyzed Starch-Polyacrylonitrile Grafts. M. O. Weaver, L. A. Guglielmelli and C. R. Russell.

2:40—32. Model Studies on the Reaction Between Starch Xanthate and a Polyamide-Polyamine-Epichlorohydrin Resin. M. E. Carr, G. E. Hamerstrand and W. M. Doane.

3:15—33. Glucose Isomerase Bound to Porous Glass Beads. Gerald W. Strandberg.

3:30—34. Preparation of Active Water-Insoluble Papain through Starch Anthranilates. C. L. Mehltretter and F. B. Wesley.

3:50—35. Permeation Chromatography of Dent Corn Amylose Fractions. F. R. Dintzis and R. Tobin.

4:10—36. Allyl Glucosides—Preparation and Chromatographic Separation of Anomeric Mixture. F. H. Otey, R. P. Westhoff and C. L. Mehltretter.

4:30—37. Crystalline Forms of Maltose. J. A. Rendleman and J. E. Hodge.

4:50—Concluding Remarks. S. A. Watson

CHEMICAL EDUCATION

General. E. L. Haenisch, Presiding

10:00—38. Are We Teaching Chemistry Like It Is? William G. Kessel

10:20—39. Chemistry for Changing Times: A Nontraditional Course for the Nonscience Student. John W. Hill.

10:40—40. A New Kind of Chemistry Course—Why? Who? What? K. E. Kolb

11:00—41. The Role of Chemistry Teaching in Polluted Planet Problems. Irwin H. Parrish

11:20—42. Early Formulations of Kinetic Molecular Theory: John Herapath. Robert M. Hawthorne, Jr.

Symposium on the Objectives and Content of Introductory College Chemistry. B. Z. Shakhashiri, Presiding

1:30—Special Presentation

1:40—Introductory Remarks. B. Z. Shakhashiri

1:55—43. Freshmen Chemistry for the Nonscience Major. W. T. Lippincott.

2:20—44. The Conquest of Chemical Illiteracy. Lawrence P. Eblin.

MONS 083279

2:45—46. Teaching General Chemistry in a Liberal Arts College. Emil J. Slowinski.
3:10—46. Revolutionary Chemistry—A New Kind of Chemistry Course for Nonscience Majors. Robert Weil.
3:35—47. Freshmen Chemistry for the Nonmajor with an Interest in Other Sciences. G. P. Haight, Jr.
4:00—Open Discussion and Questions

FRIDAY, JUNE 11

General. D. K. Kolb, Presiding

1:20—48. Reactivity Ratios from Copolymerization Kinetics by Quantitative Gas Chromatography. W. A. Mukatis and Tamsis Ohi.
2:00—50. Equilibrium Calculations in Freshman Chemistry. A "Trial and Error" Approach Using Computer Assisted Instruction. A. Keith Jameson.
2:15—49. The Eastern Michigan University Center for the Exchange of Chemistry Computer Programs: EMU-CECCP. Ronald W. Collins, Keith R. Powell and Sudhir K. Vaidya.
2:40—51. Computer-Simulated Inorganic Qualitative Analysis. Larry D. Francis.
3:05—52. Undergraduate Research Projects for Gifted Students. Norbert Isenberg and Charles F. Kugel.

COMPUTERS IN CHEMISTRY

General. G. F. Pollnow, Presiding

2:00—53. Computer Techniques in the Analysis of Nuclear Gamma-Ray Resonance Spectroscopy. Robert A. Arnott.
2:25—54. Interfacing of Remotely Located Gas Chromatographs, Mass Spectrometers and Other Laboratory Instruments. H. J. Dutton, R. O. Mumford, D. J. Wolf and J. O. Ernst.
2:50—55. On-Line Computer Processing of Kinetic Data. Harry L. Perdue.
3:15—56. ITT Research Institute Has Developed a Computer Search Center (CSC) for Providing Information from Machine-Readable Data Bases to Government, Industry and Academic Institutions. Martha E. Williams.
3:50—57. Problems of a Remote Terminal Network. John Read.
4:15—58. Fast Fourier Transforms in the Industrial Environment. Albert Starshak.

ENVIRONMENTAL CHEMISTRY

THURSDAY, JUNE 10

General. C. E. Moore, Presiding

2:00—59. Solids We Breathe. Leslie Gatschalk, Alan W. Weinstein, R. Harris Cummings and Thomas F. Cummings.
2:25—60. Distribution of Selected Metals in Bottom Sediments, Water, Clams, Tubificid Annelids and Fishes of the Middle Illinois River. B. J. Mathis and T. F. Cummings.
2:50—61. The Biochemical Effects of Possible Pollutants on Bluegill Liver Mitochondria. Robert C. Hilliblan.
3:05—62. A Poly-β-Hydroxynitrenoate from Activated Sludge. L. L. Welton.
3:20—63. Man's Impact on the Ecosystem of the Illinois River. W. C. Starrett.

FRIDAY, JUNE 11

Symposium on Bioengineering Aspects of Wastes Treatment. J. T. Pfeffer, Presiding

9:00—64. Introduction: Fundamentals of Biological Waste Treatment. John T. Pfeffer.
9:05—65. Aeration and Agitation. James Y. Oldshue.
10:10—66. Environmental and Nutritional Requirements of Biological Waste Treatment Systems. Ross E. McKinney.
10:40—67. Sludge Management. Jack A. Borchardt.
11:15—68. Waste Monitoring and Equalization. Joseph Ling and Douglas W. Johnson.
11:40—General Discussion: All Speakers.

Symposium on Waste Management Processes. D. L. Miller, Presiding

1:30—Introductory Remarks. D. L. Miller.
1:35—69. Biological-Chemical Treatment of Industrial Waste Water Effluents. James F. Grutsch and Russell C. Mallatt.
2:05—70. Evaluation of the Ability of the Activated Sludge Process to Handle Loading Variations. James C. McLellan.
2:35—71. Industrial Waste Treatment and Disposal at a Regional Facility. Peter Williamson.
3:05—72. Removal and Recovery of Fatty Materials from Edible Fat and Oil Refinery Effluents. W. Seng and E. C. Beck.
3:35—73. Waste Management in Agricultural Processing Industry. Kenneth R. Majors.

INORGANIC CHEMISTRY

THURSDAY, JUNE 10

General. G. Gordon, Presiding

9:30—74. The Reaction of Tellurium(VI) with Iodine Ion in Acidic Media. Richard Bayak and Bruno Jaselskis.
9:50—75. The Rates of Formation and Exchange for Oxovanadium(IV)-Glycine Complexes. Hiroshi Tomiyasu, Kiri Dreyer and Gilbert Gordon.
10:10—76. Electronic and Magnetic Circular Dichroism Spectra of Platinum(II) Cyano Amine and Alkyl Isocyanide Complexes. Huseyin Isci and W. Roy Mason.
10:30—77. Nickel(II) Complexes with Ortho-Substituted Benzoate Anions. S. F. Pavkovic and T. R. Pelton.
10:50—78. Synthesis and Characterization of (Substituted Pyridine 1-Oxide) Ammine-Cobalt(III) Salts of Weakly Coordinating Anions. Roy G. Garvey and James B. Woell.
11:10—79. Aquation Reactions of Several Complexes of the Type trans-[Cr(A)$_2$F$_2$]$^+$. James M. DeJovine, W. R. Mason, and Joe W. Vaughn.
11:30—80. Synthesis of Various Aminodiacetatoboranes. D. T. Haworth and G. J. Barrett.

MICROBIAL CHEMISTRY AND TECHNOLOGY

Symposium on Mycotoxins of Agricultural Importance. C. W. Hesseltine, Presiding

8:30—Introductory Remarks. C. W. Hesseltine
8:40—81. Analytical Methods for Mycotoxins. Leonard Stoloff.
10:05—82. Some Recent Developments Concerning Ochratoxin A. Peter M. Scott and Wilhelmina van Walbeek.
10:35—83. The Aflatoxin Problem in the Southwest in 1966-70. Harry W. Schroeder and Robert A. Boller.
11:00—84. Isolation and Characterization of Mycotoxins from Trichothecium roseum. J. J. Richard and G. W. Engstrom.

John Tuite, Presiding

2:00—85. Host-Specific Toxins from Fungi Pathogenic to Plants. R. P. Scheffer.
2:25—86. Toxins Produced by Helminthosporium maydis. A. L. Hooker and S. M. Lim.
2:50—87. Secondary Metabolites of Helminthosporium. Odette L. Shotwell and C. W. Hesseltine.
3:30—88. The Estrogenic Metabolites of Fusarium. Chester J. Mirocha, Clyde M. Christensen and Glen H. Nelson.
4:00—89. Mycotoxins from Fusarium. Eugene B. Smalley, Frank M. Strong and Ru-Doug Wei.

ORGANIC CHEMISTRY

Natural Products. A. G. Fischer, Presiding

9:15—90. Alliin and Related Compounds. Norbert Isenberg and Marcel Gridinic
9:30—91. Photochemical Cycloaddition of a Steroidal 4-en-3-one to Cyclic and Acyclic Olefins. George R. Lenz.
9:55—92. Reaction of 4-Methyl Ring A Aromatic Steroids with Co(IV). L. S. Eichmeier and David M. Pistek.
10:15—93. A Study of Euphorbia serrulata. K. A. Reimann and D. M. Pistak.
10:35—94. New Diterpene Resin Acids from Pines. Duane F. Zinkel and Brian P. Spalding.
10:55—95. Structures of Some Homoerythrine Alkaloids from Cephalotaxus Harringtonia. R. G. Powell.
11:15—96. Preparation of Porphyrins from Brominated Dipyrrylmethenes, 2-Methyl-3,4-Disubstituted-pyrroles and Knorr Reaction Intermediates. Anne T. O'Brien, Paul P. Hipps, LeRoy L. Richer, Donald D. Preble, James Mott and David J. Rislove.
11:35—97. Configuration of Diastereoisomeric 16α,17α-Ethylidenedioxy-20-Keto Pregnanes. Charles S. Markos.

General. E. K. Fields, Presiding

1:30—98. Photochemistry of Ethyl α-Methyl-β-Phenyl Glycidate. J. T. Przybylek, S. P. Singh and J. Kagan.
1:45—99. The Migratory Aptitude of the Carbobenzyl Group in the Pinacol Rearrangement. D. A. Agdeppa, Jr., S. P. Singh and J. Kagan.
2:00—100. Thermal Decarboxylation of 1,2-Cyclopropanediol Cyclic Carbonates. Fred W. Breitbeil, Richard C. Larose and Theodore J. Fogg.
2:20—101. Bromine Rearrangement during Demethylation of Bromoveratric Acids. D. M. Pistek, K. Yim and J. Rosenberg.
2:40—102. Mannich Condensations of Thiophenols. Carl Weatherbee, Jerry W. Nieft and Gregory C. Mumie.
2:55—103. A New Dihydro-γ-Pyrone Synthesis. Robert M. Carlson and Frank Sher.
3:15—104. Cycloaddition Reactions of Conjugated Ketones. Suhail Abdo and K. R. Fountain.
3:35—105. Bond Index Studies on Fluorinated Cummulenes. K. R. Fountain.
3:55—106. Synthesis and Properties of some N-Alkyl-N-Arylhydroxylamines. Available by Cope Elimination of N,N-Dialkylaniline Oxides. Terry L. Kruger, Stephen Hartzell and James Kress.
4:15—107. A Spectroscopic Study of the Structure of Dihydroxy-B-Tristine Malonic Ester. G. Fred Reynolds and Michael Doda

FRIDAY, JUNE 11

General. Michael Kurz, Presiding

1:30—109. Studies on exo-3,3-Diphenyltricyclo [3.2.1.0^2 4] oct-6-ene and Related Compounds. James W. Wilt and Thomas P. Malloy
1:50—108. The Pentachlorocyclopentadienide Anion. Gary Wulfsberg and Robert West
2:10—110. Reaction of Iodine with Olefins IV. Effect of Chain Length and Light. K. E. Kolb, D. A. Wilder, E. S. Taylor and M. A. Taylor
2:35—111. Reactions of Nitrosa Compounds with Sulfur Ylides. Melvin L. Dmelinger, Steven R. Lehrnard and Thomas V. Sloppe
2:50—112. A Kinetic Study of the Reaction of Phenyl Isocyanate with Water. LeRoy A. McGraw and Stephen D. Robling
3:10—113. Aromatic Hydroxylation with Hydrogen Peroxide-Aluminum Chloride. Michael E. Kurz and Glen J. Johnson
3:35—114. Substituent Effects in the Mechanolysis of Benzoyl Halides in Acetonitrile. Dennis N. Kevill, William F. K. Wang and Donald C. Knauss
3:50—115. Temperature Dependence of the Modified Gabriel Reaction of Chloromethylstilazene and Phthalimide. William S. Shove
4:05—116. The Stereochemistry of the Solvolysis of Cyclohexyl Tosylate. Joseph B. Lambert and Gerald J. Putz.

PHYSICAL CHEMISTRY

General. B. Musulin, Presiding

9:30—117. A Simplified Method of Obtaining Ground State Energies of Polyelectronic Atoms, Unknown Ionization Potentials and Repulsion Energies. Leslie Leifer, Kimio Inoue and Paul A. Larson
9:50—118. Correlation of Solubility Parameters with Surface Tensions of Liquids. R. L. Ensslet and J. A. Stolp
10:10—119. Temperature Behavior of Ionic Mobilities Calculated from Continuum Models. Gary J. Clark.
10:30—120. Dynamic Stereochemistry in Several Metal Complexes Containing the Fe-S$_2$ Core. Louis H. Pignolet, Robert A. Lewis and R. H. Holm.
11:00—121. Multiplicity and Identification of Ion Sites for NaCo(CO)$_4$ in a Variety of Solvents. W. F. Edgell, A. Barbetta, T. Yahl, and C. Y. Pang.

SPECTROSCOPIC METHODS IN CHEMISTRY

THURSDAY, JUNE 10

Symposium on Spectroscopic Solutions to Chemical Problems. K. L. Rinehart and R. Drago, Presiding

8:30—122. X-Ray Photoelectron Spectroscopy, Inorganic Applications. David N. Hendrickson
10:15—123. Applications of Ion Kinetic Energy Spectroscopy. J. H. Beynon and R. M. Caprioli.
11:00—124. Chemical Ionization Mass Spectrometry. G. P. Arsenault

MONS 083280

FRIDAY, JUNE 11

K. L. Rinehart and R. Drago, Presiding

9:00—125. NMR Studies of Paramagnetic Meteriels. Ronald J. Fitzgerald.
10:00—126. Carbon-13 Fourier Transform NMR in Chemistry and Biology. Adam Allerhand.
11:00—127. Nuclear Quadrupole Resonance Spectroscopy as a Structural Tool in Organic Chemistry. Robert West.
1:30—128. Small Computers in Spectroscopic Control and Interpretation. C. S. Kopiensteiner.
2:30—129. Asymmetric Solvents in NMR Studies. W. H. Pirkle, S. D. Beare, T. G. Burlingame and R. T. Muntz.
3:30—130. Multiple Ion Detection (MID) of Biologically Important Molecules Using a Gas Chromatograph (GC)-Mass Spectrometer (MS) with On-line Data Acquisition. J. Throck Watson, Brian J. Sweetman and Don Peister.
3:50—131. Mass Spectrometry and Gas Chromatography in Investigations of Alkaloids and Antialeitics. Kenneth L. Rinehart, Jr., Woodlin V. Ligon, Jr., David S. Millington, Phillip Schaefer and J. Carter Cook.

Southeast Regional Meeting

The ACS Southeast Regional Meeting will be held Nov. 4-6 in Nashville, Tenn., with the ACS Nashville Section as host. Papers in chemical education and analytical, biological, medicinal, inorganic, organic, and physical chemistry are solicited. Deadline for submitting titles and letters of intent is July 1; for abstracts, Aug. 1. Authors should request abstracts form from the program chairman.

A symposium on polymer science will include invited papers by H. G. Khorana, G. C. Overberger, K. G. Scott, R. S. Stein, and J. K. Stille in each of the major areas of chemistry.

General chairman of the meeting is Dr. J. E. Bishop, Pigments Dept., Du Pont Co., Johnsonville, Tenn. 37134. Program chairman is Dr. D. E. Pearson, Dept. of Chemistry, Vanderbilt University, Nashville, Tenn. 37203.

Travel grants

Grants in support of travel by selected participants in the International Conference on Molecular Energy Transfer at Cambridge University, July 19-23, are being offered. NAS-NRC administers the grants with funds provided by the Air Force Office of Scientific Research and by National Science Foundation.

Application forms can be obtained from the Executive Secretary, NRC Division of Chemistry and Chemical Technology, NAS, 2101 Constitution Ave., N.W., Washington, D.C. 20418, and should be returned no later than May 15. Write Dr. A. B. Callear at Cambridge University or Dr. C. Bradley Moore, University of California, Berkeley, for details of the scientific program.

Calendar of Events

Future ACS national meetings

Sept. 12–17, 1971. Washington, D.C.
April 9–14, 1972. Boston, Mass.
Aug. 27–Sept. 1, 1972. New York, N.Y.
April 8–13, 1973. Dallas, Tex.

Write Meetings Dept., ACS, 1155—16th St., N.W., Washington, D.C. 20036

May 11–15. 21st Intl. Science Fair. Civic Center, Baltimore, Md. Write Science Service, 1719 N St., N.W., Washington, D.C. 20036.

May 12. 22nd Intl. Science & Engineering Fair. Municipal Auditorium, Kansas City, Mo. Write Science Service, 1719 N St., N.W., Washington, D.C. 20036.

May 12–13. Solid Waste Resources Conf. Columbus, Ohio. Write George F. Sachsel, Battelle Memorial Institute, Columbus, Ohio 43201.

May 19. Symp. on Incineration and Clean Air. Sponsors, AIChE, AIME, ASCE, ASHRAE, ASME, ASTM, & Manhattan College. Hotel New Yorker, New York, N.Y. Write Louis Theodore, MECAR, c/o Chemical Engineering Dept., Manhattan College, Bronx, N.Y. 10471.

May 24–26. 12th Annual Medicinal Chemistry Symp. Heterocyclic Chemistry. State U of New York, Buffalo. Write Robert A. Coburn, Dept. of Medicinal Chemistry, SUNY, Buffalo, N.Y. 14214.

July 21. Symp. and Panel Discussion on Evaluation of Experimental Data. National Bureau of Standards, Gaithersburg, Md. Write Dr. H. van Olphen, Numerical Data Advisory Board, NAS-NRC, 2101 Constitution Ave., N.W., Washington, D.C. 20418.

Sept. 9–10. ASTM Committee D-12 on Soaps and Other Detergents. Annual Mtg. Belmont Plaza Hotel, New York, N.Y. Write J. B. Schapiro, ASTM, 1916 Race St., Philadelphia, Pa. 19103.

Sept. 16–17. Symp. on Explosion Hazards in the Chemical Industry. U of Manchester Inst. of Science and Technology, Manchester, England. Write Dr. B. J. Tyler, Dept. of Chemistry, UMIST, Sackville St., Manchester, M60 1QD, England.

Nov. 9–10. Soc. of Engineering Science. 9th Annual Mtg. Rensselaer Polytechnic Inst., Troy, N.Y. Write H. F. Tiersten, RPI, Troy, N.Y. 12181.

Nov. 30–Dec. 3. 7th Intl. Symp. on Advances in Chromatography. Caesars Palace, Las Vegas, Nev. Write Albert Zlatkis, Dept. of Chemistry, U of Houston, Houston, Tex. 77004.

ACS SHORT COURSES

May 7–8. Liquid Scintillation Counting; Donald L. Horrocks. New York City area.
May 14–15. Gas Chromatography; Roy A. Keller and Michael F. Burke. Boston, Mass.
May 21–22. Communication Skills for Chemists and Chemical Engineers; Frederick G. Sawyer. New York City (new course).
May 21–22. Intermediate Gas Chromatography; Harold M. McNair, Richard S. Juvet, and Stuart P. Cram. Philadelphia, Pa.
June 4–5. The Small Computer in the Chemical Laboratory; Raymond E. Dessy and David G. Larsen. Detroit, Mich.
June 4–5. Heterogeneous Catalysis; Robert L. Burwell, Jr., and Michel Boudart. Pittsburgh, Pa.
June 4–5. Modern Liquid Chromatography; Lloyd R. Snyder and J. J. Kirkland. Chicago, Ill. (new course).
June 7. Column Selection in Gas Chromatography; Harold M. McNair and Walter R. Supina. Houston, Tex.
June 11–12. Business Aspects of Chemistry; Almison Jonnard. New York City.

To obtain complete information and registration forms, write to Education Department, ACS, 1155—16th St., N.W., Washington, D.C. 20036, and specify course and location. To register by phone, call (202) 737-3337, ext. 255.

New journals

National Science Teachers Association will publish a quarterly directed to science faculty at the college level beginning next October. The *Journal of College Science Teaching* will emphasize science programs in general education. Dr. Leo Schubert, head of chemistry department at American University, will edit the journal, which will have full-length articles, news sections, abstracts from other journals, and reviews of books and other instructional materials. It will also carry advertising. Subscription rates are $8.00 a year to NSTA members and $10 a year to nonmembers and libraries. Write NSTA, 1201—16th St., N.W., Washington, D.C. 20036.

International Journal of Sulfur Chemistry, in its first volume (four issues) will be published during July-December 1971. It will contain notes, articles, and communications on all aspects of sulfur chemistry and also on selenium chemistry, and is subtitled Part A—Original Articles. **Quarterly Reports on Sulfur Chemistry** (volume 6) will be published as Part B of the journal, and **Mechanisms of Reactions of Sulfur Compounds** as part C. Requests for information and submission of manuscripts may be sent to Intra-Science Research Foundation, P.O. Box 430, Santa Monica, Calif. 90406.

New Books

The Mammalian Mitochondrial Respiratory Chain. Walter W. Wainio. viii + 499 pages. Academic Press, Inc., 111 Fifth Ave., New York, N.Y. 10003. 1970. $23.
Concise review, discussing mitochondria from the liver, heart, brain, and kidney. Said to be of interest to investigators in mitochondrial research, especially enzymologists interested in the respiratory chain. Also useful to graduate students in bioenergetics.

Practical Quality Control. David A. Simmons. xiv + 240 pages. Addison-Wesley Publishing Co., Inc., Reading, Mass. 01867. 1970. $9.50.
Combines practical principles with examples illustrating problems of quality control.

Reviews in Macromolecular Chemistry. Vol. 5, Part 2. George B. Butler, Kenneth F. O'Driscoll, Mitchel Shen, editors. vi + 236 pages. Marcel Dekker, Inc., 95 Madison Ave., New York, N.Y. 10016. 1970. $17.50.

Rodd's Chemistry of Carbon Compounds. 2nd rev. ed., Vol. 2, Part D. S. Coffey, editor. xvi + 500 pages. American Elsevier Publishing Co., Inc., 52 Vanderbilt Ave., New York, N.Y. 10017. 1970. $30.50.

Symposium: Sulfur in Nutrition. O. H. Muth, editor. x + 251 pages. Avi Publishing Co., Inc., P.O. Box 670, Westport, Conn. 06880. 1970. $9.50.
Proceedings of symposium in Corvallis, Ore., September 1969.

Synthetic Peptides. Vol. 1. George R. Pettit. xii + 467 pages. Van Nostrand Reinhold Co., 450 West 33rd St., New York, N.Y. 10001. 1970. $19.95.

Synthetic Methods of Organic Chemistry. Vol. 24. W. Theilheimer. xix + 521 pages. Albert J. Phiebig, Inc., P.O. Box 352, White Plains, N.Y. 10602. 1970. $60.

MONS 083281

DIRECTORY SECTION

This section includes: CHEMICALS EXCHANGE—Chemicals, Resins, Gums, Oils, Waxes, Pigments, etc.; EQUIPMENT MART—New and Used Equipment, Instruments; Facilities for Plant and Laboratory; TECHNICAL SERVICES—Consultants; Engineering, Testing, Professional Services.

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Letters

Continued from page 6

care of his family. Here is your valuable bridge person. What is ACS doing to locate, utilize, and encourage these perceptive and resourceful people?

If I am reading the current educational scene in a realistic manner, the best thing ACS or any major foundation can do is start is a "Project Bridge" and supply some funds, based on ability and not on financial need, to allow people over 30 to return to full-time university study to broaden their talents. The recent Carnegie Commission Report on Higher Education has encouraged easier access to further university study for older students. And with the current ghetto situation existing on most university campuses, we desperately need to get more older people back to campus who have been a part of the real world. If ACS would sponsor a "Project Bridge" patterned after "Project SEED," I would be the first to contribute.

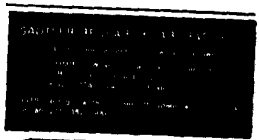
Unlike some members of ACS who are dissatisfied with the present state of affairs and find it necessary to voice their protest with a resignation, I will not. I think I can be much more effective romping around within this organization wearing hobnail boots.

This letter represents only the view of the author and is aimed at triggering intelligent discussion. But would you personally support a "Project Bridge"?

Thank you for your interest and consideration.

Howard M. Peters, Ph.D.

Palo Alto, Calif.



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MONS 083282

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Members of the Society who are unemployed or under notice of involuntary unemployment within sixty days, shall, upon stating the circumstances, giving the name of the company where last employed and date of termination, be allowed *without charge one nondisplay situation wanted* classified advertisement per issue for a maximum of six in a calendar year, not to exceed 50 words each (45 words plus 5-word box address or advertiser's name and address). Excess words charged at 25 cents per word. Members who are retired shall be allowed three nondisplay insertions in a calendar year subject to the same conditions outlined above. The foregoing as it relates to unemployed members applies to situations wanted advertisements for regular employment only, not to part-time, free lance, or consulting work. Retired members may advertise for full or part-time positions or consulting work. Additional insertions after the free ones may be made at 25 cents per word. Nondisplay insertions by EMPLOYED Society members seeking full- or part-time positions or consulting work and all nondisplay insertions by Student Affiliates of the Society shall be accepted at 25 cents per word for each insertion, no minimum charge. Individuals placing situations wanted advertisements should declare in letters of transmittal whether or not they are Society members and whether or not they are retired (and 55 years of age or older) to ensure appearance of the advertisement in the proper classification. Nonmembers of the Society are charged $1.20 per word, minimum charge $18.70.

In printing these advertisements, the Society assumes no obligation as to qualifications of prospective employees or responsibilities of employers, nor does the Society endeavor to obtain information concerning the positions advertised, or of those seeking employment. Those replying to announcement with supporting documentation should send copies and not original documents. Every reasonable effort will be made to prevent forwarding of advertising circulars. Employers desiring application data on company forms should send duplicate copies.

The ACS expects that each user of this section consider himself morally obligated to acknowledge all replies to his advertisement.

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EMPLOYERS. To find well-qualified chemists and chemical engineers, including those retired or retiring within a year of application, please telephone area code 202 RE7-3337 or write to the National Office and specify qualifications desired. Number of applications on file with those qualifications will be quoted to you. Copies of résumés, if desired, will be made at 25¢ per copy and forwarded to you. No other fee involved. In turn, the Society insists that no user make a placement charge against registrants. Further details on this change, including a list of data input items on each applicant, can be had upon request.

APPLICANTS. Must be members or student affiliates of the ACS. This service is year-round and nonconfidential. (The Retired Chemists Clearing House is now an integral part of this service, and, therefore, members who are retired or retiring within one year of application may request forms now.) Applications will be available to all employers in search of all types of technical personnel. There is no charge for this employment aid of the Society.

For application forms and further details, please write to: **AMERICAN CHEMICAL SOCIETY,** *1155 Sixteenth St., N.W., Washington, D.C. 20036* **Attn.: Employment Clearing House**

MONS 083283

PROCESS/PROJECT

CHEMICAL ENGINEER

GROWTH CHALLENGE

The expansion of the Molecular Sieve Department at UNION CARBIDE'S Tarrytown Technical Center in New York has created a challenging opportunity for a chemical engineer with 2-7 years' experience in process/project engineering in the petrochemical and petroleum refining industries.

Work will be in our Technical Service Group on process design and review, project engineering, trouble shooting, customer liaison and economic-market evaluation.

This is an opportunity for you to achieve professional growth and to increase your responsibility in a new technical area of vital interest to Union Carbide. Salary will be commensurate with your experience. Excellent company benefits include educational refund. Send your résumé to:

Mr. E. J. Hickey

UNION CARBIDE CORP.

Tarrytown Technical Center

Tarrytown, N. Y. 10591

UNION CARBIDE — The Discovery Company

An equal Opportunity employer

SUPERVISOR

CRACKING CATALYST RESEARCH

Chemist or chemical engineer, Ph.D., with a minimum of 5 years' experience in catalyst preparation or related area. Should be knowledgeable in silicate chemistry and colloidal systems. Familiarity with the application of modern methods of instrumental analysis: NMR, GC, X-ray, DTA, etc. essential. Knowledge of unit operations such as filtration, mixing, spray drying, etc. highly desirable. This opening exists in the Davison Chemical Division Research Department of W. R. Grace & Co., located at the Washington Research Center in Maryland, halfway between Washington and Baltimore, near Columbia, with easy access to either.

Send résumés in confidence to:
Personnel Department

W. R. GRACE & CO.

Washington Research Center
Clarksville, Maryland 21029

An Equal Opportunity Employer

GRACE

ORGANIC POLYMER CHEMIST. Advanced degree. At least five years' broad based background in resin synthesis formulation and application, preferably polyurethane, for synthesis and formulation of resins for coatings, adhesives, foams, textile finishing in new research laboratory of large diversified company. Location: attractive suburban area of major southeastern city.
Box 10 I-4, C&EN, Easton, Pa. 18042

URETHANE AND EPOXY CHEMIST OR chemical engineer. Product development and applied research on adhesives, coatings toolings, encapsulating compounds for multiple industry applications. Occasional technical service. Desire 5 years minimum experience, with degree. Write to:
Personnel Manager, Magnolia Plastics, Inc., 3547 Peachtree Industrial Boulevard, Atlanta, Georgia 30341

Fermentation Engineer

A rewarding opportunity is available for an individual interested in working in our Fermentation Pilot Plant. The ideal candidate should have a B.S. or M.S. in chemical or biochemical engineering or related areas and preferably some industrial fermentation experience. The selected candidate will be working on the laboratory and pilot scale development of new techniques for the production and recovery of fermentation products.

Should you be interested in exploring this opportunity, please write stating salary requirements to: Mr. Edward C. Meseck, Associate Personnel Manager.

Hoffmann-La Roche Inc.

Nutley, New Jersey 07110
An Equal Opportunity Employer

PLASTICS PROCESS & PRODUCT DEVELOPMENT

SAN FRANCISCO BAY AREA

Exciting opportunities available in a newly formed Pharmaceutical Research Company. We are investigating advanced drug delivery systems, and need capabilities in the following areas:

CHEMICAL, MECHANICAL ENGINEERS & TECHNICIANS

Plastics films and coatings process development: knowledge of methods, machinery, materials—coating, laminating, casting, extrusion.

Plastics Product Development: design, fabrication methods, assembly, sealing injection molded & extruded plastics parts. Also die & tooling design.

Please send resume & salary history to:
Personnel Manager

pharmetrics, inc.

2631 Hanover Street Palo Alto, Calif. 94304

RESEARCH CHEMIST

The individual we're seeking for this challenging position has at least a BS with a major in chemistry or equivalent. Prefer 3 years experience in an industrial laboratory in the areas of silver emulsion chemistry, offset printing, and/or photographic type coating.

You'll be involved in the preparation of laboratory emulsions, formulations, pilot coatings, and supervision of production coating of new products. Handsome salary commensurate with your ability and experience.

Outstanding benefits and advancement potential.

Send resume in confidence to:

MR. L. F. KRIZKA

APECO

American Photocopy Equip. Co.
2100 Dempster Evanston Ill. 60204

equal opportunity employer

SPRAY DRYER ENGINEERING. Established equipment manufacturer has opening for Manager of Spray Dryer Division. The man we seek should have a good sales record, and be acquainted with other associated processing equipment. Growth opportunity with quality minded company. Contact:
R. M. Komline, KOMLINE-SANDERSON ENGINEERING CORP., Peapack, N.J. 07977, Tel: 201-234-1000

Organic Synthesis. Flavor Chemistry Natural Products. 1-3 years experience including instrumentation desired. Corporate R&D position. Send complete resumé stating salary requirement to: H. L. Dudek, McCormick & Company, Inc., 11350 McCormick Road, Cockeysville, Md. 21030 (Just north of Baltimore)

An Equal Opportunity Employer

TEXTILE CHEMICALS

Outstanding opportunities in MARKETING MANAGEMENT - - - RESEARCH and RESEARCH MANAGEMENT. Contact in strictest confidence:

John E. Panos

COOK ASSOCIATES, INC.
230 N. Michigan Ave., Chicago, Ill. 60601
312/782-1119

PATENT LAWYER-B.A. CHEMIST OR chemical engineer with LL.B. or J.D. for corporate staff opening. Handle all patent matters including infringements and prosecution. Excellent potential. Start to $20,000. Contact: N. V. Pompina, Anderson-Taylor, 230 S. 15th St. Phila., Penna. 19102

EMULSION POLYMERIZATION CLIENT seeks BS/MS with experience in R&D and process improvement. To $18,000. Contact W. Nigoski Fox-Morris Assoc., 1500 Chestnut, Phila., Pa. 19102, 561-6300

Academic Positions

MEDICAL COLLEGE OF GEORGIA: Graduate programs in the Life and Medical Sciences, 1971-72 academic year, leading to the Ph.D. (or M.S.) in Biochemistry, Endocrinology, Microbiology, Anatomy, Physiology and Pharmacology. NSF, NDEA, NIH and institutional fellowships, traineeships, and assistantships for qualified students, with dependency and tuition allowance in many cases. For details of the graduate program in each field, application materials, and financial assistance information write to:
Dean P. J. Behal, School of Graduate Studies, Medical College of Georgia, Augusta, Georgia 30902

GRADUATE TEACHING ASSISTANTships: $3000-4000 for nine months. United States academic experience required.
Dr. Robert Jarnes, Graduate Advisor, Department of Chemistry, San Diego State, San Diego, California 92115

POSTDOCTORAL RESEARCH ASSOCIATE, September 1971. Investigation of nonmorphic behavior of organo-cardiosonne and nitrogen-boranes. Write:
Dr. T. J. Klingen, Department of Chemistry, The University of Mississippi, University, Mississippi 38677

ANALYTICAL CHEMISTS OR SENIOR technicians. Positions in State Chemists' Laboratory. Full time or part time basis in Graduate School. Fertilizers, feeds, and automated chemical analyses. Starting salary: $8,000 to $8,000
C. W. Gehrke, University of Missouri Room 4, Agriculture Building, Columbia, Missouri 65201

FELLOWSHIPS AVAILABLE LEADING TO the Ph.D. degree in Biology. Training in molecular biology, genetics, immunology, microbiology and the biology of disease is offered through the extensive facilities and programs of a major research institute coupled with a university graduate division. Stipends start at $2,400, with dependency allowances. Write:
Dr. K. Paigen, Chairman, Graduate Biology Department, Roswell Park Memorial Institute, Buffalo, New York 14263

TURKISH CHEMIST: Ph.D. IN CHEMistry. Teaching appointment at Robert College in Istanbul. Apply:
RECA, 805 East 45th Street, New York 10017

CHEMISTRY DEPARTMENT CHAIRman. General administration of fiscal, research and instructional operations. Take leading roll in development of interdepartmental biochemistry program. Act as liason with life science programs (Biology, Pharmacy, Dentistry and Medical School). Must have successful experience as research investigator and with granting agencies. Teaching and administrative experience preferred. Submit complete resumé plus statement of educational philosophy by May 15, 1971 to:
Dr. Antonio A. Sandoval, Department of Chemistry, University of Missouri-Kansas City, Kansas City, Missouri 64110

ONE YEAR FELLOWSHIPS FOR COLLEGE chemistry teacher preparation leading to Masters degree. $2400 plus tuition and dependency.
Write:
Dr. Leo H. Spunar, Chemistry Department, South Dakota State University, Brookings, So. Dak. 57006.

MONS 083284

TWELVE-MONTH M.S. CHEMISTRY program at growing urban university with new facilities and young faculty. Assistantships available beginning Fall and Winter Quarters with annual stipend of $4,000 plus fee and tuition waiver. Ph.D. program planned to start in Fall, 1972. Study options in analytical, clinical, environmental, inorganic, organic, and physical chemistry. Write:
Dr. Karl M. Mortensen, Chemistry Department, Cleveland State University, Cleveland, Ohio 44115

ANALYTICAL CHEMIST, NEW PH.D. OR postdoctoral. Emphasis on instrumentation preferred but any emphasis other than electroanalytical acceptable. Assistant professor to start September but February possible. Send transcripts, three letters of reference and résumé to S. L. Brown, Chairman, Chemistry Department, University of North Carolina at Charlotte, Charlotte, North Carolina 28213

ONE TEACHING ASSISTANTSHIP ($3,600/9 months) and one *research assistantship ($3,000/9 months)* in water chemistry. M.S. program-waiver of non-resident tuition. Chairman, Department of Chemistry, New Mexico Institute of Mining and Technology, Socorro, New Mexico 87801

FELLOWSHIPS AND ASSISTANTSHIPS. Ph.D. program in *Biochemistry for students with* good undergraduate records in chemistry or biology. Diverse research interests. Prefer U.S. Citizens. Address inquiries to:
Dr. Alan H. Mehler, Department of Biochemistry, Medical College of Wisconsin, Milwaukee, Wisconsin 53233

SITUATIONS WANTED
(ACS Members)

CHEMIST 24, 1969, PHYSICAL-ORGANIC. 1½ years experience in solid-state process development, design & construction of CVD apparati. Instrumental background. Seeks industrial R&D or pilot production. Will relocate. Box 814-F-1, C&EN, Easton, Pa. 18042

PHYSICAL CHEMIST, Ph.D., 1968. SEEKS academic/industrial position. Background in theoretical chemistry, molecular spectroscopy (instrumentation, application of IR, Raman), and computer programming. Postdoctoral and teaching experience. Publications. Available immediately. No Agencies.
Box 327-F-1, C&EN, Easton, Pa. 18042

BIOCHEMIST/ANALYTICAL. Ph.D. 1964. *2 yrs postdoctoral 5 yrs industrial* proteins, drug-metabolism, pharmacokinetics isolation, identification. Analytical methods, radioisotopes publications, seeking research position in industry, hospital or Academic. Available immediately.
Box 326 F-1, C&EN, Easton, Pa. 18042

ORGANIC, Ph.D., 1965; AGE 34; KINETICS, mechanism, *synthesis, labelled compounds*; 5 years industrial experience—chromatographic, spectrometric methods development; Publications; Seeks product/process improvement, development, quality control oriented position needing physical-organic/analytical skills or academic position. Location, salary open. Agencies state needs entirely in first letter.
Box 304 L-2, C&EN, Easton, Pa. 18043

ORGANIC AND POLYMER CHEMIST, Ph.D., 1951 research and product development, pharmaceuticals, specialties, polymers, coatings, elastomers, biocompatible plastics, metal-reinforced plastics, injection molding and extruding of *reinforced thermoplastics, polyurethane foams*, unsaturated polyesters, isocyanate-, urethane-, epoxy-chemistry.
Box 325 L-2, C&EN, Easton, Pa. 18042

POLYMER-ORGANIC CHEMIST, Ph.D. 1966, Tokyo University. Postdoctoral, Brooklyn Poly Tech., 1968. Two years industrial experience, Polyelectrolytes, enzyme and polypeptide copolymers. Block and graft water-soluble polymers aimed at the paper, mining etc. areas. Emulsion technology. Polymer characterization. Publications. Permanent visa status. Industry or academia.
Box 324 L-2, C&EN, Easton, Pa. 18042

INORGANIC CHEMICAL ENGINEER: Ph.D. 10 years industrial R&D process development experience in initiation, conduction, supervision, appraisal of projects, bench scale and scale up with cost estimates; will relocate within USA.
R. J. Savage, RR3, Box 300, Belleville, Illinois 62221

BIO-ORGANIC CHEMIST, 37, Ph.D. 1960, 3 yrs. postdoctoral, 2 yrs teaching, 6 yrs industrial research. Drug metabolism, enzymology, isotope methodology, GC, analytical chemistry, organic synthesis. Publications. Supervisory experience. Relocate. Available now.
Box 331 H-2, C&EN, Easton, Pa. 18042

PHY. CHEM., Ph.D., R&D.
Box 315 J-4, C&EN, Easton, Pa. 18042

CHEMIST 30, Ph.D. 1967. DIVERSIFIED experience in homogeneous catalysis, organometallic chemistry, petrochemicals, coal, analytical techniques. (IR, UV, NMR, TLC, GC). Seeks industrial or academic position, available immediately. Publications. Prefer mid-Atlantic states but will consider other areas.
F. D. Vastine, 406 Gayley Street, Apt. B-404, Media, Pennsylvania 19063

SALES-SALES DEVELOPMENT—WEST coast BS chemistry. Have had good success in building virgin territories. Have good rapport established in western region with following industries: Cosmetics, Petroleum, Rubber, Coatings, Detergents, etc. Age 46. Able to handle responsible position and produce results.
Box 301-J-2, C&EN, Easton, Pa. 18042

WATER POLLUTION CHEMISTRY, OR inorganic. B.S., math, biology minors. 8 months experience in water and soil analyses. Familiar with analytical and inorganic instrumental techniques. Enjoy responsibility and leadership. *Like challenge of R&D.* Prefer middle America, will consider relocation.
Williams G. Wilson, 3145 S. Fern, Wichita, Kansas 67217

ANALYTICAL-PHYSICAL CHEMIST, Ph.D., 1971. Thesis topic: "New Selective Membranes." Experienced in IR, UV-VIS, Electrochemical Methods, Radiochemistry. Taught undergraduate analytical laboratory, graduate radiochemistry laboratory; Adjunct Lecturer in instrumental methods of analysis. Personable, 25, married. Seek industrial, academic, or government position. Location flexible. Barry Laffin, 4190 Bedford Avenue, Brooklyn, New York 11229

CHEMICAL ENGINEER, Ph.D. 17 YEARS experience in R&D, process development work on polymers and chemicals, pilot plants and high pressure reactions. Desires challenging process/product development work.
Box 305-N-2, C&EN, Easton, Pa. 18042

PROCESS ORGANIC CHEMIST, Ph.D., 34. Twelve years of operation and supervisory experience in cutting production costs via process innovations and improvements for products ranging in volume from biologicals to solid monomers and petrochemicals. Strong background in catalysis and instrumental analysis. Desires *responsible problem solving position.*
Box 306-N-2, C&EN, Easton, Pa. 18042

ORGANIC CHEMIST, Ph.D. 1966. AGE 28, major university, two years experience in protein chemistry, two years experience in synthetic organic chemistry, desires responsible position in industry, government or research institute. Experience involves enzymes, peptides, natural products and synthetic biocides, as well as the corresponding techniques of these disciplines.
Box 307-N-2, C&EN, Easton, Pa. 18042

ECONOMY MINDED COMPANIES: WILL compromise salary for job in warm south, southwest, Florida, California. Ph.D. 1963. Six years industrial supervision. Experience in Surface Chemistry, adhesion, Organic coatings, Fiber-reinforced-plastics synthesis of high temperature polymer, polyester, imidi-ester, epoxies, emulsion polymerization, electrodeposition of polymers. Patents. To direct research and development. Call (601) 582-6884
Box 311-N-2, C&EN, Easton, Pa. 18042

ORGANIC-ANALYTICAL, Ph.D., 1968, seeks industrial or academic position. Experience: 2 Friedel-Crafts reactions small ring synthesis, ketone photochemistry, porphyrin structure determination; (industrial, 2 yr.) analysis of wood extractives. Knowledgeable in modern synthetic and spectroscopic methods and aspects of pulp and paper processing. Publications. Age 30. Married. North America, Australia or New Zealand.
Ralph A. Chapman, Apt. 6, 1700 Sandgate Crescent, Mississauga, Ontario, Canada.

ANALYTICAL CHEMIST-ENGINEERING supervisor, B.S. 1952. Varied experience includes analytical instrument development, application engineering, and manufacturing area responsibility, process control and computer interface equipment. Experienced in instrumental analysis, chemical microscopy, metallography, microwet chemical methods, rubber and plastics processing. Any opening seriously considered.
Box 313-N-2, C&EN, Easton, Pa. 18042

R&D CHEMIST-ENGINEER, PLASTICS. 14 yrs. accomplishment, new process development, guiding novel processes from lab development to full production including equipment design. Polyolefins, fluoropolymers, neoprene, silicone; radiation, flame-retardancy; elect. insulation and packaging fields. M.S. Chem. Eng. MIT. Seeks position requiring responsibility, initiative in R&D. Write:
Box 317-N-2, C&EN, Easton, Pa. 18042

Ph.D. PHARMACY, M.S. PHARMACY admin. (marketing) June '71. 4½ years academic, 1 year ethical drug sales experience. Age 30, family, will relocate.
Box 311-F-4, C&EN, Easton, Pa. 18043

R&D MANAGER, TECHNICAL DIRECTOR, group leader B.S. + 6 mos. faculty. 20 years diversified experience, organics, polymers, additives for textiles, paper, coatings, fine and industrial chemical fields, specialist in fire retardance. Creative, new products, organizer. Administrator demires challenge and opportunity. Free to relocate.
Box 312-F-4, C&EN, Easton, Pa. 18042

ORGANIC Ph.D. (1970): PEGGED BY ONE year industrial experience in how pigments research but interested in polymer, health, environment opportunities as well as paints. Wide background, experience in analysis, formulation, process development, chromatography, spectroscopy. Willing to learn new areas. 33, married. Location, *salary open. Résumé available.*
Box 318-F-4, C&EN, Easton, Pa. 18042

CHEMIST-TECHNOLOGIST: EXPERT IN adhesives, binders, gaskets, cork products. Competent analyst and technical serviceman. N.Y. metropolitan area.
Box 317-F-4, C&EN, Easton, Pa. 18042

*MARKETING RESEARCH AND DEVEL*opment. Twenty-five years of experience covering all aspects of chemical research and development and commercial development. MS, Ch.E. Seeks opportunity to use background in chemical economics and marketing research on plastics, petrochemicals, agricultural chemicals.
Box 320 F-4, C&EN, Easton, Pa. 18042

PHYSICAL/ANALYTICAL CHEMIST: Ph.D. Positive, personable, productive. Desires industrial or academic position. 10 years experience in solving problems: Particle identification (techniques-mass spectrometer, electron microprobe, etc.); Air pollution monitoring; Vapor deposition; Thermodynamic and physical property measurement; Apparatus design. Proposals/reports—both oral and written. Will relocate.
E. H. Hall, 885 Highview Drive, Worthington, Ohio 43085

YOU NEED ME IF YOU HAVE A TEACHing position for a young, energetic Biochemistry Ph.D. (1971) with excellent college teaching and research. I have successfully taught General Chemistry and Biochemistry. Research interest is mechanism of enzyme action. Available Sept., 1971; eastern U.S. preferred.
Box 330 F-4, C&EN, Easton, Pa. 18042

INORGANIC CHEMIST (PHYSICAL MINOR) Ph.D. (1969 with 2 yrs. teaching (4 quarters)-Postdoctoral Experience, Age 29. Married, Familiar with use of modern instrumental methods (IR, VIS, UV, NMR, EPR, MAG. SUS.). Computer programming (Fortran). High Vac. techniques. Desire some or research position.
Peter J. Nassiff, Department of Chemistry, *Southern Illinois University, Carbondale, Illinois* 62901

INDUSTRIAL CHEMIST-BIOCHEMIST, Ph.D., 1943. Biological, chemical, and macromolecular sciences background. Pharmaceuticals, proprietaries, polymers, food, and fermentations products experience. 26 years in administrative, bench, full time or consultancy wanted.
Box 302-H-4, C&EN, Easton, Pa. 18042

PHYSICAL CHEMIST, Ph.D., (1966) B.S. and M.S. in Chemical Engrg. Postdr. and industrial exp. in fiber reinforced composite materials, solid state semiconductors, transport phenomena of fluids, biophysics and molecular engineering properties of polymeric materials. Desires industrial R&D positions or academic. Applying for U.S. citizenship. Available immediately.
Box 311-H-4, C&EN, Easton, Pa. 18042

PHARMACEUTICAL-ORGANIC CHEMIST. Ph.D. Now, 1970. *S2, Permanent Residence (applied for citizenship).* Three years' experience in analytical toxicology, three years' industrial experience in production, Dissertation in Synthetic Chemistry. Extensive experience in GC, TLC, IR, NMR, UV etc. Seeking a suitable position. No agencies please.
S. Jayarkar, 2216, 919 West County Road B, Roseville, Minn. 55113

ORGANIC-POLYMER CHEMIST. B.S. 1966. Five years experience in synthesis and characterization of monomers and polymers. Teaching experience in organic, analytical, and general chemistry. Academic or industrial opportunities considered. Location and salary open.
Box 309-J-4, C&EN, Easton, Pa. 18042

WATER RESOURCES SCIENTIST. Ph.D. 1971, Interdiscipl. training. 12 yrs R&D, publications. Extensive experience in water and industrial waste treatment, air pollution, kinetics, oxidation, adsorption and coagulation. Problem organized and people oriented. Seeking academic or meaningful industrial position in environmental field. No agencies.
Box 301-J-4, C&EN, Easton, Pa. 18042

ORGANIC CHEMIST M.S. (1964) SEEKS position in synthesis and/or process development. Experience in synthesis of biological active compounds and in process development and process improvement; some scale-up from bench to pilot plant. Salary and location open. No agencies.
Box 318-F-3, C&EN, Easton, Pa. 18042

MONS 083285

CERAMIST, Ph.D., 12 YEARS RESEARCH and development experience in thick film microelectronics, enamel coatings, vitrified abrasives, and enamaling steels. Seeking research or development position in ceramic fields: electronics, coatings, glass, refractories, or pure oxide bodies. BS Chemistry. Experience in water chemistry. Robert M. Kingr, 639 Sandlewood Rd., Lewiston, N.Y. 14092

NEW PRODUCT DEVELOPMENT OR marketing venture manager. MS, Chemical Engineering, work toward MBA, age 34. 14 years proven performance in creating and managing industrial R&D, and working with marketing in disposable, paper, and consumer products. Two years as entrepreneur with own consulting firm. Write:
Box 852-N-8, C&EN, Easton, Pa. 18042

MANAGEMENT; CHEMICAL SPECIALties, M.S. 16 yrs industrial experience in R&D; detergents, insecticides, polymers, coatings, aerosols and adhesives. Management functions included product planning and manufacturing, Quality Control, cost analysis, registration and coordination with Marketing and Sales Groups. Proven record of successful national products.
Box 851-J-3, C&EN, Easton, Pa. 18042

ORGANIC CHEMIST—9 YRS R&D EXPERIence preparing biologically active carbohydrates, amino acid derivatives, nucleotides, enzyme substrates, monomers on 1-5000 g scale. Good scale-up and managerial expertise, publications, languages, expert in literature surveys, cost studies. Desires responsible position in profit-minded company on West Coast. Write:
Box 854-N-8, C&EN, Easton, Pa. 18042

ACADEMIC-Ph.D. (CHEMISTRY: CHEMical physics), 1968, Brown University. Interdisciplinary chemist with degrees in physics and mathematics seeks position in small or medium-sized college/university. Experience teaching physical chemistry, general chemistry, general studies chemistry, mathematics. Phi Beta Kappa, Sigma Xi, B.A. summa, Fellowships, publications.
Box 858-N-8, C&EN, Easton, Pa. 18042

SURFACE/POLYMER/FIBER CHEMIST Ph.D. Academic research, wax emulsions, emulsion polymerization, polyvinylpyrrolidone absorption. Applied research, filled elastomers, carpet fiber wear and antisoiling/antistatic treatments. Production problems, melt spun and acrylic fibers. Edited polymer publications abstracts. Seeking R&D or academic work. Want specifically-maintained consulting replies.
Box 807-P-4, C&EN, Easton, Pa. 18042

ORGANIC Ph.D. 1971, SEEKS POSTDOCtoral position. Teaching and Research Assistant at major university. Thesis research includes the kinetics and mechanism of organometallic reactions, synthesis of organometallic compounds and physical measurements of air sensitive compounds. Experienced in modern instrumentation. Available July.
Box 859 P-4, Easton, Pa. 18043

INORGANIC CHEMIST SEEKS POSTDOCtoral position. Ph.D. 1971. Has working any location, publications productive promising, interested in synthetic, kinetical and spectrochemical, thermochemical, solid-solid in transition metal complexes, having challenging topic in Co(III)-Amine area, willing to work hard, many publications and research proposals, considering any offer, available summer 1971.
Box 860 J-4, C&EN, Easton, Pa. 18042

CHEMIST, M.S. ORGANIC CHEMISTRY, broad analytical background, 3½ years as graduate instructor in general chemistry. Age 25, married. Strong interest in pollution control or waste recycling. Desires position in any area of research or development.
Box 807-J-4, C&EN, Easton, Pa. 18042

BIOCHEMIST: AGE 30, SEEKS CHALlenging position in pharmaceutical, R&D, or related industry; 8 years experience in isolation and characterization of biologically-active compounds (primarily proteins) using chromatography (column, TLC, paper and gel), electrophoresis, centrifugation, enzymology, U.V., I.R. Publications. Available immediately. Relocate.
Box 813-J-4, C&EN, Easton, Pa. 18042

ANALYTICAL CHEMIST: B.S. 1967. TWO years experience in coating and resin analysis. Familiar with wet and instrumental methods. Desire R&D position in Chicago area. No agencies.
Box 866-P-4, C&EN, Easton, Pa. 18043

ANALYTICAL CHEMIST, Ph.D. 1966. Versatile researcher or supervisor. Experienced in spectrophotometry, color and gloss measurement, fluorescence, phosphorescence, colorimetry, instrumental and wet method development, supervision of research and routine, some TLC, GC, and thermochemical analysis. Seeks academic, industrial, or governmental position. Publications, honors. No agencies.
Box 864 P-4, C&EN, Easton, Pa. 18043

PITTSBURGH: ANALYTICAL CHEMIST desires position in Pittsburgh area. Experience includes: GC, AA, NMR, UV, IR and wet methods. Résumé available.
Box 817-P-3, C&EN, Easton, Pa. 18042

INORGANIC/ANALYTICAL Ph.D., JUNE, 1971. Background: organometallics, NMR, IR. Publications. Seeks industrial R&D or academic position; interested in environmental control and/or bio-inorganic fields and Mid-Atlantic area, but other offers will be considered. No agencies.
Box 810-J-4, C&EN, Easton, Pa. 18042

OPERATIONS RESEARCH, PLANNING. B.S. Chem., B.S. Math., Certificate Business Administration. Eight years experience in Refinery Economics Mostly Linear Programming. Univac 1107 & 1108. Salary open. Was earning 17.5 M/yr.
244 South Saint Andrews Place, Los Angeles, Calif. Phone 213-981-9945.

ORGANIZER/MANAGER/BUSINESS ANAlyst/Project Coordinator/Mature Engineer/Ph.D./Process Development/Bench, Pilot, Plant Scale/Plant Design and Construction/Synthetic Resins/Latices/Vinyl Monomers/Thermoplastic Compounds/Specialty Organics.
Box 821-J-4, C&EN, Easton, Pa. 18042

SYNTHETIC ORGANIC CHEMIST, 43, M.S. experience in the synthesis of biologicals, surfactants. Publications. Prefer industrial R&D or literature searching position. Willing to relocate. Will answer all agencies immediately.
Box 824-J-4, C&EN, Easton, Pa. 18042

POLYMER/ORGANIC CHEMIST, Ph.D., heavy industry experience many phases polymer technology, including polyolefins, acrylics, vinyls, thermosets, and potting compounds. Seeks R&D or product development position requiring broad background and flexibility.
Box 822-J-4, C&EN, Easton, Pa. 18042

PROBLEM SOLVING CHEMIST. MONEY and time saving innovations for plant and laboratory. Line or staff position. Experience: heavy and fine chemicals, supervision, process and quality control, R&D, start-ups, plant problems, technical service. South only.
Box 829-J-4, C&EN, Easton, Pa. 18042

PHYSICAL CHEMIST, Ph.D., 1965. THERmodynamicist; research experience in vaporization studies, metal and actinide halide chemistry, high temperature spectrophotometry, molten salts, calorimetry, vacuum. 4½ years industrial research, 1 year management, 4½ years part-time teaching undergraduate, graduate courses. Publications. Seeking industrial research or academic position. (509) 783-2961.
L. D. Christian, Battelle-Northwest, Richland, Washington 99352

ORGANIC CHEMIST: Ph.D., 1968. FOUR years R&D experience includes paint formulation and evaluation; development of new wire enamels; synthesis of addition and condensation polymers. Desires industrial R&D. Prefers North-Eastern States, but will consider other area. No agencies.
Box 394-J-4, C&EN, Easton, Pa. 18042

PHYSICAL BIO-ORGANIC CHEMIST. Ph.D., desires research associate position in magnetic resonance laboratory in research institute, medical school or industry. Publications, extensive and research interests in applications of nuclear magnetic resonance to biochemical, biological, and chemical problems. Available immediately.
Box 803-L-4, C&EN, Easton, Pa. 18043

POLYMER RESEARCH CHEMIST, Ph.D., 1965. 5 years industrial experience in elastomer research, expertise in areas of block polymers and anionic polymerization systems interested in structure-physical property relationships, experienced in computer programming.
G. A. HARPER, 3106 Keswick Road, Shaker Heights, Ohio 44120

CHEMICAL SYSTEMS ENGINEER: DEng (Aug. 71), strong background in transport phenomena, process dynamics and control, mathematical modeling, and systems analysis. Desire position in research and development, process design, or teaching. Will relocate. Salary open.
Box 816-F-3, C&EN, Easton, Pa. 18042

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Richard Weakew, Chemistry Department, University of Missouri-Rolla, Rolla, Missouri 65401. 314-341-4457.

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John C. Cloyd, Dept. of Chem., UMIST, P.O. Box No. 88, Manchester M60 1QD England

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PHYSICAL CHEMIST, Ph.D. 1967; 4 YEARS industrial experience; excellent record. High temperature chemistry, thermodynamics, transport chemistry, kinetics, photochemistry, gas phase energy transfer, gas lasers, discharge physics. Also experience with technology transfer, technological forecasting, R&D planning systems. Desire responsible position solving significant industrial problems.
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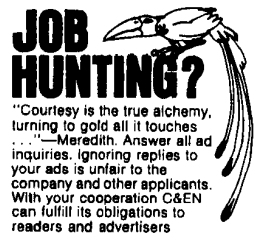

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INDEX TO ADVERTISERS IN THIS ISSUE

Air Products & Chemicals 20
Rumrill-Hoyt, Inc.

American Gilsonite Co. 29
Ross Clay Advertising

Amoco Chemicals Corporation IFC-1
D'Arcy, MacManus-Intermarco, Inc.

Cambridge Industries Co. 25
Bernard F. Ostreicher

Climax Molybdenum Co. 14
The Harry P. Bridge Co.

Emery Industries, Inc. ..... IBC
Northlich, Stolley, Inc.

Evans Chemetics, Inc. 25
Daniel H. Price, Inc.

Hodag Chemical Corp. 22
Burlingame Grassman, Inc.

Pennwalt Corp. 2
Aitkin-Kynett Co., Inc.

Petrolite Corporation 16
Betz Hodgson Neuwoehner, Inc.

Charles Pfizer & Co. 19
D'Arcy, MacManus-Intermarco, Inc.

Scientific Design ..... OBC
Michel-Cather, Inc.

Sherwin Williams Chemicals 48
Odiorne Industrial Advertising, Inc.

Wang Laboratories, Inc. 29
Chirurg & Cairns, Inc.

DIRECTORIES

Chemicals Exchange 42
Classified Advertising 43-46
Equipment Mart 42
Technical Services 42

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Don't eat Huskies' livers!

Polar explorers fallen on hard times have been forced on occasion to eat their Huskies, and some at least have suffered severe illness from eating the dogs' livers. Eskimo folklore counsels against eating Huskies' livers, and zoologist R. V. Southcott of the South Australian Museum, Mitcham, S.A., evidently has found the reason. His analyses of the livers of Huskies have shown them to contain extremely high concentrations of vitamin A, enough to produce hypervitaminosis.

Dr. Southcott's calculations suggest in fact that a meal of 100 grams of Husky liver would be toxic to man. The liver of the Arctic bearded seal is even more dangerous, and polar bear liver is also to be avoided. The livers of the southern elephant seal and Weddell seal also accumulate vitamin A. They are considered safe to eat, however, because the concentrations are such that only an exceptionally large meal would endanger the diner. Modern Australian Antarctic explorers have been encouraged to eat seal meat, including the liver, with no harmful effects.

This department is indebted for the above report to C&EN's man in Tokyo, who found it in the science newsletter distributed there by the Australian Embassy. He also reports a recent trip on a Japanese ferryboat. The signs aboard ship appeared in both Japanese and English. A little metal plaque on one closed door, he says, bore the legend "spare room."

Retirement of the Research Supervisor
(A Fable)

A mystery chemist of unknown age and sex, one J. H. Lowell of Havertown, Pa., has penned a fable in what seems to be unrhymed free verse. This fable—it appears at right—is a rewarding literary experience.

An old chemist
and some young chemists
were trying to break a hole in a rock wall.
(This is what chemists do—
they break holes in walls
in search of "better things for better living.")
The young chemists did most of the work.
They hacked and hammered and drilled
while the old chemist tried to help them
find weak spots in the wall.
He also kept them supplied with sharp tools
and on dark days did much to improve the lighting.
After some months of hard work
they broke through the wall;
but, alas, a few yards farther on
they encountered another wall as formidable as the first.
The old chemist exhorted the young chemists
to continue their efforts.
He was sure, he said,
that beyond the second wall lay rich rewards.
In this way he kept them working
until they had broken through 34 consecutive walls.
In the 35th wall there was a tiny chink.
Peeping through, the old chemist could see
a beautiful garden where tropical flowers
bloomed in the sun and palm fronds
swayed in the breeze like Polynesian dancers.
There were some beach chairs beside a swimming pool
where bikini'd maidens laughed and splashed.
The old chemist rallied the tired young chemists
for an assault on the final wall.
Success was now assured, he said—
it lay just around the corner.
So saying, he left them to their picks and drills,
ducked around the corner of the wall
and stretched out on one of the easy chairs
under the palms, where his wife
awaited him with a frosty gin-and-tonic
and watched him watch the playful maidens
cavorting in the pool.

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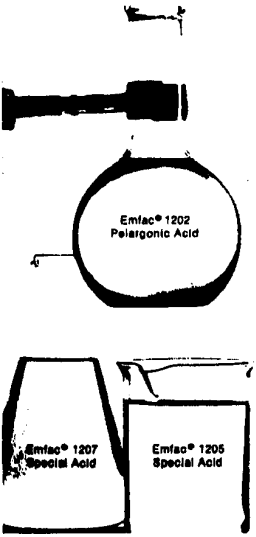



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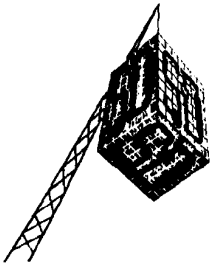

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