CALTECH NEWS

PUBLISHED FOR ALUMNI OF THE CALIFORNIA INSTITUTE OF TECHNOLOGY

VOLUME 2 / NUMBER 2 / APRIL 1968 • PASADENA, CALIFORNIA

Four of six student research associates—undergraduates from other colleges—working on the ASCIT Research Project: Jeff Ruben, Carnegie-Mellon; Helene Silverblatt, Swarthmore; Connie Staisey, Swarthmore; and Nancy Grana, Carnegie-Mellon.

Students Collide with the 'Real World' in Their Ambitious, Self-Devised Educational Experiment

"We would like to propose to the students that they get together to work on a significant research problem that has a lot of social impact. They would have the problem first of raising money, first convincing other students that they should do it . . . We want to get a problem that is immediate, that you can really throb for, but which has a lot of technical aspects. You have to find something that will interest all kinds of scientists and engineers. We would make it clear to everyone that this is basically an educational problem; we're not out to solve the world's problems. We don't want to set up an organization that's too large for the students. If there are problems along the way, they should be able to go right to the source and work it out. We want a cadaver-type of project that can be cut up and analyzed—you won't be able to do this when you get out of college. The main advantage in doing the project here and now, instead of waiting until we each go to work separately, is that we have the capability to change the program. I'm really interested in how people will deal with it when it starts developing problems."

—Joe Rhodes, ASCIT President
August 3, 1967

Idle chatter? In spite of Joe Rhodes' bravura performance in organizing students to request academic reforms in the spring of 1967, his words to this newspaper in mid-summer seemed to be overreaching the possibilities of even his extraordinary leadership. Better, said *Caltech News* in preparing an article for last September, to save him the embarrassment of having such inflated talk printed.

On September 1—less than a month after his too-preposterous-to-print speculation—Rhodes, for ASCIT, wrote an open letter to the student body. In it was announced an intention to have a campus-wide research project of social and scientific importance to be carried out second term and continued into the following summer. It was to feature participants from other schools and training of ghetto residents as lab technicians. The project, claimed the letter, had the initial approval of the Institute administration—a point that was to muddy the waters later.

The ASCIT research project had its roots in the proposals made by the students in the spring of 1967. Included in

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The Draft in the Halls of Ivy; Ill Wind That May Blow Away 25 Percent of Caltech Grad Students

The recent directive from the National Selective Service Administration that eliminates draft deferments for first-year graduate students and, to all intents, for most occupations is going to have a profound impact on Caltech.

The new policy immediately affects most seniors and first-year graduate students. They will be reclassified 1-A, losing their 2-S student deferments, and become prime prospects for induction. Some students have already received their new classifications, although they will not be called to active military service until after completion of this academic year in June.

Those who enrolled in graduate school before September 1966 will not be affected. They are given five years to obtain their doctoral degrees.

H. F. Bohnenblust, dean of graduate studies, predicts a drop of up to 25 percent in total graduate enrollment and 50 percent in first- and second-year classes for the fall of 1968. Under the old draft policies, Dean Bohnenblust said, 850 students would have been expected. The projected graduate enrollment is now 750 for the fall term, with further attrition during the year as students are called up. Of the 230 students who began their graduate work at Caltech in the fall of 1967, Dean Bohnenblust fears 150 might actually go on active duty with the armed forces. The remainder would not qualify because of age, citizenship, or physical condition.

"This sudden change is going to be very, very disruptive of graduate work. This will mean not only a delay, but a real loss to the nation in the long run, since many will change their minds and not come back after their tours in the service.

"Even if they do return, once the student life is interrupted, it takes a much greater positive action to pick it up again."

Caltech will grant any of its drafted students a military leave of absence for the period they serve. Such a leave will also be granted to those current seniors who are drafted before they can enroll in Caltech graduate school.

Caltech President Lee A. DuBridge and Dean Bohnenblust endorsed the Council of Graduate Schools' statement that the obligation of serving should be borne equally by all citizens and that neither graduate nor undergraduate students should be deferred or exempted from such service. The Council took the position that all fields of higher education are of equally critical importance to the continued welfare and the balanced development of the nation. The Council also recommended a change in the selective service system whereby selection would take place at the

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INSIDE

Nation's Science Reporters Catch up on Caltech Research

Although many good scientific and engineering publications are available today, most people still read their science news in the popular press. Fortunately, on many newspapers and magazines—as well as television and radio—"science" is no longer a beat for a semi-retired ex-police reporter who once took a high school course in chemistry. Nowadays the reporters and editors who cover science are science-oriented, either by training or interest, and able to bring perspective to the complicated events and discoveries in modern technology. For Caltech—which has as one of its "products" new knowledge in science—these people are vital paths to public awareness and understanding of what Caltech does.

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Observatory staff member Edwin Dennison demonstrates for visiting science writers the electronic instrumentation that is increasing the efficiency of the 200-inch Hale telescope.

Middle East Peace May Not Come Until Arab States Develop Technologies Comparable to Israel's

"There is no peace in the Middle East, and I do not foresee any time in the immediate future when there will be . . . "

This was the valentine that visiting lecturer Charles Gallagher of the American Universities Field Staff handed out to those attending the YMCA Luncheon Forum on February 14.

"I can also remember saying the same thing in '57 when I was here and meeting with a rather uneasy audience reception," added the specialist on Arab and Islamic affairs.

"Americans," he went on, "like to hear about problems that have solutions or at least a potential for solution. I think they often suspect there is a solution, but the speaker doesn't know it; or there is one, but he's saving it for another audience."

Speaking from experience based on study of and residence in the Far East, Middle East, and North Africa, Mr. Gallagher sketched some basic differences, as he sees them, between the present Vietnam crisis and the Israeli-Arab quarrel.

He cited the Cuban missile crisis, the Congo in 1960, the French war in Algeria, and even the Korean war as crises for which solutions were ultimately worked out because they had one thing in common: They were all concerned with clashes of great powers and were settled because the powers willed it. He believes this will happen with Vietnam. "It is very possible that, after the Vietnam crisis is settled, we will ultimately regard it as a secondary matter even though you may not feel that to be the case now."

But the Israeli-Arab clash was—and is—something else again, he declared.

"First," he said, "it is a clash of ideologies at a functioning level of true believers. Both sides feel they have the true right to the territory they claim and the true right to build the kind of civilization they wish to build."

He described the issue as essentially a part of an enduring, long-lasting struggle between the Muslim Arab civilization and the West.

The Industrial Revolution threw the fairly equal Islamic and Western civilizations into a severe imbalance, so that today the former has become completely unstable, Gallagher said.

"This was compounded by the colonialism and the obvious material, military, and technical superiority of the West, all of which led the Arabs to begin to question some of the ultimate values of their own civilization."

He also pointed out what he called the chicanery of the British and French in the Middle East during World War I.

"This was compounded by the emergence of Zionism and the return of the Jews to Israel. But these were Jews who weren't the kind the Arabs had been used to dealing with in the Middle East, where they were looked on as second-class citizens. These returning Jews were coming back as technologically adept Europeans, and they installed themselves in Arab eyes as a variant of European civilization."

The military disasters the Arabs have undergone at the hands of the Israelis have left a deep bitterness, Gallagher said, adding that the Arabs lack a sense of reality about what has happened to them. "They have not yet begun to understand the whole thing, and we'll have to wait a few years until a genuine reaction sets in."

In discussing the factors of Israel's quick and easy victory over Egypt, Gallagher cited the facts that Israel has overwhelming numerical superiority of PhD physicists and mathematicians over the combined Arab states.

"This is why the Weizmann Institute can build computers and use them for military intelligence, and why Israel's intelligence was so good. They knew everything the Arabs were doing, and the Arabs had almost no idea what Israel was doing."

Gallagher pointed out that the Arab-Israeli clash was the first time since World War II that a developed country has faced an underdeveloped one in what was not a colonial situation, and in which no holds were barred.

Mr. Gallagher made a few predictions as to the future of the Far East.

There is no power today that could force Israel to withdraw from places where she doesn't want to withdraw. She would only do so with certain Arab guarantees, which will not be forthcoming.

The shakiness of Egypt is a worrisome problem. The only future basis of Arab unity is Israel's continuing as a menace.

As to the reaction of the United States and the Soviet Union to the situation: It is possible the Soviets will not allow the Arabs to sustain any further major defeat, but then it is almost impossible for this to happen anyway. The Arabs cannot lose the war, and they cannot win it. Israel is close to nuclear power, and there is no possibility of any military defeat of Israel in the next couple of decades. And, Gallagher added, he does not believe the United States would allow her to be defeated.

He said that Russia has largely eliminated American influence in the Arab countries over the past 20 years. But "although our prestige is at an all-time low, this doesn't mean Russian prestige is at an all-time high. The Arab world has serious reservations against Russia, and will not commit itself ideologically."

In conclusion, he said that the only ray of hope for peace in the Middle East is that, eventually, the Arab states will catch up to the rest of the world technologically, and when this is done—as always happens—the points of view of many of her citizens will change. □

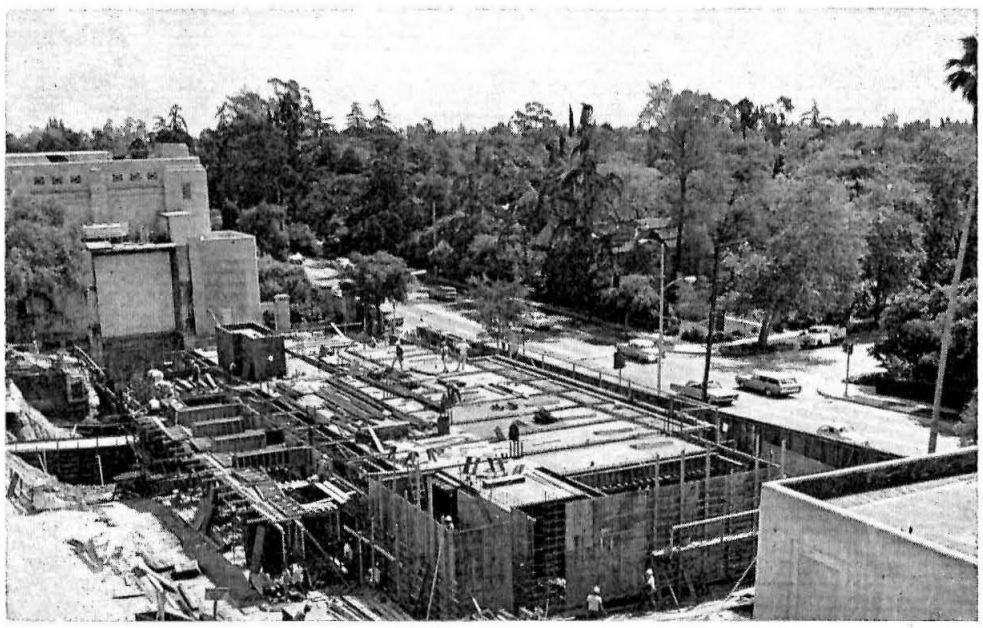
Long-Awaited Physics Building Reaches for Its Share of Caltech Skyline

In early 1969 Caltech physicists will begin moving into a $3.5 million physics building that is now rising on the site of what once was the Central Engineering Machine Shop and the Caltech arch. The new facilities will ease long-standing congestion in existing buildings and provide more adequate space for Caltech's physics faculty.

Located between Karman Laboratory and California Blvd., the new structure will be composed of two sections—the Particle Physics Laboratory and the George W. Downs Laboratory of Physics. The integrally colored concrete building will have four stories above ground and two below. The second, third, and fourth stories will be cantilevered beyond the first floor.

Funds for the Particle Physics Laboratory are being provided by the Atomic Energy Commission, and for the Downs Laboratory by the National Science Foundation and the estate of the late George W. Downs, a Caltech alumnus.

The Particle Physics Laboratory will have offices, classrooms, and laboratories for those involved in theoretical and experimental studies of the fundamental particles of matter—a field Caltech has had a strong tradition in for more than 30 years. The new facilities will provide adequate office, conference, and library space for the theoretical group. Extended office space will also be provided for the experimental "user's program." This program involves designing, building, and testing equipment on campus for experiments that are run elsewhere. Caltech physicists use facilities at the Stanford Linear Accelerator, Lawrence Radiation Laboratories in Berkeley, and Brookhaven National Laboratories in New York. After the experiments are completed, the Caltech scientists return to the campus to analyze their data.



The George W. Downs Laboratory of Physics (foreground) and the Particle Physics Laboratory (rear) under construction along California Blvd. at Arden Road. The beginnings of the cantilevered second floor already extend from the left and right sides of the building.

The George W. Downs Laboratory section, roughly 40 percent of the building, will include laboratories, classrooms, and offices for those working in the fields of space physics, solar physics, cosmic rays, infrared astronomy, and theoretical physics.

A library and a research library—as well as conference rooms, darkrooms, and numerous laboratories located throughout the building—will be shared by those working in both laboratories.

Located in the two basements will be machine shops, electrical vaults, welding shops, stock rooms, assembling rooms, and storage areas.

According to J. A. Partridge Jr., project architect from Caltech's Office of the Campus Architect, construction is on schedule. The contractors are Fellows and Associates, Inc., of Los Angeles, and the architects are Neptune and Thomas Associates, Pasadena. □

ALUMNI FORUM

Editor:

As the first woman graduate of Caltech (PhD in chemistry, 1955), I am pleased to see that women graduate students have flourished at Caltech and that women undergraduates may soon be admitted. I have followed your article and Alumni Forum letters expressing the views of women at Caltech with great interest [*Caltech News*, June 1967 and February 1968]. I wish to comment on their discussion of opportunities for women in science.

My present perspective is based on experience which includes: research and teaching in chemistry at UCLA and Pomona College; a PhD and clinical practice in psychology; and current research in neurobiochemistry at the Brain Research Institute at UCLA.

Whatever the statistics on opportunities in science for women as compared to men, a woman's overinvolvement in her *expectation* of discrimination against her may be a more important detriment to her success than is any *actual* discrimination. If she responds to her expectation with depression that impairs her working efficiency or with endless time-consuming bull sessions on the evils of discrimination against women, then by this very behavior she may unknowingly sacrifice scientific accomplishment which could enable her to achieve success *despite* any discrimination. The result is that her expectation of "discrimination" becomes a self-fulfilling prophecy, one purpose of which is to provide a sour-grapes buffer against the inevitable frustrating moments of science.

Dorothy Semenow Garwood, PhD '55
Department of Biological Chemistry
Health Sciences Center, UCLA

Editor:

In answer to General Ivan Farman's letter as to whether I was the same Gordon Weir whom he corralled in the shower to con into the weather cadet program, I must plead guilty.

General (then Major) Farman's understanding of the problems of a card-carrying civilian when thrust into the military was one of the warmest memories of my military career. I remember his assistance with the greatest of affection.

Considering my dismay when I discovered I had to sign up for three years, I find it a little ironic that today I am still in the Air Weather Service Ready Reserve, after twenty-eight years. And as a colonel yet, when my fondest ambition in those days was to reach the exalted rank of first lieutenant.

To this day, however, I lock the door when I shower!

Gordon Weir, '40
KNBC Meteorologist □

Chemistry Boils Down to Three Elements, Says Hammond: Structure, Dynamics, and Synthesis

George Hammond came to Caltech in 1956, and in 1964 became the Arthur Amos Noyes Professor of Chemistry. In January of this year he took over John Roberts' division chairmanship for 14 months so that Dr. Roberts could have some respite for his own research.

Dr. Hammond, whose field is photochemistry, is an ardent, and lucid, talker about chemistry—its teaching, research, and impact. Here he passes on to alumni some evaluations and predictions about that field at Caltech.

Q: What are Caltech's research areas in chemistry and chemical engineering?

A: I can answer this in two ways, and, if you'll indulge me, first I'll do it my way.

Chemistry breaks down naturally into three kinds of fields. One is *structural chemistry,* the study of the structure of matter and the translation of this structural information into understandable models. These models are described in terms of molecular structure, the unique focus of chemistry. One can study the structure of small molecules (the relationships between atomic positions in the molecules), or the structural relationships in very large molecules such as proteins or enzymes, or the structure in what is essentially an infinite-size molecule (like a crystalline solid, where there aren't any bounds that mark off one molecule from the next).

Caltech is probably regarded by most chemists as one of the world's greatest centers of emphasis on structural chemistry.

Caltech is probably regarded by most chemists as one of the world's greatest centers of emphasis on structural chemistry. The tradition was established largely by the genius of Linus Pauling. During the past 30 years—which I regard as sort of a golden age of experimental and theoretical structural chemistry—Caltech has been pushing right at the forefront.

The second principal field of chemistry, in my definition, is *chemical dynamics*—the systematic study of chemical reactions and reactivity. I think it's fair to say that at one time Caltech had barely a minimum effort in this field. Now it's surprising to find out how much there is, and I'm optimistic that the Institute is going to be doing more of it.

Chemical synthesis, the third principal field of chemistry, has always excited people and is perhaps the most creative part of the field. It's my frank opinion that historically Caltech has been almost completely deficient in chemical synthesis. At the present time we have more chemical synthesis here than I can find any record of in the history of the Institute. This is an important change in the character of the division, but I still can't say that we are exactly in a position of eminence in the field. We do have on the faculty at the present time Professor Robert Ireland, who is widely recognized as one of the most accomplished workers in the field of synthesis.

Now let me talk about chemistry in more traditional words, beginning with chemical physics. One of my colleagues says that chemical physics isn't really a field—it's a state of mind. Some of the other chemical physicists consider this an indecent admission, but it may be partly true.

The objective of chemical physics is to do experiments that are closely correlated with formal theory and to build up an interlocking matrix of theory and closely related experiment. Theory in this case means the development of mathematical models similar to the mathematical models in theoretical physics. Chemical theory can be expressed in terms of mathematics, and probably more than anything else this is the emphasis in chemical physics. Structural chemistry had its great flowering in the extreme success of quantum mechanics in dealing with structural chemical problems.

The changes of structure that are the focus of chemical dynamics appear as terribly complex events when viewed by the theoretician. One of the most exciting advances of the past few years has been development of very sophisticated experimental methods that allow study of chemical changes that are simple enough to be attractive to theoreticians.

By simple experiments, I mean experiments that are conceptually very simple, and simple to interpret once you have the results. They may be distressingly difficult to engineer. The great objective in doing them is to get information about very simple kinds of interactions on which this theory of dynamic behavior can be built.

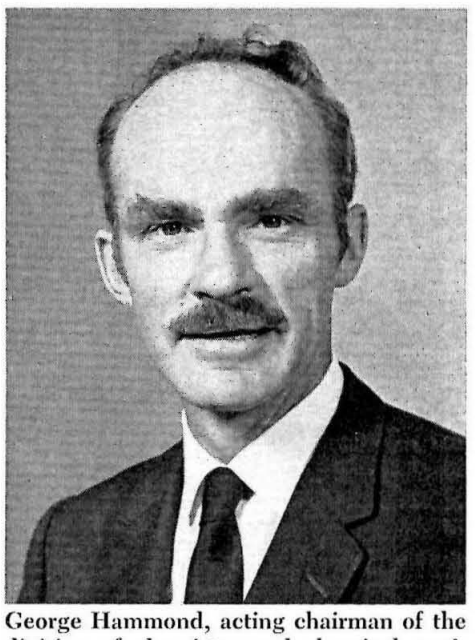
Another part of chemistry that's very important at Caltech is biological chemistry, which has grown in vigor and performance continuously since the late 1930's. This is the sort of thing that, when done in the chemistry division is called biological chemistry, and when done in biology is called molecular biology. The effort is completely continuous, and it's rather silly to try to separate them.

Professor Michael Raftery is trying to study the detailed mechanisms of reactions of biologically important molecules catalyzed by enzymes. Professors Jerome Vinograd and Norman Davidson are studying the biophysical chemistry of large molecules in solution—trying to infer things about the detailed configuration of molecules. These big molecules do what they do because they twist themselves up and into very special shapes.

At the same time Caltech's experimental structural chemistry has been for some years right at the forefront of the worldwide effort to determine in great detail the molecular structure of crystalline enzymes. All other studies of the behavior of biological molecules feed continuously on information that is beginning to come in about the detailed molecular architecture of these molecules in crystals.

Another important field at Caltech is the study of reaction mechanisms. This, of course, is part of chemical dynamics. The work has generally been subclassified into inorganic reaction mechanisms, organic reaction mechanisms, photochemical reaction mechanisms, electrochemical reaction mechanisms, and so on. Now we're beginning to take the view that all these reaction mechanisms are intellectually related and that they're also related to elementary reaction processes of the kind that Professor Aron Kuppermann is studying with molecular beams.

It's interesting to look back over the past 30 years and see that from the beginning of work in the chemistry division there has always been a little work in reaction mechanisms going on, back to the days of Professor Roscoe Dickinson. The amount of work has increased steadily, and the timing of the phasing-in of this



George Hammond, acting chairman of the division of chemistry and chemical engineering until spring of 1969.

as a principal preoccupation of the division is very good.

Chemical synthesis has also been traditionally subdivided into organic and inorganic synthesis. At the present time the fringes of the two fields are overlapping so strongly that the distinction may eventually be completely lost. Personally, I think that this loss of distinction between subfields can't occur too soon.

Q: What are some of the once-active chemistry fields that Caltech no longer works in?

A: Recently I looked at our bound collection of papers from the division. I picked up 1938-40 and also 1953-54 and looked for some things going on in those periods that are not going on now. One thing that's fairly striking is that research in methods of analytical chemistry, which was rather important in earlier periods, has essentially disappeared. We still do instruction in analytical chemistry, but explicit research is not here any longer.

Another thing is that there are clear-cut differences in the kinds of structural chemistry now being done. In the 1938-40 period a large number of papers were published on the structures of crystalline small molecules; the size of the molecules that people are doing structures of has increased, although some small molecule structure is still being done.

It's interesting that today small molecule structures are taken on as something a fellow can knock out in a month; in 1938-40 a similar kind of objective could be a project for a couple of years. This is because of the development of better procedures of obtaining x-ray diffraction data and because of the advent of the computer, which makes the analysis unbelievably faster and more accurate.

The technique of electron diffraction, which was at one time pioneered at Caltech for determining structures of gaseous molecules, is essentially phased out. The potency of x-ray crystal structure work is so great that the amount of additional information possible with electron diffraction is not enough to warrant its being made a research activity.

Q: Can you predict what areas Caltech chemists and chemical engineers will be concentrating on a few years from now?

A: There will be more focused interest in the entire field of chemical dynamics, for reasons that I mentioned. In addition, I foresee other changes in emphasis.

Chemical engineers have a lot of ambitions; there's probably going to be growing emphasis on the analysis of very complex chemical systems

There's likely to be some growth in what I call solid-state chemistry. The sort of thing that's now called solid-state physics is really, in many ways, a totally chemical problem. The Institute's efforts in solid-state science are almost all in electrical engineering and materials science.

The work in molecular biology is going to continue very strong in both chemistry and biology, but there may be a slow shifting of emphasis from structure to a little more consideration of the implications of structural information concerning chemical functions—more of a marriage between dynamics and structure.

Chemical engineers have a lot of ambitions; there's probably going to be growing emphasis on the analysis of very complex chemical systems. At present, chemical engineers study heat transfer, mass transfer, reactions, rates of reactions—in both static and moving systems. There's going to be a heck of a lot of more serious attempt to get all of these integrated in a very sophisticated manner so that you can do a better job of describing a whole system in which energy and material are moving and involved in complex sets of chemical changes. Chemical engineers have known for a long time that this sort of thing is the problem, but their competence to deal with it is increasing rapidly.

Also, there may be a trend toward considering more how chemistry can be used in engineering. The traditional concept of a chemical engineer is that he is someone who engineers large-scale chemical processes. There has been relatively little formal emphasis on the other part of the question: How do you take things from chemistry and put them into engineering?

Q: What changes have taken place recently in undergraduate chemical education at Caltech?

A: About 11 or 12 years ago Caltech established a new undergraduate curriculum; at that time it was regarded as sort of far out. The course in organic chemistry was put in the sophomore year, and physical chemistry went to the junior year, so the senior year was free for chemistry and other science and engineering electives. Now that kind of curriculum has been copied widely all over the country and is more or less standard.

I think we're doing as serious and advanced experiments in this sort of total revision of the curriculum as are being done anywhere.

At the present time we're doing a lot of experimentation with other kinds of changes. For example, I've suggested that the entire course structure of the undergraduate curriculum ought to be revised. The old subdivisions of the field—pedagogically—don't make very good sense. I would set it up so that the core courses are structural chemistry, dynamics, and synthesis. We're conducting pilot programs now. I hope that eventually we'll have a program in which organic and inorganic chemistry are not separated at the elementary levels, and physical chemistry wouldn't be separated from other kinds of chemistry.

I think we're doing as serious and advanced experiments in this sort of total revision of the curriculum as are being done anywhere. It's a lot of fun, and a number of people in the division are keenly interested and have participated vigorously. Our biggest problem is that the experiments are so expensive in terms of faculty time. □

Ruth and Isaiah Gallily

The Gallilys: Scientific Frontiersmen in a Country That Their Parents Pioneered and They Defended

Caltech research fellows Isaiah and Ruth Gallily are *sabras*—native-born Israelis—who lived their teen years in the emotion-charged environment of the Jewish underground. They are children of European-born pioneers who helped turn Palestine into a productive country for future generations.

Although their early lives were austere and danger-ridden, the Gallilys look on the experience as a valuable gift.

"Our parents lived lives of great idealism," Isaiah Gallily says. "That was all they had. There was nothing to be material about. They worked the land and paved the roads, and lost their health in the process.

"Our generation, too, had goals to dream of. There was always something to be done. Israel was a young country; most of the people were young. There was hardship, but also great comradeship."

Like most young people of their generation, the Gallilys were members of the Zionist Hagana, the secretly trained, volunteer defense organization. During the Jewish war for independence in 1947-48, they were both fighting in the Arabs' siege of Jerusalem, and first met at that time.

They didn't see each other again until Ruth resumed her university studies at the end of the war. They met again by chance on the campus of the Hebrew University in Jerusalem, with more lasting results this time, since there was no longer a war to complicate human relationships.

The Gallilys will return to Israel next year with their three young daughters. Isaiah, a 1956 PhD from the Hebrew University, holds a post as a senior scientist at the Weizmann Institute in Rehovoth, and has been a senior research fellow at Caltech since 1967 working in environmental health engineering. He is studying interfacial phenomena and is also interested in dispersed systems like aerosols —smog probably being the most notorious example of an aerosol system.

Ruth is an immunologist in Dr. Dan Campbell's research group. She is studying the mechanism of antibody production and, specifically, what types of cells are engaged in it. Her previous studies showed the participation of two cell types in the production of antibodies against bacteria.

"Now I am trying to establish whether this kind of interaction in the immune response is a general one."

She started out in the area of cancer research and received her PhD in 1956 at the Hebrew University in this field.

She was able to continue in cancer research the first time she and her husband came to the United States to study. This was in 1956, when Isaiah was at Columbia University and she was a research fellow in the Sloan-Kettering Institute in New York.

However, his subsequent work at the University of Illinois led her into immunology. There was no work going on in cancer research there at the time, but she felt that immunology would be of assistance in her approach to cancer. She continued along this line when she went with her husband to Johns Hopkins later, and then at Caltech. She will keep on with her work in immunology and cancer research at the Weizmann Institute when they return to Israel.

There are many projects waiting there for people like the Gallilys. One of them is smog.

"In Israel," Isaiah says, "we have many of the same problems that bother Southern California. Where smog is concerned, the area around Haifa Bay has the same drawbacks as the Los Angeles basin. It is bordered on the east by mountains, and the pollutant dispersal is not adequate. There is also smog around Tel Aviv now."

There is also a strong possibility that he may do work in meteorology, especially in cloud physics, later on.

"I am sure we can start a program of the chemistry of the atmosphere. One reason why work along this line is so stimulating today is that the problems have become international."

Another project useful to Israel occupies his planning: work on artificial rain.

"It's done now, of course, but not on a large scale, and not with the right kind of push. There are many areas where an additional two or three inches of rain would be the deciding factor in crop survival."

He also talks about the problem of water evaporation in arid regions, something else that is of interest to him and vital to Israel.

They feel at home at Caltech, not only because Southern California is geographically reminiscent of Israel, but because "being in contact with, and conversing with, the people who are here is one vast learning experience."

Their parents worked the land and built roads, and left them a legacy of future work and dreams. In their busy years ahead, the Gallilys and others like them will establish a scientific and academic legacy for future *sabras* to build on. □

CALTECH NEWS
Vol. 2, No. 2 April 1968
Issued six times yearly, in February, April, June, July, September, and November. Published by the California Institute of Technology (with the cooperation of the Caltech Alumni Association), 1201 East California Blvd., Pasadena, Calif. 91109.
Second-class postage paid at Pasadena, California.
Editor: Bruce Abell, '62
Associate Editor: Janet Lansburgh
Photographer: James McClanahan

The Draft in the Halls of Ivy--Seniors and First-Year Graduate Students Are in a Tizzy Over the Uncertainty

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completion of high school. A lottery system of eligible 19-year-olds was suggested.

"Students who, under the present law, have been deferred to pursue a baccalaureate or higher degree should not be inducted until they have completed their immediate degree objective," the Council maintains.

Both Drs. DuBridge and Bohnenblust sent telegrams endorsing the Council's stand to congressmen from California.

Since the end of the Korean War, the draft has been a *controllable* element in the lives of Caltech students and alumni. With few exceptions, student deferments were available for as long as a man was in school. For a sizable number of Caltech students and alumni, that meant freedom from military service for the years it took to get a PhD, then freedom through a job exemption. Even those students who took only a BS or MS degree found an abundance of draft-exempting, cold war jobs waiting for them upon completion of school.

Thus, the only significant serious student concern with the draft at Caltech in the last decade has come from those who were contemplating "dropping out" of the protective custody of science, generally to take up some other field of work.

However, while almost no Caltech BS recipients seemed to wind up in the military—with the exception of those few already mentioned and a dwindling number in the AFROTC program—quite a few MS candidates and some PhD candidates have been sent to Caltech by the military and have continued as career officers after leaving the Institute.

Now in 1968 the Caltech students, conditioned by tradition to support the military from laboratories and classrooms, have been slow to recognize the extent to which the new laws will disrupt their way of life. Throughout the winter there has been a progressive realization that it *can* and probably *will* happen here and that this time the cavalry will arrive—if at all—after the wagon train has been decimated.

It is safe to say that almost nobody at Caltech *wants* to go—not necessarily because they oppose the war, but because —well, nobody *wants* to go. Accordingly, students are showing avid interest in finding ways in which they can avoid or at least make more pleasant their military service. About 400 of them showed up for a March 1 meeting in Beckman Auditorium at which Dean Bohnenblust and Registrar John Weldon fielded questions from students about the draft. For the bulk of the students there were no silver linings disclosed in the threatening clouds. Indeed, one of the reasons for the meeting was to convince the students of the reality of their predicament. Even their ace-in-the-hole illusion—that *they* surely would get preferential treatment once in the military—was pretty much dispelled by Dean Bohnenblust's reminder that college graduates, who used to be a minority in the draft pool, will become the majority. He added that "I don't see how on earth you can make a statement concerning the future when there has been such an abrupt change in the system."

In a letter handed out to the students as they left the meeting, Dean Bohnenblust said he felt the new policy "will be a very serious and crippling blow to graduate schools and, more important, will damage the country, which depends on the 5 percent of students who go to graduate schools to provide teachers, scientists, and industrial and political leaders."

He suggested that those who believe that the present draft legislation ought to be changed should write their congressmen.

Needless to say, student reactions have been unenthusiastic, although ASCIT President Joe Rhodes thinks that college students—while naturally disinclined to interrupt their lives—are generally ready to serve their country.

"But," he says, "they object to serving in the Vietnam War, which they find hard to believe in, particularly in light of the severe urban problems that are going largely unsolved in our own country."

In addition to those who don't want to go but will, there are, according to Burt Housman, YMCA associate secretary, "several dozen" seniors who are saying they will *not* go. Many of those will seek conscientious objector status, but some talk of leaving the country or flatly refusing induction (and going to jail).

Caltech, like nearly every other university in the country, has had unofficial draft "counselors" visiting campus periodically over the last few years. Most of them have tried to answer questions about selective service and to clarify the ramifications—some, obviously, quite serious—of the various alternatives that the students might take. Business last year was slow—three or four students showing up for a session. This year it is brisk and picking up—30 and 40 students attending now. It looks like a hectic and gloomy springtime at the Institute. □

Don Anderson

Don Anderson, New Chief of Seismo Affairs: The Lab's Going Off in Many New Directions

When Don Anderson, director of Caltech's Seismological Laboratory, got his BS from Renssalaer Polytechnic Institute in 1955, he thought he was through with school. His training was in an oil industry type of geophysics, and he immediately went to work in the Montana foothills of the Rockies on a doodlebug crew looking for oil.

His experience there told him something about himself that he hadn't known: He didn't like sending off his data to the central offices to interpret. He wanted to investigate them himself.

After a year of "prospecting," he decided to get the inevitable over with and finish his hitch in the Air Force (started in college ROTC). For the next two years he spent part of his time in Greenland doing geophysical research for the Air Force Cambridge Research Laboratory.

"It was a useful tour of duty," he recalls. "I became a project director, so I controlled my own research. The Air Force wanted to know if they could land heavy aircraft on floating sheets of ice in an emergency."

He found out the ice could hold up under the strain, which must have put him in solid with crews in that part of the world. He did it by designing criteria by which one could decide—from the air—if the ice were thick enough and strong enough.

Out of this experience he says he saw his own limitations and realized his need for graduate work.

"Deciding on Caltech was easy," he says. "At that time it had most of the giants in the geophysical field: Beno Gutenberg, Charles Richter, Hugo Benioff, Frank Press, C. Hewitt Dix. The frosting on the cake was Bob Sharp, who was a glaciologist—and my Greenland experience had left me with a well-developed interest in ice."

Anderson, who got his PhD in 1962, says that Frank Press was the most influential person during his graduate days at Caltech.

"At the time I came he was certainly the most outstanding young geophysicist in the world and was doing new, exciting, modern things. His innovations, plus the good, strong classical department here in geophysics, were the reason I wanted to come. Of course this faculty meant you drew a very good collection of students. The interaction of the students with each other and with the faculty made it, in my mind, the most exciting place in the country to do geophysical research."

Anderson cited some of the students at that time: "Bob Phinney, PhD '61, has set up a modern geophysics department at Princeton. Bob Kovach, PhD '62, is doing the same thing at Stanford. Charles Archambeau, PhD '65, and Stewart Smith, PhD '61, are two of the strong people at Caltech. Dave Harkrider, PhD '63, is developing a geophysics program at Brown, and Shelton Alexander, PhD '63, is doing outstanding work in the same field at Pennsylvania State.

"Ari Ben-Menahem, PhD '61," he added, "although an outstanding theoretician, is setting up an experimental program at the Weizmann Institute of Science in Rehovoth, Israel. He's duplicating many of the instruments we have here. All of these successes, I feel, were due primarily to Frank Press."

Anderson maintains that the parade of prominence and excellence is still going strong, and mentioned Lane Johnson, PhD '66, currently a research fellow at the seismo lab, who is going to the University of California at Berkeley. "Leon Teng, PhD '66, is now over at USC. Our graduates are leaders in their field all around the country. And all these people had as much influence on my career as the professors did."

Anderson, who took over as director of the seismo lab last fall, is not too distracted by the administrative responsibilities of running one of the world's most important seismological laboratories.

"Actual duties—except at budget time—can be taken care of in about two hours a day. The job certainly doesn't wipe out my research. The lab is really a small organization—six scientists—and they take care of themselves pretty well. I take some of the load off their backs, but then I create work for them as well."

Anderson stressed the strong *esprit de corps* among the staff at the lab; a common interest underlies their work, although they may be doing different things.

"We all have our strengths and weaknesses, but there's a lot of communication between the students here and the professional staff, and we all benefit from that. In addition to our individual research projects, we tend to collaborate to make a broad attack on a problem, hit it from slightly different angles; and we get quicker, better, more important results than if all had only our own individual projects."

He mentioned the work of the department on the San Andreas fault as typical of the kind of teamwork that advances the frontiers of seismological knowledge.

Recently Anderson has been studying the structures of other planets as well as the earth. He became interested in that field in the early 1960's when the seismo lab was building small seismometers—which, alas, never got a chance to return data—for JPL's Ranger mooncraft.

Another reason for his extraterrestrial interests is that the Caltech astronomy department has always "given" the division of geological sciences the solar system—except for the sun and the particles between the planets.

Anderson thinks that predicting models of the Moon, Mars, and Venus will help to decide what kinds of measurements will be most useful to make when the opportunity arises, and the models will also aid in interpreting data that are returned.

Modern seismology, as Anderson and his colleagues practice it, involves the integration of physics, chemistry, mathematics, geology, and geophysics.

"We're using basic concepts of physics now—solid-state physics, interatomic forces, things like that—on the seismic data we get into. We use those other disciplines to interpret the earth's interior, and to discuss in detail the chemistry of the earth's crust, core, and mantle. So geophysics—which has always been an interdisciplinary science—is really coming into a revolution now. Its frontiers are the integration of all these disciplines. It's allowing us to learn things about the interior of the earth we never thought we'd be able to get before.

"In fact," he continued, "the lab itself is going off in directions it's never been involved in before: We have a high-pressure lab that's set up to handle the elastic properties of minerals and rocks under very high pressures and temperatures. Jim Brune and Rob Roy are measuring heat flow in deep wells. Stewart Smith and his students are measuring creep along the San Andreas fault zone. Charles Archambeau is doing problems in solid-state geophysics as well as theoretical and experimental seismology."

This year Caltech acquired the talents of Thomas Ahrens, an associate professor of geophysics. Ahrens received his MS at Caltech in geophysics ten years ago and his PhD at Renssalaer in '62. He came to Caltech from the Stanford Research Institute where he was chairman of the geophysics department.

"He's setting up a program to do shock wave research. With shock wave methods it's possible to obtain pressures that are as great or greater than those that occur in the very center of the earth. This is an exciting and fairly recent development in the physics of materials: to be able to study the properties of rocks at the pressures at which they exist in the earth, instead of just studying them at moderate pressures and then extrapolating, as we've had to do in the past. Both Ahrens and Jim Brune have given the lab and their colleagues a shot in the arm and have started important new projects."

The seismo lab now has students working on equations of state—materials at high pressure and temperature—and some who are using the most modern techniques in the physics of solids. They hope to find out more about the composition, crystal structure, and mineralogy in the earth's mantle at inaccessible depths.

"To do all this, we need well-developed, modern solid-state theoretical physics and the experimental data of rocks and minerals at high pressures and temperatures, as well as the seismological data itself," says Anderson.

Seismologists have, in the past, used the seismic data to define the zones in the earth, considering the data an exploratory tool to tell them the geometry of the earth.

"Now, in addition," he says, "the actual velocities and the amplitudes of the seismic waves are telling us about the temperature, crystal structure, and the composition of the earth's various regions." □

Alumni Query #4: Has Engineering Been Deemphasized?

My contemporaries and I feel that engineering has been deemphasized in favor of pure science at the Institute. What has caused the Institute to have such a change of policy over the past 20 years?

Engineering at the Institute has not been deemphasized. Rather, it has changed in character and grown substantially in staff, facilities, and graduate study. The division of engineering and applied science is the largest of the Institute's divisions in number of faculty and number of degrees granted annually, despite the fact that undergraduate enrollment in engineering has declined.

The engineering fraction of the undergraduate school beyond the freshman year has stabilized at about 30 percent. This Caltech experience is like that of similar schools having restricted freshman enrollment and a free choice of option. The national experience has been a declining fraction of male college students choosing engineering. With our fixed enrollment and admissions procedure the effect is exaggerated.

As a consequence of having fewer undergraduate engineering students and because technological trends have blurred the distinctions among the older engineering specialties, we now have a single option in engineering at the Institute. Within this option a student has freedom to elect courses in his field of interest. Our objective is to provide good basic education that will prepare students for graduate study in more specialized areas, because three-fourths or more of our students go on for graduate study here or elsewhere.

In the process of emphasizing fundamental undergraduate study at increasingly higher levels, some of the older art and practice of engineering has disappeared. We are trying to focus on education which has lasting value and which does not quickly become obsolete in our modern changing technology.

—F. C. Lindvall
Chairman, division of engineering and applied science □

ASCIT Research Project: Despite Major Setbacks, The Optimistic Students Continue to Think Big

Continued from page 1

them were the suggestion that study be made of the possibility of an exchange program with other schools, a student-sponsored research conference at Caltech, and more undergraduate research.

An initial public meeting of students interested in the project was held in Winnett Center on October 17; some 100 undergrad and graduate students attended. By the end of October, air pollution had been chosen as a research topic. An executive board was established, headed by Mike Garet, '69; a financial director was appointed (Steve Pomeroy, '69); and thoughts were given to converting the vacant upstairs of the student coffee house into offices for the project.

On December 2 and 3, Joe Rhodes and Mike Garet participated in two meetings (one at Columbia University and the other at Carnegie-Mellon University) with eastern college students who might be interested in coming to Caltech for a quarter or semester to work on the project.

During November and December the students began to outline their project and assess the costs associated with various phases. They came up with a proposal for a pilot study "to plan specific aspects of the research project and to determine viable research areas." Cost of the pilot study as envisioned by the students: $110,000. The primary expense was some $70,000 for the "Student Research Associate Program" whereby students from other (mostly eastern) universities would come to Caltech.

The students—with copies of their proposal printed up—prepared, early in December, to begin fund solicitation. However, when Institute officials read the proposal, they wanted to talk things over before it was submitted to outside groups. The reasons were that it seemed to assume: (1) the availability of laboratory space for student research and for training technicians from Pasadena's black ghetto; (2) participation of faculty and administration on advisory boards; (3) permission for student research associates to audit Caltech courses for credit; and (4) employment, purchasing, and accounting facilities of the Institute for use by the project.

At that point it became apparent that the students thought they had far greater faculty and administrative approval than they did. Whatever approval had been given was preliminary and nonspecific.

On December 11 the Faculty Board took up the matter of the research project. As a first step toward ironing out the confusion, Dr. DuBridge asked that Lyman Bonner, PhD '35, an assistant to Dr. DuBridge and an associate in chemistry, be appointed as liaison between administration and students. The Faculty Board then appointed an *ad hoc* faculty committee "to look into the ASCIT research project with all diplomatic urgency."

While the faculty committee was deliberating, Rhodes sent a letter to faculty members on January 3. In it he explained that the students working on the project recognized "its ambitiousness in terms of its goals and scope." He maintained that the comprehensiveness was necessary "to reach some of the basic aims of the research project, such as increased interaction and intellectual exchange among the Caltech student body, extension of the dialogue between the Caltech faculty and student body, and the reaffirmation to Caltech students that a large portion of science and technology has social value. Caltech students share the frustrations manifested by our colleagues on campuses throughout the nation. We hope that our research project will demonstrate to ourselves and to other students that hard work and a realistic attitude can still resolve America's problems." He went on to request faculty aid in providing accommodations for student research associates from other colleges.

We hope to demonstrate that hard work and a realistic attitude can still resolve America's problems.

On January 15 the *ad hoc* committee reported back to the Faculty Board. All seven members agreed that the project could be a useful educational experience. They differed, however, on the quality of the document written by the students.

The committee and the students believe the project would be (and has been) of educational value.

A majority report, signed by five of them, admitted that the project appeared naive and impractical in several respects. "Nevertheless, it is an imaginative and constructive response of a substantial number of our students to their feeling of a need to be actively involved in problems of current public concern, and represents, in our opinion, an attractive alternate to the type of activist response that has appeared on some other campuses. Both the committee and the students believe that the proposed project would be (and already has been) of educational value. . .

"The committee has, to the best of its ability, avoided its natural inclination to try to induce the students to rewrite the technical and other aspects of the proposal in accordance with the committee's view of what would constitute a sound proposal . . . We feel that any attempt at a thorough revision directed by the committee would tend to destroy the initiative and sense of responsibility of the students for the success of the project and is therefore undesirable . . . It will be the students' responsibility to 'sell' their proposal and to answer satisfactorily any questions which the prospective sponsors may have . . ."

The minority report—signed by two members of the committee—argued that "Caltech is first an educational institution, and education is not served by applauding and encouraging (as is interpreted by our silence) such an inept attempt at formulating a research proposal . . . We read the proposal as an opportunity for students at Caltech to interact with students from other schools . . . It is not a research proposal at all. We feel that the proposal should be rewritten with an objective to define clearly that the pilot study will mainly be planning and interaction among students and in no way imply that there will necessarily be a successful attack of the air pollution problem.

"The research associates phase has the best chance of being of value as an educational experience. Why can we not tell the students that the logical interaction is with local schools?

"There has been an implication that to speak clearly and honestly to the students will hurt their morale and decrease their enthusiasm. We do not agree with this thought. We recommend that the Faculty Board not accept the ASCIT document but seek for it the same high standards of excellence that have traditionally been expected of undertakings originating at Caltech."

At the Faculty Board meeting at which the two reports were discussed, Dr. DuBridge reported that the Caltech Board of Trustees had no objection to the ASCIT research project, provided that normal responsibility for fiscal management was assured by faculty supervision. The Faculty Board finally voted to permit the students to proceed on their own with the understanding that they would "continue to consult the Ad Hoc Faculty Board Committee and secure its prior approval on matters concerned with Caltech involvement."

The students, buoyed by the faculty approval, went to San Francisco on January 24 to present a proposal for $30,000 to a charitable foundation that they had been advised would look favorably on their request. Sadder, but perhaps wiser, they came back empty-handed. But fund raising was to be, as they said, an educational experience, so they accepted their rejection and set about trying other sources.

They were in a bind though, because the $1,000 originally given to the project by ASCIT was more than used up. However, by the end of February they had gotten another $1,000 from the Institute, $1,000 from Trustee Simon Ramo, $1,000 from the Caltech Alumni Association, $500 from Trustee J. S. Fluor, $100 from the Gnomes (the sometimes-active alumni fraternity), and some 50 unsolicited dollars from the community as a result of an extensive article in the *Los Angeles Times*.

Moreover, they had the assurance of several private homes to house student research associates and the tentative promise of a small apartment house as temporary quarters for the project.

We read the proposal as an opportunity for students at Caltech to interact with students from other schools. It is not a research proposal.

Six student research associates (four of whom are women) have joined the project—three from Carnegie-Mellon University in Pittsburgh, two from Swarthmore College in Philadelphia, and one from Pitzer College in Claremont. Preliminary study groups have formed to investigate aspects of: mass transit, batteries and fuel cells, steam cars, electric cars, biological effects of smog, smog meteorology, computer applications, a smog movie, psychology, and political science-government. This summer, in an event sure to publicize the project more (and perhaps even advance science an iota), Caltech senior Wally Rippel, designer and owner of an electric Volkswagen [*Caltech News*, June 1967], will be racing across country against an MIT electric car. Rippel and two friends will start from Pasadena, and the other team from Cambridge.

The goals of the project have matured along with the students' knowledge about the difficulty of fund raising. Mike Garet says that the project is now aiming to categorize for the community a series of alternative programs that could be used to reduce air pollution. The studies will combine economic, social, political, and psychological aspects of possible solutions.

Some of the specific tasks they've taken up are to evaluate and perhaps build an inexpensive device to test actual pollutant emission on automobiles; to make quantitative analyses of the pollutant contributions from specific sources (a California legislator would like to know if gasoline spillage at service stations is significant, as some people claim); to compile a composite picture of smog research to date; to survey personal attitudes toward smog throughout Los Angeles County; and to design a computerized car pool that would be flexible enough to attract participants.

The students are currently trying to put together a large summer program. Garet says they hope to be able to have 100 technical (Caltech students) and 100 non-technical (from other colleges) people being paid to work on campus, along with several hundred high school volunteers and a dozen or so lab trainees from the ghetto. However, chances for such an ambitious (and expensive) summer seem slim.

Garet points out that the average lifetime of a student project is a matter of weeks or perhaps a few months. The ASCIT research project has been active for about six months now—almost a year if the planning period is counted. He says frankly that "we have to show some more progress soon. We've already learned a lot by bringing things this far, but without some material results the project is going to get pretty tenuous." □

Science Writers at Caltech

Continued from page 1

On February 19 to 22, nearly 30 top reporters from newspapers, news services, magazines, and broadcasting, who had accepted Caltech's invitation, settled down in the trustees' meeting room adjacent to Millikan Library for news briefings and peeks at the future by Caltech faculty. The affair was arranged by Caltech's public relations office and news bureau to acquaint the science writers with the kinds of research being done at Caltech and to introduce them to some of the faculty who are doing it.

Included in the presentation were general summaries of latest knowledge in astronomy, physics, geology, chemistry, and biology by Drs. Jesse Greenstein, Stephen Frautschi and Frank Sciulli, Clarence Allen, George Hammond, and Ray Owen. Reports on recent Caltech research were presented by Harold Zirin (solar flares), Halton Arp (quasars), Thomas McCord (color studies of the Moon and Mars), Bruce Murray (U.S. space program), Aron Kuppermann (chemical physics), James Bonner (genetic control of living organisms), Gilbert McCann (use of the computer in the study of how a fly sees), and Derek Fender (the brain's response to what the human eye sees).

After three days of morning and afternoon sessions, about a dozen of the reporters hopped an Institute-chartered bus to Palomar Observatory. There, staff member Edwin Dennison showed and explained the electronic instrumentation that is extending the capabilities of the 200-inch Hale telescope [*Engineering and Science*, April 1967]. □

Poets: The First Wave Of an Invasion of Arts

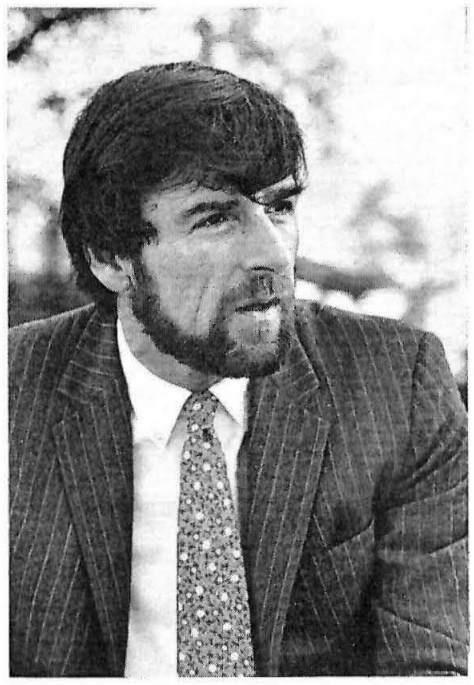
Contemporary poets, it seems, have something to say on a young person's wavelength, and Caltech students are interested not only in the message but the medium as well.

That interest was demonstrated by their response to two visiting poets, Thom Gunn and Lawrence Ferlinghetti, who were on campus in February. Both were invited by the Faculty Committee on Programs, headed by J. Kent Clark, professor of English.

Thom Gunn, an English poet, spent several days at Caltech early in the month. He gave one public reading, took on a formal seminar, and left enough free time so that students could meet with him informally. One afternoon Gunn saw ten students, several of whom brought their own poetry to him for criticism. "Some of it," he said later, "was amazingly good."

Gunn has taught poetry at the University of California at Berkeley. He was recommended to John Zeigel, assistant professor of English at Caltech, by the English writer Christopher Isherwood, who calls Gunn today's best English poet.

Dr. Clark feels that Thom Gunn, who empathized so well with the students, is the type of personality who could do much for the campus intellectual climate by spending a term in residence.



Thom Gunn

Lawrence Ferlinghetti, who came into prominence during the 1950's as a "beat poet," attracted hundreds of people, almost all under 25, to a poetry reading in Dabney Lounge on the evening of February 28. His readings so delighted the audience that a tape made at the time was being replayed by small *klatsches* in the weeks following his visit.

Dr. Clark, who has given a course in modern poetry since 1952, suggested some reasons why American campuses are tuning in to modern poetry as never before.

"The whole coffee house and beat and hip movement has been extremely important to American poetry," he said. "Instead of poets being just the property of eggheads and literary types and people with hyperbole attitudes, the modern poets suddenly became gutsy and made poetry a part of the lively arts.

"It seemed as if the poets were the only people who cared about the human condition, what the interior of a person is like, and the quality of the modern experience."

Dr. Clark's modern poetry course has always attracted more students than it could take, and originated from student requests.

"And I find now that students are more sophisticated in poetry than they used to be. There's been a tremendous amount of good work done in some of the high schools, and students have cut their teeth on people like e. e. cummings and T. S. Eliot."

Dr. Clark finds this is one reason for the upsurge of interest in poetry on campus. Another, he feels, is the social awareness among students today.

"And oddly enough," he added, "the modern lyric writers have helped along the cause of modern poetry. Bob Dylan may be a long way from Ferlinghetti in sophistication and poetic technique, but he uses the tools. So people of this sort—Simon and Garfunkle, and Donovan—had a lot to do with it. In fact, one thing I do in an elementary poetry course is to say: 'Go out and get a song lyric you think is good.' "

Next year, Clark says, the Faculty Committee on Programs would like to bring a painter on campus, "and we might also have a novelist—and more poets."

Since the humanities division is closely allied with the committee's interests, there are times when the division and the committee co-sponsor events. As the humanities division expands, Dr. Clark sees more cooperation taking place.

"The committee wants the people who come to have fun, too. The way we sold Ferlinghetti on this business was by saying 'Caltech's a damned interesting place and you, as a man interested in the modern scene, ought to see it.'

"I think we do have an attraction for the artistic types, and they ought to get around. God knows we need them, and I think they need us."

The next cultural innovation the committee will present to campus and community will be an exhibition of contemporary sculpture April 30 to May 6 in the Dabney garden.

"We're scheduling it so it will overlap Alumni Seminar Day. We'll have a preview for students, and a formal opening for the community. We hope to have the sculptors here to talk about their stuff, and naturally we'll have a good catalog."

The exhibit is being put together for the committee by Carl Hertel, an art professor at Pitzer College in Claremont.

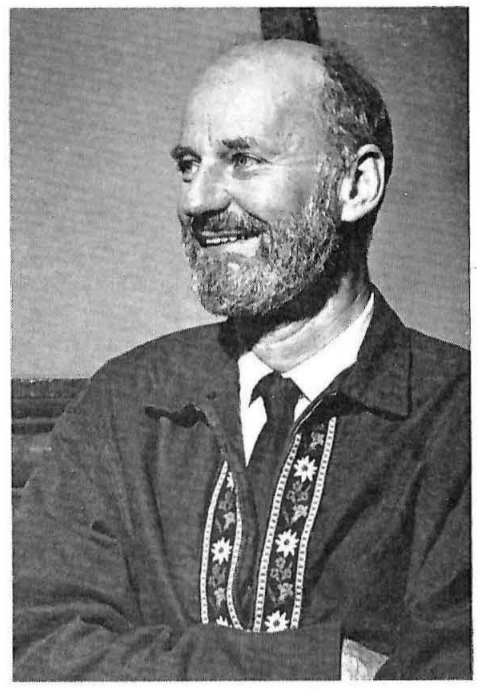
"It's going to be significant and exciting. The people are big names in modern sculpture. It should be a good overview of what modern sculpture's like, with pieces from 30 feet long down to two inches, and from clay to bronze."

Dr. Clark suggested that the campus itself could stand some good art, and declared that the committee is exploring the question: After a building is completed, then what about appropriate paintings and sculpture to enhance it?

The committee has been studying the whole area of the visual arts at Caltech and intends to submit recommendations on the subject in the near future.

Dr. Clark stressed the work done by Edwin Munger, Caltech's professor of geography, who headed the faculty committee on programs from its inception in 1963.

"Ned did a tremendous job getting music, drama, and public affairs seminars into the Caltech community life. What we do in the future is going to be a logical extension of what has already been done."



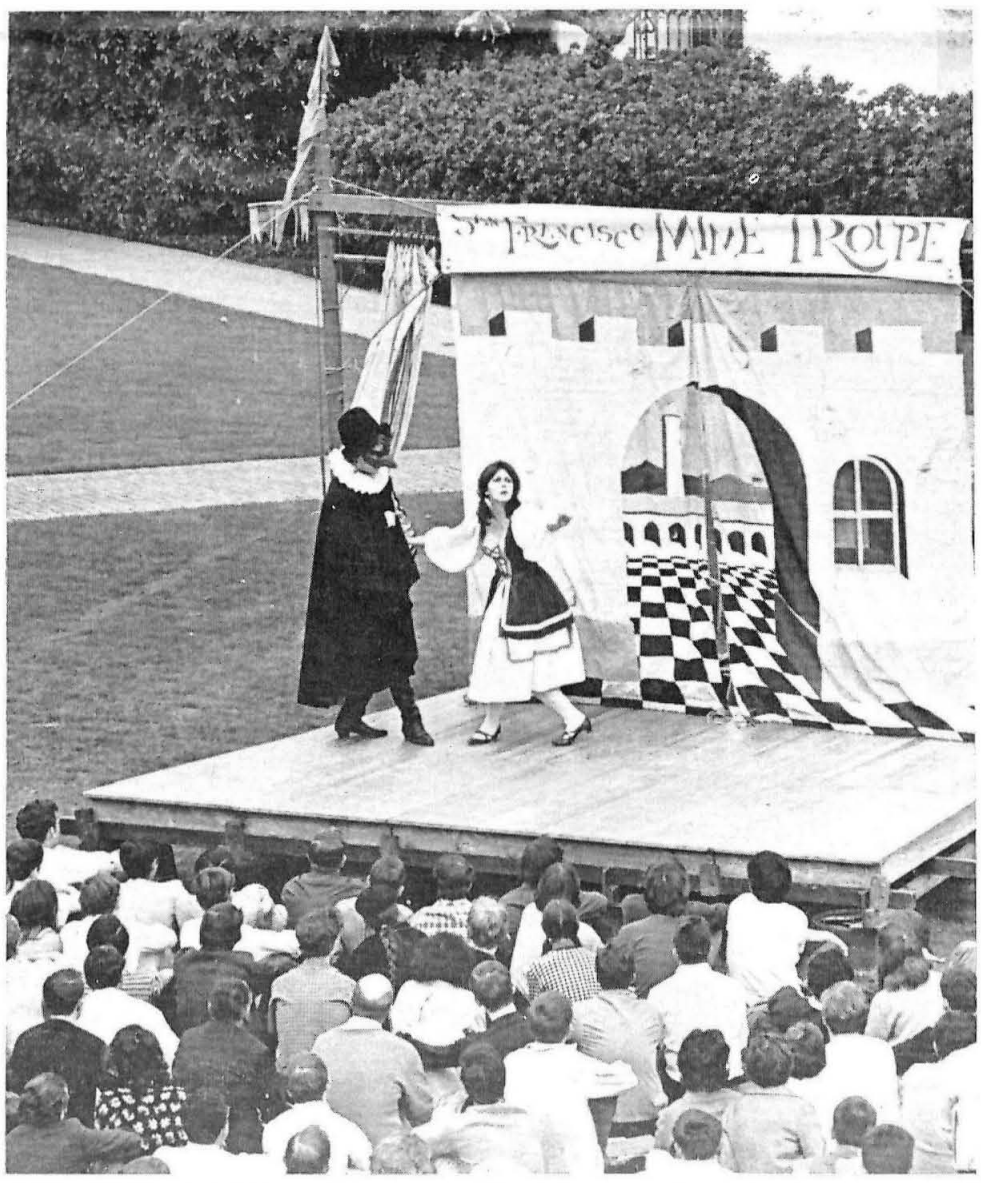
Lawrence Ferlinghetti

The faculty committee was created at the time Beckman Auditorium became a reality, and although auditorium events are a large part of the committee's concern, Dr. Clark stressed the importance of enlarging the number of smaller cultural events on the campus. He would like to see someone like Ferlinghetti return to the campus for a longer period than his previous overnight visit.

"By next year we think we can move up a step in art activities, and Beach Langston [of the English faculty] has an idea that I'd like to see us do sometime in the near future: a series of humanities lecture-seminars with several of our people speaking on their specialties—Langston on Hemingway and Faulkner; David Smith, of our committee, on Conrad; Hallett Smith, our division chairman, might give a lecture on Shakespeare; and we have John Zeigel, who specializes on Willa Cather and other American novelists."

It would seem that things have changed some since the days when poetry at a school of technology consisted of:

Motors—bridges—beveled gears,
CIT engineers.
Boom! Ah!
Tech! Rah! □



THE FEBRUARY 9th performance on the Athenaeum lawn by the controversial (banned recently at Cal State Fullerton) San Francisco Mime Troupe beefed up campus conversation for some days. Decked out in all the trappings of medieval travelling players, the polished young performers freely adapted—too freely, a few of the audience thought—an 18th century Italian play to accomodate the most prickly issues of today. The troupe, invited by ASCIT, attracted several hundred people, most of whom were intrigued enough to sit on the wet grass for the entire two-and-a-half-hour show. □

New Alumni Books

The Ever-Changing Sea, David B. Ericson, MS '33, and Goesta Wollin. Knopf, N. Y., 1967. $7.95.

Animal Toxins, Findlay Russell and Paul R. Saunders, PhD '43, Eds. Pergammon, N. Y., 1967. $18.50.

Design and Construction of Concrete Shell Roofs, Guruvayur S. Ramaswamy, MS '47, CE '48. McGraw-Hill, N. J., 1968. $25.00.

Development in Transport Theory. A NATO Advanced Study Institute, Ankara, Turkey, August, 1965, E. Inönü, MS '48, PhD '52, and P. F. Zweifel, Eds. Academic Press, N. Y., 1967. $19.50.

Poly-α-Amino Acids. Protein models for conformational studies, Gerald D. Fasman, PhD '52, Ed. Dekker, N. Y., 1967, $34.50; to students. $25.50. □

Swimmers Take Ten Medals, Set Seven Caltech Marks in NAIA & NCAA-College Championships

Four Caltech swimmers brought home a seventh place from the NAIA national championships in St. Cloud, Minnesota, on March 13-16 by scoring 2 firsts, 1 third, 2 fourths, 1 eighth, 1 ninth, and 1 tenth for a total of 94 points. Senior Henry DeWitt defended the two championships he won at the NAIA last year with repeat wins in the 50- and 100-yard freestyles in times of 22.4 and 49.4.

Junior Gregg Wright bettered the SCIAC and Caltech records in both the 100- and 200-yard backstrokes with times of 57.6 and 2:07.5, good for a third and fourth. He also set a new Caltech record and won ninth place in the 200-yard individual medley with a time of 2:10.2.

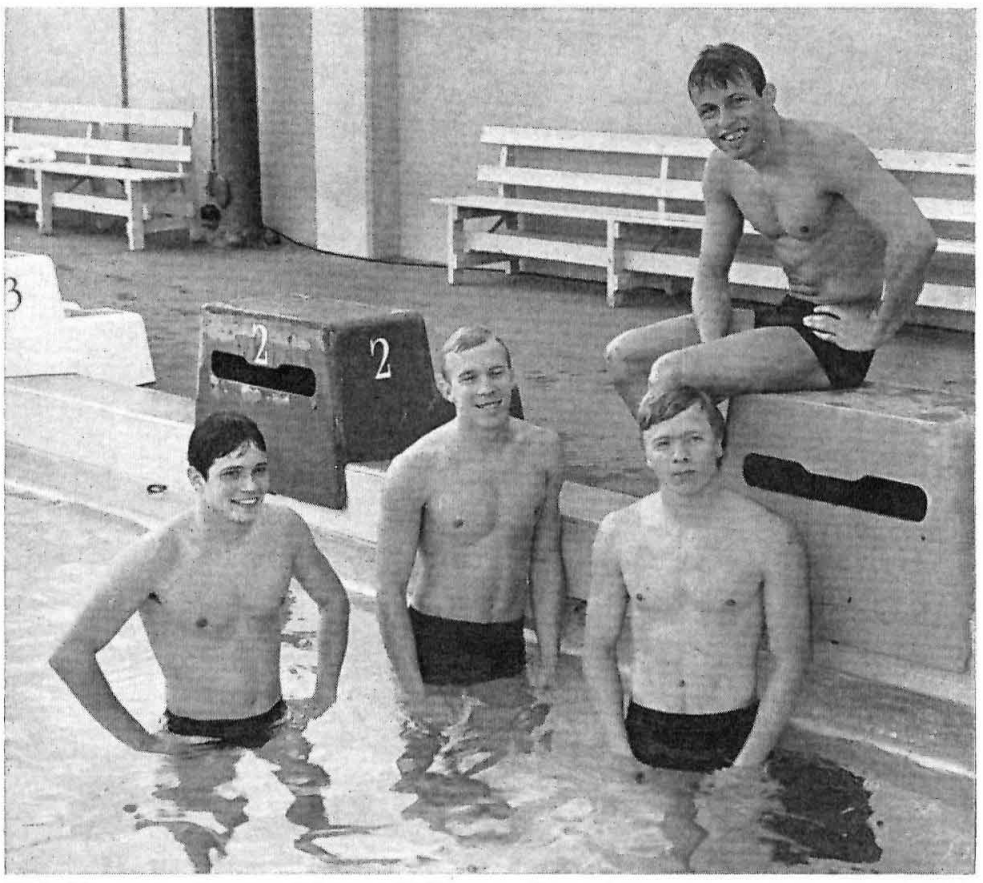
Sophomore Mabry Tyson set a new Caltech record and took tenth in the 100-yard breaststroke with a time of 1:05.1. Junior Maarten Kalisvaart recorded his best times ever in both the 50- and 100-yard freestyles (23.4 and 52.4), although he failed to place in either.

Caltech's 400-yard medley relay team, consisting of Wright (backstroke), Tyson (breaststroke), DeWitt (butterfly), and Kalisvaart (freestyle), took fourth place and set a new Caltech record of 3:49.2. The same men swimming the 400-yard freestyle relay took eighth place with a Caltech record time of 3:26.0.

The following week Henry DeWitt went to Atlanta to compete in the NCAA college division championships—which drew competitors from schools like the California State Colleges at Los Angeles, Long Beach, and San Diego, and from University of California campuses at Santa Barbara and Irvine. In that fast company DeWitt placed second in the 50-yard freestyle with a near-record time of 21.9 and eleventh in the 100-yard freestyle (with a heat time of 48.2, a new Caltech and SCIAC record). He also tied his own Caltech record in the 200-yard freestyle with a non-placing time of 1:52.4.

It was back in 1956 that the *Big T* made the audacious prediction that, with the addition that year of coach Warren "Web" Emery and a group of fine young swimmers, winning swimming teams might become a permanent Caltech asset. In the 12 years since that prediction Caltech swimmers have won five conference swimming titles and shared the titles twice. For four consecutive years—1959, 1960, 1961, and 1962—Caltech was the conference champion. Although team competition from other schools increases each year, individual Caltech swimmers continue to smash existing records and keep swimming as Caltech's preeminent sport.

Warren Emery has since succeeded Hal Musselman as director of athletics, and this year Emery finally relinquished his duties as swim coach. The new coach, Lawlor Reck, came to Caltech fresh from coaching high school championship swimming teams, and has already been having his share of success at the Institute. Caltech won 8 of its first 11 dual meets this year.



Caltech's superswimmers: Maarten Kalisvaart (freestyle), Mabry Tyson (breaststroke), Gregg Wright (backstroke and freestyle), and Henry DeWitt (freestyle and butterfly).

NAIA 50- and 100-yard freestyle champ DeWitt churns to a victory in the butterfly.

Of the three it lost, one was to Pasadena City College (the 1967 JC champions), one was to Claremont-Mudd (the 1967 NAIA champions), and one was to USC (the 1967 NCAA champions).

If there is any standout on the team this year, it is DeWitt. Reck says he "is the kind of athlete that comes to a coach once in a lifetime." His victory in the 100-yard freestyle at St. Cloud qualifies him to try out for the United States Olympic team this summer, making him the first Caltech swimmer since Clark Rees in 1956 to have that chance.

DeWitt's championship performance is all the more amazing because he never swam competitively until he came to Caltech. In his freshman year he set a frosh record in the 50-yard freestyle (22.7); at the end of his sophomore year he held five individual Caltech records and was on three record relay teams. He had lowered his 50-yard freestyle time to 22.3, and swam the 100-yard freestyle in 49.6. In his junior year he lowered those to the current NAIA records of 21.8 and 48.6; by the end of that year he held seven out of fourteen individual Caltech records and three relay records.

His teammate, junior Gregg Wright, has been piling up almost as impressive a collection of statistics. By the end of his sophomore year (1967) he held six individual records (leaving only one individual record that he or DeWitt hadn't set) and was on the three record relay teams. Wright specializes in the longer distance (500-1,000-1,650) freestyle and the backstroke; DeWitt in the shorter freestyle, breaststroke, and butterfly. Each holds an individual medley record.

This year those 1967 records keep falling. Six Caltech marks were set at the NAIA meet. Record-making performances will probably continue right through the end of the season when the SCIAC finals are held at Caltech's Alumni Swimming Pool on April 24-26. □

PLACEMENT ASSISTANCE
TO CALTECH ALUMNI

The Caltech Placement Service may be of assistance to you in one of the following ways:

(1) Help you when you become unemployed or need to change employment.

(2) Inform you of possible opportunities from time to time.

This service is provided to alumni by the Institute. A fee or charge is not involved.

If you wish to avail yourself of this service, fill in and mail the following form:

To: Caltech Placement Service
California Institute of Technology
Pasadena, California 91109

Please send me: (Check one)

☐ An application for placement assistance

☐ A form indicating a desire to keep watch of opportunities although I am not contemplating a change.

Name .....

Degree (s) ..... Year (s) .....

Address .....

.....

Football May Have a New Look This Fall as a New Coach Takes Over

Caltech has a new head football coach, Tom Gutman, a 31-year-old former UCLA football player. He replaces Bert LaBrucherie who, after 19 years of coaching Caltech football teams, has decided to hand the job over to a younger man. LaBrucherie, 63, will continue as track coach and will become cross country coach as well.

Gutman, an assistant football coach at Caltech since 1966 (and also wrestling coach), is hoping to provide a new spark of interest in football at Caltech. He doesn't laugh at the stale jokes about the teams' losses, and he says the players don't either. He emphasizes—and would like to demonstrate—that "there's absolutely no reason why Caltech can't win football games. But," he adds, "we need the genuine support of the Caltech community."

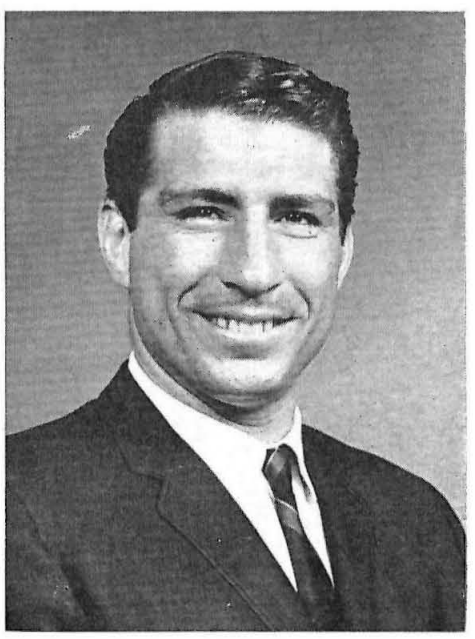
Gutman's intensive coaching plans include off-season practice and a weights program this spring and summer for all athletes. In addition, to promote more student interest in the team, all home games this year will be played on campus, not at the Rose Bowl.

Gutman sees the possibility for some exciting action. Only two players were lost by graduation, and the 1968 team should have 14 juniors and seniors—9 more than the 1967 squad. He called attention to three outstanding players—all of whom were second team all-SCIAC in 1967—who will be back: Tom Burton, '69, quarterback; Lonnie Martin, '69 offensive end; and Mike Girard, '69, defensive halfback.

Burton could have a great season, says Gutman. Last year he led the league in both passing and total offense, and he was 14th in the nation in total offense for a player from a small college.

"Tom, who runs the 100 in 10.5, was much quicker on the field last year, and he can throw a football about 75 yards." His coach adds that "he is probably the most outstanding quarterback ever to play at Caltech."

Before coming to Caltech Gutman coached at Beverly Hills High School for three years. He played on the 1962 UCLA Rose Bowl team against Minnesota, and was on the national champion Santa Monica City College team that beat Oklahoma A&M Junior College in the 1958 Junior Rose Bowl. □



Tom Gutman, new Caltech football coach.

31st ANNUAL
ALUMNI SEMINAR
SATURDAY, MAY 4

PERSONALS

1913

CHESTER RAYMOND HOVEY died in January in South Pasadena at the age of 75. Hovey was a lifelong resident of South Pasadena and is survived by his wife, a daughter, and two grandsons.

1922

CLYDE R. KEITH is a volunteer technical consultant to Recording for the Blind in New York City. He was married to Dolores Hardy in August; they are living in Chatham, N. J.

1925

DAVID T. JONES, a staff supervisor for Pacific Telephone & Telegraph Company in Los Angeles, died in January in Studio City, Calif. A registered professional engineer, Jones had been with Pacific Telephone & Telegraph since 1925 and had been active in the Southern California Cathodic Protection Committee.

1926

ALPHEUS M. BALL died in Phildelphia in February at the age of 63. He was a nationally recognized authority on rocket fuels and had been manager of quality assurance for the explosives and chemical propulsion department of Hercules, Inc., since 1962. He joined the company in 1929. Ball served for several years as a consultant to the director of the Department of Defense, and he held membership in the American Ordnance Association, the American Chemical Society, the American Institute of Chemical Engineers, and the Franklin Institute. He is survived by his wife, two sons, and a daughter.

ERNST MAAG died in February in Los Angeles. He had been an engineer with the State of California, retiring in 1965. He is survived by his wife, two daughters, two brothers, and five grandchildren.

EDGAR P. VALBY, senior special projects engineer for Atlantic Richfield Company's Southern California District, headquartered in Long Beach, retired in January after 41 years with the company. Valby joined Richfield as an assistant chemist in the gas department, and in the early 1930's he helped develop a gas lift technique now used widely in the oil industry. He is a member of the board of directors of Western Gas Processors and Oil Refiners Association and the Southern California Meter Association. He and his wife will continue to live in Lakewood, Calif.

JOHANNES A. VAN DEN AKKER, PhD '31, chairman of the Department of Physics and Mathematics and research counselor at the Institute of Paper Chemistry, has received the Gold Medal for 1968 from the Technical Association of the Pulp and Paper Industry. He was cited for his pioneering studies of mechanical properties and structure of paper and for his contributions as a teacher in the industry.

1930

JOHN E. ANDERSON has been appointed chief electrical engineer of the Metropolitan Water District of Southern California in Los Angeles. Anderson who was formerly assistant chief electrical engineer, joined the District in 1936.

1932

JOHN A. LEERMAKERS, PhD, vice president for Eastman Kodak Company and director of Kodak Research Laboratories in New York, is the 1968 chairman of the Corporation Associates Committee of the American Chemical Society. This committee is the major channel of communication between industry and the ACS.

WILLIAM H. PICKERING, MS '33, PhD '36, director of Caltech's Jet Propulsion Laboratory, has been chosen "Man of the Year" by *Industrial Research* magazine. Pickering was chosen because of his imaginative leadership and scientific accomplishments and because of his direction of the successful Surveyor, Mariner, and Ranger unmanned explorations in space.

1933

WILLIAM C. PAULY has been named a project engineer for the Babcock & Wilcox Company, Mt. Vernon, Ind. Pauly, who joined the company in 1934 as a draftsman on the Hoover Dam Project, was formerly an engineer in industrial engineering at the company's Barberton, Ohio, plant.

1934

JOHN R. LITTLE died in January in Sandusky, Ohio. He was 56. Little retired as technical director of the Hinde and Dauch Paper Co. in 1962 and had since been active in a number of organizations in Sandusky. He was president of the Erie County Guidance Center and had maintained an interest in the American Field Service since hosting an AFS student in 1959. Little authored a number of books on papermaking prior to his retirement. He is survived by his wife, a daughter, and a son.

1935

HUGO BENIOFF, PhD, Caltech professor of seismology, emeritus, died in Mendocino, Calif., March 2. He was 68. Benioff, who was at Caltech for more than 30 years, was the world's foremost designer of seismic instruments. Since his retirement in 1964, he had been active as a consultant on the location of nuclear power plants. He had served as chairman of the consulting board for earthquake analysis of the State Department of Water Resources and as a consultant on the detection of nuclear explosions for the Air Force Office of Scientific Research. In addition he was a member of the National Academy of Sciences and a former president of the Seismological Society of America.

BRUCE B. GRAVITT, marketing manager of the distribution transformer department of the General Electric Company, Pittsfield, Mass., has been named marketing manager of the company's new commercial distribution transformer department. Gravitt joined General Electric in 1935 and has since acquired considerable marketing background. His new position involves responsibility for marketing operations for the department's worldwide sales and manufacturing plants in Pittsfield and one planned for Shreveport, La.

1936

DONALD F. FOLLAND is currently in charge of the development of fluidic process control systems for governmental and industrial use at Univac Salt Lake City, a division of the Sperry Rand Corporation.

WALFRED E. SWANSON is manager of the contractors section of the Portland Cement Association in Chicago, Ill. This new section promotes and coordinates the activities of the Association in support of the construction industry and its markets throughout the U. S. and Canada. It is also responsible for developing and maintaining liaison with major contractor organizations. Swanson, who was for 14 years vice president and general manager of Roberts Construction Company in Nebraska, joined Portland Cement in 1967.

1938

FREDERICK LLEWELLYN, president of Forest Lawn Memorial Parks, Los Angeles, has been appointed to California's State Cemetery Board by Governor Reagan.

CHARLES F. ROBINSON, MS, PhD '49, a newly appointed vice president of Applied Research Laboratories in Glendale, Calif., has assumed direction of ARL's Hasler Research Center in Santa Barbara, Calif.

1939

STEPHEN C. CLARK, Ex, is now senior research scientist and project director at the Development Education and Training Research Institute of American University in Washington, D. C. In February 1967, he married Margaret Fletcher, formerly of Berkeley, Calif.

JOHN R. GRIFFITHS is in the exploration department of the Shell Oil Co., Los Angeles.

1940

JEROME KOHL has recently returned from a tour of Yugoslavia, Czechoslovakia, Hungary, and the U.S.S.R. He attended an international atomic energy meeting in Ljubljana, Yugoslavia. Kohl is still with ORTEC, a subdivision of Edgerton, Germeshausen & Grier, Inc., at Oak Ridge, Tenn.

1941

JOSEPH. P. La SALLE, PhD, is the new chairman of the division of applied mathematics at Brown University in Providence, R. I. He was formerly director of the school's Center for Dynamical Systems.

1942

SHELDON W. BROWN, AE, a retired Navy captain, is now a representative for Naess & Thomas Investment Counsel in Washington, D.C. He was formerly manager of the industrial systems division of Aerojet-General Corporation in El Monte, Calif.

RICHARD LATTER, PhD '49, is one of five American nuclear scientists selected to receive the Ernest O. Lawrence Memorial Award for 1968 by the U. S. Atomic Energy Commission. Latter is a member of the technical staff at the RAND Corporation in Santa Monica.

JOHN H. RUBEL has been named senior vice president for technical planning at Litton Industries, Beverly Hills, Calif.

ERIC SCHAUER is currently head of the human factors staff, ground systems group, Hughes Aircraft Co., Fullerton, Calif.

EVERETT P. TOMLINSON, PhD, is "reveling" in a full-time teaching career as a member of the faculty at Cape Cod Community College, Hyannis, Mass. He resigned in 1967 as head of the operating division of the Princeton-Pennsylvania Accelerator.

1943

EDWARD I. BROWN recently became president of the Remington Electric Shaver Division of Sperry Rand Corporation in Bridgeport, Conn. He was formerly vice president and general manager of the machinery division of Vickers Inc., a division of Sperry Rand.

1944

OTIS BOOTH JR. is the new corporate vice president in charge of forest products and commercial printing for the Times Mirror Company in Los Angeles. Booth joined the *Los Angeles Times* in 1950 and was appointed operations director in 1962. In his new position, he will be in charge of the operations of Publisher's Paper Co. of Oregon and Times Mirror Press in Los Angeles.

RUBEN F. METTLER, MS '47, PhD '49, an executive vice president of TRW Inc., Redondo Beach, Calif., was recently promoted to assistant president and made a member of the company's four-man chief executive office.

FRANK C. SMITH JR. has retired as president of Dannemiller-Smith, Inc. after eight years to become president of the L. W. Erath Company, a Houston Manufacturer of high-fidelity audio equipment.

1945

JOHN A. HEINZ, MS '47, died in February 1965 of multiple sclerosis, after being hospitalized for the last ten years. Prior to his illness he was an engineer in the producing department of Standard Oil Company of California.

PAUL G. RASMUSSEN is the construction engineer for Brigham Young University in Provo, Utah, administering the major construction projects on campus.

Continued on page 10

COMING CALTECH EVENTS

April 15, 8:30 p.m., Beckman Auditorium. Monday Evening Lecture Series. "Spin-Orbit Coupling in the Solar System." Peter Goldreich, Caltech associate professor of planetary sciences and astronomy. Free.

April 17, 11 a.m., Dabney Lounge. Seminar sponsored by Faculty Committee on Programs. Speaker: Dr. Jules Mock, French politician. Free.

April 19, 8:30 p.m., Beckman Auditorium. Alirio Diaz, classical guitarist.

April 20, 8:30 p.m., Beckman Auditorium. Caltech band concert. Free.

April 21, 3:30 p.m., Beckman Auditorium. Coleman Audition Winners. Free.

April 21, 8:15 p.m., Dabney Lounge Goldman-Brown Sonata Duo. Free.

April 22, 8:30 p.m., Beckman Auditorium. Monday Evening Lecture Series. "Particles, Polymers and Pollution: New Approaches to Water Purification." James J. Morgan, Caltech associate professor of environmental health engineering. Free.

April 26, 8:30 p.m., Beckman Auditorium. The United States of America, electronic rock band.

April 28, 8 p.m., Beckman Auditorium. Cantorial concert: "Song of Songs."

April 29, 8:30 p.m., Beckman Auditorium. Monday Evening Lecture Series. "Darwin and the Molecules." Richard E. Dickerson, Caltech associate professor of physical chemistry. Free.

May 1 through 6. Dabney Garden. Exhibit of modern sculpture.

May 2, 8:30 p.m., Beckman Auditorium. "The Barber of Seville," sung in English by the Turnau Opera Players.

May 3, 4, 8:30 p.m., Beckman Auditorium. Caltech Glee Club annual home concert.

May 4, all day. Alumni seminar.

May 5, 8:15 p.m., Dabney Lounge. Pacific Woodwind Quintet. Free.

May 6, 8:30 p.m., Beckman Auditorium. Monday Evening Lecture Series. "Airs from Heaven or Blasts from Hell." A. J. Haagen-Smit, Caltech professor of bio-organic chemistry. Free.

May 6, 7, all day. Beckman Auditorium. Symposium and dedication of the Arthur Amos Noyes Laboratory of Chemical Physics.

May 7, 8 p.m., Beckman Auditorium. "Is There a Crisis in Science?" Donald F. Hornig, Special Assistant to the President of the United States and Director of the Office of Science and Technology. Free.

May 13, 8:30 p.m., Beckman Auditorium. Monday Evening Lecture Series. "Seismology and the Structure of the Earth's Interior." Don L. Anderson, Caltech associate professor of geophysics and director of the Caltech Seismological Laboratory. Free.

May 17, 18, 8:30 p.m., Beckman Auditorium. ASCIT musical production, "The Castle."

May 23, 8:30 p.m., Beckman Auditorium. The Coleman Chamber Music Association presentation of a concert by Isaac Stern, violin; Eugene Istomin, piano; and Leonard Rose, violincello. □

PERSONALS

Continued from page 9

1946

E. RICHARD COHEN, MS, PhD '49, associate director of the Science Center at the North American Rockwell Corporation and research associate in engineering science at Caltech, is a recipient of the Ernest O. Lawrence Memorial Award for 1968. This award is presented to five American nuclear scientists each year by the U. S. Atomic Energy Commission.

1948

MAX GARBER, former vice president of Microwave Associates (West) of Sunnyvale, Calif., has accepted a position as general manager of PEK, Inc., manufacturer of high intensity light sources and electronic accessory equipment, also of Sunnyvale.

ALFRED L. MORTIMER, former president of Mortimer Chemicals, Inc., has joined the ARCO Chemical Company Division of Atlantic Richfield Company, Dallas, as product manager, oil field chemicals.

C. GORDON MURPHY has been named vice president of Litton Industries, Beverly Hills, Calif. He will also continue as president and general manager of the data systems division in Van Nuys, Calif. Murphy joined Litton in 1964 as vice president, program management, data systems division, and was named president of the division in 1965. He was formerly with Hughes Aircraft Company as associate director of the space systems division and program manager for the SYNCOM Communications Satellite Program.

1949

DAVID K. HAYWARD resigned his position with Texaco last June and is now working for the State of California as chief petroleum engineer, state lands division, Long Beach operations. This work is in the Department of Finance and is primarily concerned with the State's exercise of economic control over oil operations and revenues from the Long Beach tidelands. Hayward and his family now reside in Huntington Beach.

WALTER B. KING JR., MS, professor of mechanical engineering at the University of Miami in Coral Gables, Fla., is one of the University's 12 outstanding teachers for 1968. King, who has been at the school since 1958, and the 11 others were selected by the composite votes of faculty, 1967 graduates, and five-year alumni.

JOHN F. KOSTELAC has rejoined the Crucible Steel Company in Syracuse, N. Y., as division superintendent-maintenance after a three year absence. He joined Crucible in 1951, but since 1964 had been with Eregli Iron and Steel Company in Turkey and later with Wheeling Steel as staff assistant to the vice president of operations.

1950

RICHARD D. DELAUER, AE, PhD '53, is a new corporate vice president and the new general manager of the systems group of TRW Inc., Redondo Beach, Calif. He was formerly general manager of the systems engineering and integration division, part of the systems group.

HARLEY C. HITCHCOCK (formerly Thomas Paul Coons), who retired last year, died in December in La Honda, Calif.

DONALD F. ROYCE died in March in Riverside, Calif. He had been employed by Bourns Inc. for the last 12 years, and the company has established a memorial fund at Caltech in Royce's honor. Contributions to the fund will be used to add library resources in the field of mechanical engineering. Royce is survived by his wife and three children

1951

ERDEM I. ERGIN, MS, PhD '54, was recently promoted to assistant manager for avionic systems in the guidance and navigation laboratory of the systems group of TRW Inc., Redondo Beach, Calif. He has been with the company for 16 years in various management capacities concerned with control, guidance, and navigation system design.

1952

WAHEED GHAURI has been appointed staff petrophysical engineer in the Shell Oil Company's Houston, Texas, area production department.

1954

WALTER C. HAMILTON, PhD, senior chemist at Brookhaven National Laboratory, Upton, N. Y., is the newly elected vice president of the American Crystallographic Association, one of seven member societies of the American Institute of Physics. He will automatically succeed to the presidency in 1969.

1956

JOHN E. YOUNG has been elected a partner in the New York law firm of Cravath, Swaine & Moore, where he has been for almost eight years. Young works in corporate finance in the firm of 39 partners and 115 associates.

1957

ORVAL E. JONES, MS, PhD '61, was recently appointed manager of the applied physics research department at Sandia Laboratories in Albuquerque, N. M. Formerly supervisor of shock wave physics research division 5133, he joined Sandia in 1961.

1959

ROBERT M. LEBOVITZ, MS '60, has received his PhD in neurophysiology from the UCLA Brain Research Institute in Los Angeles and is now a postdoctoral fellow of the National Science Foundation in the Department of Physiology and Biophysics at the New York University School of Medicine in New York City. He was formerly a resident consultant to the RAND Corporation in Santa Monica, Calif.

1960

STANLEY A. SAWYER, PhD '64, is assistant professor of mathematics at Brown University in Providence, R. I. He had been Courant Instructor at the Courant Institute of Mathematics and Science at New York University for the last three years.

DONALD VOET is working as a postdoctoral fellow in the biology department at MIT.

ROBERT L. WAX is a member of the technical staff at TRW Inc. in Redondo Beach, Calif.

PAUL M. WEICHSEL, PhD, is associate professor of mathematics at the University of Illinois at Urbana.

1961

JOSEPH C. FREE, MS, is an associate professor of mechanical engineering at Brigham Young University in Provo, Utah.

ELLIOT N. PINSON, PhD, has been promoted to head of the Computer Systems Research Department at the Bell Telephone Laboratories in Murray Hill, N. J. He joined the Bell Laboratories in 1961 and has recently been engaged in research on man-machine communication, particularly computer graphics.

MARTIN H. SCHULTZ is now at the Carnegie Institute of Technology, Pittsburgh, Pa., as an assistant professor of mathematics and computer science. He joined Carnegie in September after serving as assistant professor of mathematics at Case Institute of Technology in Cleveland, Ohio.

1962

WILFRED P. CHARETTE, MS '64, a Caltech graduate student in electrical engineering, is the recipient of the Metabolic Dynamics Foundation Award for 1968. This is given to the Caltech graduate student who has contributed most to the field of homeostatic controls systems during the previous year.

STEPHEN C. CROW, MS '63, PhD '66, is working at the National Physical Laboratory, Teddington, Middlesex, England.

FREDERICK J. HAMEETMAN has joined the Palos Verdes Penninsula Center office of Hayden, Stone Inc., members of the New York Stock Exchange, as an account executive. He just returned from New York where he was studying investment analysis and related topics on Wall Street.

1963

JOHN C. ALLEMAN is studying linguistics at the University at Debrecen, Hungary, under a grant from the Institute of Cultural Relations. He is, he believes, the first American to study there. He, his wife, and his daughter will be in Hungary for one year.

WILLIAM C. GIAUQUE is in his second year of study for an MBA degree at Harvard Business School. He spent from June 1963 to December 1966 in West Germany as a Mormon missionary, and he worked for U.S. Steel in Pittsburgh, Pa., last summer.

J. PATRICK MANNING, following graduate work at the University of Wisconsin and field work in France and Dahomey, is assistant professor of African history at Stanford University.

KENNETH B. STOLARSKY, who recently received his PhD from the University of Wisconsin, Madison, is doing research in the department of mathematics at the Institute of Advanced Study in Princeton, N. J.

1964

KEVIN L. CARRY, MS, is a research civil engineer working for the U.S. Army Cold Regions Research and Engineering Laboratory in Hanover, N. H. He works on a cooperative project that involves field work in Alaska, studying stream and ground icings and associated problems encountered by the Alaska Department of Highways.

DAVID L. COLTON received his PhD in mathematics at the University of Edinburgh, Scotland, in September and is now assistant professor of mathematics at the University of Indiana in Bloomington

MELBOURNE F. GIBERSON, MS, is now working in the large steam turbine generator department of General Electric Company in Schenectady, N. Y., as a turbo-rotor research engineer.

DAVID L. HYDE, after finishing his MS in chemical engineering at the University of California, Berkeley, in February 1966, moved to Cincinnati, Ohio, to work for Procter & Gamble. Formerly with the products research department, he is now technical brand manager in the bar soap and household cleaning products division.

THOMAS W. LATHAM is now studying at the Woodrow Wilson School of Public and International Affairs at Princeton University. Last summer he worked as an assistant to Congressman Frank Thompson (D., N. J.) and is presently working on the congressman's campaign. He expects to accept an assignment with the Public Health Service in the Air Pollution Control program next July.

JOSEPH TSU CHIEH LIU, PhD, is assistant professor of engineering at Brown University, Providence, R.I., and is a consultant to AVCO space systems division, where he works with HARRIS GOLD, PhD '63.

RAMANI MANI, MS, PhD '67, has joined the General Electric Research and Development Center as a fluid mechanics engineer in the mechanical technology laboratory in Schenectady, N. Y.

EDWARD QUILL, MS, a major in the U. S. Air Force, died in February in Vietnam.

1965

LEWIS M. FRAAS is now in the electrical engineering department of the University of Southern California in Los Angeles, working toward his PhD.

WILLIAM M. HARDHAM, PhD, announces the birth of his second son, John Morgan, born October 16, 1967. The Hardhams are living in Hockessin, Del.

ROBERT H. HARRIS, MS, is beginning his third year as a graduate student in environmental sciences and engineering at Harvard University. His PhD thesis deals with the aggregation of microorganisms.

WILLIAM D. HIXSON is a research engineer with the Fort Worth, Texas, division of General Dynamics.

PAUL G. MIKOLAJ, PhD, is assistant professor of chemical and nuclear engineering at the University of California at Santa Barbara

WERNER A. MUKATIS, PhD, has transferred from the research division of Rohm and Haas Company to the firm's Spring House Research Laboratories in Philadelphia. He is working on the development of techniques for the preparation of viscosity index improvers for motor oils.

DANA L. ROTH, MS, and his wife write that their first child, Sandra Corinne, was born in September 1967. Roth has served as the chemistry librarian at Caltech since 1965.

STEVEN JAMES SHARP, MS, is a branch administrator for Texas Instruments in Dallas.

MICHEL WEHREY MS, is a production engineer for Air France, living in Rungis, France.

1966

JOHN S. MURRAY JR., MS, is serving as a Peace Corps Volunteer teaching high school teachers in Bucaramanga, Colombia, S. A.

VERN POYTHRESS is studying at Harvard University under a three-year grant from the National Science Foundation, working toward his PhD in mathematics and physics.

JOHN DAVID ROUSE received his MS in space and planetary science from the University of California, Los Angeles, in December 1967 and has accepted a position at the Illinois Institute of Technology Research Institute in Chicago. He was married in December to Sharon Sleeter.

RICHARD N. SILVER, a Caltech graduate student in physics, has been awarded the Institute's annual Daniel Guinier Memorial Fellowship for summer travel in France. The fellowship is in memory of a French graduate student at Caltech who was killed in a mountain climbing accident near Idyllwild, Calif., in 1959, and it was established by his parents in 1960. Silver plans to take language courses in Paris next summer and possibly attend a summer school in theoretical physics.

MICHAEL J. YARUS, PhD, is assistant professor of chemistry at the University of Colorado at Boulder. He was a postdoctoral fellow in biochemistry at the Stanford University School of Medicine before joining the CU faculty.

1967

PETER BALINT is an English teacher at the Tokyo YMCA English Language School in Japan.

GLEN E. ENGEBRETSEN is a graduate student in the department of mathematics at the University of Oregon in Eugene.

TIM HENDRICKSON is doing graduate work in the department of mathematics at the University of California at Los Angeles.

JOHN C. PERRIN, MS, is working on his LLB degree at the Stanford University School of Law, Stanford, Calif.

GEORGE JOHN WILLIAMS, PhD, and Nancy Christine Finch have announced their engagement and intended wedding date of June 1968. He is serving as a second lieutenant in the U. S. Air Force, stationed in Dayton, Ohio. Miss Finch is a senior at the University of Southern California.

GLENN L. WILLIAMS is at the University of Utah in Salt Lake City on a year's National Science Foundation Traineeship for graduate study in electrical engineering. He lives in a dormitory for Americans and foreign students representing 13 countries. □