

# CALTECH NEWS



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## Walking on Water is Passé, So YMCA Imports Seminarians to Build Bridges to Land of Science

As part of its never-ending campaign to "round out" Caltech students, the campus YMCA imports a group of seminary students (or theologs) every other year to live with the undergraduates for a week. Their function is primarily to try to convey to Caltech students what motivates a young man to become a minister today and, secondarily, to learn a little about what makes a science student tick.

This year, from April 3-7, three Methodists, and one each Baptist, Catholic, Jew, Presbyterian, and Unitarian came to visit. They spent the first few days breaking down the students' misconceptions of what they were on campus to talk about (*not* science versus religion, *not* the infallibility of millenia-old doctrine) until they got to the point where they could make contact.

Among the topics grappled with was a non-doctrinal approach to religion, with love as the unifying element in many of the theologs' faith. They spoke at length about religion being the result of some kind of *ultimate commitment* (*not* even necessarily theistic); many of them felt the need to "do love," particularly through various kinds of social action.

The visitors, most of whom were more nearly the age of graduate rather than undergraduate students, were far more sophisticated and aware of society's problems than most of the Caltech students. Their language was as secular as that of the scientists, which made for some candid dialogue. In fact, one theolog pointed out, "In the seminary I go to, many of us have rebelled against the language that has been imposed on us all our lives. When you hear words and phrases like 'sin' and 'salvation' and 'Jesus saves,' you turn off. I don't want that stuff thrown at me. If I use old words, I have to redefine them."

The theologs reported that although they were involved in bull sessions in the student houses, the most satisfying sessions were on a one-to-one basis. Besides their hours in the student houses, members of the group were involved in discussions with faculty and students at homes of faculty members. Subjects were unpredict-

able. At one home, talk centered on the war and the draft; at another, it settled on the topic of sensitivity training.

Student reactions to the theologs were mostly uniform and rather naive. Many were surprised that these fledgling clergy were not following the path beat out by the kind of men most students thought of as still typical: rigid, pious, "churchy" types requiring Sunday behavior.

A few students felt there were inconsistencies between the seminarians' liberalism and their basic commitment to their religion. One received the impression that this new, "cool" type of theologian who prides himself on being able to communicate with dowager or hippie may just be a fad.

The theologs, in turn, came up with some impressions of Caltech students. Among their observations:

"Students' relations with each other tend to be superficial. Some admitted that they don't even know their roommates very well."

"Our lives are centered around people; their lives are around science."

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Wesley L. Hershey, executive secretary of Caltech's YMCA since 1946, was elected an honorary member of the Caltech Alumni Association by the Board of Directors on April 25. He is the tenth honorary member in the Association's 52-year history.

## Plumbing the Depths of the Caltech Netherworld: Psychologist's Survey Measures Student Drug Use

"The marijuana business" has been around the Caltech campus ever since the editor of the *California Tech*, in an article published on January 12th of this year, estimated that about 50% of the off-campus undergraduates and 20% of the on-campus undergraduates have used marijuana, and that 15% of the undergraduates on campus were currently using it. The editorial ramifications (mostly noise) were documented in the April *Caltech News*, and in recent months the author of the original "Drugs On Campus—Caltech Students Use Marijuana" article has committed accounts of personal experiences with marijuana and LSD to posterity in the student paper.

Because it was obvious that the existence of the activity among students could not be kept as private knowledge (the Pasadena paper eventually picked up on the story—without, however, causing even a ripple of excitement in the community), Kenneth Eells, Institute psychologist, decided to take advantage of the public disclosure to survey the students for some accurate figures.

Dr. Eells' study was made in February and March, with results released privately to the Caltech community on April 13. (The *California Tech* printed the results on the same day; Pasadena and Los Angeles papers followed suit.) The form of the poll was an anonymous questionnaire, which was eventually returned by 90% of the entire undergraduate and graduate student body. As far as Dr. Eells knows, no other college in the country has conducted as

comprehensive and systematic a survey of actual drug use by its students.

Results of the poll showed that 20% of the undergraduates and 8% of the graduate students responding have used marijuana at some time, and that 9% of the undergraduates and 2% of the graduates have used LSD. In all cases the incidence of use was much greater for students living off campus than for those living on campus.

The use of other drugs was much more equal between undergraduates and graduates (pep pills, such as Benzedrine and dexedrine: 12% and 10%; sleeping pills: 7% for each; tranquilizers: 5% and 6%).

The poll also revealed patterns of drug use. Of those lumped under "LSD users," 97% also had used marijuana, whereas only 40% of the marijuana users also had used LSD. These double users (not necessarily current users) represent 5% of the total student population. At the other end, 74% report never having used drugs of any kind.

Of the undergraduate marijuana users, nearly half appear to be "current users" (having used the drug within the week before filling out the poll); far fewer of the graduate students are current users. About 1.1% of the undergraduates and 0.3% of the graduates are current users of LSD.

For the most part students began using the drugs while at Caltech (83% of the undergraduates using marijuana, 64% of the graduates using marijuana, 91% of the undergraduates using LSD, and 50% of the graduates using LSD). However, it is interesting that of the few freshmen who use marijuana (about 15), a third did so before coming to Caltech.

As for future use, 19% of the undergraduates and 9% of the graduates expect to use marijuana at least once or twice, while 50% of the undergraduates and 73% of the graduates say they will *not* use it. Figures for future use of LSD are 12% for undergraduates and 7% for graduates, with 65% and 80% *not* going to use it. Those students currently using the drugs show little desire to cut down, although there is some tendency for heavy LSD users to be more interested in cutting down than are casual users.

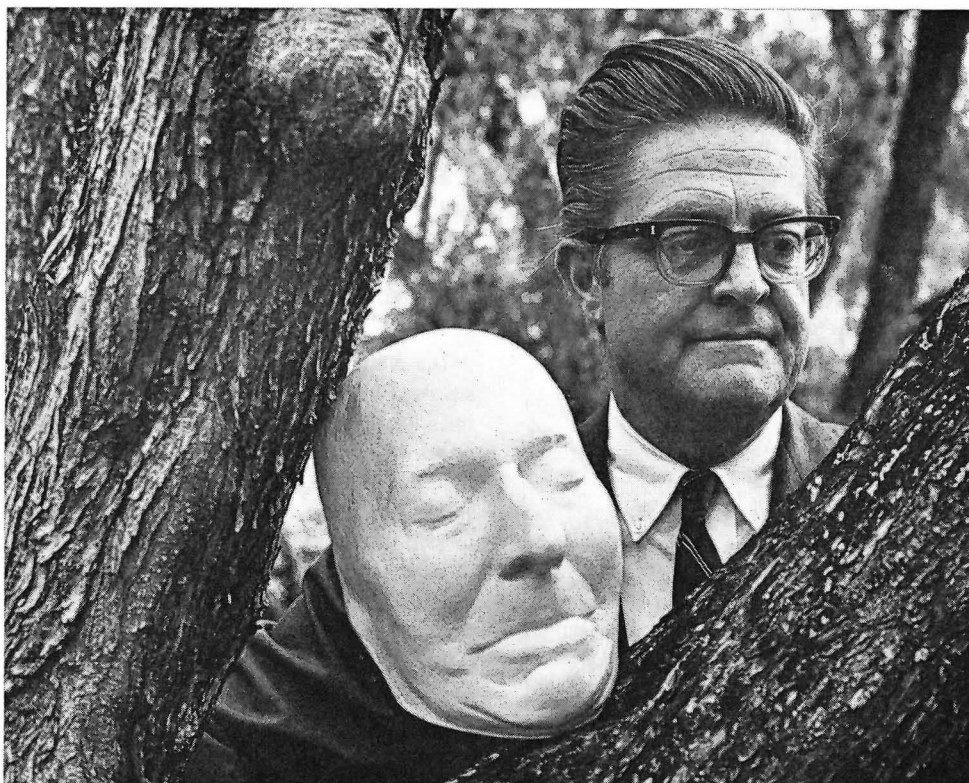
According to the report, students consider marijuana to be comparatively innocuous. They view LSD with more concern, considering it to be harmful to the extent that the risk outweighs the possible benefits. However, there is a vocal minority—particularly undergraduates—who consider the benefits of LSD to more than offset the risks. Users' personal experience is that both drugs are generally beneficial or neutral, although 9% of the graduate users of LSD report very disturbing, upsetting, or harmful effects.

Reasons given for using drugs ranged over "curiosity," "kicks," "escape," "worth-

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ALAS, POOR SWIFT. George Mayhew, associate professor of English, pictured with a death mask of Jonathon Swift, recently returned from Trinity College, Dublin, where he participated in celebration of the tercentenary of Swift's birth. Mayhew, an authority on the Irish satirist, just published *Rage or Rallery*, a collection of essays written in the course of several years' study of the Huntington Library's Swift manuscript collection.



## ALUMNI FORUM

## Editor:

I was most delighted with the first issue of the *Caltech News*. A publication of this type has been long needed, and I am sure that most of the alumni will look forward to receiving it.

In reading the articles, I received a distinct impression of the environment and attitude of the students and faculty on the campus. This is good if it truly conveys what is actually going on at Tech. I am sure that you will agree that if it does not, the *Caltech News* can be an implement for misleading the alumni who are not closely associated with the Institute. If you can, however, accurately portray this aspect of the students on campus, then I feel that the *Caltech News* will provide much more than just facts and figures.

Good luck on this new endeavor. I am looking forward to the next issue.

Harry J. Moore, '48  
Armonk, New York

## Editor:

First, my thanks for starting (and continuing) *Caltech News*; I received Volume One, Number One just the other day.

Second, I would like to direct myself to the editors of the *California Tech*. On page four of the *News* I note a failure of most of the discussants as to what is and what is not news. Unfortunately, the vast majority of the population has been brainwashed by the daily newspaper that news is anything which is sensational. If the ordinary daily newspapers had to confine themselves to what is going right in the world, they would lose subscriptions promptly. Let me put it another way: In your ordinary day, how much of it is good,

and how much of it is bad or sensational? I think you will note that it is at least ninety-nine percent good.

In short, why can't the *California Tech* try to show what is going on well and why it is going on well around campus? Showing why a thing is going well is far more important, to my mind, than trying to dig up what is going wrong. If you find out what makes things tick, you would find easier solutions for what is not right. I'm sorry to say that this takes an awful lot more effort than it does to write a column about what seems to be wrong at the moment.

If the *California Tech* editors don't want to go to too much trouble, and don't want to delve into what makes things go right, they might listen to Mr. Tim Hendrickson, whose opinion was published in the *News*.

For your and their information, I graduated from Caltech in 1936 and have therefore had plenty of opportunity, over a good many years, to form an opinion about what is good in the world versus what is bad in the world.

Paul J. Schneider, MD, '36  
Oakland, California

## Editor:

I wanted you to know that I enjoyed reading *Caltech News*. I think it has a good chance of pulling in the participation of some hard-to-reach alums like me, who visit occasionally but are otherwise immune to your appeals. The kind of news you carry is of much greater interest to me than in *Engineering and Science* (on the whole).

John Stevens, '57  
Walnut Creek, California

## Editor:

Thanks for sending *Caltech News*. I think it will be unusually effective in bringing Caltech and its alumni closer together. I especially liked the story on the *California Tech*; as an ex-staffer I feel these fellows now are putting out a more essential paper than we ever did.

Samuel R. Phillips, '56  
Palos Verdes Estates, California

## Editor:

Congratulations on the first issue of the newspaper. It is a welcome addition to the scene and should go a long way toward the stated goal of bringing alumni closer to the campus and vice versa.

Your "in-depth coverage of alumni" was particularly interesting inasmuch as Steve Nathanson, the "California Bullduster," was a long-lost classmate.

Keep up the good work.

Arne Kalm, '56, MS '57  
Woodland Hills, California

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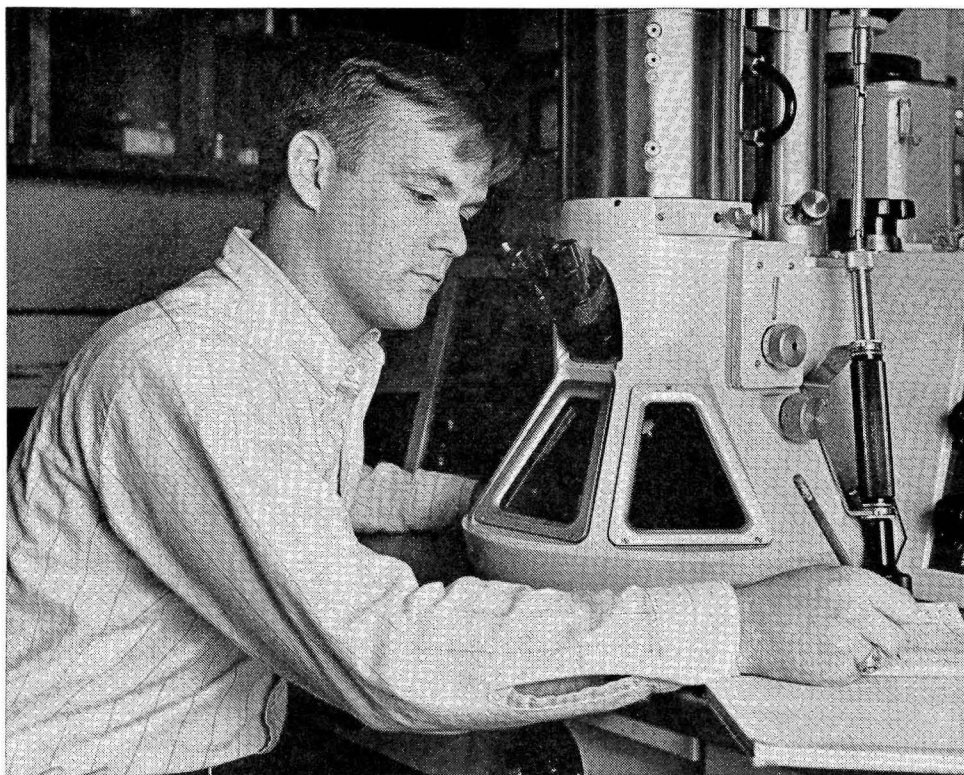
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JOHN EYLER, '67, of Wilmington, Delaware, is one of 12 national winners of the annual *Chemical and Engineering News* Awards of Merit, made for scholarship in chemistry and extracurricular activities. He ranks third in his class of 152, is in Tau Beta Pi (he was its Freshman of the Year in 1964), is vice president of the glee club, a board member of the YMCA, and president of Dabney House. Next stop: Stanford.

## 'Reality Is Bad Enough As It Is and Should Not Be Heightened In Any Way' -- More on Drugs

*Continued from page 1*

while experience," and "help with personal problems." There was almost no incidence of social pressure as a factor.

For the most part, those who have not used marijuana have simply not been interested; less than 20% were deterred by its illegality. However, nearly 40% of the non-users of LSD were primarily deterred by possible health hazards.

Almost 80% of the undergraduates favor some kind of access to marijuana, ranging from use by anyone to controlled sale; graduate students are somewhat less enthusiastic, but even so, 60% would like to see some kind of access. Many more students favor tight controls on LSD, however, with about half favoring its availability only for bona fide research. For both drugs, outright prohibition (as now exists) got little support.

The students were invited to augment the statistical information they supplied for the poll with comments or explanations. Included in their comments were:

Marijuana is pleasant, like alcohol, not "helpful" or "beneficial."

Boredom is closest to describing the reason for continued use; in this respect pot is sort of like the flicks—you ask yourself what to do tonight, and if there isn't anything particularly exciting, you get stoned.

It's hard to say what my *primary* reason is. First time, I guess just curiosity and for kicks. But both drugs have been very helpful in sorting out the tangles of a confused adolescent mind. Not that they have shown me any solutions, but they have helped me to increase my understanding of many things. I think they have made me much more aware of beauty, both sensory and intellectual. They are both very loving experiences.

My moral code requires that I maintain the maximum possible control over my mind and senses. Taking drugs, as with excessive amounts of alcohol, has the effect of removing that control. It is therefore morally wrong for me to use these drugs. Of course, it is also against my principles to do something illegal.

I do not believe in the use of any habit-forming substances—tobacco, alcohol, or even coffee—or any other stimulants or depressants which are artificial props or crutches people come to depend on for the enjoyment of life (e.g., morning coffee), or which are in some way anti-social (e.g., smoking). I believe no man should relinquish any portion of his "free will" to any habit or substances of this type.

I do not use marijuana or LSD because I believe that human beings progress in understanding through sobriety rather than drunkenness and that lasting happiness and pleasure are not to be found through the use of drugs. Moral dictates, rather than state law, should forbid the use of these drugs; but until all people become aware of the moral law and obey it, state or federal law will have to approximate the moral law as closely as possible by prohibiting general usage. As far as individual rights are concerned, I would be ashamed to demand the classical human rights which we enjoy in this country and then demand the right to debase or debilitate myself and others.

An individual should ask, "Can actual happiness be found in a pill—a bit of matter?" Not by retreating into a mental shell, but by active living and love for our fellow man will a person feel complete and satisfied.

Reality is bad enough as it is and should not be heightened in any way.

I think that pot should be treated somewhat like alcohol. I don't like the "over 21" laws for liquor either; they are too easy to get around, and the forbiddenness of the booze they do get makes them want it all the more. It is not illegal for an adult to drink alcohol, but it is illegal for him to drive while intoxicated. I think that similar rules should be made with respect to pot and LSD. There is some question of course as to whether LSD can cause permanent brain damage, but there is also a question as to whether cigarettes can cause permanent lung damage (cancer). I think that the *real* (not only the imagined) dangers of LSD should be publicized more.

## Alumni Books

*Discretus Calculus, A Variable-Metric Approach to Physical Theory*, Herbert S. Ingham, '31. Philosophical Library, Inc., New York, 1964. \$6.00.

*The Cold War in Biology*, Carl C. Lindegren, PhD '31. Planarian Press, Ann Arbor, Mich., 1966. \$6.50.

*Nuclear Astrophysics*, William A. Fowler, PhD '36. American Philosophical Soc., Philadelphia, 1967. \$3.00.

*Engineering Economy*, E. Paul DeGarmo, MS '37. Macmillan, New York, ed. 4, 1967. \$10.95.

*Linear Vibration Theory: Generalized Properties and Numerical Methods*, James B. Vernon, '40. Wiley, New York, 1967. \$19.95.

*Hypersonic Flow Theory, Vol. 1, Inviscid Flows*, Wallace D. Hayes, '41, AE '43, PhD '47, and Ronald F. Probststein. Academic Press, New York, 1966. \$16.50.

*The Elements of Continuum Mechanics*, C. (Clifford A.) Truesdell, '41, MS '42. Springer-Verlag, New York, 1966. \$5.40.

*Rapport sur la Cohomologie des Groupes*, Serge Lang '46. Benjamin, New York, 1966. Paper \$3.95, cloth \$8.00 (Mathematics Lecture Notes Series).

*Desalination by Reverse Osmosis*, Ulrich Merten, '51, Ed. MIT Press, Cambridge, Mass., 1967. \$10.00.

*Residue Arithmetic and its Application to Computer Technology*, Nicholas S. Szabo, '53, and Richard I. Tanaka, PhD '58. McGraw-Hill, New York, 1967. \$12.50.

*Highway Collision Analysis*, James C. Collins, '54, and Joe L. Morris. Charles C. Thomas, Springfield, Ill., 1967.

*Algebraic Structure Theory of Sequential Machines*, J. (Juris) Hartmanis, PhD '55, and R. E. Stearns, Prentice-Hall, Englewood Cliffs, N.J., 1966. \$12.00.



## Don't Be Fooled By the Electron Microprobe and White Lab Coat; Make A Caltech Geologist Wipe His Feet Before He Comes Into Your House

Robert P. Sharp, '34, MS '35, now completing his twentieth year on the Caltech faculty, became chairman of the geology division in 1952. He is sometimes surprised himself at the wide-ranging changes in the division under his direction in the last 15 years. Nevertheless, some of the most exciting changes may be taking place right now, as evidenced by this interview with Dr. Sharp.

**Q: What is the current size of the geology division's faculty?**

**A:** Next year we'll have 22 professorial appointments (full, associate, and assistant professors). We also have four senior research fellows whom we regard as permanent parties—men like Clair Patterson (who has been here 14 years) and Jim Westphal. Then we have about 15 research fellows who are here for one to not more than three years for postdoctoral work, and we always have two or three visiting professors during the year.

We're going to have some interesting developments next year in that Dick Goldstein of JPL, who has done some fine work in planetary radar, will be spending quarter-time with us. We've also got a new man who will be arriving in the fall, Duane Muhleman from Cornell; he's a radio astronomer who has been moving into planetary radio astronomy. These are the newest developments in terms of staff.

**Q: Isn't it unusual for a geology department to incorporate people like that?**

**A:** In recent years several additions to our staff have been rather bold for a geology department. Don Burnett, a nuclear chemist from Berkeley, now in his second year on our staff, was a research fellow in Willie Fowler's group in low-energy nuclear physics. At Caltech he got interested in the radiation- and cosmic history of meteorites. When he needed to analyze potassium-argon and strontium-rubidium ratios, he had to come to geology to use our mass spectrometers. He spent so much time with us, and we liked him so much, that we added him to the staff. Don represents an interesting venture for us. He gives us good liaison with the low-energy nuclear physicists and a wholly new approach to the solution of problems involving the earth and other planets. This is going very well.

Then just last fall we added Andy Ingersoll in planetary science. He's actually an applied physicist, one might say a geophysical hydrodynamicist, out of Harvard. He didn't know much about geology, but he's learning, and the prospects are enticing.

**Q: How about the size of the student body?**

**A:** At present we have about 48 graduate students, and roughly five in each undergraduate class (sophomore, junior, and senior). We're one of the smaller groups on campus. I saw just yesterday that six freshmen this year have indicated they will choose the geology option as sophomores. That's the largest number of freshmen we've had opting for geology in 15 years.

**Q: It has been nearly 30 years since Arms and Mudd Laboratories were built. Are you ready for another building yet?**

**A:** Ready and anxious. We're well along in the planning of a new geophysics-planetary science building to go in the space occupied by the Culbertson Auditorium and parking lot. The new building will be larger than either Arms or Mudd. When it's completed, we plan to move the seismological laboratory group to the campus, maintaining one of the present seismo lab sites, probably Kresge—the older one at

the bottom of the hill—as a recording center.

The new building represents the principal expansion of our facilities. It would provide a home not only for geophysics but also for planetary science, which is growing rapidly. We badly need space for both.

**Q: Do you foresee growth in undergraduate enrollment to keep pace with facilities expansion?**

**A:** Undergraduate enrollment is something over which we don't have much control. Obviously we can handle many more undergraduates than we get. We've tried to appeal to them in various ways, but with no apparent effect. Those who want to major in the geological sciences do so for reasons we haven't yet been able to define. It's hard to predict what will happen in the future, but it looks like we have only one direction to go, and that's up.

**Q: How about future graduate enrollment?**

**A:** Our graduate student population should and will increase, but the limiting factor there, more than anything else, is finances. Graduates are supported by teaching fellowships, commercial and government fellowships and traineeships, and graduate research fellowships. Practically all require financial support now, and our limitations involve finding additional financial assistance more than finding students.

We've made special efforts in recent years to look at the applicants to Caltech's graduate schools of physics, chemistry, and astronomy, who, it seems from their applications, should have an interest in the earth sciences. With the blessing and cooperation of these other divisions we make an approach to these people. This year we had more responses from these sources than we could accommodate.

**Q: How much of an increase in faculty do you expect in the next few years?**

**A:** We have 22 live bodies and three vacancies at the moment. It takes time to find the men we want; I would think that within the next five years our staff should grow to something in the neighborhood of 26 to 28 members.

**Q: Where will the expansion come?**

**A:** Recently it has come primarily in planetary science. The other area in which there is provision for growth at the moment is geophysics. Some of the new men there will probably be involved in solid-state behavior of materials at high pressures and high temperatures.

I'd like to emphasize that we are not getting out of the seismology game. Our intent is to maintain a strong position in seismology; it's still one of the most effective ways of learning about the interior of the earth.

Also, it has long been our philosophy to have at the center of our operation a good, solid geological core, represented by men who know about the earth. This doesn't mean they're old-line classical geologists, but they know and understand the earth, what it's made of, and what the problems are; they bring reality to the operation. This is still the largest single group in our division. We've tried to populate it with people who are good geologists but also understand the new approaches and techniques too. We intend to strengthen this core and to build further strength and competence in geochemistry as opportunity arises.

**Q: Then there really is no place here for what used to be a geologist—someone who spent nearly all his time working in the field?**

**A:** I wouldn't say that at all. For ex-



Photo by Leigh Wiener

Robert P. Sharp

ample, Lee Silver spends much of his time in the field. He's as good a field geologist as you'll find anywhere. If the day comes when we don't have Lee Silvers, Arden Albees, and fellows like that who do field work, then I think we're dead.

We still put a large amount of time and energy into our field courses. Clarence Allen, Barclay Kamb, Arden Albee, Lee Silver, Hugh Taylor, Art Boucot, and Hewitt Dix all teach in some aspect of the field program. We probably put a larger amount of staff time, effort, and energy into the field training program than any other single educational endeavor within the division.

**Q: What are some of the projects under way in the division now?**

**A:** Our studies in *seismology* include the work on microearthquakes that Jim Brune is doing and investigations by Clarence Allen and Stewart Smith of the continuing lateral displacement that seems to be going on along many fault lines. We've got a big project just getting started which involves a study of geothermal relations in the earth's crust and crustal structure in the western United States. Don Anderson is getting more and more interested in the interior of the earth and also of other planets. We have already set up at the seismo lab a small high-pressure, high-temperature operation to start some preliminary work on the behavior of material under such conditions.

Earthquake prediction is still a thing that deeply concerns us, and much of the work we do is aimed at understanding better seismic sources and strain behaviors.

The *planetary science* group has been doing considerable infrared work on the moon and planets. Jim Westphal is about to get started on a project of measuring the actual diameter of some of the asteroids by occultation with the moon. We have essentially no reliable information on the size of asteroids.

Peter Goldreich is doing some very nice theoretical work on tidal and orbital characteristics of planetary bodies. We [Bruce Murray and Sharp] are up to our necks in interpretation of the Mariner IV pictures. We're also involved in the planning for more pictures of Mars to be taken in 1969. Bob Leighton [Caltech physicist] is the primary investigator, of course, but Bruce Murray is also very deeply in-

volved in that effort. Gene Shoemaker [research associate in astrogeology] is working at JPL right now on Surveyor 3 pictures.

In *geochemistry* Clair Patterson is continuing his lead work. He's just about ready to analyze the samples he got in Antarctica. Sam Epstein and Hugh Taylor continue to do interesting things with hydrogen and oxygen isotope variation in all sorts of earth materials, as well as carbon isotope variations, even in human beings. It may be possible to find out some very spectacular things about people by using deuterium as a tracer in the human system, for example.

In *geobiology* Art Boucot is working on a massive project to reestablish the paleogeography of the middle paleozoic. This bears on the evolution and history of our continental masses and their possible interrelationships, including continental drift or lack of it.

Heinz Lowenstam, of course, always has all sorts of interesting new ideas. He has found that animals synthesize certain minerals that we never suspected they made at all. A while back he discovered that animals synthesize magnetite, and I think he recently said that he suspects that they might have made fluorite, a calcium fluoride. These minerals show up in marine sediments, and for years people have formulated complex theories as to how they got there. Nobody ever thought the animals made them.

**Q: All of this implies that the division today doesn't bear much resemblance to the division of 15 years ago, doesn't it?**

**A:** There can be no question on that score. Fifteen years ago we were just getting into geochemistry and hadn't even thought of planetary science. Fifteen years ago, of the 22 staff members we now have, only three of us—Hewitt Dix, Charles Richter, and myself—were here. Everybody else is new. This almost complete turnover in the staff has naturally brought a difference in orientation. We now have a major effort in geochemistry that focuses largely in the areas of geochronology and of the stable isotopes—oxygen, hydrogen, and carbon—and their distribution and what they can tell about the origin and evolution of earth materials. We also work with lead isotopes. We're interested in all radioactive systems in nature, and partly because of this we get into origin of rare gases and into nucleosynthesis—Wasserburg and Burnett are constantly interrelating with Fowler's people who are worried about what happened in the early history of the solar system when the elements were formed. Some of this story is locked up in meteorites.

Our seismology was strong 15 years ago and has remained strong. It is now being supplemented by geothermal work, geophysical hydrodynamics, and high-pressure investigations.

Planetary science, except for work on meteorites, is all new. Geologists going to Mt. Wilson, Palomar, or Owens Valley to use telescope facilities were a rarity 15 years ago. Now our planetary scientists even have their own 24-inch telescope at Mt. Wilson—a highly instrumented one for infrared work.

Obviously, the focus of our work has changed a great deal. However, a lot of us still do what might be called classical geology, but we try to do it in a modern manner. I'm a classical geologist, for instance. But Sam Epstein and I do work on oxygen isotopes in glaciers, and geochemistry has made an impact on my work. I'm currently wound into the Mariner IV effort, so I'm also concerned about probes flying to planetary bodies, in this case Mars. Gene Shoemaker is a classical geologist, but he's up to his neck in the rubble on the lunar surface. Many more examples could be cited.



## Women -- Now Five Percent of the Graduate Student Body -- Find a Happy Home at Caltech

Under "Requirements for admission to graduate standing," DELETE: Women students are admitted only in exceptional cases. ADD: At the graduate level the California Institute of Technology accepts applications from both men and women.

Thus spake the Faculty Board on February 27, 1967, with regard to the 1967-68 Institute catalog. The truth is out: Caltech's graduate school is now officially coeducational.

"Only a formality," according to Harold Lurie, professor of engineering science and associate dean of graduate studies; he says that women have been admitted to the graduate school on an equal basis with men ever since advanced studies were first offered to women in 1953.

But the change in wording will at least clear the air and eliminate the inevitable misunderstandings, such as a letter of considerable acerbity received last year from a lady applicant.

"On reading your catalog," she charged the graduate office, "I was shocked to learn of your discriminatory policy in admitting women graduate students. My first impulse was to reject any thought of applying here. It seemed improbable that any institution holding such an archaic and unjustifiable philosophy as this could be the same excellent graduate school that yours is reputed to be . . . Upon reconsideration, however, I have decided to request forms for application to admission . . .

"If your first impulse on reading this letter parallels mine on reading the catalog, I hope you, too, will reconsider. We may eventually reach an understanding, and perhaps both of us will be better for the encounter."

They are now in the process of finding out, because she was one of the seven women accepted for advanced work this year, bringing the total of Caltech women graduate students up to an all time high of 37, or exactly 5 percent of the graduate total.

Of the 37 women, 11 are from foreign countries: 5 from China, and 1 each from Egypt, Canada, Scotland, Israel, Korea, and Yugoslavia.

Their work is scattered over a variety of fields. Biology and chemistry tie with 12 each; there is one woman in applied mechanics, two in mathematics, three in aeronautics, two in physics, four in astronomy, and one in geology.

Why chemistry and biology take such a popularity lead was put to Richard E. Dickerson, associate professor of physical chemistry, who mother-hens Caltech's chemistry graduate students. He feels that women have traditionally gone into the biology and chemistry fields. "I share the opinion of those who feel that women, generally, are more subject-oriented and less mathematical. They are more experimental and have less interest in abstractions."

Dr. Dickerson also says that there have been more jobs for women in the biological and chemical fields. Incidentally, the first woman to receive a PhD from Caltech got it in chemistry in 1956.

Dr. Lurie states that the graduate school requisites for women, as for men, are basically the ability to do important research, and whether the applicants' goals mesh with what Caltech can offer them. He also maintains that the past cryptic catalog wording never deterred women from applying. "Nowadays, it's a highly competitive struggle to gain admittance to a top graduate school, and a

woman who is confident of her ability isn't going to let a line in a catalog deter her."

Anxious to learn more about these undeterable women, *Caltech News* invited five of them to talk about their experiences at Caltech. Excerpts from their discussion appear below.

**Janet Jones, chemistry, BS '61, Swarthmore College, PhD '67, Caltech, currently a research fellow at Caltech:** The kind of women who apply to graduate school at Caltech have the same characteristics as the kind of men who apply here. They are seriously interested in a professional career in whatever field they have chosen, and that's what determines their decision about where to go.

**Jeanette Asay, chemistry, BA, '65, University of Utah:** But still, there is some fear, perhaps, before you come. You think, "I heard there were very few women there." I didn't know what to expect. But I heard it was a good school so I came for that reason.

**Nancy Rathjen, chemistry, BS '66, Rochester Institute of Technology:** If you go to a coeducational undergraduate school and study the kinds of fields that Caltech has, the ratio of men to women is large anyway. So it isn't a completely different situation.

**Jones:** Almost every department has its somewhat amusing history of die-hard opposition to having women in the graduate school, and I think in every case the situation has been resolved because one or two women were admitted. Then, just the fact of their experience—that they turned out to be people just like everybody else—broke down the barriers, and resistance disappeared. I think it *has* largely disappeared.

**Sue Kieffer, geology, BS '64, Allegheny College:** Certainly people outside the Caltech community would tend to over-emphasize the presence of a woman here. When I meet friends from other fields or non-academic fields, it's a great big novelty that you're a woman student at Caltech, and they want to know what it's like. But you meet other people here at Caltech and in other university communities, and there's no strain at all—and no novelty at all.

**Jones:** I think that a woman teaching assistant has a very good opportunity to teach well to a really receptive group of students and to have a very good relationship with those students, just because it is still somewhat of a rare thing to have a woman teaching assistant.

**Kieffer:** My contact with undergraduates came not through teaching but through going on field trips with them. I had the impression that the discussions were not at all biased by the fact that I was the only woman participating. Of course, there was a lot of fun mixed in with it too. It wasn't just a four-hour lab, but a three-day field trip where I was expected to prove that I was a good cook by making fried chicken on a Coleman stove. It was a very pleasant way to meet the undergraduates, sitting around the campfire and talking. We had some good discussions about the academic life and the social life of the undergraduates at Caltech. And they were greatly worried about the fact that they weren't meeting women.

**Mary Baker, applied mechanics, BS '66, University of Wisconsin:** I notice that people of the Caltech community seem to be less conscious of convention and more conscious of what you can do and what you can't do.



**Baker:** I don't see why what you can do with your ability is so much limited by what other people allow you to do.

**Kieffer:** I would agree with that. I came from a very small liberal arts school where there were only three physics majors in my class, and I was the only girl. It was a novelty, and nobody was quite sure whether to take it seriously. Caltech was one of the first places where I felt I was accepted seriously as a student in scientific work.

**Rathjen:** I think that's a good point. As undergraduates we really seemed much odder because there were conventional means of comparison, whereas at Caltech all the women around are more or less like you.

**Jones:** The only real problem that a woman in science has is after she gets her degree. Caltech graduate school is great. As far as I can see, women at Caltech just don't have any particular problems because they're women. But then, when you graduate, you find out that—certainly in the academic world—women just don't count. And this is the most severe problem that you have to face, because appointments and promotions and grants and all of the associated monkey business that goes along with having a job in a university or college depend on one's prestige. And women neither have prestige nor do they not have it. They just don't exist as far as the system is concerned.

**Baker:** I don't know this academic problem, but I think there's not a problem in industry, especially now that there's a shortage of technical help. Industry cares whether a job is going to get done, not whether you're a woman.

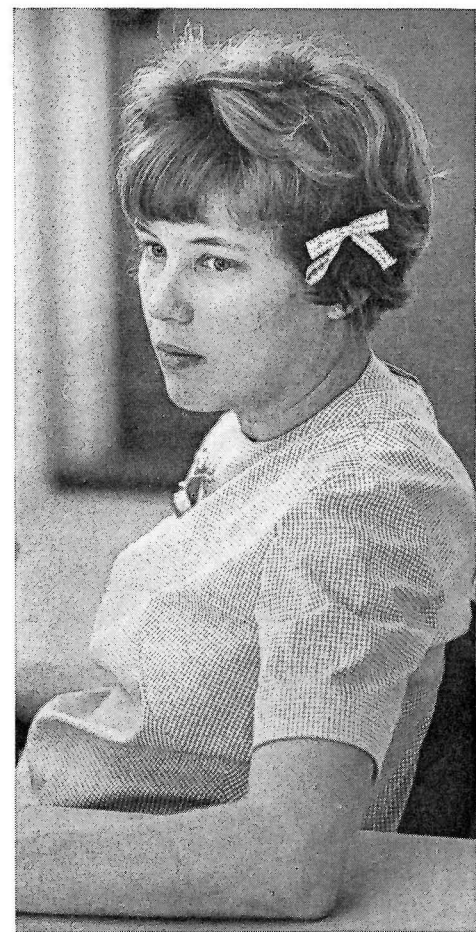
**Jones:** But brains and skill are of no special value in the academic world, essentially, for anyone. It's accepted that you have a certain minimum level of brains and skill. Industry places a very high premium on brains and skill, and therefore a woman can get along much better, I think, in industry.

**Kieffer:** I don't agree that women are generally discriminated against in the academic community. I think there are two very extreme cases. One is a university with a policy which says we won't hire women; the other says we won't hire women who are married to faculty members. In my case, both my husband and I will have our PhD's in the same field, and there are a sizable number of institutions that won't hire a husband and wife team. But I came from a college where, out of the three faculty members in our department, two were women. And the

college was used to having women faculty members in all fields, and they had no trouble getting NSF grants and serving on NSF boards for control of money.

**Jones:** I think that you have to go through the process of trying to get an academic job and see the kinds of reactions that you get before you really know. Official policies about hiring women are irrelevant to the problem that I am concerned with. It is just simply that a woman doesn't have any bargaining power when she goes out to get a job, because her value to the department is not really measured in terms of how much research she will turn out, or how good a teaching job she will do. Almost anybody that a department in a good school would get will turn out a reasonable amount of research and do a reasonable teaching job. That's not the problem. The problem is that in most fields the respect of your peers is what the department is looking for. That's what they value. They want to hire somebody who will be respected by people in that person's field who have a good reputation—and women just don't have any reputation.

**Kieffer:** You're saying that the criterion



**Kieffer:** Caltech was one of the first places where I felt I was accepted seriously as a student in science.



for judging an applicant is the respect of his peers. Yet how could anybody who is, say, 28 years old, fresh out of college, and relatively unknown, command respect? Both men and women are in the same position of not commanding respect because of their age.

**Jones:** That's right, but it's the potential respect that the department is hiring for. When they hire somebody, the question that they ask themselves is: "When this person is 35, what is everybody going to think of him?" So it turns out that X has a job at a certain university, and his wife, who is generally considered by everybody to be better in their common field than he is, teaches in the local community junior college. And she doesn't exist as far as the profession is concerned.

**Baker:** I just don't see how anyone—especially someone in science, who is so used to looking at facts—can be so unlogical on one small area.

**Jones:** The unscientific way that departments go about getting students and faculty members is a well-known part of the academic life, and it's just as prevalent in science departments as in any other department. I guess the major point that I'm driving at is that most women who come to Caltech graduate school have extremely strong professional motivation. The first thing they have to learn when they graduate from Caltech and try to get a job is to get rid of this. Because they can't do what they would like to do to satisfy their professional ambitions. They have to reorient their thinking, because they come to graduate school with a primary purpose of doing good work in their field and building up a good scientific reputation.

**Kieffer:** Why does it have to change when you go to get a job? Your desire to do good work in your field certainly shouldn't change.

**Jones:** It can receive some pretty shattering blows when you try to get a job.

**Rathjen:** But are you sure it's that much different, though, for men graduate students? Are you sure this isn't based on the fact that you're a recent graduate?

**Jones:** It's a general problem that applies to some extent to men too, because graduate students at Caltech, by and large, are at the peaks of their careers when they are graduate students at Caltech. They will never do any better than that, because they will never have positions at a place that is comparable to Caltech. They have more prestige as graduate students at Caltech than they will have as professors at whatever institutions they go to.

**Rathjen:** I have a high opinion of Caltech, but I wouldn't quite go so far as to say that if you were anywhere else you couldn't possibly be doing as well.

**Jones:** No, I'm not saying that. I'm just saying that every year's crop of graduate students that comes out of Caltech is very large, and it is so large that a very large fraction of the people who come out of Caltech are not going to be able to get jobs, then or eventually, at schools that are comparable to Caltech in their department. There is a clear division between the major leagues and the minor leagues and the bush leagues and Siberia. Part of the training that people get at Caltech is to want the major leagues—and part of the training they also get is to settle for nothing less than the minor leagues. If they find when they graduate that they are condemned to the bush leagues or Siberia, it's pretty hard to take.

**Rathjen:** You feel that more women will be confined to the bush leagues and Siberia just because they're women?

**Jones:** Yes, but the problem is especially severe at Caltech because graduate stu-



**Jones:** There is a clear division between the major leagues, minor leagues, bush leagues, and Siberia. If women find that they are condemned to the bush leagues or Siberia, it's pretty hard to take.

dents are exposed to the kinds of contempt that people here have for people at other places. Whereas if you went to one of the Big 10 schools that had a good department, you wouldn't get quite the same kind of indoctrination about what was acceptable and what was not in terms of a job.

**Baker:** I don't see why what you can do with your training and your ability is so much limited by what other people allow you to do. Even if nobody would give you a job and you went off in your room at home and developed something really wonderful, people are going to respect you for it, no matter what your institution is or isn't.

**Jones:** That's not true. They're going to say, "He's some kind of a nut. This couldn't be right."

**Kieffer:** I think the point was brought out that, depending on your individual interest, you probably would find a job to fulfill it somewhere.

**Jones:** I think that's a grossly over-optimistic statement myself.

**Rathjen:** The trouble is that, except for Janet, none of us has the experience of seriously applying for an academic position on the PhD level. We're all sort of babes in the woods. But my personal reaction would be, I just wouldn't accept it. I don't care if that's the way it is; I would either break down the door or refuse to recognize it. This may be unrealistic. I think it's unrealistic in industry, for example, because there is discrimination. You get salary discrimina-

tion and promotion discrimination because most of the promotions lead in the direction of increased administration. Most industries are very reluctant to take on woman administrators.

**Baker:** I don't think that's wrong. If you talk about women engineers, it's easy to say that you can judge them on what they can accomplish for you. But in administration there is a problem, because it's not only what they can accomplish; it's also how the people under them are going to react. Nevertheless, when I was a senior, I got a lot of literature from companies inviting me to interview for their management training programs. So they are certainly not just drawing the line.

**Rathjen:** I didn't mean to imply that this was completely closed. I was just saying that, given a man and a woman with comparable background, they would be very cautious about advancing a woman into a top managerial position.

**Baker:** I think that they would have a reason for doing this. It gets down to a situation of whether or not you can do a good job. If you realize that you can't do as good a job as somebody else, then you probably don't want that management job. If I wanted to apply for an engineering job where I was competing against men—if I can do the job as well and I feel enthusiastic, I'm going to try for it. But if I just knew darn well that someone else was better, I would just let him have the job.

**Jones:** I think you've been brainwashed.



**Rathjen:** I just wouldn't accept job discrimination. I don't care if that's the way it is; I would break down the door or refuse to recognize it.



**Asay:** You know there are very few women at Caltech, but you heard it was a good school so you come for that reason.

## Third Annual International Crisis Played Out On Campus

Three years ago Edwin S. Munger, professor of geography, and the Caltech YMCA successfully introduced a political-military-diplomatic role-playing game to the campus.

Since then students, faculty, a peppering of faculty wives, and some co-eds from Scripps and Oxy have involved themselves annually in a weekend of playing out a supposed crisis in Africa.

So far, the outcome of each game has closely paralleled actual events in the ensuing months. Last year's "crisis" in Rhodesia, for instance, was similar to subsequent happenings, even to the contents of messages exchanged between governments.

Thus, a look at the way things turned out in this year's exercises in international crisis diplomacy might be in order. First, President Johnson did not win in 1968. This was principally because Johnson (played by economics instructor Roger Noll, '62) lost the Negro vote due to a misunderstanding with the civil rights group. Victory was then assured to the Republican team of Romney and Reagan, played by students Al Hartstein, '69, and Dennis White, '67. (White had been playing the role of Senator Percy until Governor Reagan got the vice presidential nod. This made Percy expendable enough so that White could switch roles.)

Meanwhile, back at the veldt, the Organization for African Unity (led by student body president Joe Rhodes, '69) got such a big shooting war going in southwest Africa that the UN had to step in.

Caltech received a \$5,000 grant from the Department of Health, Education and Welfare to underwrite this year's game. In return, Dr. Munger and his role-playing buffs will develop a manual and directions kit for distribution to interested schools. Already close to a hundred requests for more information on playing the game have rolled in.

Dr. Munger initiated the political-military exercises at Caltech because he felt it would be the best way to help science-oriented students understand the complexities of international relations. He says that the game is an exercise in frustration for them and that it bugs them no end to have to make decisions before all the facts are in—which is what their government has to do all the time. Munger cites the classic example of the harried State Department official who snarled: "I'm too busy making decisions to study the matter!"

That the game has more student converts each year is especially gratifying to Dr. Munger and others in the humanities and social sciences division. They feel it is an indication of the Caltech student's increasing concern in today's political and social matters.

A gift to Caltech may now be made through payroll deduction. The Caltech Alumni Fund has been approved by AID—United Givers as a valid designation for gifts. This is an excellent way (for an alumnus participating in AID) to build regular contributions to Caltech into his giving program.

Other similar payroll deduction plans exist in industry and education. Alumni are urged to investigate the possibility of making their gifts to Caltech through these convenient channels at their place of employment.



## National Academy of Engineering Chooses Eight Caltech Alumni

Eight Caltech alumni were elected to the National Academy of Engineering this spring. Members are elected to this two-year-old body, similar to the National Academy of Sciences, on the basis of outstanding contributions to engineering theory and practice, or to the pioneering of new and developing fields of technology.

The new alumni members are:

Arnold O. Beckman, PhD '28, for invention and development of precision instruments.

Maurice Anthony Biot, PhD '32, for research on applied mechanics.

James Boyd, '27, for development of mineral resources.

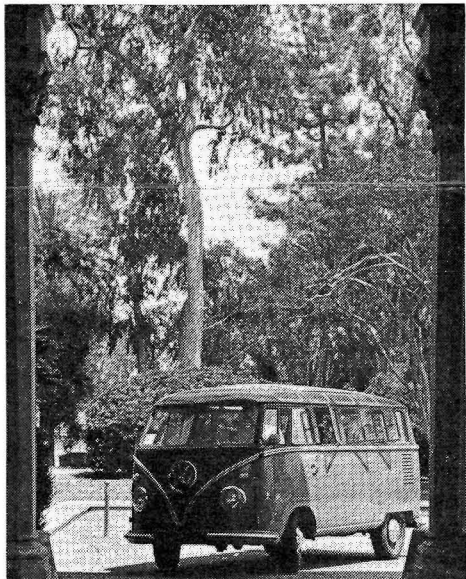
Frank W. Davis, '36, for design, development, and testing of supersonic aircraft and missile systems.

Arthur T. Ippen, PhD '36, for sonic and hydrodynamics research.

Frederick C. Lindvall, PhD '28, for research and development of equipment for transportation and underwater ordnance.

George E. Solomon, PhD '53, for design and development of space and weapon systems.

Carlos C. Wood, MS '34, MS '35, for development of aircraft and missiles.



## Does a Historian-Biologist Coalesce Into a Histologist? Not Dan Metlay, '67. Caltech's First History Graduate Is Off For a Career in Political Science

Dr. DuBridge has declared that "the total ingenuity of man needs to be applied to the challenge of making this planet a better place on which to live," and has stressed the resulting need for "a new kind of man" as well versed in humanities and social sciences as in pure science.

In Dan Metlay, a senior, Caltech will be graduating its first official "new kind of man."

Metlay, 21, whose home is in Los Angeles, has carried a double option in humanities and biology, and has the distinction of being Caltech's first history major.

Metlay's goal lies in the bracketed area of science and public policy. Although he has never had a course in political science, he was accepted into the political science departments of every top graduate school he applied to. He can only surmise from this that the country's leading graduate schools are beginning to look for young men of interests similar to his.

He chose the University of California at Berkeley for two reasons: he likes the intellectual climate there, and he feels it has the only graduate school with a philosophy of looking for entirely new ways to solve old problems. As an example, he cites a course in Organizational Theory. In the course, students try to come up with new ways of looking at old organizations, instead of trying to modify old ways. He found other graduate schools "more concerned with things as they were five or ten years ago."

Metlay's science adviser, Dr. Norman Horowitz, refers to him as an outstanding biology student among bright students and says he could have a successful future as a geneticist if he wished.

Dan's next two years of graduate study



Dan Metlay, '67

are assured by a National Science Foundation fellowship, and the following three years by a Ford Foundation grant. He had to pass up a Fulbright scholarship to England, since he couldn't figure out how to be in two countries at once.

Last year he was a winner in the Junior Travel Prize competition and spent the summer in England studying poverty conditions among Commonwealth immigrants.

He recently won first prize in a Southern California competition sponsored by Phi Alpha Theta, national history fraternity. His winning paper, chosen from 50 submitted, was on "The Response of the

Negro to the Communist Party in the Early 1930's."

An active campus YMCA member, Dan was primarily responsible for planning this spring's Caltech-Scripps conference, described by participants as one of the most creative and successful ever held.

Dan feels his education and activities at Caltech have contributed uniquely to the foundation of the career he has set for himself. "To go through here with a strong science education and concentrate on contemporary American problems really gives you a wide choice later on," he says.

WALLY RIPPEL, '68, a physicist from Hollywood, has the ultimate Volkswagen (left)—It passes OTHER VWs stopped at gas stations. In the last year he has spent about \$1500 converting it to an electric vehicle (below). The purpose of his project—aside from seeing other drivers' double-takes as he whines by—is to demonstrate to the public that electric-powered cars are worth developing.



## Commentator Suggests Technology Schools Contributors to Expanding Military Mess

In a day of talks and informal discussions on campus, professor and commentator Marshall Windmiller declared his belief that institutions like Caltech are one of the sources of "the increasing and alarming militarization of political thought in the United States."

Dr. Windmiller is an associate professor of political science at San Francisco State and a foreign affairs commentator for the Pacifica Foundation. He was invited to Caltech by the YMCA at the request of students who listen to him on FM station KPFK in Los Angeles.

During his talk at the Athenaeum luncheon forum Dr. Windmiller admitted that Caltech is not in the business of applied research. However, his feeling is that no technological institution can stay apart any more from defense-related activities.

He described militarization as a belief that military solutions can be applied to political problems and the lack of ability to distinguish between political and military problems; an emphasis on technology as an instrumentality of political and social matters; and a lack of concern for and a turning away from the discussion of matters of values and philosophy.

"War is being taken away from soldiers and given to the PhD's," Dr. Windmiller said. "And this new kind of military man loses the advantage of being a part of certain traditions of honor in warfare."

He said that too much emphasis is placed these days on independent research and not enough on teaching, where-

in questions of moral values can be raised and discussed. He believes that the teaching process must not only be more with us, but in itself must go back to awakening a consciousness of moral issues. He added that our national leadership must offer an image of moral leadership. It was his belief that a figure like Adlai Stevenson had a unique opportunity to do this, but failed.

The commentator sees no respite from a militaristic philosophy so long as the country is involved in foreign wars. Asked how he would suggest stopping the trend, he advocated citizens and institutions re-examining their values.

"We have to decide which ones are important, and which institutions are appropriate to the production of these values."

"The place for starting this dialog," he concluded, "is among people who are feeling uneasy about the current trend."

He believes that most of the uneasiness is found among the young people, whom he describes as seeking a new morality.

### Alumni Association membership brings:

- Engineering and Science magazine
- Triennial Alumni Directory
- Athenaeum membership privilege



## Rodman Paul, Caltech's Senior Historian, Has Found His Gold Mine In California's Past

Rodman Paul, Caltech professor of history whose specialty brackets the discovery of gold in California and the ensuing 25 years of western mining history, will expand his domain next year with the help of a Guggenheim Fellowship. He expects that a year's leave from Caltech will enable him to produce a draft of a history of the Far West and Great Plains from the Civil War to World War I.

Dr. Paul is already established as the foremost historian of mining in the west; a considerable part of that reputation is based on his first book, *California Gold*, which he developed from his PhD thesis.

His interest in the subject was born during a year spent, at 17, in a boarding school in the shadow of Arizona's Superstition Mountains, where he was smitten with the lure of the old West. When he returned to New England to enter Harvard the next year, he was intent on doing as much work as possible in this field.

In Harvard graduate school in the late '30's he was trained to pay respectful attention to disciplines having an obvious value for the historian: economics and political science, for instance. But he says nobody ever suggested that geology and other scientific fields might be just as important for certain types of history.

When he was in California gathering material on the gold rush, he spent some time in the State library in Sacramento. When the library closed at 5 p.m., he moved up the street to the public library and read until the 10 p.m. closing time.

Depression conditions were still strong in central California during the early '40's, and a popular way of making a little money was to work small mining claims. During the winter months he found the Sacramento library full of men waiting for the rains to stop so that they could return to their claims. They were avidly reading state and federal geological papers. Paul drew up a chair and started reading along with them. From the first, he was impressed by the geologists' concern for the past. Gradually he groped his way through geological findings to an understanding of why the events around California gold mining happened as they did. In geological findings were clues leading to historical explanations.

In investigating early California gold mining, he saw his central task as ascertaining "how gold mining managed to emerge as a great industry from out of the confused, thoroughly amateurish beginning that we call the California gold rush."

Dr. Paul further describes it as "one of the most extraordinary, illogical episodes in man's history."

In spite of the many historians who labelled the gold rush an example of typical mass hysteria, Rodman Paul's geological grounding showed him that the tales that raced across the continent to electrify the East were not exaggerations. Geological discoveries proved that there actually were such extensive surface deposits of gold that any half-baked method of getting it was successful in the first few years of the rush.

His winter evenings in the Sacramento library resulted in a better understanding of his whole thesis subject. And on the strength of his thesis he won a Sheldon Traveling Fellowship at Harvard and headed back to California to do further research and expand his thesis into the book. It was published in 1947, the same year he came to Caltech.



Rodman Paul

Ray Allen Billington, the noted historian now on the Huntington Library staff, feels that Paul, by demonstrating a thorough knowledge of both geology and technology, is the only historian who can write a lucid account of all the early Western mining techniques. Further, it is through his knowledge of this early technology that he is able to underscore the characters of those men who played leading roles.

Billington says that it was Paul who rescued the story of Western mining from "the hands of fact-worshipping antiquarians, irresponsible popularizers, retired mining engineers, and imaginative tall-tale-tellers to reveal its true importance as a molding force in the evolution of the American social order."

In 1963 Paul extended his field to include silver mining and several more states in *Mining Frontiers of the Far West*.

Paul's first two books proved the usefulness of scientific literature in explaining certain types of historical phenomena. He feels that a study of the physical sciences is historically helpful in any area in which exploitation of natural resources has been the chief occupation.

His most recent book is *The California Gold Discovery*, a compilation of all documents written around the discovery of gold in California. Some of the documents are seeing the printed page for the first time. Paul says that his central editing problem was a common one: a great historical event witnessed only by meagerly educated men and women who left few written records, and whose credibility as witnesses was often questionable.

"It was intriguing," he says, "to edit the conflicting original accounts of the gold discovery. A Western historian rarely has an opportunity to deal closely and precisely with the kind of controversial evidence that is commonplace to a medievalist or diplomatic historian."

In the book he will be working on next year he will analyze the histories of the major industries, such as mining, merchandising, stock raising, farming, lumbering, and transportation, of the representative geographical regions, such as the

Great Basin, California's Central Valley, the Great Plains, Puget Sound, the Rio Grande Valley, and the northern Rockies. He believes that they must be studied separately and in comparison before it will be possible for anyone to explain the uneven history of this area as a whole. His studies will include not only geology but geography, meteorology, and soil science.

Dr. Paul says there are both rewards and frustrations in teaching a non-science course (this year: *The Far West and the Great Plains*) at Caltech. He finds the students responsive and stimulating. For the most part they have never come into contact with a person who writes books, and they are curious about the process. He also says that the very fact that they come with little background in history and politics leaves them inclined to ask unorthodox questions, "which often open up entirely new trains of thought—especially for the teacher," he adds.

He admits that it is not easy, being a non-scientist at a place like Caltech. "If you're not careful, you wind up living in two separate worlds: that of your own specialty, which is completely unknown to the science colleagues you see every day, and that of the science-dominated world of your campus life. If you are not to develop problems concerning exactly where you belong, you must cultivate a constructive schizophrenia."

He manages to bridge his two Caltech worlds somewhat by heading the faculty library committee and serving on the committee of academic policy, but the binding essence between the two spheres is, for Paul, the growing field of social sciences within the humanities division and the concern of so many of his scientist colleagues about the interaction of humans in an increasingly complex environment.

200 copies of the proceedings of "The Next Ninety Years," an Industrial Associates conference held at Caltech in March, are available on a first-come, first-served basis to alumni. Send requests to Director of Alumni Relations, Bldg. T-6, Caltech.

## Seminary Students

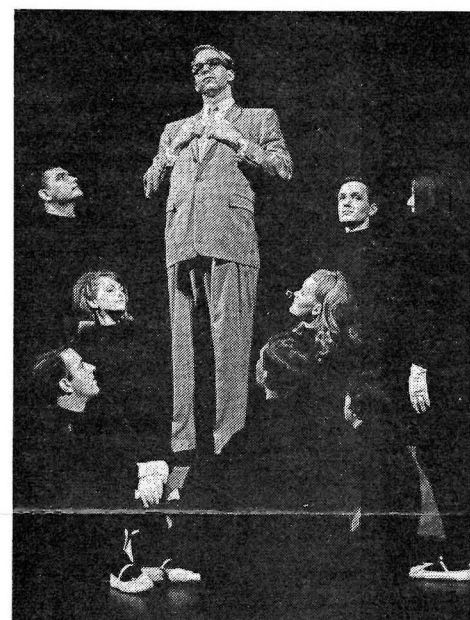
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"Here I see people learning to relate to machines and numbers, not to their fellow men."

"At meals your plate is snatched away if you don't watch it. Everything is on a graceless, let's-get-it-over-with basis. The pleasures of having a meal seem to be unknown. It's as if the students didn't know a meal could be pleasant and leisurely."

"The students who complain about lack of social opportunity at Caltech are not doing much to seek out existing opportunities or make their own."

Burt Housman, YMCA associate secretary, who arranged the visit, declares it's "too bad that a science student's religious education has ended at the third or fourth grade." He thinks the visiting seminary students program advances that level of education somewhat. Certainly there is reason to believe that Caltech students benefit from meeting young men as dedicated to religion as they are to science.



WITH AN ORIGINAL score and libretto and intricate choreography, ASCIT put on a political satire titled "A Game of Chance Played in the Rain" as its second annual talent show. Dan Erickson, '67, is shown in the role of a pompous politician bested by a new kind of political animal: a Caltech grad student.

### 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 .....



## Travel Prize Winners Head For Europe To Interview Youth Groups, Sail, Study Tree Rings, Get 'Organized'

From a record 16 entries in the 1967 Junior Travel Prize competition, four Caltech students will be given funds to pursue special interests abroad this summer. The diversity of the prize-winning proposals once again points up the Caltech undergraduate's versatility.

Jim McWilliams, an applied mathematics major, will sound out the personal political beliefs and world views of youth groups in Holland, Ireland, and Spain. After spending time with politically active young people in Ireland, the Tulsa student will head for Holland where he aspires toward some liaison with a group called the Provocateurs, most of whom are under 25. Their efforts are focused on urban Amsterdam. In Spain he will concentrate most of his activities around the University of Madrid, known as one of the centers of national student politics.

Marshall Schor, a physics major from Visalia, will study and play some of the famous old pipe organs of North Germany and Denmark. He will also investigate differences between new and old organ construction.

Earl Whitehead, a mathematician from Los Angeles, will visit European institutions interested in air pollution, meteorology, and tree ring research. His activities during the past four summers have led up to his '67 summer plans. Under National Science Foundation sponsorship, he studied atmospheric physics at the University of Nevada. He spent the next two summers in Flagstaff, Arizona, making tree ring studies of the rare Bristlecone pine, and studied wind flow patterns around the San Francisco Peaks. Last summer he was assistant field director of the Natural Sciences Institute at Durango, Colorado.

Whitehead looks forward to his European travel if for no other reason than that he has never been east of Colorado, and has never flown on a jet plane.

Sandy Pokras, a chemistry major from Encino, may have the most physically active summer. He has arranged to sail with members of yachting associations in nine European countries. Pokras' enthusiasm for sailing is particularly noteworthy since, as he says, his "most intimate experience with water was a rowboat or bathtub before coming to Caltech and joining the sailing club."

The Junior Travel Prize was an important honor in Caltech student life in the Institute's earlier days, when physicist Carl Anderson and film producer Frank Capra, as undergraduates, were among the winners. According to Dr. Anderson, it was done on a different basis then, being awarded purely as a reward for high scholastic ability. The resulting trip to Europe was done in the old style of a rigidly scheduled cultural grand tour, with emphasis on cathedrals and museums.

The Junior Travel Prize dropped into limbo during the '30's and '40's. It was reactivated in 1957, and the basic philosophy changed. According to faculty committee chairman John Richards of the chemistry department, the idea of the prize is to enrich a student's life by helping him to expand his special interests.

In the fall of the school year the prize committee extends to approximately 30 juniors, who stand highest in sophomore scholastic ranking, invitations to submit summer travel proposals. The committee then invites those students who, in its view, have submitted the most interesting proposals to a series of informal meetings.

## Alumnus William Stewart, Los Angeles County's Official Green Thumb

If it's growing in your southern California garden, chances are it has been grown before by the Los Angeles County Department of Arboreta and Botanic Gardens. If it's not growing in your garden and you can't figure out why, or if you're itching for something exotic to take the place of the daisies, hie yourself over to see what William S. Stewart, PhD '39, and his crew have waiting for you.

As director of the Arboreta and Gardens, Dr. Stewart is in charge of the Arboretum in Arcadia (adjoining Santa Anita Race Track), Descanso Gardens in La Canada, and South Coast Botanic Garden now taking form on a land-fill site in Palos Verdes. The enterprise, county-run and partly state-owned, is multifaceted. It conducts research (virus inhibition in plants, fire-retardant ground cover, fungus prevention, effects of air pollution and radiation on plants); test-plants new varieties to see how they will grow in various environments; educates with classes (children and adult) and tours (more than 25,000 a year); and provides variegated oases for more than 850,000 visitors a year.

The Arboretum, where Dr. Stewart makes his headquarters, is the only botanic garden in the southern part of the state that has a collection of plants from all over the world; he has collected quite a few of them himself in the 12 years he has been director. In 1959 he filled up his bag in Australia while there as a Fulbright lecturer, brought more home after an exchange program took him to South Africa in 1961, and collected in India, again as a Fulbright lecturer, in 1964.

Before coming to the Arboretum, Dr. Stewart had been chairman of the department of horticulture at the University of California Citrus Experiment Station in Riverside. Prior to that he was chairman of the department of plant physiology of the Pineapple Research Institute in Honolulu, which was responsible for research in fertilization, weed control, and plant hormones for all of the pineapple companies in Hawaii.

Dr. Stewart's research specialty in plant



William S. Stewart

physiology is plant hormones. Of course, as a triple director now of research, education, and finances, he has been forced to cut down considerably on his own research. Nevertheless, he still gets away from the Arboretum occasionally to do some work at Caltech, where he has been a research associate since 1955. His current interest is the "nervous systems" of certain plants that respond to physical forces by quickly folding their leaves. He would like to determine if the mechanisms occurring in such plants are similar to those in animal nervous systems.

Plants at the Arboretum are grouped

according to geographical region of origin (including a jungle in constant demand for movies and TV). The gardens get new varieties from far away through the medium of seeds exchanged with other arboreta. "We've been able to exchange seeds with practically every country but Red China," states Dr. Stewart. "Our own list has about 400 varieties on it each year. After all, our number one research project is still plant introduction and testing."

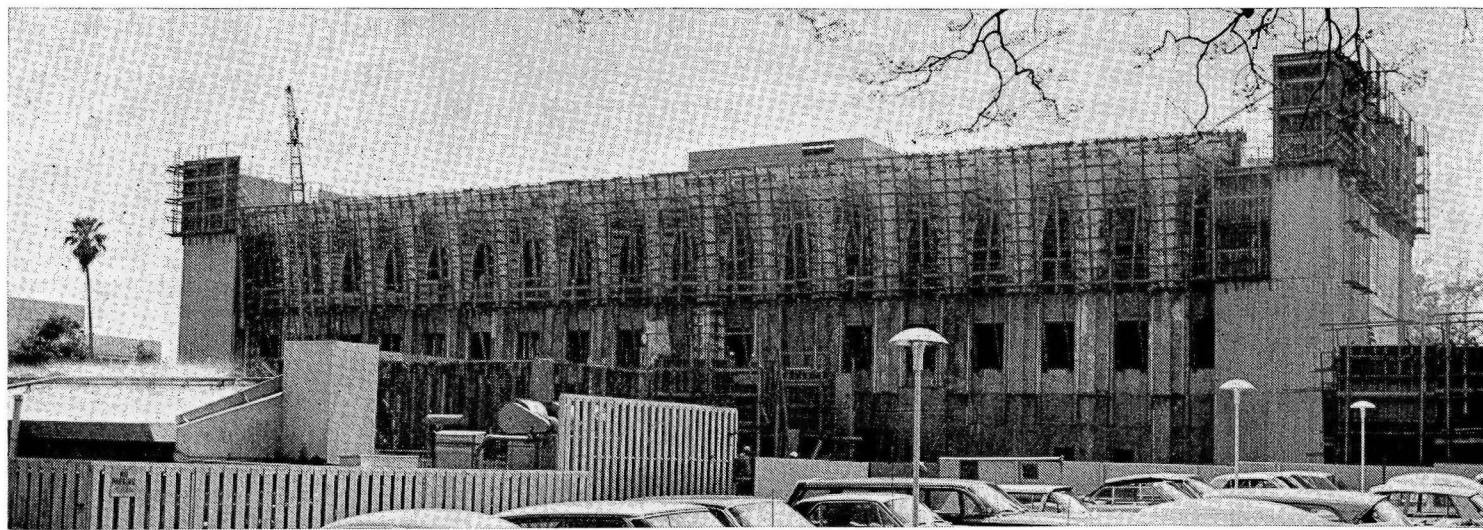
There is also an herb garden, historic rose garden, specialized flower gardens, and four crowd-attracting demonstration gardens set up in conjunction with *Sunset* magazine. These are designed around four hypothetical families: a boat-in-the-garage, we-don't-have-time family; three kids and a dog; outdoor entertainers; and amateur horticulturalists with time on their hands.

"The demonstration gardens are supposed to be essentially a showcase where we can show people how to use the plants that we introduce," says Dr. Stewart.

The other major part of the department's operation, Descanso Gardens, specializes in flowering shrubs, particularly camellias (100,000 bushes) and roses (8,000 bushes).

The Arboretum hopes to expand its laboratory-type research operations and is looking forward to getting a research building to enable the projects currently being carried out all over the property to be collected in one place. Even so, Arboretum researchers will probably continue to take advantage of the resources of places like Caltech and the University of California at Riverside to supplement what is available on-site. Among other things, there is nothing quite like the stimulation of a university faculty.

Dr. Stewart moves through the Arboretum as if it were his own back yard, with a cheery greeting ("Good morning, Charles. How do you like summer?") for any of the staff of 70 he meets. The staff, in turn, must be the happiest group anywhere; they obviously enjoy working in a supergarden.



WHILE ALL EYES have been focused on Millikan Library as it grew prominently in the middle of the campus, two other buildings have been digging their roots in on the campus periphery. The Noyes Laboratory of Chemical Physics (above), on the north side of San Pasqual across from Church Laboratory, will be the largest building at Caltech (about 90,000 square feet). A new central plant (below) to meet the growing campus' power needs is being erected adjacent to the athletic field on the southeast corner of Wilson and California. Both are scheduled for completion in the fall of this year.

Winners are chosen from this group.

Over the last ten years, winners have pursued a variety of activities, ranging from the study of the martial arts in Japan to scuba diving for buried antiquities off the coast of Greece. There is talk that further funds may be requested from interested donors in order to expand the whole operation. Anyone to study architecture on Venus?

