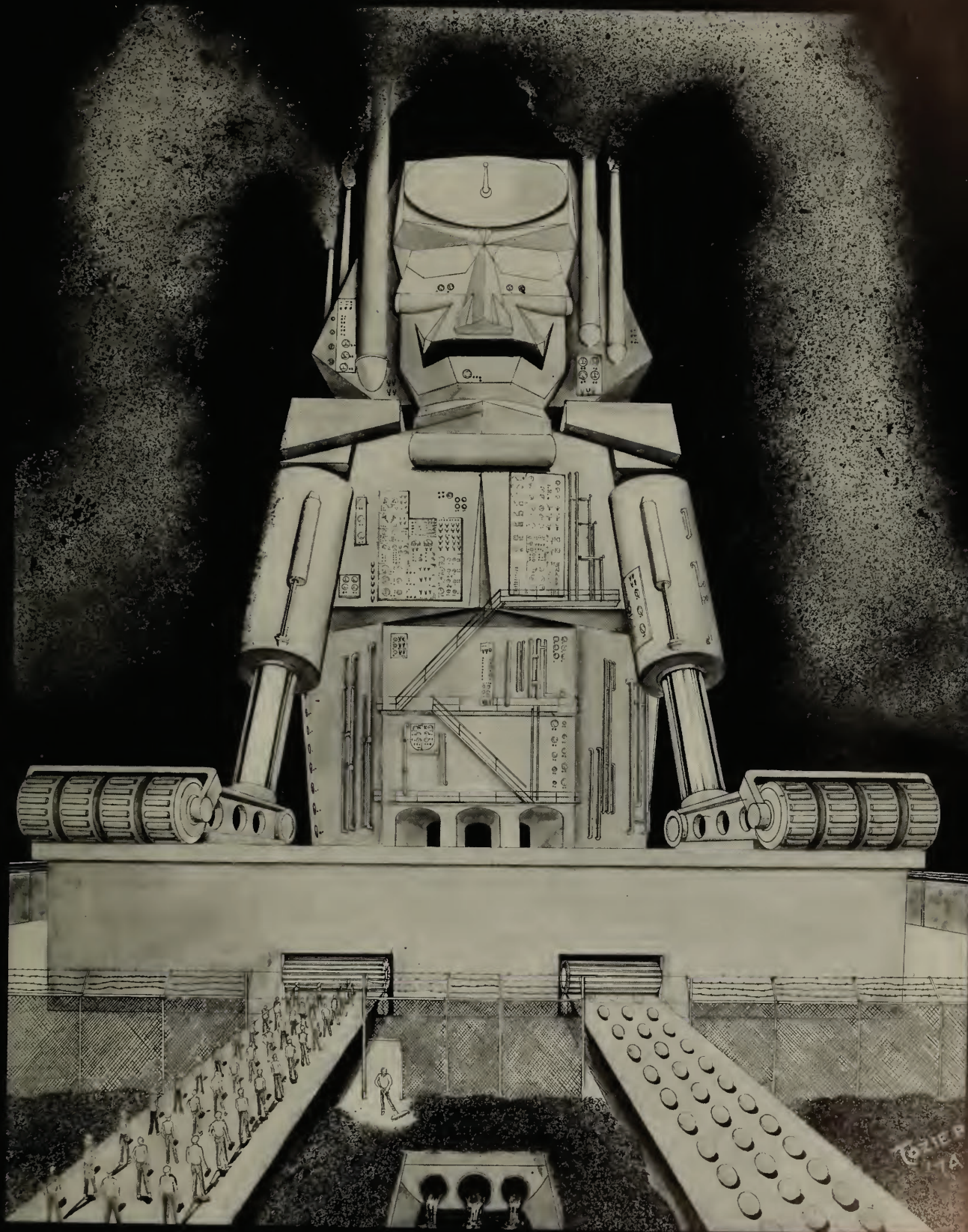


August 1974

# WPI Journal



Energy: where's it going to come from?



# WPI Journal

Vol. 78, No. 1

August 1974

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## 13 seniors confront the administration

A quiet revolution surfaced on campus this spring. A small group of students, all seniors and campus leaders discovered last winter that they *all* felt that students get the short end of the stick in dealing with the WPI administration.

"We decided that we would have to take the initiative to improve the situation," says Len Brzozowski, leader of the group. "In a rapid four-year stay at WPI, a student doesn't even begin to become aware of many of the realities of our campus until senior year. By that time, either it's too late to try to initiate change or the graduating class is too wound up in job-hunting to care. The 'Well, it's not our problem anymore' syndrome is the rule rather than the exception. We were determined not to let this happen to us."

So Len and John Young, Lee Turner, and Garry Balboni started talking with other students to determine a viable course of action. Len freely admits, "some of our early thoughts were based in anger and disgust and would have served no one." Peter Thacher provided a moderating influence on the group, which responded to his concern for not making false accusations, not being spiteful and contemptuous. The group's concerns ranged from the cost of food on campus to the lack of communication among the WPI community.

By the beginning of April, the group had decided to proceed with factual exposes of some of the practices they felt were unfair, to meet with the President's Committee, to publish a series of detailed articles and reports in the campus newspaper, and finally to

meet with individual members of the administration about specific problems.

The group had been operating quietly, and the first public indication of their existence came on Tuesday, April 30, when the entire front page of the *WPI Newspeak* was devoted to an open letter from the group, by then numbering thirteen. The group identified themselves as those "responsible for the big social weekends, the Class of '74 kickoffs, for the operation of many clubs, the student government, campus hearing board, the IFC, and several other bodies. We are . . . just beginning to grasp the nature of this institution, its business functions, its power structure, its services, and the sources of support for our endeavors as well as the sources of bureaucratic doubletalk and noncooperation which only serve to make our efforts more difficult."

The letter went on to discuss specific, representative gripes and problems. There was the \$192.75 charge by Buildings and Grounds for the use of Alden Memorial Auditorium one evening, which by the student's reckoning was \$125 too much. There were complaints about the food service on campus, charging that one could eat better for less at certain local restaurants which operated at a profit. There was the lack of communication, and where are faculty and students supposed to meet out of class? The only apparent answer, the Pub, was described by the thirteen as "suffering from the same cancer that infects the snack bar." In the same vein, groups of students had attempted, during the year, to invite faculty members to lunch and dine with them on occasion. The campus food service was asked to contribute the faculty member's meals (\$2—vs. the \$1.50 charged in the faculty dining room for allegedly better food), but they refused. Dean Grogan solved that problem by dipping into one of his own budgets.

The long list of complaints, small and large, added up to a serious problem. But it was a problem that they wanted to solve, not ignore.

*"In our opinion, the students on WPI's campus are effectively nothing more than second class citizens. This is in spite of efforts on the part of some Boynton administrators and because of some other Boynton Hall inhabitants. . . . The 'Tute' has been quite good to us though, and for that we are thankful, but we cannot accept the way the college is and some of the ways it is being run. There are so many crying needs, yet so much blatant waste and bureaucracy. We believe that WPI is one of the few engineering schools in the world that is really trying to be innovative and we feel that its objectives are both vital and noble. Yet we are cursed with less-than-innovative administrators, back-stabbing politics, kingdom-building, and cases of people working against each other. This institution's growing pains are intense right now, and we are not at all sure that even our lofty goals and high philosophies will get us through. Brown University, which possessed an innovative program similar to ours, just this year threw in the towel and retreated to a more conservative and rigid program. We want very much to insure that WPI will not suffer a similar fate."*

The letter recommended action that would be felt: *we have decided that we simply cannot justify in our minds making any contributions to the general WPI Alumni Fund when we graduate this June second. Instead we shall submit only restricted contributions. . . . This is one of the surest ways to help formulate school policy even as an alumnus. We have just not seen it demonstrated that those who administer the school policies have a good perception of how best to use those funds in a*

*manner which meets the need of the student body . . . We feel it's about time that someone indicated the urgency of the situation . . . We also wish it to be known that we stand ready now, in four weeks, or in ten years, to help WPI in any way that we can to effect whatever changes are ever necessary to make this a better college for its students."*

Not heralded in that first *Newspeak* letter, but voiced to the President's Committee and later published, was a complaint about the content of the *WPI Journal* (reprinted below in Feedback).

The thirteen seniors, (including, besides those already mentioned, Bill Delphos, Ted Ledden, Mike Boyden, Tom Burns, Dave Demers, Jim Rubino, Dean Stratouley, and Dave Lapre) were cordially received by the President's Committee, which included President Hazzard, Vice President and Dean of Faculty Ray Bolz, Vice President for Business Affairs David Lloyd, Vice President for University Relations Thomas Denney, Dean of Student Affairs Donald Reutlinger, and Director of Physical Planning and Plant Services Gardner Pierce; Steve Hebert, secretary-treasurer of the Alumni Association, was also at the meeting.

The students presented their case and encountered, in Brzozowski's words, "a responsiveness which I have not seen in some time. Each administrator seemed concerned about the problems we brought to his attention." Vice president Denney was impressed with the concern the students showed for WPI and the entire campus community, and with how well they had done their homework. "These students have done a real service to WPI. They have brought out some problem areas which we had relegated to the back burner, so to speak, and given us what is perhaps a more realistic perspective on campus life from the students' point of view. Most of their suggestions and proposals were constructive and really helpful, and I hope we in the President's Committee can maintain a continuing dialogue with them. Their input is important and valuable, and it is too easy for us not to give proper weight to students' views when we are too well insulated from them."

In the weeks that followed this

meeting, the student members held talks with individual administration people about the specific problems. Agreements were worked out regarding hall rental charges and the campus Pub, which has been speeded up with the help of some money released ahead of schedule by WPI, a restricted gift from the Class of '74, and the offer of students to help with the work.

The juniors and sophomores who were recruited by the original thirteen plan to continue their efforts in representing the student viewpoint to the administration. They will meet periodically with the President's Committee so that their ideas and view will be accurately presented to those charged with making policy.

The thirteen seniors are now thirteen alumni, and their part in the situation has changed, their leadership roles passed on to the Class of '75. About the experience, Len Brzozowski feels pleased. "I think we accomplished about everything we could realistically have expected to this year. But I sometimes wonder if our concerns about communications and a student-centered campus were really understood. I hope so."

## The greening of the campus — but where are you going to park?

With the (so far temporary) closing of the West Street and the virtually complete elimination of vehicle access to the East Campus from Salisbury to Boynton, there has been a real change in attitude among the WPI staff. Most people's reaction is resentment and/or disapproval. Before, a campus visitor was reported to have said that the college staff could park closer to their offices than he could to his house. That's all changed, with some 45 fewer parking spaces available, but the real crunch is yet to come; right now it's only inconvenient. Come September and the return of the students, things are going to get crowded and the campus police are likely to have a field day ticketing parking offenders. Come December and the return of ice and snow, the climb up Boynton Hill from the lower reaches of the Gordon Library parking lot may become a real adventure.

It used to be that you could hardly see what certain buildings really looked like, because they appeared built on a foundation of automobiles. Now everything is bare; being summer, of course, there isn't much pedestrian traffic to make the place look lived in. The roadway in front of Boynton Hall was sawn in half lengthwise, and the outer half of the paving removed and grassed over. The ex-parking area along Washburn facing Salisbury has been similarly depaved.

If you come to campus now, there are precisely four places you can enter (vs. the previous nine), and in no case can you get very far. Visitor parking is still on the West Campus, but there is only one entrance (off Institute Road between Daniels and Riley) and one exit (alongside Morgan). No traffic is permitted on the circle between Alden and Higgins, the one with the flagpole and the beech tree in the middle. There is also an entrance off West Street (which ends at that point) to the small parking lot behind Goddard.

On the East Campus, you can enter off West Street between Atwater Kent and Salisbury. That deadends in another small parking lot. The last place left is the Gordon Library parking lot, entrance off Boynton Street as before. This lot has been extended to the south, where it joins the road coming down the hill. No traffic is allowed on the upper hill road.



## Fraternity life supported

In response to your recent issue devoted to WPI fraternities, I would like to point out that *fraternity* means *brotherhood*; and that fact is no less significant by virtue of its being so obvious. Brotherhood presupposes a

commitment to subvert individual interests in pursuit of mutual benefits. This sort of spirit seems to be lacking at WPI.

The old-style curriculum was highly standardized and regimented. There was little flexibility or opportunity for individual expression. The Plan is radically different in that it has few requirements, is almost completely flexible, and allows each individual to march to the beat of his own personal drummer. I submit that such a fundamental change in educational philosophy coincided with a fundamental change in student attitude.

Evidently, today's student is more self-contained and less of a "joiner." He seems to shy away from organizations and institutions as a threat to his individuality. Witness the coincident decline of such campus activities as student government, the campus newspaper, etc., with that of fraternities. Such an overemphasis on individuality is anathema to school spirit, fraternity spirit, "social responsibility," and to the concept of the "humane technologist." Indeed, such an attitude breeds paranoia, elitism, and a lack of the "common touch."

Fraternity life, while not for everyone, is completely consistent with the educational goals of the WPI Plan. Fraternities are not anti-intellectual; rather they are non-intellectual in nature. Fraternity living serves to develop interpersonal rather than academic skills. It complements regular studies much as does project work.

Fraternities are not anti-school-spirit. Historically, they have provided the bulk of class officers, intermural athletes, and heads of professional and honorary societies and other campus organizations.

Nor do fraternities foster immaturity or "locker-room mentality." Immature or destructive behavior is usually more prevalent in the dorms. In fact, fraternity living promotes responsibility and maturity due to the cooperative nature of the experience.

More importantly, fraternities provide a "supportive group atmosphere" which tends to stabilize otherwise turbulent student life. The institutional nature of the fraternity helps maintain a dynamic equilibrium which allows for growth and change while serving as a frame of reference. Fraternity living doesn't foster parochialism or shorten horizons. It serves as a foundation, not an anchor. It's something to build on.

*Jack Zorabedian, '72  
Saratoga Springs, N. Y.*

## The Current WPI Journal

An area deserving greater effort is the *WPI Journal*. Upon receiving the *Journal*, the alumnus seeks information concerning his Alma Mater and the fellow students he knew so well during his years here. The parents of the students look for information about the school's academic and physical growth which distinguishes WPI from many other colleges, or for information on their sons' or daughters' friends. In the current [February 1974] issue of the *WPI Journal*, the alumnus and the parent find a small amount of the information they seek and discover a large amount of completely unwarranted and ludicrous pictures of ice, a technical report on the engineering of snow skis, and a small amount of alumni news.

Photographs of ice on the WPI campus are pleasant and should be displayed in a photography show or hung on many of the campus's blank walls, but these photographs should not be the main portion of the *WPI Journal*. One or two pictures of WPI in winter would be appropriate, but so many photographs with so little news on WPI or the alumni tend to lead the reader into believing WPI and its alumni are inactive and that the only means of filling up the publication is pictures.

The technical report on the design of snow skis by Brian Kashiwa '73 in his article, "Skis: They Aren't Barrel Staves Anymore," is another example of the *WPI Journal's* failings. The alumni and parents are interested in what recent graduates are doing, but such a lengthy report is unnecessary

and certainly not the correct material for a feature article. The feature article ought to contain information concerning the greening of the campus, alternative plans for WPI's educational or physical growth, the new projects being worked on, this year's excellent job market for engineers, how well the Plan and the exchange programs with colleges overseas are working, the continuing problems and advantages of the Consortium, the exchange of teachers within the Consortium, or any of the many endless topics which show WPI is alive and striving to become a better, more exciting site for learning.

Finally in an area of great concern to both the alumni and the parents of students, the news of the alumni, the *WPI Journal* is far too concise and terse. Rarely was more than five lines of a narrow, printed column devoted to only one alumnus. The *WPI Journal* needn't be so brief, and it really ought to elaborate on the alumnus's news. The magazine should state not only the alumnus's new job promotions, new children, and marriages, but it should also include the alumnus's new address, interests, extra curricular activities, recent trips, or any other peculiarity which would be of interest to his classmates.

If the current issue of the *WPI Journal* is a fair representation of the staff's goals, then these goals must be changed. The *WPI Journal* must be changed into a source of information concerning WPI and its alumni; it should not remain a picture book with a technical report as a feature article. Many other schools and colleges produce viable alumni publications. Why can't WPI? According to the magazine's poll, the *WPI Journal* (not the WPI newsletter) is the "best single source of information about WPI" to 77 percent of its receivers. If this publication is a main source of information on WPI, then the *WPI Journal* has a serious responsibility to its recipients and ought to report the changing educational and recreational life of the students and the alumni. WPI is not dormant and neither are the alumni; however, the last issue of the *WPI Journal* is.

*The Committee of  
Concerned Seniors  
WPI*

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# Where's it going to come from?

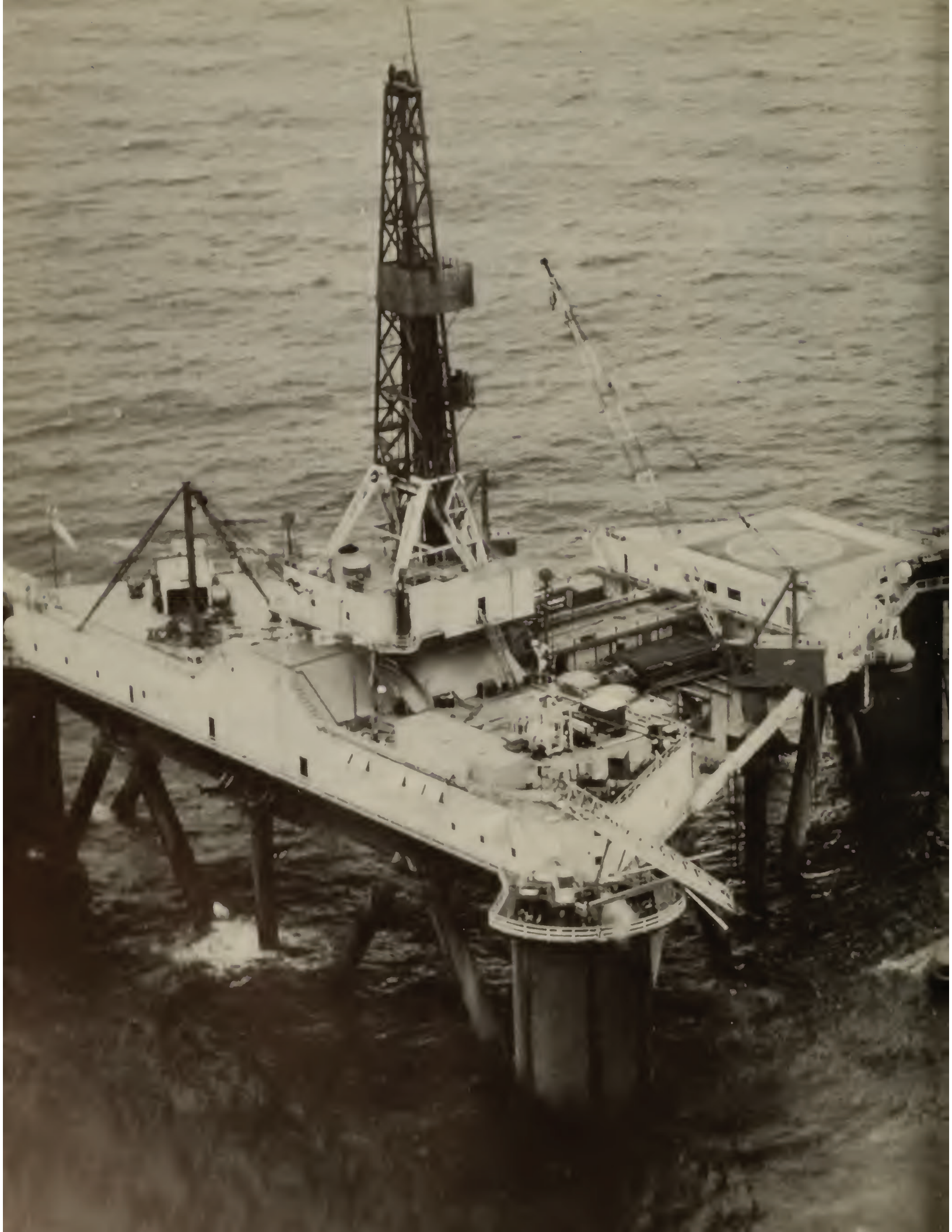
## Energy Sources and Resources

ENERGY IS ABOUT as overworked as any word can be these days. Perhaps only Watergate is heard more. First there was the gasoline shortage predicted for last summer, which mostly never materialized. Then came war in the Middle East, the Arab oil embargo, and *Lo and Behold!* we had the "energy crisis" on our hands, and we all spent last winter hunting for open service stations or waiting in line at the pumps. But Secretary Kissinger worked things out in the Middle East, the gas stations stopped keeping banker's hours, and the federal government told us energy was now only a "problem." Of course energy, in whatever form we got it, suddenly cost a heck of a lot more.

But it's more than a consumer problem. As engineers and scientists and businessmen, as inventors and mechanics, as people living in an age whose very fabric has been shaped by technology and the Industrial Revolution, as people whose lifework is inextricably tied to technology — energy is particularly important to us. Indeed, we can define technology in its broadest sense as the ability to produce and use energy — to extract the most energy from available resources, to use that energy most efficiently to meet our needs and wants.

So WPI, which is committed to a technological society, has a special concern with energy. More than a year ago, before the effects of limited energy resources were apparent to many, the mechanical engineering department at WPI began assembling a year-long colloquium with noted speakers discussing various aspects of energy production and utilization. Professor John Mayer, whose interests encompass both antipollution automobiles and nuclear reactors, put together a series of nine lectures which, in their entirety, constitute a remarkable statement on the energy situation.

With this issue of the Journal, we are publishing two articles derived from that ME colloquium, both dealing primarily with non-nuclear energy resources. In the next issue, we plan to present a further series of articles dealing with the problems and promise of nuclear energy.



# “Don’t sleep with two women in your bed”

## Perspectives on Energy Production

By Dr. Edward Teller

*Dr. Edward Teller was born in Budapest in 1908. He received his doctorate from the University of Leipzig in 1930, then taught at Göttingen, Copenhagen, and London before coming to the U.S. and George Washington University in 1935. He was a theoretical nuclear physicist until 1939, when the discovery of controlled fission and the menace of Nazi Germany and imperial Japan drew him into work on atomic explosives. His wartime assignments took him to Columbia and then the University of Chicago. After World War II, he continued work on atomic weapons, believing their development necessary for world peace. This work has given him the sobriquet of “father of the hydrogen bomb.” Dr. Teller is currently University Professor of Physics at the University of California and associate director for physics at the Lawrence Livermore Laboratory, the nation’s second weapons laboratory, which he helped establish.*

I DON’T THINK it is right to speak of an energy crisis, and certainly not in the past tense. If there was an energy crisis, the real difficulties are yet to come. Oil has become the prime source of energy throughout the world, partly because it is easily transported, partly because at least for the time being it is accessible (or was so until recently), and partly because our instruments to use energy have been adapted to oil so therefore we have a tremendous capital investment in oil.

To appreciate what has happened and what is likely to happen, I would like to mention to you one of my great accomplishments. I have invented a new unit. I don’t like to talk about billions of barrels — it’s a little hard to imagine them — instead I talk about A units. An A unit is the amount of oil reserves that the Arabs have. Now, the known reserves of the rest of the world are one-half of an A unit, and what is really accessible in additional oil is unknown. It is clear that, within a year, the price of oil has risen by a factor of four. That has caused some slight disturbances in the United States. The effect in Europe and in Japan is much more serious. The consequences in developing countries like India may be tragic because their new crops, which yield more per acre and which they need for survival, will not grow without nitrogen-based fertilizer. And in order to produce these fertilizers, one needs gas or oil, which the Indians could afford before the recent price rise; whether they still can afford them is more questionable. The starvation of millions of people is certainly a horrible effect, compared to which anything we have gone through becomes insignificant.

So here we have an energy problem which is made more difficult because, with the world-wide growth of energy demand — and most of this growth is not in the United States — the shortage is apt to become more severe. Now, the solution to this problem, in my opinion, is in one field and essentially only in one field — technology. Technology can solve the energy shortage, and furthermore can solve it without deterioration of the environment. The question is only, How? The possibilities are many, and the practical possibilities are more than I can mention here in a way that will make sense. Whatever I omit, I omit because I believe that these are not practical solutions.

## Oil and Gas

I propose that there are essentially four ways in which the energy shortage can be alleviated and, in the long run, remedied. The first of these is to look for more oil and more gas. Today we have 1½ A units. Perhaps the total accessible oil in the world is not more than another 1½ A units, altogether 3; perhaps it's lots more.

Let me mention an exciting possibility. The continental shelf is an extension of the continent under the ocean, a shallow part down to a depth of roughly 800 feet, which was laid bare in the ice ages. Oil has been produced by decaying living things where the decay occurred under conditions practically excluding oxygen. People have been looking at the continent and the shelf as the main regions where these decaying living products have been deposited over many millions of years. At the limit of the continental shelf there comes the continental slope, a very steep section which goes down to a depth of a few thousand feet. And beyond that comes the continental rise. (I don't know why they call it rise when it goes downward; but if you look at it from the point of view of the abyss, the deepest part of the ocean, then it is indeed a rise.) It is believed that this rise was formed by loose material from the continental shelf being shaken down. It has been found that on the continental rise there are great masses of sedimentary deposits, and in these deposits, you find the kind of trap in which oil accumulates, like soil domes. And drilling near such soil domes, oil has actually been found in the Gulf of Mexico at a depth of many thousand feet. There are those who believe that more oil is on the continental rise. There may be 10 A units there. If so, it will be quite a technical problem to produce that oil cheaply. It will have to be done with the help of apparatus which works by remote control and under very high pressure.

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**In all the oil fields where the oil has been pumped out, the "dry" wells still have two-thirds of their original hydrocarbon.**

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There is another question, a very important one: What about the American continental shelf? Along the eastern seaboard, in the wide expanses of the continental shelf which essentially belong to Florida, there is no drilling on both sides of Florida. Drilling has been essentially forbidden for fear of oil spills. These oil spills are exceedingly unlikely. The oil spill in Santa Barbara never should have occurred. One of the simple rules, to have a casing going all the way down, was violated. There is also a rule which says that an oil company that wants to drill, in whichever region, has to make a deposit of \$32 million which the company forfeits to that region if there is a spill. But on top of that, the permission is simply not given. Now having said that, I would like to ask you to guess how much money we spend, in the whole of the United States per year, for the purpose of cleaning up an oil spill if it occurs. The figure is \$2 million. It

is incredible. It might be justified to spend so little if there would be no hope of success, but there is. One can corral these spills. One can sop up the oil. The best way may well be to drop bacterial cultures, bacteria which have the peculiar habit of living only on oil — funny taste. However, these poor oil-eating bacteria starve and die off, and if there is an oil spill, there are no bacteria to eat it. It takes a year until they multiply back and then, in the end, Santa Barbara is clean again. We could have these bacterial cultures ready to go if there is an oil spill. And there is hope of cleaning up the oil spills promptly. Here is a little piece of technology which should be pursued and isn't.

There's still another way of getting oil. In all the oil fields under our feet in the United States where the oil has been pumped out, the "dry" wells still have at their bottoms two-thirds of the original hydrocarbon. There are various reasons why one cannot get at that. The most common is that what remains is too viscous. One of the possible remedies is called fire drive. You pump air down one oil well, light a fire and try to pump out of a neighboring well. The fire will heat the neighboring oil and decrease its viscosity. Furthermore, as the oil burns it makes carbon dioxide, which is sucked ahead of the flames and dissolves in the oil. And oil in which carbon dioxide is dissolved has a lower viscosity still. One probably could get a second third of the oil reserve this way. Good work by the oil companies is proceeding, but this sort of thing should be encouraged.

Wherever one finds oil, one usually finds gas. We need more gas: we seem to be running out of it and, unlike oil, gas is not easily transportable. To liquify it and transport it is very expensive, about \$1 per thousand cubic feet of high BTU oil, where the regulated price today is approximately 27c. We could produce more gas from tight formations, formations with small pore sizes which have to be shattered by hydraulic fracturing, by high explosives, or by nuclear explosives. All three methods have to be tried. Research of this kind is apt to pay off more than 100 to 1 if it is successful. I believe all three, but in fact only one will be successful, and one does not know which approach will be successful, because whichever of the three is cheapest will get rid of the other two. But nobody can predict which will be the cheapest, which will be the most adaptable. What has to be done is to proceed on all these fronts because here is the possibility of much more oil, much more gas . . . though not enough. So this is the first step. It could come at the earliest time. It could suffice for a few years, but where do we go next?

## Other fossil fuels

So the second point in the program which I am recommending is to utilize other fossil fuels. These can be used in a variety of ways. I want to zero in on the method which I believe is the cheapest and best, the *in situ* utilization of these resources where we convert the fossil fuel into something that's usable right where the fossil fuel sits.

In the case of coal, this has been tried, it hasn't worked, and we know why it hasn't worked. You pump in air or oxygen in one well that you have sunk into a coal field and you try to draw out gas out of a neighboring well, having added water and using the old city gas process according to which coal and high pressure steam will give hydrogen and methane and carbon monoxide. Now let me discuss how it works if it works well . . . and it usually doesn't. You sink a



well to a shallow coal vein only a few feet thick and you pump in oxygen if you want high quality gas, or air if low quality is sufficient. (It's just as good as the high quality gas, but the nitrogen remains in it and dilutes it, and then it becomes too expensive to pump around in pipe lines. You have to use it on location.) Now you try to pump out here from another well. What happens first of all is that the whole thing is shallow, so you can't put in high pressure steam. Otherwise it blows up. Second, if the burning begins, it proceeds in a funny profile. It burns out here and there but then the gases rise and only the top of the field burns. And even that doesn't burn completely, because the combustion goes around the regions which are less permeable. You will find fingers which extend from one well to the other, and the process is uneconomical.

What should be done, what my colleagues in Livermore are trying, is to go to Montana or Wyoming where there are deep coal layers which are 50 or 100 or 200 feet thick, and which are not mined because they are too deep. Now we start by planting high explosives, one ton of them. An explosion of this kind at a depth of 500 feet or more will just tickle your soles if you stand right on top of it, so there is no trouble about it. With these explosions, as we found out from nuclear explosions in Nevada, we can reduce coal to rubble with caves in between. Now we pump down again, let us say, oxygen and try to saturate the top with oxygen and light it. We light it throughout the whole surface of many, many acres so that the top is burning. The flame will not spread farther down until the top has been consumed. This way gravitation works for us and we can burn essentially all of the coal; furthermore, we now have a head of 500 feet of water, which gives enough pressure to operate where the chemical reaction will best proceed.

Maybe this process won't work, but it should be tried. We had the hardest time trying to sell it, and we now have \$3.6 million to try it next year, enough to try it in one location. It should be tried simultaneously in a dozen locations of different properties. We believe we can make gas this way, not for the regulated 27¢ but for 50¢. This is cheaper than

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## You can easily get confused about oil shale, because it is not shale and it contains no oil.

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bringing in the gas from abroad. This is cheaper than digging up the coal from below. This does not have environmental disadvantages. It does not endanger the miners and it essentially does not hurt the environment. There might be, if we succeed, some subsidance, but we are not going to destroy the vegetation on the surface. What's most important, we are not going to import the one ingredient that really disturbs the environment — man. If we wanted to mine the coal and then convert it in man-made steel vessels, we would need plenty of water, and in addition to the 300,000 souls already living there, a million more would have to go into Wyoming; strangely enough, the people in Wyoming don't look forward to such ample company.

There is a similar situation with respect to oil shale. (You can easily get confused about oil shale because it is a material which is not shale and it does not contain any oil.) Instead of shale it is essentially a calcium carbonate — limestone. And it has hydrocarbons which are not oil but which will become something like oil when you heat them to several hundred degrees. You do the same thing as I described to you in the *in situ* production of gas from coal. It is beautiful. First of all, you don't want to pump in oxygen, you pump in air — because what you are going after is not gas but oil, and air will not mix with oil. Second, you omit the water. You don't need the water. You dry it up. Thirdly, oil shale deposits come in phenomenally thick layers. There is a region in the northwest corner of Colorado, quite desolate, where you find these oil shale deposits in a thickness of 2,000 feet. The deposit in that one place alone amounts to four A units. Now in this case if you want to do it cheaply you should make a nuclear explosion below the oil shale layer. In the case of coal I did not propose it because the layer was too thin. Such a nuclear explosion 2,500 feet below the surface will make a cavity 200 feet across, relatively small, filled with rock vapor and carbon dioxide liberated from limestone. Then, as the vapor cools the roof collapses (we have seen it many times at our test site in Nevada) and this continuing collapse extends upward maybe 800 or 1,000 feet. Now you have rubble there forming a natural rubble chimney, a natural retort in which the process can be executed. We estimate that we could make oil for approximately \$3 a barrel by this method in ample amounts. We haven't been allowed to try it, not even once. Environmentalists should like it because it gives minimal environmental disturbance. They are opposed to it, perhaps because they think of a nuclear explosion as a nuclear explosion and, of necessity, evil. So this is the second possibility, the *in situ* production of gas and oil in a vault. We could have plenty and both could be produced relatively cheaply. \$3 per barrel and 50¢ per thousand standard cubic feet are costs which are pretty close together in dollars per calorie.

## Nuclear Reactors

Now, a third approach is electricity produced with the help of nuclear reactors. Some people raise the false objection that we are going to run out of nuclear fuel and therefore we need something very difficult and very new — the fast breeder. I used to think this was a really important project... but we've been trying to get it going for 29 years and it hasn't worked yet. I think there's a lesson there.

About thermal pollution we have an expert, and the expert sits in the right place. She is Dixie Lee Ray, head of the Atomic Energy Commission, and she happens to be a limnologist, a person who studies the fish and the spinach to be found in lakes. Her remark on thermal pollution is that the fish are much more adaptable than most people think and she wishes the environmentalists would be as adaptable as the fish.

Now we must deal with the radioactive hazard in normal reactor operation. One of my colleagues at Livermore, Dr. Tamplin, went to a hearing for the Dresden III reactor in Illinois, and protested. An AEC employee asked him, "Dr. Tamplin, from which do you think you would get more radiation — from leaning up against this reactor for a full year or from your habit of sleeping with your wife each night?" Well, Dr. Tamplin was a little confused. So the AEC guy explained, "I don't want to imply that your wife is particularly dangerous, but she, as all of us, has some potassium in her blood and some of the potassium is radioactive and of course you get more radiation when you are next to her than from your own potassium. So for the sake of comparison, the reactor or your wife?" Dr. Tamplin still didn't know. So the AEC man went home and wrote a report, which fortunately he did not classify (I got a copy of it). He describes all this and then he says, "I made the calculation and I found that one gets a little more radiation from Dresden III, and therefore I will not recommend to the AEC that each married couple should purchase twin beds. However, from the point of view of the radiation hazard, I warn against the practice of sleeping each night with two girls. Then you get more than from Dresden III." So he has neatly bracketed the danger from Dresden III. I think I have answered the normal radiation danger from reactors on the level which this worry deserves.

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**Therefore I will not recommend to the AEC that each married couple should purchase twin beds. However I warn against sleeping each night with two girls. Then you get more radiation than from Dresden III.**

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The rare accident that may liberate most of the radiation of a reactor is a much more serious affair. It could kill thousands of people. It could shorten the lives of many more thousands; but, what is worse, with the present radiation hysteria literally millions of people would imagine they were dying. This is something that never must happen. So, one has to prevent these accidents, even though reactors can behave in all kinds of surprising ways. I have been chairman of the world's first reactor safeguard committee. I want to quote to you one of the favorite definitions of a great physicist, Neils Bohr, his definition of an expert. An expert is a man who through his own painful experience has found out all the mistakes one can commit in a very narrow field. And I claim that, in reactor accidents, no experts exist because we haven't yet found out all the mistakes that one might commit. We have been very careful and not a single major accident has occurred so far. But we must be even more careful.

I want to make one suggestion which I think is reasonable. Let's build reactors by first digging a pit in dry soil, putting the reactor at the bottom of it and then filling up the pit with appropriate kinds of earth — dense but not rock, so that it won't split, and 200 feet between the top of the reactor and the surface will be enough to guarantee, from all our experience with hundreds of nuclear explosions, that even if the reactor destroys itself and causes damage of \$500 million, not a single person will be hurt. If we have the reactor underground, we need pipes going down and that's a little dangerous. Pipes to carry cooling water, to bring up the steam. The turbines can be on the surface or just under grade. They need lots of cooling water, the reactor does not. You need an access shaft. All these have to be closed up if there's real trouble but you have 200 feet or more in which to make the closure. And the greater the distance, the greater the certainty that you can close safely. I think this is worth considering.

Some of my friends have estimated that this will cost more than present reactor construction. Others say it will cost 50 percent more. And my answer to that is *so what*, because today, having to go back to square one in discussing any reactor wastes years. To make a new reactor today takes ten years. We could easily and safely build them in four years if we only could convince people that they are really safe. Putting them underground will make them much safer and the difference between four and ten years, in the present money market, corresponds to practically doubling the price of the reactor.

I'm not sure that putting reactors underground is the best answer. It is a possible answer, and the scandal is that no really decent engineering study has been made yet. Nuclear reactors are competitive today. They could be available the world over and not only in countries which are rich in oil or gas or coal or oil shale or tar sand. They could be used everywhere and should be. And furthermore there is no danger that we'll run out of fuel. Uranium, particularly poor grade uranium which we can afford, is abundant. We know in present reactors how to use an auxiliary fuel, thorium, and one could run present reactors as they are or with slight modifications, in such a way that four units of thorium are used for every unit of uranium. And thorium is and will remain dirt cheap. And as time goes by, gradual improvements will mean that you need less and less uranium and can use more and more thorium. So here

is an important solution. Today 35 percent of our energy goes into producing electricity. In the nuclear form it is cheap and clean and we can make it safe. And I hope that by the turn of the century 50 percent of our energy will come from reactors. This may mean a thousand reactors for the United States, which may mean an investment of \$500 to \$700 million. We can afford it. In fact, other energy sources are much more expensive.

## Don't waste it!

The last point of technological achievement is simply to cut down on the wasteful use of energy. Of course that can be done by setting the thermostat at an appropriate level or generally being a little more spartan. And I'm not arguing against such principles. But the real point is that an incredible amount can be saved just by putting in more insulation.

Now I would like to give you two examples on how to save energy. One, of course is the automobile. I have saved all my criticism for Detroit, because if someone deserves it, it is Detroit. I am sure that except for the mental inertia in Detroit we could have a fifty mile per gallon car in perhaps as short a time as three years. It would be a smaller car, between 2,000 and 2,500 pounds. It should be a hybrid, having a gasoline engine coupled with batteries, maybe simply lead-acid batteries, maybe something better. The latter will

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## The way we make steam today is to boil water — and that's wrong.

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be too heavy if you want to run on batteries alone but I want to run on batteries only for short trips, twenty miles or less. Then you can plug in your car and use the more efficient electricity. But even without that you can get fifty miles per gallon if you take the best gasoline engine, use it at its optimal speed and at no other speed, and use the batteries partly for the energy surges that you need and partly as a reservoir into which to put back energy when otherwise you would have applied your brakes. You don't throw away the energy when you brake your car; you charge up your battery. With a smaller car and better energy economy, you could have cars that will cost more but which will save energy and in a couple of years at the high gasoline prices which are and may be coming, you will have the capital investment paid back. We are not going to get something for nothing.

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## Except for the mental inertia in Detroit, we could have a fifty mile per gallon car in perhaps three years.

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The other application I would like to tell you about also requires some investment and this is simply the use of processed steam, which is one of the biggest energy users in the United States, well above 10 percent of all our energy use. Now let me tell you how I would do it. The way we make steam today is to boil water — and that's wrong. At least we shouldn't boil it at the boiling point. And we certainly shouldn't use a real hot flame to boil it, because that's high grade energy, and it's not right to throw away these high temperatures and the entropy that this implies for such a relatively minor purpose as boiling water. One way to do it is to use solar heat, solar energy. I do not believe in the use of solar energy in producing electricity, but I know that if you are satisfied with water of 50 or 60° C, that you can get that by using black surfaces and flowing water over them in appropriate ways and covering it up with some cheap and transparent covering using the greenhouse effect — radiation in but not out. I suggest that you boil water at 50 or 60° C, which you can do by creating a modest vacuum. The vacuum is not thin enough to require very big turbines or very much machinery, but some is required. You are using cheap and easily replenished solar energy or other low grade energy. Then, you use work derived from electricity to compress this cool steam into denser hot steam, but this costs only a little less than 10 percent of all the energy. Even today we can produce electricity with 40 percent efficiency, and with improved methods we could step it up to 60 percent.

Now these are the four legs on which I propose to build an energy program. More oil and gas, the *in situ* exploitation of other fossil fuels, nuclear reactors, and technological tricks to utilize energy in the best possible ways. There is no question in my mind that if we go after the main points, if we are not distracted by will-o'-the-wisps, and if we use the ample resources of the United States, we in this country can have plenty of energy. There is a broader problem — can there be enough energy for the world? I hope yes, but I have to acknowledge that this is a bigger problem about which I do not know enough.

**WPI**





# Let the sun shine in

## Solar Energy

by Dr. Peter E. Glaser

*Dr. Peter Glaser is vice president and head of engineering sciences at Arthur D. Little Inc. He directs advanced engineering development projects on the use of solar energy, space and lunar science instrumentation, and technology assessment. Dr. Glaser is a graduate of Leeds College of Technology, England, and Charles University, Prague. He has advanced degrees from Columbia University. He is a past president of the Solar Energy Society and is editor-in-chief of the society's journal.*

PEOPLE DON'T LAUGH at the sun these days. More people are interested in solar energy, and they're more attentive. For some reason they don't look on my colleagues and me as being wild-blue-yonder misguided people who obviously are working on something that may never come, or if it does come it will be at some future time and have a very small impact on the way we organize our lives. It is clear that solar energy today is a much more serious proposition. I would like to survey some of the possible applications of solar energy today and indicate where we can go from here, what some of the challenges are, and indicate also where some of the costs have to be in order for solar energy to take a place in the competitive scheme of our future energy supply.

The sun smiles on us today, so in a sense we are no longer dealing with a subject that is strange to the people in our government. For the first time, the United States is spending a significant amount for solar energy research and development. Over the next five years this may reach about \$200 to \$600 million, depending upon which of the various solar energy bills passes congress. That \$200 million is the sum of money which Dr. Dixie Lee Ray has proposed as part of the President's \$10 billion funding program for Project Independence; the \$600 million is what several congressmen feel and what industry feels is a more realistic figure.

By the time we receive solar energy here on earth, it is about 1 kilowatt per square meter. As such it is highly diffused, and that's where some of the problems lie. Compared even to the flame at the end of a match, we have to be able to convert it, we have to be able to harness it, and we therefore have to be able to cover large areas in order to do this effectively. We have used solar energy in many ways without even thinking about it: for example, the drying of fertilizer in Chile, salt in Utah, fish on countless seacoasts, or today, in these energy-saving days, even our Monday morning wash. We've tried to use solar energy to help other people, particularly in developing countries, with the development of solar cookers. We've learned there are some problems in overcoming cultural resistance, because many of these peoples prefer to eat their main meal at night rather than at lunch time. We've also thought it would be nice to

develop these solar cookers for our more pleasurable moments, and indeed some of these devices are on the market today. Somehow they haven't quite caught on as popularly as the hula hoop did. We've also learned how to take the heat of the sun and use it to distill brackish or ocean water in a solar still to produce fresh water. On island communities this makes eminent economic sense, particularly if you use 10,000 gallons or less. And in the Greek islands and some of the Pacific islands, on the coast of Pakistan, and in Australia, these kinds of solar stills are in operation today.

The next step, rather than just vaporizing water, is to use the sun's heat to produce hot water. There are plastic hot water heaters developed by the Japanese which you can buy for \$10, enabling us to provide hot water at a very low cost. Various large Japanese companies have produced millions of these hot water heaters and sold them all over the world. The Australians have added an electric heater so that you can still have hot water even when the clouds obscure the sun, and that's what it's all about. They're producing about 63,000 square feet of these hot water heaters a year now in Australia. They've equipped schools, hospitals, and other public buildings with it. The Grover Cleveland Junior High School in Boston was equipped just recently with similar hot water heaters, so we can learn from others. There are four schools in all which were equipped with these hot water heating solar collectors. What is significant about this is that from the time the National Science Foundation decided to do it to the time it was operational took exactly two months. That says something about the maturity of the technology and our capacity to produce about 25,000 square feet of solar collector area. With this we can also heat air and use the air for such prosaic purposes as the drying of wood, which of course conserves energy.

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### **There is a house in Washington D.C. that cost \$12 to heat with oil last year.**

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We used to do the same thing in this country; in Florida solar hot water heaters were very popular 40 years ago. Today of course they no longer are because natural gas came in and electricity was cheaper and it was just simpler not to bother with things on the roof of the building. I talked with an acquaintance who had one of these on his roof and he said,

"Well, the price oil and gas are now, I wish I still had mine on the roof working." If you look at the amount of solar energy we have available to us in the United States, we are a fortunate country, because just about everywhere there is enough solar energy to take care of our heating and eventually our cooling needs. The principle involved is very straightforward. We put a so-called solar collector on the roof of the building and we pass a fluid through it, which may be air or water or a water-glycol mixture if we are in freezing climates. This heated fluid is then stored in a tank from which it may be withdrawn whenever we wish to heat the building. We use an auxiliary heat source, since it wouldn't make economic sense to rely completely on solar energy. The principle of solar collectors has been explored for many years, analyzed and is well known. Typically one or two glass panes are used to keep the convection and conduction losses to the outside to a minimum. A blackened surface is used to absorb the sun's rays; if this is insulated as an absorber plate, typically metal, we can obtain reasonably high temperatures, between 170-200°F. The fluid is then passed through passages in the absorber plate and this is the objective, to heat the house. M.I.T. built such a house in the 1950's; it operated very nicely and was then abandoned because a barrel of oil cost \$1.75 and the solar house just didn't make any economic sense. There is a similar house in Washington, D.C., that last year cost about \$12 to heat with oil. There's a house in Denver, Colorado, in which the owner has lived for 15 years and he hasn't had to maintain the solar collector on top of his roof. The design of solar houses is usually quite pleasing and certainly is effective.

We can go the next step, not only to heat but also to cool, because the heat can be used to actuate a refrigerator based on an absorption or a rankine cycle principle. You may recall there once were gas-operated refrigerators. So we have a system which provides heat in the winter and cooling in the summer with some auxiliary input from electricity, oil, or gas.

The next step is to provide not only heating and cooling but electricity, and we can place solar cells in a collector. A house has been built by the University of Delaware which also produces electricity while heating and cooling the house. We've just completed the design of a laboratory for the Desert Research Institute. This will primarily use solar energy for cooling, and it indicates that you can have a fairly large structure supplied with solar energy. It can be aesthetically pleasing and all of the various functions of a laboratory can be built into it. We've also completed a design for an office building for the Massachusetts Audubon Society in Lincoln, Massachusetts.

You might ask if all this makes economic sense. For those of you who wish to study the subject I urge you to obtain the NSF/NASA Solar Energy Report from the department of mechanical engineering at the University of Maryland. In 1972 this report indicated that solar heating was competitive with electrical heating in eight major cities of the United States. With the upward changes in the cost of gas and oil, of course, it may now be competitive in many other regions as well. Recognizing this potential, we at Arthur D. Little have started what we call our solar climate control project, whose objective is to look at the possibility of developing a new industry and to see whether we can indeed make technical sense out of this and what the marketing, economic, and business feasibilities are. We now have 80 sponsors of this

project, and this leads me to believe that we have an excellent opportunity to see in this country in perhaps three to five years at a cost which will be very attractive the kind of equipment that you may use in a residential setting or for public buildings. I might say that industry can make an offer which most people will find hard to refuse.

Another way we are using solar energy and expect to use more is to grow trees and algae and to use municipal wastes. We have a number of processes which allow us to turn organic materials into solid, liquid, or gaseous fuels. One ton of dry organic material produces about 100,000 cubic feet of methane and about two barrels of oil if you use a pyrolysis process. We can also use our municipal wastes, and pilot plants are going up in various cities so that we can recycle some of the products of photosynthesis.

The concentration of sunlight has for many years been of great interest and there are solar furnaces going back to 1612. In this country, a solar furnace was constructed at Natick and used by the U.S. Army to do high temperature research, to expose materials to temperatures of about 6,000° F. The French have built a solar furnace in a beautiful setting in the southern part of France. They have heliostats in front of the huge mirror which follow the sun during the day and direct the sun's rays toward the parabolic mirror where they can concentrate the sun's rays to reach 6,000°F and have an equivalent output of 1,000 kilowatts. This furnace, for example, can burn a two-foot diameter hole through half-inch thick steel plate in about 20 seconds, a really awesome demonstration of solar energy.

Of course we are very interested in the production of electricity from sunlight and we have a number of routes open to us — wind, ocean, thermal, burning the clean and renewable fuels such as I've mentioned, the concentration of sunlight, and the direct conversion of sunlight into electricity by the Photovoltaic process. Windmills are thousands of years old, and we are rediscovering that this is indeed a workable way of extracting power which can operate day and night. A windmill was constructed in the 1940's at Grandpa's Nob in Vermont near Rutland and it produced 1,125 kilowatts. It broke during an ice storm, teaching us that construction is really a major engineering problem. Today you can buy windmills of this size commercially, and there are thousands of them in use throughout this country and the world. Before the rural electrification administration came along in the 1930's, farms in the Midwest produced about 50,000 kilowatts with windmills of this type.

We can extract heat from the sun-warmed oceans. The process was first suggested in the 1890's and then worked upon by Claude in 1900. A plant was built on the coast of Cuba in 1926, another on the coast of Africa in 1956. What we do is scoop up the sun-warmed ocean waters, boil off a working fluid like ammonia or propane, and finally condense the fluid after it has passed through a turbine, with very cold water pumped from several thousand feet below the ocean surface. It can be done in principle. Again, there are engineering problems — how do you build very large heat exchangers which are efficient? The accent here must be on efficiency since the overall process is only about 5 percent efficient at the maximum. Practical efficiencies are about 1½ percent. The University of Massachusetts has designed a platform which might be anchored in the Gulf Stream to produce 400 megawatts of electrical power; it is possible to consider anchoring hundreds of these platforms in the Gulf Stream without unduly affecting the temperature of the current.

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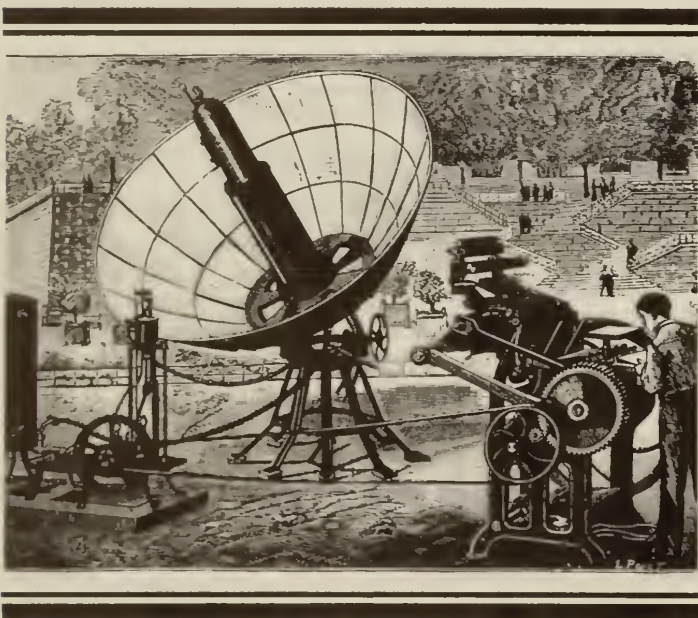
**We can extract heat from sun-warmed oceans . . . we can consider anchoring hundreds of these platforms in the Gulf Stream without unduly affecting its temperature.**

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Direct production of power from sunlight has again been of interest for many, many years. In 1968 I received a Christmas card showing the central attraction of the Paris exposition of 1878, which was a solar powered steam engine driving a printing press on which was published a newspaper called the Sun. The idea was so worthy of imitation that a man built such a device in California in 1901 which produced 50 horsepower. An Egyptian application of this was designed by two British engineers, Schuman and Boyd, who produced 100 horsepower to pump Nile water for irrigation purposes. The Israelis produced a much smaller device which was competitive with the diesel engine and was exhibited at the 1961 United Nations Conference on New Sources of Energy in Rome. In this country this solar steam engine has been rediscovered, and a so-called solar farm was proposed by Professor Meinel about three years ago; it's remarkable how closely it parallels the work done in Egypt in 1913. Of course we've learned to place the tubes which are heated by focused sunlight in an evacuated enclosure, and to use selective radiation coatings which allow us to heat the material to several hundred degrees F.

The principle of a selective radiation coating deserves some explanation. If you just place a black surface in sunlight, in the visible part of the spectrum it will heat up and then in the infrared it will radiate, reaching a fairly high temperature. But the radiant heat loss is what we want to do away with, and therefore we use a coating that remains black in the visible and acts like a mirror in the infrared, and we can achieve much higher temperatures with this.

Pilot plants are now being discussed for this type of solar thermal energy conversion plant. The disadvantage of such a plant is that you have to have heat transfer loops and the larger the plant the larger the heat losses, so there's a practical limit on the size of power plant. One approach to obviate these heat losses is to reflect the sun rays onto a steam boiler with a series of mirrors, and the Russians did this about 15 years ago in a power plant which produced about 1,500 kilowatts.



I BELIEVE that really the future of solar energy conversion on a very large scale lies in the successful realization of a low-cost photovoltaic process. We know how to convert sunlight directly into electricity. This was done at Bell Labs in 1953 with a silicon solar cell. Silicon is the material we know most about. It's quite familiar in the semiconductor electronic industry, although there are some other materials which are quite interesting. The largest application of solar cells has been in Skylab, which produced 25 kilowatts. In spite of the various problems they had with deploying the solar cells, it was a very successful space mission and all the power that the astronauts used was obtained by direct conversion of sunlight into electricity. Now this tells us that today we can produce large arrays of these solar cells. But we don't have to go into space to use solar cells. We can use them on the ground for communication purposes; on the sea for flashing buoys, where during the sunny part of the day we charge up batteries and then during the rest of the day they provide the power to a flashing light or communication system, as on an unattended drilling platform. It is, of course, worth a lot of money if we don't have to go out to it every few months just to replace batteries. The Russians have done a lot of work in this field and they have produced solar cells which allow concentration of sunlight thereby reducing the area of solar cells required.

Today you can buy solar cells for these applications for about \$20 a peak watt — that is, at the maximum sunshine available. Within two years this is expected to drop to \$5 a watt, and within ten to fifteen years to about \$1 a watt or less; there's a high likelihood that perhaps, as a market develops, that cost will reach 30 to 50 cents, or \$500 a kilowatt. It's really primarily dependent on how large a market this is. A group of photovoltaic specialists got together a conference in Cherry Hill, New Jersey, last October and projected that for \$250 million we could develop the process and do everything necessary to come up with this low cost. By the way, this cost of 30 cents is five times the cost of plate glass, the major difference being the energy input to the process. There are other materials, for example the cadmium sulfide thin film cells which can be mass produced again at low cost. The difference is that a silicon cell tends to be more efficient, about 15 percent; the cadmium sulfide thin film cell about 5 to 7 percent, so you have to cover a much larger area. Somewhere in the future is the possibility of developing organic semiconductors. At the moment these are still laboratory curiosities with very low efficiency, but we can imagine producing certain plastic materials with the semiconducting properties to convert sunlight into electricity, and this looks very interesting for the future. This then allows us to design larger areas, on rooftops or in the sunny part of the Southwest, where we can directly convert sunlight into electricity. Remember that if we have one square mile of these devices, even if they're just 10 percent efficient, we can generate 180,000 kilowatts while the sun shines. The challenge is "while the sun shines." It means that since it does not always shine, we have to have some form of energy storage on Earth, which may include batteries, pumping water to a higher placed reservoir, electrolysis of water to produce hydrogen.

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**I'm suggesting we use a fusion power plant which has been operating successfully for billions of years.**

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I suggested in 1968 that one way we can overcome this difficulty is to place a satellite in synchronous orbit around the earth where we have continuous sunlight available to us. The advantage then of doing that is that in this particular location we not only have no weather to contend with and no day and night, but also because we are in zero gravity we can use very flimsy structures greatly reducing the weight requirements and the amount of materials we use. We have studied the concept of a satellite solar power station, and it looks to us like this is not only technically feasible but it will be a very interesting and competitive way of producing power on a very large scale on Earth. The way this is done is to use solar cells and partial concentration of sunlight to reduce the area of solar cells. Then the electricity from the solar cells is fed to microwave generators which form part of a transmitting antenna, which allows us to direct a beam of microwaves back to earth where the microwaves can be converted directly into electricity. Today we can convert microwaves directly to DC with an 85 percent efficiency.

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**If we have one square mile of solar cells just 10 percent efficient, we can generate 180,000 kilowatts — while the sun shines.**

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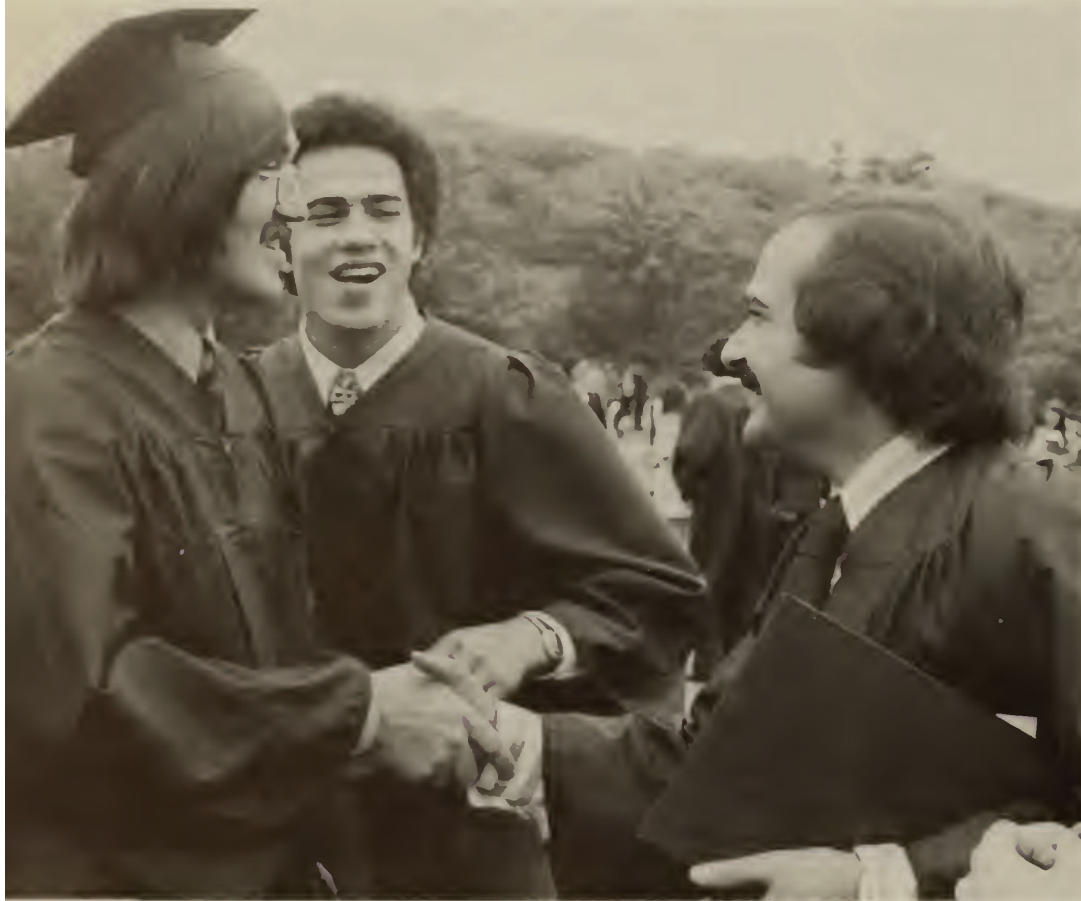
There is no thermodynamic process based on the thermal cycle which can obtain this kind of efficiency on Earth. Furthermore, the power density in the microwave beam is so low that it does not constitute a hazard. We are able to devise a system for locking the microwave beam onto the receiving station so that it cannot move to any other place; even if somebody would try and do so, the beam would demodulate and the signal level then reaching the earth would be that of a TV signal. Since we have a lot of space available to us in synchronous orbit, we can talk about very large solar collector arrays to produce power on Earth which may range from 2,000 to 20,000 megawatts and do so in any desired location. You're no longer restricted to having a sun area, and you can imagine what this means to nations that don't have areas like Arizona within their boundaries. It may also be interesting to look at the cost, which today we project will

be about twice the cost of nuclear power, based on the cost of all the equipment in space and on the ground as well as the space transportation system. And we find that all of the other methods which rely on nonrenewable fuel most likely will increase in cost as the fuels get scarce. Even nuclear power, which today is very important, though perhaps a temporary stopgap measure to meet our needs over the next thirty or so years, will eventually have to be costed at its true cost, including insurance as well as the disposal of radioactive waste material. We're quite confident that under the conditions we expect will prevail when this kind of device is ready twenty or so years from now, it will be very competitive with just about any other energy production method and thus this option for the longer term ahead would make us independent of any other energy source that we may need.

I believe that solar and fusion power, and in a sense both rely on the same physical process, can be the key to the long term energy independence that we all seek. The major difference is that I'm suggesting we use a fusion power plant which has been operating successfully for billions of years and which we know is really available to us and benign, since all life depends upon it.

**WPI**

# Commencement and

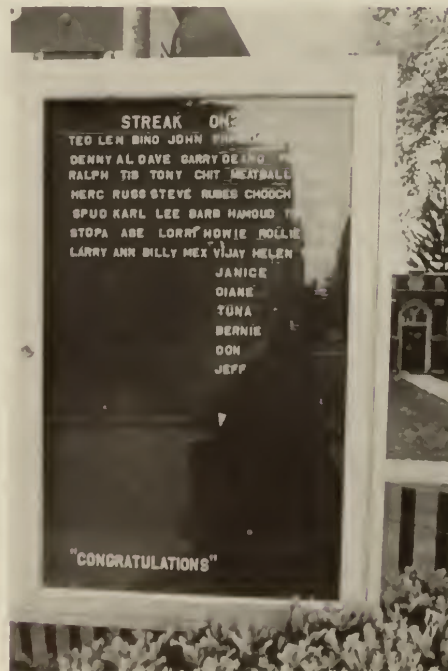


THE RAIN GODS, which spent all spring trying to flood New England and maybe float it out to sea, apparently liked the idea of Commencement and Reunion this year, for both events, on separate weekends, were blessed with fine weather.

Commencement was its usual mixture of pageantry and pomp, relief that the four-year college trip was now officially over, and celebration of jobs and marriages and grad schools to come. Exactly 400 degrees were given out, including the single honorary doctor of engineering presented to former U.S. Attorney General Elliot Richardson.

In his commencement address, Richardson called for the decentralization of federal government power. "One of the byproducts of Watergate should be a speeding up of the process of giving the individual a greater degree of participation in the federal government . . . Watergate warned us of the dangers of a powerful centralized government — a suppression of privacy, widespread use of electronic surveillance." Richardson argued that the federal powers should be subdivided, "even if it reduces the efficiency of government, but it's unlikely that we'd have to pay that cost." Commenting on the course of the Watergate investigation since his resignation last October, when he refused to fire special prosecutor Archibald Cox, Richardson concluded that "we've seen that the Constitution system of two hundred years ago is working well. The courts and Congress are playing their proper roles. Congress is doing a particularly creditable job in avoiding partisan politics."

Richardson spoke at WPI as one leg of a marathon commencement-speaking tour which saw him at the University of Massachusetts and Yale before WPI, and at the Worcester Foundation for Experimental Biology afterwards.



REUNION THIS YEAR attracted nearly a thousand people to the WPI campus, by the time the families of returning alumni were all counted. Along with many individual class functions, the Association sponsored a Friday night "Good Old Days Get-Together" with beer, peanuts, and banjo music. A day-long seminar on "Changing American Values" had been scheduled, but this had to be canceled because not enough people registered to make the program possible.

On Saturday, Reunion Day, some 450 people turned out to visit with one another, tour the campus (including car-free West Street), and attend the annual Reunion luncheon. At that time, the Class of 1924, celebrating their fiftieth anniversary, walked away with the attendance cup (and the accompanying bottle of champagne) for having 75 percent of the living class members there.

One of the important events of the day is the presentation of the annual awards. Recognition for dedicated service to WPI and the Alumni Association, in the form of the Herbert F. Taylor awards, was given to *Chester F. Inman*, '14, one of the founders of the Alumni Fund and a man long concerned with investment returns from Association funds; to *C. Eugene Center*, '30, architect of the current alumni trustee selection process; and to *Luther C. Leavitt*, '34, an active chapter leader, Council and Fund Board member.

Robert H. Goddard awards, for outstanding achievement in their professional life, were presented to *Howard C. Warren*, '42, an entrepreneur who started an instrument company in his basement and parlayed it from there until he is now board chairman and chief executive of the Riley Company; to *William R. Grogan*, '46, WPI's dean of undergraduate studies and one of the guiding lights of the WPI Plan's design and development; to *Ravindra L. Kirloskar*, '38, founder of the largest electrical equipment firm in India and a leader in his country's economic and industrial development; and to

# Reunion



George R. Rich, '19, honorary DEng '48, an engineer instrumental in the design and building of the Tennessee Valley Authority, the Saint Lawrence River Power Development, and many other steam power plants, flood-control facilities, and hydroelectric developments.

Association officers for the coming year include the following elections and reelections: Walter J. Bank, '46, reelected president; William A. Julian, '49, vice president; Leonard Polizzotto, '70, member-at-large of the Executive Committee; Bradley E. Hosmer, '61, reelected to the Executive Committee; Walter J. Charow, '49, reelected to the Fund Board; G. Albert Anderson, '51, newly elected to the Fund Board; Paul W. Bayliss, '60, Trustee Search Committee; and Stephen J. Hebert, '66, still secretary-treasurer.

The week before, the WPI Board of Trustees welcomed two new alumni trustees and reelected a third. The returning trustee is John E. Hossack, '46, vice president and director of the American Appraisal Company of Milwaukee, Wisconsin. Hossack has been a WPI Board member since 1964 and is chairman of the Board's Finance Committee. The new trustees are C. Marshall Dann, '35, currently U.S. Commissioner of Patents in the Department of Commerce, and Hilliard W. Paige, '41, chairman and chief executive officer of CML Satellite Corporation and until last year president of General Dynamics Corporation.



*Immediately above, Richard Burke, '38, is shown talking with Ravindra Kirloskar, his classmate. Burke retired as chairman of the Alumni Fund Board after six years of leadership.*





## 1912 – 62nd

It may be that 1912 has come to the end of an era. We had only three at our reunion: Henry and Madeline Rickett and Harrison Brown. But we increased the party 33% by adopting Joseph K. Schofield, 1909, for the evening.

From letters received from 16 of our 24 living members and from 11 of our 20 widows, we find there is still a lot of life in the class. Only a few are in poor health. But many have given up or reduced driving a car, especially at night. Those who live 1000 or more miles away are reluctant to make the trip.

At our 50th in 1962 we invited our wives for the first time and spent two full days at Northfield. We then voted to meet every year with our wives, also widows of our deceased classmates. For eleven years we have had a minimum of 8 at these reunions. We consider this a success. Next year we may have an informal meeting but as long as we get letters from two-thirds of our members, our spirits our running high.

Harrison G. Brown  
Secretary

## 1914 – 60th

The day arrived! Warm, sunny, beautiful, with just a gentle breeze to make the sun feel even softer. What could be more lovely than this, our day in June? It was Friday, the seventh of the month in 1974, and some of the Class of 1914 were arriving with their wives at the Copper Lantern Motel in West Brookfield, the same place that we celebrated our last reunion five years ago. Impossible but true, that this was our 60th year out of Tech. The busy eventful years had slipped by so fast and here we were old only by recorded time, but still young in spirit.

Most of us arrived in the morning early enough to sit outdoors in earnest, interesting conversation on the lovely spacious lawn that sloped gradually down to the Quabog River in the distance. We talked of everything, children, grandchildren, families, former professors and

about how different was the world of 1974 compared with 1914.

To make our discussions more relaxing, and perhaps more interesting, our genial and generous Class President, Mike Dufault, invited us to use his room, which was adequately stocked with various beverages such as, gingerale, coke, soda water, and some other colored concoctions. This helped out our thirst and our tongues, and contributed to a sense of complete well being and enjoyment. As we left Mike's room for the last time before lunch, it appeared that some of the colored fluid containers were empty, whereas the gingerale, and the coke bottles had hardly been disturbed.

Sixty years? Well perhaps those of us who are left deserved that friendly relaxing and wonderful time together. Lunch at Salem Cross Inn, a little way up the road, was enjoyable and good. Our tongues continued to wag because we had so much to say to each other and we sat at the table long after our food was consumed.

The afternoon conference again on the lovely back lawn was perhaps a little less talkative until the official photographer, whom Mike had arranged for, arrived in the late afternoon to record our gathering on film.

Our dinner, again at the Salem Cross Inn, was quite an affair, good food, excellent service, and congenial classmates and wives to communicate with. The following sixteen people were present: Win and Mary Brown, Horace Cole, Al and Matilda Crandon, Mike and Chris Dufault, Bud and Dorothy Hennessy, Earl Hughes, Chet Inman, Kirt Marsh, George Ross and his daughter-in-law Helen Ross, Bill and Frances Spratt.

Following the dinner, Mike Dufault called the roll of the class, just as "Coombsie" (Prof. Coombs) used to do it in our Freshman year. With only ten men to answer "Here", out of the hundred plus who formerly replied, we had an opportunity for deep thought, and another chance to thank God that we were indeed alive and "Here". We stayed at the table a long long time discussing many things, our absent classmates, our former professors, and our new and

changing College of today, and tomorrow. What will Worcester Polytechnic Institute, our Alma Mater, be like in the years to come? Who knows? But assuredly we will not be here to find out.

Letters were read from some of our interested but absent classmates. They sent their best wishes for a Happy Reunion and explaining that they were with us in spirit, if not in body. A second letter was received from Si Zung Yang, who came to Tech in 1914, originally from Mainland China, and now living in Taiwan, some 12,100 miles away. He told Mike that he celebrated our Reunion by eating a "boiled duck's foot" for dinner. "It is simple," he says, "but is considered a gourmet item here in Tapei, Taiwan." How we wish that Yan and our other absent class members could have been with us.

Following a good breakfast at a nice little restaurant in the town the next morning we assembled on the campus in the lobby of Harrington Auditorium for the 11:00 a.m. 50 Year Associates Meeting. President Hazzard interestingly addressed the group as did the young, personable and energetic president, Bill Delphos, of the Class of 1974. Bill's remarks to the old graduates were concise, to the point, and worthwhile. His delivery was friendly, clear, impressive and most remarkable.

It was our pleasure to find Clayt and Marion Wilcox at the Reunion Luncheon. We were sorry not to have had their company in West Brookfield.

All members of the 1914 Class were proud to rise in tribute to Chester M. Inman, as he was presented an award from the Head Table by the College for "Sixty Years of an uninterrupted career of service to WPI." Chet, our Class extends its best wishes to you with very great pride in the honor you have received for your worthwhile achievements for our College.

For this 60th Reunion we owe a great deal of gratitude to our energetic and hard working President, Mike Dufault, for what he did, and he did it all, to make the reunion a success. Indeed, we owe him our thanks for all of his work in presiding over our class for the entire sixty years. He has been an excellent President, an efficient executive, a charming gentleman, a good friend, and a real nice all around guy. Mike, we love you and sincerely thank you.

To those of the Class of 1914 who could not come to this Reunion, and to those of you who have never come, we send our best wishes. As Win Brown so sincerely put it "we ask for God's Blessing upon you all."

Ellwood N. "Bud" Hennessy  
Secretary



## 1924 – 50th

The 50th anniversary class of 1924 were graciously entertained with a cocktail hour given by President and Mrs. Hazzard on Thursday, June 6th, 1974. Orchid corsages for the ladies added a festive note. The reception was followed by a banquet in the feudal atmosphere of the Higgins House given by WPI in honor of the occasion. President Hazzard, introduced by the Alumni Secretary, Steve Hebert, welcomed the class and brought us up to date on the present operation of the Institute. The booklet, edited and printed by Don Wilson and Les Hooper, containing the history of our class was distributed by Les Hooper. This will be made available to all class members. They contain the available resumes of the entire class.

Travel by bus between appointments had been thoughtfully provided by the Alumni Association.

Buffet luncheon was served at Morgan Hall, at noon on Friday, June 7th. This was followed by a walking tour of the campus. The Harrington Auditorium brought back many memories of the old Gym. The new bowling alleys, with a champion bowling team, were a far cry from the two alleys we remembered. The campus tour ended at the Seminar Room, Gordon Library. Some members went from here to the Worcester Art Museum, while the rest met with Roger Perry, Director of Public Relations and Prof. Roy Bourgault. They explained the WPI Plan and the operation of the IPI program. A good question and answer period followed.

We gathered for our 50th reunion class picture at the Sheraton, Yankee Drummer Inn. From left to right, standing, M/M Ronca, Gallotte, Terry Counihan, M/M Bragg, M/M Storms, M/M McElroy, M/M Johnson, Nilson, Bartlett, Estes, M/M Danielson & M/M Burke. Front row, M/M Hooper, M/M MacAdam, M/M Leyland, M/M Alberti, M/M Hurd, M/M Miller, M/M Wilson, M/M Anderson. Present but not in picture M/M Wilcox & M/M Kallander. M/M Preston Hale and Warren Fish with guest attended the Alumni Day Dinner

Following the reunion banquet a meeting was called by Helge Johnson. The following motions were approved: (1) the balance of all class funds would be turned over to the Alumni Association by the treasurer after all bills had been paid; (2) it was voted that the class gift be given to the Alumni Association to be used at their discretion; (3) also voted that the present class officers would propose a new slate of officers, the slate to be mailed to the class membership for their consideration. There was a discussion of future reunions and five year periods were agreed upon. A letter was read from Dorothy Styffe, widow of Jack Styffe,

regretting that she could not be with us but sending the class of 1924 her best wishes. Letters were read from Lionel Lundgren and Frank Linsley. Each member and their wife spoke briefly. Mrs. Alberti added this bit of wisdom: "I can see through my bifocals, my dentures suit me fine, I can live with my arthritis — But how I miss my mind!"

We attended our first 50 year Association Meeting on Saturday and received our 50 year diplomas at the Reunion luncheon held in Harrington Auditorium. The class gift was presented by Norm Alberti. We received the best attendance cup.

All arrangements for this successful, enjoyable reunion were made by one of our busiest members, Dr. Leslie Hooper. We were grateful for the cooperation and help given to us by Steve Hebert, Alumni Secretary and by his staff. Please notify them of any change of address.

Don Wilson

## 1929 – 45th

When the preliminary Reunion meeting was held last Fall, no one dreamed that we were on the verge of an energy shortage. Then during the winter, there were times when it seemed that there might not be any Reunions. Fortunately, by June, the situation had eased, so that we were able to count 38 at the banquet. Attending were: Berry, Cook, O'Connell, Gilbert, Richmond, Heald, Crosby, Petrie, Carlson, Deranian, Donahue, Horton, Barnard, Matson, and Labonte, all with their own wives. Alone were Dobie, Wiley, Wiesman, Robinson, Newton. In addition it was with real pleasure that we were able to welcome Bea Merrill, Norm's widow. Stone, Nims, and Abadjieff were able to make the General Alumni Reunion Luncheon Saturday Noon. The Berrys, who drove up from Florida, take the prize for distance, and are to be con-

gratulated. The weather was perfect both days. For the first time, Art Knight was unable to attend because of his health. We sincerely hope that he will continue to improve, and will be with us at the 50th. Another sad note was the realization that 24 of our classmates have passed on, 8 since the last reunion. This year, some traditions were pushed aside in order to afford as much time as possible for visiting with each other. We did not have any entertainment nor speakers. Even then, the time passed all too quickly. After Dinner, each in turn gave a summary of current activities. At one time, the interest was in the growing families. More recently, grandchildren were at the center of the stage. Now, it is how retirement time is being spent. It seems that almost everybody has retired already. In fact, those of us who are still working feel a little out of step. How times change. Letters and notes of regret were received from Knight, Cushman, Clapp, Chin, Holt, and Burr. Burr is now head of the mechanical engineering department at the University of the Americas, Puebla, Mexico. He would be happy to see anyone who happened to be in that area. He has been traveling all over the world, teaching and lecturing in South America, India and Australia. Many of the retirees are also becoming world travelers, with trips to all parts of North and South America and Europe. Time was taken for elections. Wiesman was elected Chairman of the 50th, Horton, Chairman of the Gift committee, and to round out our slate of officers, Barnard was elected Vice President. A big vote of thanks is due the committee for their willing efforts during these trying times: Wiesman, Donahue, Deranian, and O'Connell. Each Reunion seems better than the last and the pleasure of seeing old classmates increases every time. We look forward with great anticipation to the 50th. We are sure that everyone who possibly can, will be there.

1929





1949

1919



1944



1924



1939



## 1944 – 30th

The Class of 1944 began its 30th reunion activities on Friday evening, June 7, at the "Good Old Days Get Together" held at Morgan Hall. This gave us a chance to unwind, renew acquaintances, and sing and dance to a banjo band.

Saturday, June 8th, proved to be another beautiful day with various activities lined up for us plus other activities that came up including a heralded tennis match between the Roths and Clayton-Terpo. Our 30th reunion dinner was held at the Worcester Country Club, preceded by a cocktail hour by the pool, giving us another opportunity to renew acquaintances with those who arrived on Saturday. After sitting down to a delicious roast beef dinner, Jim Donahue opened the reunion meeting in his usual rare form. Our speaker, Tom Denney, brought us up to date on WPI today in a most interesting and humorous way. Len Israel was responsible for all of the banners, signs, tags, and hats which livened up festivities. John Patterson was responsible for the awards and prizes made that evening, and they were outstandingly unique. Following the meeting we were invited to attend a floor show, and this was followed by dancing to conclude the evening. For those real hardy souls who stayed on, and there were a large number, we sang to Jim Donahue's piano accompaniments into the wee hours of the morning.

Members of the class in attendance were: Gordon Anderson, Roy Baharian, John Bateman, Tom Bombicino, Dave Clayton, Charlie Cooper, Jim Donahue, Roger French, Len Israel, Bud Holbrook, Erl Lagerholm, Dick Merrell, Bill Raymond, Miles Roth, Dick Russell, John Patterson, Kim Woodbury, and Chris Terpo. For all of you unable to attend, our deepest sympathies! Your regrets and greetings were read to the class.

See you at the next reunion!

Christopher T. Terpo  
Chairman

## 1949 – 25th

Over one hundred Forty-Niners, wives, sons and daughters from near and far found their way to Boynton Hill on Friday, June 7th to begin a reunion that was to be one of the greatest WPI reunions of all time. At the "Good Old Days Get Together" at Morgan Hall "change" was the main topic of conversation. "Tremendous" was the adjective most used to describe the changes that have taken

place on the Tech Campus. "You haven't changed a bit" was the greeting most commonly voiced to one another by the slightly graying, slightly balding and slightly overweight Forty-Niners.

Saturday was an active day with tours arranged for the campus, the art museum and the science museum. Swimming dominated the informal activities. At the reunion luncheon our good President, Jim Adams presented our class gift to the school. Our class gift exceeded \$23,000.00 and was the largest class gift ever given to our Alma Mater. Congratulations must be given to Steve Spencer, Walt Charow and Jim Adams for the hard work expended in raising this money. Nor should we forget any Forty-Niner who pledged and gave to this great cause.

Saturday night provided a fitting climax with Dr. and Mrs. Hazzard acting as perfect hosts with a cocktail party par excellence at their home. After posing for a reunion picture in Higgins House garden a gourmet roast beef dinner was served in the Great Hall.

After dinner and before the music and dancing lingered on into the night, Jim Adams refreshed our memory of the great events of twenty-five years ago, reminiscing about such old landmarks as the Boynton and the Blue Marlin.

Since no reunion would be complete without bestowing recognition of the accomplishments of class members a limited number of awards were made. Paul Feeney received the first award for becoming a father most often. Dean Amidon received an award for having children who made him a grandfather most often. Hugh Robinson and Fred Brennan were honored for traveling the greatest distance having both come from California. Allen Campbell was recognized for driving the greatest distance from Melbourne, Florida. This award was challenged unsuccessfully by Bob Lawrence who drove his airplane from Boulder, Colorado. The final award went to our own Yul Brynner, none other than

Moe Nirenstein, for having the cleanest shaven head.

Bob Pritchard and his wife were guests at our reunion dinner. Ken Scott and Bill Grogan and their wives also stopped by to extend their greetings to us. It should be mentioned that Steve Hebert and the girls in the Alumni office did a great job of putting together all the details that contributed to a great reunion.

## 1959 – 15th

Twenty-two members of the class attended their 15th reunion on June 7 and 8.

Most of us began the weekend at the Good Old Days Get Together on Friday evening and after a few beers together, wound up at Worcester's famed El Morocco.

On Saturday there were some who arranged to take the campus tour and were much impressed with the improvements made over the last few years.

Saturday evening was started with a social hour at 6:p.m. and followed by a well prepared banquet at the Wachusett Country Club. After the food was served, we all got a chance to summarize our travels and good fortunes of the past fifteen years.

Our good fellowship didn't stop there for we were all invited to Bob Kelly's house after the banquet to taste some home-made wine prepared and served by Ed Fenny. I'm sure that Ed's talents have never been more appreciated.

Those attending the weekend festivities were: Mr. & Mrs. Richard Bratt, Mr. & Mrs. Lee Courtemanche, Mr. & Mrs. John Gale, Mr. & Mrs. Michael Gasek, Dr. Frederick H. Lutze, Jr., Mr. Norman Monks, Mr. & Mrs. Edward Saulnier, Mr. & Mrs. David Sawin, Mr. & Mrs. George Schreiner, Mr. & Mrs. Edwin Fenny, Mr. & Mrs. Robert Berg, and Mr. & Mrs. Robert Kelly.

1959





## 1915

MAURICE G. STEELE, who retired 15 years ago from Rome (N.Y.) Cable, then formed and sold his own successful firm, M. G. Steele, Inc., is again retiring. For five years he has been serving as a salaried consultant to his former firm, but he is now making retirement more or less official. He will, however, be available for further consultation.

## George Rich, Distinguished Engineer

The Engineering Societies of New England have presented George R. Rich, '19 with the Distinguished New England Engineer Award at a luncheon ceremony which was held in Boston to highlight Engineers' Week.



"Reese," as he is known to his friends, is still on the go. Currently he is historian of the Rome Rotary Club, of which he is a past president. An art enthusiast, and former tenor soloist, he is also an accomplished magician and has given a number of professional performances.

One of his best professional performances was his development of an electric brazer for joining sections of copper wire by soldering, a device he perfected and patented through research at Rome Cable and later at M. G. Steele, Inc. The brazer, which is still the leading product of the Steele Company, is superior to other methods of joining wire in its precision and in the resulting tensile strength of the joint, which is greater than that of the wire itself.

## 1923

Dr. PAUL R. SWAN, former associate dean of admissions and students at WPI and the retired president of Leicester (Mass.) Junior College, recently moved into an apartment in Winter Park, Fla. He writes that he and his wife are enjoying life and the Florida climate.

## 1926

RUDOLPH T. DANSTEDT, assistant to the president of the National Council of Senior Citizens, Inc., Washington, D. C., has been appointed to the Statutory Social Security

The 32nd recipient of this award, Mr. Rich is senior vice president of Chas. T. Main, Inc., professional engineers based in Boston. He has overall responsibility for the firm's activities in the hydroelectric, thermal power, and electrical transmission and distribution fields.

The Distinguished New England Engineer Award is presented annually to "a living engineer, resident of New England who, by outstanding achievement, merits recognition of his accomplished works as well as his character by his fellow engineers of the New England states."

During a career spanning 55 years of engineering and managerial activities, Mr. Rich has contributed to the design and/or construction supervision of such major projects as: the Passamaquoddy tidal power project, the Cornwall pumped-storage project, the Niagara power project, and the St. Lawrence power project. More recent projects in which he has been involved include: the Blenheim-Gilboa pumped-storage power project and the Bear Swamp pumped-storage project.

Mr. Rich is licensed as a Professional Engineer in 33 states and by the National Bureau of Engineering Examiners. Before going to Main, he was chief design engineer for the Tennessee Valley Authority, in charge of engineering for all hydroelectric, steam-electric, and other power work undertaken by TVA.

Advisory Council. The council reports to Congress on the financing, scope, and adequacy of the benefits of the Social Security program, Old Age Insurance, and Medicare.

Mr. Danstedt was also appointed a public member of the key Committee on Finance which will review the actuarial and tax aspects of the Social Security program. The committee is a 13-man statutory body which is composed of a chairman, three representatives of employers, three representatives of employees and six public members.

## 1928

FORREST S. NELSON has been elected a member of the Corporation of the New England Baptist Hospital in Boston. Currently he is a real estate consultant to the First Federal Savings and Loan Association, Worcester, which he has served for over 40 years as senior vice president, director, and chief appraiser. He belongs to the American Institute of Real Estate Appraisers, the Society of Real Estate Appraisers, the Worcester Economic Club and the Worcester Board of Realtors. The New England Baptist Hospital is known internationally for its treatment of complicated medical and surgical problems.

LEONARD M. OLMSTED, formerly a senior editor at McGraw-Hill Publishing, Inc., New York City, retired last year.

In addition to his involvement in numerous international power projects for Main, Mr. Rich has also represented the United States as a member of this country's delegations to the International Commission on Irrigation and Drainage, and the International Commission on Large Dams.

Mr. Rich has lectured on hydraulic engineering at Columbia University and served as the Gordon McKay Visiting Lecturer in Civil Engineering at Harvard University. In publishing activity, he authored the book, *Hydraulic Transients*, and has contributed technical papers to numerous professional journals and trade magazines.

Among the professional societies, Mr. Rich is an Honorary Member of the American Society of Mechanical Engineers, and of the Boston Society of Civil Engineers, a Fellow of the American Society of Civil Engineers, and a member of the American Institute of Consulting Engineers. His memberships in honorary societies include Sigma Xi, Tau Beta Pi, and National Honor Member of Chi Epsilon. He was also awarded an Honorary Doctorate of Engineering from WPI in 1948 and presented with the Rickey Medal Award from the American Society of Civil Engineers in 1968. This year he received the Robert H. Goddard award from the WPI Alumni Association.

**WPI**

## 1929

FRANK R. JOSLIN, the former vice president of New England Electric Systems and Power Service Co., Boston, has retired. . . . HALBERT E. PIERCE, JR., who was with Northeast Utilities, New England Power Planning, West Springfield, Mass. for many years, is recently retired.

## 1930

WILLIAM W. LOCKE, professor of electrical engineering at WPI, who had served 44 years on the faculty, retired in June. . . . DONALD R. SIMONDS, past vice president of Beloit (Wis.) Corp., retired in February. . . . RALPH H. GILBERT is presently employed at Modern Concrete Pumping Co. in West Hartford, Conn.

## 1931

WALLACEN. BAILEY, JR. retired in June. He was with Northeast Utilities Service Co., Hartford, Conn., where he served as a system operations coordinator. . . . FRANK S. FINLAYSON, professor of mechanical engineering at WPI, also retired in June. He joined the faculty in 1937 and received his MSME from WPI in 1945. . . . GEORGE RAK is a retiree. He was with Pratt & Whitney Aircraft, East Hartford, Conn. . . . MICHAEL C. SODANO, who has been serving as president of Asian Economic & Tech Service Co., Tokyo, Japan, is now chairman of the board of the company and is currently located in Scottsdale, Arizona.

## 1932

WILLIAM F. REARDON has retired from General Electric's real estate and construction operation after 25 years. This operation handles the design and construction of major facilities for GE worldwide, with an annual volume in excess of \$150 million. During his career at GE Mr. Reardon held positions of manager-construction, manager-engineering, and manager-advanced facilities planning.

## 1933

HUGO P. BORGATTI retired from Unlroyal, New York City, this summer. . . . ALBERT H. ENSOR recently retired from New England Electric System as superintendent of communications and controls after 39 years of service. Currently he is located in Brewster, Mass.

## 1934

B. "GUS" LARSON retired in April. He had been a staff assistant at New England Power Service Co., Westboro, Mass.

## 1936

ROGER W. BRUCE, who is retired as general superintendent from United States Steel Corp., Worcester plant, is a candidate for the Republican nomination for state representative in the 20th Worcester District. He is a former member of the Worcester Planning Board and the Central Massachusetts Regional Planning Commission. He is past president of the Worcester County Republican Club and president of the Worcester Area Mental Health Association.

## 1937

ARTHUR P. MOOSSA works for American Optical Corp., Southbridge, Mass. . . . DANA W. WOODWARD is now president of American Shoe, Division of Katy Industries, Wakefield, Mass.

## 1938

THOMAS M. BONNAR, assistant vice president and director of administrative services of the Eastman Kodak Company, was recently elected president of the Genesee Hospital Board of Governors in Rochester, N.Y. . . . Presently DONALD L. MILLIKEN is employed at Bechtel Corp., San Francisco, Calif. . . . THOMAS E. O'NEIL, western manager-business development for Chemical Construction Corp., New York City, is now located in Phoenix, Ariz. . . . MAURICE PRESSMAN has been nominated for the Commander's Award for Technological Achievement at the U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va. The award is given for science, leadership, and



support and is considered the most prestigious the Center can present. Nominated by the Military Technology Department, Mr. Pressman was cited for his work as an analytical chemist in the Sanitary Sciences Division

leading to the development of new and original water treatment processes enabling kitchen, laundry and shower waste waters to be reused for nonconsumptive purposes. . . . FRANCIS B. RITZ works for Pittsburgh-Des Moines Steel Co., San Jose, Calif.

## 1939

CHARLES W. CUMMINGS, who has retired from Pacific Telephone & Telegraph in Los Angeles, Calif., is now raising show cats. . . . DONALD E. HOUSER serves as assistant to the president of Bostik Division, United Shoe Machinery Corp., Middletown, Mass. . . . RICHARD J. MULLER works for Tucker Assoc., East Longmeadow, Mass.

## 1940

LEWIS F. BEHRENT is with Laboratory Equipment Sales & Service in Renton, Wash. . . . Dr. WALTER E. CRANDALL holds the position of vice president-manager at Corporate Laboratory, Hawthorne, Calif. . . . H. ROGER ERICKSON is personnel manager at Worcester County Institution for Savings, Worcester. . . . ROLFE G. JOHNSON, a self-employed consultant, is currently with Crawford & Russell, in Grangemouth Stirlingshire, Scotland. . . . PHILIP LEVINE works as a supervisor for the U.S. Postal Service in Worcester. . . . JUDSON D. LOWD has been named president of C-E Natco (National Tank Co.), a Tulsa-based subsidiary of Combustion Engineering, Inc. As chief executive officer he will direct the operations of the company's domestic manufacturing, sales and service facilities and its five international subsidiaries located in Canada, United Kingdom, Australia, and Singapore. Lowd, who belongs to ASME, the Institute of Petroleum (London), and is a trustee and member of the Academic Board of Management, Beirut University College in Lebanon, formerly served as executive vice president of C-E Natco. . . . CHARLES C. McDONALD, who has retired from the U.S. Civil Service, writes that he is "Enjoying the warm Florida weather in the brand new house I designed."

Prof. LAWRENCE C. NEALE, director of WPI's Aiden Research Laboratories, has won the Worcester Engineering Society's 1974 Scientific Achievement Award. . . . FRANK G. GUSTAFSON, senior product engineer with Bay State Abrasives Division, Dresser Industries, Inc., Westboro, Mass., was a featured speaker at the 13th Abrasives Conference held in Philadelphia, Pa. in June. His topic was "High Wheel Speeds in Precision Grinding." He has had wide experience in the grinding wheel industry both as a manufacturing process engineer and product engineer, and has written numerous articles on grinding wheel applications.

# 1941

DONALD E. SMITH, president of Smith, Legge & Darcy, Inc., Rochester, N.Y., was recently reelected to a three-year term on the Genesee Hospital Board of Governors. . . . ROBERT F. WILSON is employed by Field, Eddy & Buckley, Springfield, Mass.

# 1942

JOSEPH N. CHRISTIAN is a realty salesman for Apple Valley Rancheros, Apple Valley, California.

# 1943

ARNOLD R. JONES has been promoted to divisional vice president and general manager of the Abrasive Materials Division at Norton Co., Worcester. He was divisional vice president and general manager of engineering and construction services. In his new position he will be responsible for the worldwide operations of the division. A registered professional engineer, he is also a director of Worcester Episcopal Housing Corp. and a member of the Governor's Business Advisory Task Group on the Energy Crisis. . . . J. FRANCIS SULLIVAN is a purchasing agent at Scott Graphics, Inc., Holyoke, Mass.

# 1944

Currently JAMES W. DASHNER is chief product engineer for Consolidated Brass Co., Matthews, N. C. . . . MARTIN J. REILLY works as a product engineer at Allis-Chalmers Corp., Jackson, Mississippi. . . . RALPH D. SCHULTHEISS has been appointed vice president-engineering, Engineered Machinery Group, York Division, Borg Warner Corp., York, Pa. . . . HERBERT E. SHELDON is with the American Telephone and Telegraph Co., New York City.

# 1945

PAUL A. MARSHALL, JR. works at Brockway Glass Co., Inc., Brockway, Pa. . . . ROGER N. PERRY, JR., WPI's public relations director, has been accredited by the Public Relations Society of America. Of the 7,200 professionals who belong to PRSA, only 2,459 are accredited. PR programs directed by Roger have won four national awards in recent years. . . . KNOWLTON P. RICE is a contractor with Falcon Research & Development, Denver, Colo.

# 1946

EARL J. BALKON is a general manager at Resurrection Cemetery in Grand Rapids, Mich. . . . CUSHING C. BOZENHARD, president of the Bozenhard Co., Inc., Worcester, was recently elected a trustee of Memorial Hospital. A registered professional engineer, he has served as past president of the Exchange Club of Worcester and is a director of the Friends of Goddard Library. He is also on the advisory board of the YWCA. . . . CHARLES D. CUMMINGS works for Atlas International, Inc., Littleton, Colo. . . . WILLIAM R. GROGAN, dean of undergraduate studies at WPI, participated in dedication ceremonies marking the opening of the new international headquarters of Phi Kappa Theta Fraternity in Worcester last May. Dean Grogan is a past national president of the fraternity. . . .

GORDON A. HOLLIS works for Mobile Pipe Line Co., Mobil Oil Corp., East Douglas, Mass. . . . HAZEN L. HOYT III is with Duplicon, Newport Beach, Calif. . . . VINCENT M. LaSORSA serves as assistant marketing manager at Dynell Electronics Corp., Melville, L.I., N.Y. . . . CARLTON G. LUTTS is product manager, USM Corp., Beverly, Mass. . . . FRANK L. MAZZONE presently holds the position of manager of engineering at Bechtel, Inc., San Francisco, Calif. . . . Col. IRVING T. McDONALD, JR., USAF retired, is now residing in Deland, Florida. Formerly he was assistant chief of staff/intelligence at USAF HQ, Pentagon, Washington, D.C.

CHARLES B. MICZEK, former assistant engineering manager at Stone & Webster Engineering Corp., Boston, has been named vice president of the corporation. Associated with the firm since 1946, he has also been appointed engineering manager. . . . Dr. PETER B. MYERS is director, advanced systems analysis office, at Magnavox, Silver Spring, Md. . . . EDWARD R. STOKEL has been promoted to a new high-level staff position, director of public transportation at GMC Truck and Coach Division of General Motors, Pontiac, Michigan. Formerly he was assistant general sales manager in charge of coaches. In his new position he will be responsible for coordinating GMC truck and coach activities related to public transportation with engineering, manufacturing, product planning and sales operations. . . . MALCOLM K. WHITE is employed by Dutchess Shoe, Salem, Mass.

# 1947

PAUL H. MUGFORD is a foreman at A. C. Lawrence Leather Company, Peabody, Mass.

# 1948

FRANK S. HOLBY serves as supervisor-compensation at GAF Corp., in Birmingham, N.Y. Previously he was with General Electric. . . . STURGIS A. SOBIN, the former mayor of Ansonia, Conn., was recently appointed executive director of the Connecticut Racing

Division. He will be responsible for the planning and supervision for flat and harness horseracing, dog racing, and jai-alai.

# 1949

RUSSELL P. BRADLAW is a project engineer at Turner Construction Co., New York City. . . . NORMAN E. COTNOIR, who was with Fellows Corp. (Springfield, Vt.) for 20 years, is now with Brown & Sharpe Mfg. Co., North Kingstown, R.I. . . . NEAL W. COX works as a plant engineer at the Connecticut Foundry Co., Rocky Hill, Conn. . . . GEORGE M. DEWIRE is product marketing manager at Martin-Marietta Corp., Orlando, Fla. . . . ROBERT N. GOWING holds the post of director of marketing at New England Electric System, Westboro, Mass.

BERNARD J. KAWECKI is marketing sales manager at Bulova Watch Co. (Systems and Instruments Div.) Valley Stream, N.Y. . . . GEORGE LEHTO serves as a systems analyst at Vitro Labs Div./Automation Industries, Silver Spring, Md. . . . EDWARD A. LUIZ is a mechanical design engineer at Killmorgen Corp., Northampton, Mass. . . . WALTER J. MUSSONI is with Feecon Corp., Westboro, Mass. . . . DONALD R. SKEFFINGTON works as a self-employed consulting engineer in Ipswich, Mass. . . . Presently JOHN A. SNYDER is employed as a market manager at Union Carbide Corp., Bound Brook, N.J. . . . CLAUDE F. VERA is with Watkins-Johnson Company, Gaithersburg, Md. . . . BERNARD C. WALSH works as a principal engineer at Polaroid Corp., Cambridge, Mass.

# 1950

The work of JOHN P. BURGARELLA was used as a reference for the article, "Behind the Lens of the SX-70" which appeared in the December 1973 issue of "IEEE Spectrum". He is the director of engineering for electronic products at the Polaroid Corporation in Cambridge, Mass. . . . JAMES N. DuCHARME has been named chief engineer at Rutland (Vt.) Hospital. Previously he had spent 23 years with the General Electric Company, most recently serving in the Ordnance Dept. at GE in Pittsfield, Mass.

# 1951

PAUL E. RADASCH serves as branch office manager at Nelson, Haley, Patterson & Quirk, Inc., Greeley, Colo. . . . VARTKES SOHIGIAN is personnel manager for Simonds Cutting Tools, Wallace-Murray Corp., Fitchburg, Mass. . . . JOHN D. WRITER holds the position of sales manager-N.E. region, at Aydin Controls, Ft. Washington, Pa.

# 1952

JOHN W. DIACHENKO is the chief engineer at Imperial Spring Co., Inc., Milldale, Conn. . . . ROBERT L. FAVREAU was recently installed as the 11th president of the Manufacturers Association of Schuylkill County, Pa. He is manufacturing manager of the Pottsville plant of Exxon Chemical Company, U.S.A. The manufacturing plant, Exxon's largest, produces polyethylene, polypropylene and laminated films. . . . RICHARD C. GILLETTE is vice president of the Telecheck Washington-Telecheck Management in Bethesda, Md. . . .

WAYNE ROBERTSON is not only a senior specialist at Monsanto (Springfield, Mass.), he is also a "specialist" in music behind the footlights. To date he has sung in a number of amateur musical theater productions in the Springfield area including "Ruddigore," "The Mikado," and "The Merry Widow." He also appears with a Simsbury (Conn.) group called the West Bank Pops Singers. While at WPI he was a member of the men's octet.

# 1953

JOHN R. BLACK is manager of engineering at W. P. Keith Co., Inc., in Pico Rivera, Calif. . . . Currently CARLETON C. COMINS holds the position of product safety consultant at the Foxboro (Mass.) Co. . . . PHILIP A. CHARRON serves as plant manager at Rochester Button Co., Duplan Corp., Wellsville, N.Y. . . . ROBERT B. CRAIG is a programmer at Raytheon Co., Norwood, Mass. . . . GEORGE H. CROZIER, JR. works as director-project management, Monsanto Environmental Chemical Corp., Chicago. . . . R. TAYLOR HOLMES, JR. is with Bay State Abrasives, Westboro, Mass.

ROBERT C. JACINO is currently assistant to the vice president at Charles Pfizer, Inc., New York City. . . . PHILIP J. KAMINSKY works for G. S. Grumman & Associates, Inc., Boston. . . . MARSHALL J. KIDDER is a resident chemist at Philips Labs, Briarcliff Manor, N.Y. . . . DONALD G. POST is now marketing manager at Foster Grant Co., Inc., Leominster, Mass. . . . WILLIAM V. RASZKA works for Colony, Inc., Quincy, Mass. . . . ARTHUR M. SHEPARD serves as manager of projects at Yankee Atomic Electric Co., Westboro, Mass. . . . CHARLES R. SMITH is with C. R. Smith Agency, Manchester, Conn. . . . HERBERT S. PETERSON is now with Dana Corp., Toledo, Ohio.

# 1954

DAVID K. BEACH, JR. is president of Beach Engineering, Worcester. . . . ROBERT C. PICKFORD is manager/systems and procedures at Warner-Lambert Co., Morris Plains, N. J. . . . MILTON MECKLER, president of Meckler Associates, Los Angeles, Calif., delivered a technical paper, "Peltier Effect Heat Pump System" at the 94th Annual ASME Winter Meeting in Detroit. His firm is currently working on the system's development as a viable alternative to meeting long range industrial energy needs. He writes that his company is also working on the development of a fully earthquake resistant tubular structural system. In April he had a paper describing the fluid logic published in *Hydraulics & Pneumatics* and even more recently he spoke before the Third World Congress of Engineers & Architects in Tel Aviv. Meckler, a registered mechanical and chemical engineer in California, Michigan, Ohio, Hawaii, Guam and Nevada, holds several patents and has written many technical articles and papers.

# 1955

MARTIN J. BURDEN is currently employed at Schlegel Mfg. Co., Rochester, N.Y. . . . KIRBY S. DUCAYET III serves as administrative manager for Kimberly-Clark Corp., Schweitzer Division, Lee, Mass. . . . ROBERT C. SMOLINSKI works at Zurich Insurance Co., Detroit, Mich. . . . ROBERT C. STEMPEL is special assistant to the president at General Motors Corp., Detroit. . . . ROBERT K. NEUNHERZ has been named production manager of the Fiberloc Division of the Felters Company in Millbury, Mass. Previously he was vice president of manufacturing at GEM Industries, Gardner, Mass.

# 1956

ERNEST BERNSTEIN serves as assistant chief engineer for Turbo Power and Marine, Farmington, Conn. . . . HOWARD H. BROWN, who has been studying at Boston University, received his doctorate in educational administration in May. Last September he joined the faculty at Southeastern Massachusetts University in the Department of Business Administration. . . . HENRY J. DUMAS, JR. is working at Honeywell, Inc., Lexington, Mass. . . . Dr. RAYMOND R. HAGGLUND, professor of mechanical engineering at WPI, has been selected the outstanding teacher of the year at Tech, the announcement being made at the annual faculty banquet held at Morgan Hall in May. Dr. Hagglund received his master's degree from WPI in 1959 and earned his doctorate at the University of Illinois in 1962. He joined the WPI faculty in 1956 and was one of the prime movers in developing student project activity under the WPI plan.

ARNOLD M. HALL is vice president, engineering at Hovermarine Corp., Pawcatuck, Conn. He helped to found the firm five years ago. The company is the only commercial builder of "sidewall" hovercraft. . . . THOMAS W. HANSEN works at IBM Corp., Boulder, Colo. . . . ROBERT E. KLEID owns and operates Robert E. Kleid Nautical Instruments, Fairfield, Conn. . . . FREDERICK J. LINDSEY is a manufacturing engineer at Dow Corning Corp., Trumbull, Conn. . . . JOHN R. MacHARG is with Sperry Systems, Division of Sperry Rand, Great Neck, N.Y. . . . JOSEPH MORGAN, JR. serves as a dynamics engineer at Raytheon Co., Burlington, Mass. . . . ROBERT V. VIERAITIS is a design supervisor at Perkin-Elmer Corp., Norwalk, Conn.

# 1957

JOHN D. DALY is employed by the Columbia Gas System, Inc. in Charleston, W. Va. . . . GERALD FINKLE holds the post of president of Wachusett Molding Corp., West Boylston, Mass. . . . ROBERT W. FRANKLIN is a commander with NOAA and is presently stationed in Miami, Florida. . . . DANIEL J. FISHER, JR. has been promoted to project manager in the Fibers and Film Product Group at Leesona Corp., Warwick, R. I. Formerly he was with General Dynamics' Electric Boat Division. . . . CHARLES I. FRIEDMAN works at Prime Computer, Inc. in Wellesley, Mass.

JOHN D. MINOTT is an environmental engineer at Ashland Chemical Co., Columbus, Ohio. . . . ALAN H. MITCHELL is with Turbo Power & Marine Systems, Farmington, Conn. . . . WAYNE E. PENDLETON has been employed at Global Marine Development Co., El Segundo, Calif. . . . ARAM H. SOHIGIAN has been named a senior project engineer in the research and engineering department of Bay State Abrasives, division of Dresser Industries, Inc., Westboro, Mass.

# 1958

WILLIAM L. BYARS, III works for Signetics, Orem, Utah. . . . JERRY A. COLLAMORE is with Forest Industrie (Tele-Comm., Inc.), Eugene, Oregon. . . . Digital Market Assoc., Sudbury, Mass. employs MICHAEL S. GUTMAN. . . . DAVID A. HELMAN serves as a financial analyst at Tecna, Emeryville, Calif. . . . CARL R. JOHNSON works as a senior instrument engineer at Fluor Engineering and Construction, Houston, Texas. . . . ROBERT M. KANEN is with Robert Wager Co., Chatham, N.J.

JOHN H. PORTER works at American Can Co., Greenwich, Conn. . . . JOAQUIM S. S. RIBEIRO, vice president and treasurer of the Jamesbury Corporation, Worcester, has been elected a trustee of Memorial Hospital. He also serves as a trustee for the Central New England Colleges of Technology, incorporator of the Worcester County Institution for Savings, and director and treasurer of the Visiting Nurse Association. . . . ROBERT C. SIMMONDS, JR. is head of the design section at United Shoe Machinery Corp., Machinery Division, Beverly, Mass. . . . JOHN B. VESEY is with Excel Industries, Inc., Lakewood, N.J.



# 1959

The Rev. HARVEY D. EGAN, S.J., who received his PhD from Munster, Germany last year, is now an assistant professor at Santa Clara University in California. . . . ANTHONY E. ENGSTROM is a real estate salesman for Home & Land Co., San Rafael, Calif. . . . WILLIAM N. FELENCZAK serves as a designer with United Aircraft Research Labs., East Hartford, Conn. . . . THOMAS R. KEEFE works for Dennison Mfg. Co., Framingham, Mass. . . . ROBERT W. KELLEY is now manufacturing engineer and production supervisor at the Berlyn Corp., Millbury, Mass., which is a manufacturer of machinery for the plastics industry. Previously he was a consultant and had spent some time at Colt Firearms developing the manufacturing process for two new stainless steel handguns. . . . MARSHALL P. KRUPNICK currently practices law in Hallandale, Florida.

Dr. ALLEN H. LEVESQUE was recently promoted to unit manager at Sylvania Electronic Systems, Needham, Mass. Prior to his promotion he was manager, special communications projects, GTE Labs. in Waltham. He is completing his term as chairman, Boston Chapter IEEE Information Theory Group; serves as a member, Educational Advisory Committee for the Chelmsford (Mass.) Schools; and represents Chelmsford on Nashoba Valley Technical High School building committee. . . . Dr. FRANKLIN SALEK is at the Newark (N.J.) College of Engineering. . . . RICHARD P. SCHOU works as a project engineer with Aberthaw Construction Co., South San Francisco, Calif. . . . LEED. SMITH, JR. is now a senior supervisor/process for Du Pont in Old Hickory, Tenn. . . . ROBERT F. STRACHAN serves as assistant vice president at Commerce and Industry Insurance Company, New York City. . . . ERNEST F. WOODTLI is principal product engineer at Honeywell, Inc., Ft. Washington, Pa.

# 1960

GARY AUGERI now serves as a senior engineer in the Guidance and Control Division at Litton Industries, Woodland Hills, Calif. . . . Dr. DOUGLAS E. BRYANT holds the position of sales manager at Foseco, Inc., Cleveland, Ohio. . . . EDWARD P. DONOGHUE is Boston area sales manager for Data 100 Corporation, a manufacturer and distributor of remote computer terminals. . . . WILLIAM J. FIRLA, JR. writes that he is "Back from an enjoyable year in England." He is still with IBM in Boston. . . .

Lambda Electronics of Melville, L.I., N.Y., employs THOMAS A. POOLE as a chief engineer. . . . BRUCE A. MacPHETRES now works at American Telephone & Telegraph, New York City. . . . ALANT. REED has been named district superintendent for Massachusetts Electric Co., Haverhill, Mass. He joined the company's Worcester office in 1960 and has held positions at the Brayton Point Station in Somerset and in Leominster. Most recently he was assistant district superintendent in Beverly. . . . WARREN J. E. TALBOT works for Varion Associates, Palo Alto, California.

# 1961

Dr. NORMAN F. BOLYEA is associate professor in the Department of Civil Engineering at the University of Nebraska in Omaha. . . . STEPHEN B. BRODY is production manager at Flambeau Southeast Corp., Monroe, Ga. . . . DAVID M. CHEMEL serves as product manager at West Chemical Products, Inc., Long Island City, N.Y. . . . Dr. HAROLD A. CHRISTOPHER currently works as manager — battery development group at Esso Research & Engineering Co., Linden, N.J. . . . EDWARD F. DOWLING is a manager of advanced design at Babcock & Wilcox, Lynchburg, Va. . . . PRESTON W. HALL, SIM, has been named president of the Knife Division of Rexnord, Inc., in Maynard, Mass. He joined the company in 1973 and had been manager of the Knife Division. He will be responsible for all the activities of the division which manufactures agricultural knives and rotary lawn mower blades. . . . HENRY J. KOSIBA, JR. works at Fenwal, Inc., Ashland, Mass.

DAVID Q. OLSON is a systems analyst at Computer Congerics of Texas in Dallas. . . . Currently DAVID M. RAAB is with Draper Lab., San Diego, Calif. . . . DONALD C. ROOT writes that he recently joined the Terry Steam Turbine Co., Windsor, Conn., as a senior engineer-gear products. The Roots, who reside in Windsor, are the parents of two daughters. . . . Presently DAVID L. ST. ONGE works for United Nuclear Corp., Montville, Conn. . . . Dr. ROBERT E. SEAMON, organist at Trinity-on-the-Hill Episcopal Church, Los Alamos, N.M., presented an organ recital at Wesley Methodist Church in Worcester in May. Dr. Seamon is a staff member of the Los Alamos Scientific Laboratory of the University of California in New Mexico. . . . FREDERIC A. STEVENS is vice president of Vantage Computer Systems, Hartford, Conn. . . . ROBERT STEWART, SIM, teaches at Uxbridge (Mass.) School. . . . PAUL S. SLEDZIK, former president of the Berkshire Chapter of the Alumni Association, is now located in Waukesha, Wisconsin, where he is manager of Waukesha Operations in the Medical Systems Division at General Electric Co. . . . THOMAS P. LOPRESTI, a systems engineer for the Data Processing Division at IBM, is currently located in Omaha, Nebraska.



Sledzik, '61



Krein, '62

# 1962

Dr. KENNETH J. ANUSAVICE currently serves as an assistant professor in the Dental Materials Section, Department of Restorative Dentistry at the School of Dentistry at the Medical College of Georgia in Augusta. He is also pursuing a course of study leading to a DMD degree. . . . ROBERT J. BAGDIS has been appointed as a member of the Millbury (Mass.) Finance Committee. Presently he is a senior engineer at Norton Co., Worcester. . . . WILLIAM C. BORLA is employed by the Dept. of Transportation, Hartford, Conn. . . . M. PHILIP DeCAPRIO has been appointed to the position of senior engineer at Northeast Utilities in Berlin, Conn. He became a cadet engineer at Connecticut Light and Power Co. in 1965. After serving as an assistant distribution engineer, he was named a division planning engineer in 1970 and in that capacity was on loan to Northeast Utilities in 1973. . . . PAUL R. CULTRERA is assistant to the director of industrial security (corporation fire marshal) at United Aircraft Corp., East Hartford, Conn.

ARTHUR E. DOBRESKI is a senior facilities engineer at Gillette Co., Andover, Mass. . . . STUART C. GILLOW, who is presently located in Mundelein, Illinois, works for IBM. . . . WILLIAM A. KREIN has been named manager, financial section, for General Electric's installation and service engineering department in Schenectady, N.Y. After receiving his MBA from Babson Institute in 1964, he joined G.E.'s advanced manufacturing training program. From 1968 to 1972 he held domestic and foreign audit assignments with the Corporate Audit Staff. His most recent position was that of manager, financial operations analysis, group finance operation for the Power Generation Business Group in Stamford, Conn. . . . RICHARD P. LAJEUNESSE has been appointed product manager for the time-series analysis systems at Time-Data Corp., Palo Alto, Calif. Since 1962 he has held marketing and engineering positions with General Radio Co., of which Time-Data is a subsidiary. Earlier he was assistant product marketing manager at General Radio headquarters.

Presently KENNETH J. LaLIBERTE is a coordinator/ microfilm-micrographics at Eastman Kodak Co., Rochester, N.Y. . . . JOSEPH D. LeBLANC has been appointed assistant plant superintendent at Maine Yankee Atomic Power Company, Wiscasset, Me. He joined the company in 1966 as a technical assistant in the Reactor Engineering Dept. in Rowe, Mass. In 1967 he earned his reactor operator license. In 1969 he became acting reactor engineer and was assigned to the Maine Yankee project. He was appointed reactor and computer supervisor at the Wiscasset plant in 1970 and directed Maine Yankee's initial startup test program. LeBlanc earned his senior reactor operator's license in 1972 and was appointed assistant to the plant superintendent in 1973.

DONALD R. MARCY is with Johnson & Higgins, New York City. . . . JOHN V. MEREGIAN serves as an administrator at Kendall Co., Walpole, Mass. . . . WALTER D. WADMAN has been named district superintendent of operations for the Connecticut Light and Power Co., Bristol, Conn. He joined CL&P in 1963 at Norwalk Harbor. In 1964 he

became a junior engineer at Danielson and an assistant engineer in 1967. Later he was named area operating engineer and area operations supervisor. . . . STEVEN W. ZIEMBA was recently named principal of John F. Kennedy Junior High School in Springfield, Mass. He was assistant principal and had been acting principal since December. A doctoral candidate at the University of Massachusetts, he formerly taught physics and chemistry at Technical High School and Roger L. Putnam Vocational Technical High School. Prior to his teaching career, he had been an industrial chemist with the U.S. Rubber Co.

## 1963

WILFRED E. BROWN, III is with the U.S. Dept. of Transportation T.S.C., Cambridge, Mass. . . . LAWRENCE N. ESCOTT serves as a systems analyst at Blue Cross/Blue Shield, New York City. . . . WILLARD W. GOODWIN, JR. has been promoted to engineering manager-precision products at the Fafnir Bearing Co. (Division of Textron) in New Britain, Conn. Since 1964 he has worked in application engineering with extensive experience in the custom precision field. He is president of the Avon Secret Lake Association and is a member of the Society of Automotive Engineers.

JAMES M. KELLY, JR. district sales manager, pollution control division at Carborundum Environmental Systems, Inc., is located in Buffalo, N.Y. . . . FREDERICK L. KUBICK is working in Sonar Research at Dynell Electronics Corp., Melville, N.Y. . . . JOSEPH MANCUSO, of the management engineering department at WPI, has been named to the board of directors of Laser, Inc., Sturbridge, Mass. He is also the president and founder of Applied Marketing, Inc., a management consulting firm. Currently he sits on the board of nine small businesses. . . . Dr. and Mrs. R. MICHAEL MALBON and their daughter Beth recently returned to the U.S. after spending two years as private citizens in Chile with the Peace Corps. Dr. Malbon was granted a full professorship and taught in the Electronic Division at the University of Valparaiso and the Naval School of Santiago. Mrs. Malbon taught English to Chilean students at the same university. Dr. Malbon has now returned to his position in the Allied Solid

States Division of the Howard Hughes Research Laboratories in Newport Beach, Calif.

KENNETH OLSEN is a patent attorney at Schlumberger Limited, Ridgefield, Conn. . . . At present WARREN R. STANDLEY is on leave of absence as a senior engineer at Pratt & Whitney Aircraft, South Windsor, Conn. and is completing research for a PhD at the University of Connecticut. . . . In April CARL STOUTENBERG received an honorable mention award for his entry in the 1973 Materials Utilization Contest sponsored by *Production*, the magazine of manufacturing. His entry was slated to be published in the July 1974 issue. A former research engineer at the Stanley Works, New Britain, Conn., he was recently promoted to product line engineering manager of the New Britain Product Line Group. . . . CONRAD P. SUPSKI works for Herbert Engineering, Inc., Worcester. . . . GERALD D. WAXMAN teaches at Santa Monica (Calif.) City College. . . . PAUL E. CAHALEN serves as district manager for Strong Scott Mfg. Co. He is located in Lakewood, N.J.

## 1964

*Married:* CARL YOUNGMAN and Miss Joan S. Blackman in Providence, Rhode Island on May 19, 1974. Mrs. Youngman, a graduate of Wheelock College, teaches in Quincy, Mass. The groom is a partner in the management consulting firm of Youngman, Charm and Associates, Brookline.

J. MICHAEL ANDERSON is currently vice president, MBA Communications, Inc., New York City. . . . JOSEPH B. BRINKMANN is a senior metallurgical engineer for G.E.-Advanced Technology Operation, Bridgeport, Conn. . . . PAUL A. COVEC works at Teradyne, Sunnyvale, Calif. . . . RICHARD A. DOWNE is reliability engineer at Fairchild Semiconductor, South Portland, Me.

WALTER J. GONIA, SIM, holds the post of regional sales manager in the Johnson Division of Universal Oil Products Co., St. Paul, Minn. . . . Presently WILLIAM S. INGALLS, JR. is marketing supervisor for American Telephone & Telegraph in New York City. He had been with New England Telephone. . . . CARLETON F. KILMER, JR. serves as manager, administrative services

division, Arthur Andersen & Co., Boston. . . . GEORGE KLANDER is with UCAC (Unemployment Compensation Advisory Corp.), Philadelphia, Pa. . . . RONALD E. LUBOWICZ works for Dstrigas Corp., Boston, Mass. . . . Dr. BRUCE MACCABEE is a research physicist in the Naval Ordnance Lab., Silver Spring, Md.

BRUCE A. OCHIEANO is with William Blair, Inc., Los Altos, Calif. . . . Dr. ALFRED R. POTVIN holds the position of director and associate professor of bio-medical engineering at the University of Texas at Arlington. . . . JOHN C. RYDER is now vice president at Fabricated Machine, Massillon, Ohio. The company designs and manufactures test equipment for the tire industry. . . . EDWARD N. SANTOS works as a district sales engineer for General Electric in Detroit, Mich. . . . MAURICE R. SILVESTRIS, who is with New Jersey Zinc Co., Palmerton, Pa., received his MBA from Lehigh University in December. . . . EUGENE N. SPRAGUE works at W. N. Sprague, Inc., Leicester, Mass. . . . MARIO TAMA is self-employed with Contemporary Builders, Woodstock, Vt. . . . PAUL A. LILIENTHAL is owner and president of Aqua Wells, Inc., Thetford Center, Vt. . . . Dr. ROBERT A. PEURA, assistant professor of electrical engineering and life sciences at WPI, has been named as an outstanding young leader of Worcester County for 1974 by the Greater Worcester Jaycees.

## 1965

PETER F. BEHME is a project engineer with Fram Corp., East Providence, R.I. . . . ROBERT H. CAHILL serves as a product manager at Hilti Fastening Systems, Stamford, Conn. . . . ROBERT K. DAWLESS works for ALCOA in New Kensington, Pa. . . . MICHAEL S. DEMBSKI is marketing manager at Brockway Glass Co., Inc., New York City. . . . RONALD GREENE has been employed at Data General Corp., Southboro, Mass. . . . WILLIAM S. HAGAR is a process engineer at General Cable Corp., Pownal, Vt.

ROBERT L. JOHNSON works for IMLAC Corp., Needham, Mass. . . . ROBERT D. KLAUBER is studying in Belgium. . . . Systems Research Laboratory, Dayton, Ohio, employs PETER E. OBERBECK. . . . THOMAS E. PEASE is with Quirk, Lawlor & Matusky, Tappan, N.Y. . . . Presently WAYNE D. PONIK is a product manager at Teradyne, Inc., in Chatsworth, Calif. . . . HARVEY ROSENFELD is president of Rosenfield & Associates, Inc., Jamaica Plain, Mass. . . . Currently PHILIP B. RYAN serves as a partner in N. F. Bigelow & Co., Manchester, N.H.

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ROBERT D. SCHLEE works at IBM Corp., San Jose, Calif. . . . Presently ALFRED G. SYMONDS is a senior field service representative for General Electric Ordnance Systems, Pittsfield, Mass. He is on assignment at U.S. Naval Weapons Lab., Dahlgren, Va. . . . MADHUKAR B. VORA holds the post of general manager at Cambridge Memories, Inc., Poughkeepsie, N.Y. . . . Lt. Cmdr. FRANCIS X. WATSON is in charge of construction at the new U.S. naval base in the Indian Ocean (Diego Garcia). He is a project engineer. . . . JOHN H. ZIFCAK, JR. serves as engineering manager at the Foxboro (Mass.) Co. . . . Dr. RICHARD FORTIER has joined Stone & Webster in Boston. Formerly he was an assistant professor in mechanical engineering at Southeastern Massachusetts University. Dick writes that he and his wife, Gail, and son, Jason, now live in Concord, Mass.

## 1966

**Married:** DAVID E. WILSON to Miss Barbara A. Davis of Chevy Chase, Maryland on December 15, 1973. He serves as a senior systems analyst for UNIVAC, Washington, D.C.

**BORN:** To Mr. and Mrs. MICHAEL T. PORTANOVA a daughter, Camy, in July of 1973. He is with Digital Equipment Co., Maynard, Mass.

GARY ANDERSON is a sanitary engineer at Ken R. White Co., Denver, Colo. Last year he received his MS in environmental engineering from Duke University. . . . WILLIAM R. BOND, JR. works as a staff engineer at Chicago Finish Metals, Bridgeview, Ill. . . . Dr. LIONEL A. CARREIRA is an instructor in the Chemistry Department in the University of Georgia in Athens. . . . DENNIS FLANNERY works for the New York Department of Transportation, Albany, N.Y. . . . Currently RICHARD E. GOODELL serves as a plant manager at Pfizer, Inc., Victorville, Calif. . . . JOHN S. JENKINS, who is a staff engineer for Terry Corp. of Connecticut, Terry Steam Turbine, is located in Windsor, Conn. . . . EDWARD A. KAZANJIAN, JR. has been appointed director of school plant for the Brookline (Mass.) Public Schools. Previously he was assistant director in Brookline and assistant director of buildings and grounds for the Framingham Public Schools.

JOHN C. LEE serves as project office engineer at Bechtel Assoc., Washington, D.C. . . . PAUL G. MESSIER works at Consolidated Controls Corp., Bethel, Conn. . . . PAUL F. PETERSON is a technical consultant in Software AG of North America, Reston, Va. . . . The First National City Bank, New York City, employs MELVYN L. SACK. . . . PETER K. SOMMER has joined his father Kenneth R. Sommer, in partnership to continue the practice of patent, trademark and copyright law as Sommer & Sommer in Buffalo, N.Y. . . . Presently ROBERT J. ZAVATKAY works at the Stanley Works, Hand Tools, New Britain, Conn.

## 1967

**Born:** To Mr. and Mrs. RICHARD H. COURT, JR., a son, Jonathan Douglas, on December 21, 1973. Dick, who received his MS from Adelphi University last year, was recently named supervisor of quality control for BMC in Danbury, Conn. . . . To Mr. and Mrs. JONATHAN A. TITUS, a son, Christopher Hendrie, on April 1, 1974. Jon has started a business (Titus Labs, Blacksburg, Va.) which is concerned with custom electronic design and computer interfacing. He has also coauthored several recent articles on computer interfacing for *Analytical Chemistry*.

MICHAEL B. BARR works as plant manager at M & T Chemicals, Inc., Elizabeth, N.J. . . . CHARLES L. BLAKE serves as a staff engineer at Helena Chemical Co., Memphis, Tenn. . . . CHARLES T. BLANCHARD is the Republican candidate for the Water and Sewer Commission in Sturbridge, Mass. He holds the post of manager of engineering for the Pneumatic Ejector Division of CPC Engineering Corp. A member of the New England Water Pollution Control Association, he also belongs to the Society of Mechanical Engineers and the Water Pollution Control Federation. . . . WILLIAM F. CARBONI works for Albert A. Web Assoc., Riverside, Calif. . . . ROBERT H. CARON is with TRW, Inc., Redondo Beach, Calif. . . . Rohm and Haas Company, Philadelphia, Pa., employs RICHARD E. DEGENNARO. . . . ROBERT E. DENIGRIS teaches mathematics at the Masters School in Dobbs Ferry, N.Y.

JOHN F. DOWNES, JR. has been appointed district manager of Fafnir Bearing Company's Detroit sales office. He has been sales manager in the Detroit area for three years and was previously in Moline, Illinois. . . . JOHN A. FACCA is an operating room engineer at Hartford (Conn.) Hospital. . . . JOSEPH G. FERRARA serves as a sales engineer for Mount Hope Machinery Co., Taunton, Mass. . . . Capt. DAVID K. HEEBNER (U.S.A.) is presently attending Naval Post Graduate School where he is studying for his master's degree in Operations Research. He is located in Monterey, Calif. . . . FREDERICK P. HELM works at Hazeltine Corp., Greenlawn, N.Y. . . . PAUL HINKLE is senior buyer at Arrow-Hart, Hartford, Conn. . . .

EDWARD W. PILTZHECKER, JR. is with the Foxboro (Mass.) Co. . . . JOSEPH R. PYZIK was recently awarded a \$100 savings bond as the winner of an employee contest to name the new unbreakable replacement glazing material being manufactured by his firm, Rowland Products, Inc., Kensington, Conn. He called the new product, "Perma-Pane." Pyzik, who is working on his MBA at the University of Hartford, is employed as a general foreman in the Sheet Products Division at Rowland. . . . GEORGE H. RAND, JR. works as a technical salesman at Union Carbide, Tarrytown, N.Y. . . . ERNEST L. SMITH, SIM, chief industrial engineer at the Cincinnati Milacron-Heald Division, recently announced his candidacy for the three-year term on the Auburn (Mass.) School Committee. He currently holds an appointed position on the committee and previously he has served as an elected member. . . . DUNCAN C. VANDENBERG is a manufacturing engineer at Dow Corning Corp., Trumbull, Conn. . . .

ELLIOT F. WHIPPLE has completed the course of study required for a master of science degree at Brown University, Providence, R.I. . . . U.S. Air Force Captain JONATHAN P. WORTHLEY has received his master's degree at the Air Force Institute of Technology at Wright-Patterson AFB, Ohio.

## 1968

**Married:** KENNETH A. CRAWFORD to Miss Mona Atallah on December 29, 1973 in Worcester. The bride attended schools in Tripoli, Lebanon and is a cytotechnologist in the Hahnemann Hospital laboratory. Her husband is a research assistant at WPI's Alden Labs and is also a graduate student in the physics department. . . . RONALD F. GOLASZEWSKI to Miss Carole Ann Grace on April 20, 1974 in Fall River, Massachusetts. Mrs. Golaszewski graduated from Bridgewater State College and teaches in Fall River. Her husband is a rate analyst for the Providence Washington Insurance Co. . . . MICHAEL A. DIPIERRO to Miss Jean Marie Mahoney on January 19, 1974 in West Harwich, Massachusetts. The bride is an interior decorator and graduated from Marymount College. The groom runs Polyform Corp., Westboro, Mass.

JOSEPH S. ADAMIK, JR. is a sales representative at Price Brothers Co., Dayton, Ohio. . . . ARNOLD ANTAK, who is a planner-engineer for Howard, Needles, Tammen & Bergendoff, is presently working as assistant project director for the preparation of the Final Environmental Impact Statement for the controversial relocation of Route 2 through Lexington, Lincoln, Concord, and Acton in Massachusetts. . . . JOHN J. BRESNAHAN, JR. works at Norton Co., Worcester. . . . JAMES R. CRABB is general superintendent at M. Rondano, Inc., Stamford, Conn. . . . MARSHALL J. DANA currently serves as a design engineer at Westinghouse Electric, Sunnyvale, Calif. . . . GAETANO DECARO is a production supervisor at Leaf Confections, Ltd., Scarborough, Ontario, Canada.

CARL A. ENGSTROM works for Eastern Refractories Co., Inc., Belmont, Mass. . . . GEORGE F. GAMACHE of Watertown, Mass. was recently appointed construction manager for Star Market which is currently engaged in a vast expansion program. He joined the 59-store supermarket chain as a project engineer in May of 1972. . . . CHESTER J. KASPER serves as a sales engineer at Pearse/Pearson, Bloomfield, Conn. . . . RICHARD KUNG, who received his MS from WPI in December, is now studying at the University of Massachusetts. . . . ROUMEN B. KORDOF, CLU, is a partner in Kordof & Golden Company, Denver, Colo. . . . JOHN J. KORZICK holds the post of account manager at Industrial Nucleonics, Columbus, Ohio. . . . WILLIAM D. MAHONEY is president of Mahoney-Smith, Inc., Union Dale, Pa. . . .

JOHN H. McCABE was recently promoted to assistant treasurer at Hammond Plastics, Inc., Worcester, the country's largest independent manufacturer and distributor of polystyrene. He joined Hammond as director of information systems in 1970. Previously he had worked as a systems engineer and marketing representative at IBM. Jack, who has his MBA from Clark University, is a member of the Presidents' Club of the Worcester Area Chamber of Commerce and a member of the Chamber's Leadership Program. He is vice president of the Worcester County Chapter of the WPI Alumni Association.

Dr. JOSEPH F. OWENS, III is a research associate/lecturer at Case Western Reserve University, Cleveland, Ohio. He received his PhD from Tufts last year. . . . Dr. MICHAEL R. PAIGE works at Sperry Research Center, Sudbury, Mass. . . . Capt. RICHARD G. PERREAU has graduated from the Engineer Officers' Career Course at Ft. Belvoir, Va. and is now assigned to the Far East Engineer District in Seoul, Korea. . . . JOHN M. PETRIE is the senior project engineer at ESE Limited, Toronto, Ontario, Canada. . . . DAVID B. POTTER has been appointed Central Maine Power Company's local manager in Damariscotta. In 1968 he joined CMP as assistant power sales engineer in the Portland office. In 1972 he became division operations assistant in Brunswick.

WALTER SACKMANN is a sales engineer for the Hope Company, Fitchburg, Mass. . . . RICHARD S. SADOWSKI was recently promoted to manager of the Fuel Burning Engineering Dept. at Riley Stoker Corporation in Worcester. He joined the firm's research and development department in 1968. After serving in Viet Nam and winning two bronze stars and the Army Commendation medal, he returned to join Riley's fuel burning department in 1971. In 1972 he joined the gas cleaning systems department coordinating the engineering of the first fuel-sized utility sulfur dioxide removal system sold by the company. He was co-author of a paper entitled: "An Experimental Correlation of Oxides of Nitrogen Emissions from Power Boilers Based on Field Data," which was presented to the American Society of Mechanical Engineers in 1972. Riley Stoker is one of the country's largest designers and builders of power generating, fuel burning, and gas cleaning systems.

RUSSELL B. SNYDER serves as an instructor in the Department of Business Administration and Economics at St. Michael's College, Winooski, Vt. . . . STEPHEN J. STADNICKI, JR. is a graduate student at Princeton. . . . MICHAEL J. TRUE is a sales and marketing representative for Maine Building Spec. Co., Portland, Me. . . . RICHARD B. VAUGHN, who is with General Electric in Fitchburg, Mass., is also a part-time MBA student at Clark University, Worcester. . . . ROBERT A. WILEY serves as a product engineer for Raytheon Co., West

Andover, Mass. . . . EDWARD F. CANNON, former WPI All America soccer player, has been appointed assistant athletic director at Saint Anselm's College, Manchester, N.H. He will also direct the college intramural program, and serve as assistant soccer coach and varsity golf coach. Since graduating from WPI, he has taught math and science at Worcester Academy where he also coached soccer and basketball. In 1972 he was named assistant athletic director of the Academy. That same year he led the Worcester Scans semi-pro soccer squad to the Mass. State Soccer League title.

## 1969

*Married:* Lt. DAVID J. PIETRASZEWSKI to Miss Kathleen M. Stochmal on May 25, 1974 in New Britain, Connecticut. The bride graduated from Saint Joseph College and Southern Connecticut State College. She is a special education teacher. Presently her husband is assigned at the U.S. Coast Guard Research and Development Center, Groton, Conn. . . .

2/Lt. DAVID J. MANCHESTER to Miss Mary M. Beaudry on February 2, 1974 in Newport, Rhode Island. Mrs. Manchester graduated from Beaver College, Glenside, Pa., and is an administrative assistant at the Naval War College. The bridegroom recently graduated from Officer Training School, Lackland AFB, Texas. . . . ROBERT W. SMITH and Miss Joan M. Bucci on May 18, 1974 in Canton, Massachusetts. Mrs. Smith graduated from Bridgewater State College. Her husband is a metallurgist at Yankee Atomic Electric Co., Westboro, Mass.

RICHARD ALPERT is a technical writer at Unitrode Corp., Watertown, Mass. . . . WILLIAM A. BENSCH works as a senior programmer at General Electric's space division in King of Prussia, Pa. . . . HARVEY S. BIERENBAUM serves as a research engineer at Celanese Research Co., Summit, N.J.

JOHN F. DODA works at Underwriters Labs, Inc., Melville, N.Y. . . . CHARLES T. DOE, who recently became an associate of the Society of Actuaries, has been promoted to actuarial associate at State Mutual Life Assurance Company of America in Worcester. . . . STEPHEN A. ERIKSON is employed by Anderson Bros., Pharmacy, Worcester. . . . JOSEPH E. FITZGERALD, JR. is a design engineer at Babcock & Wilcox, Lynchburg, Va. . . . WARREN F. FOLLETT is with Hughes Aircraft Co., Culver City, Calif. . . . New England Telephone & Telegraph Co., Framingham, Mass., employs CHARLES E. FORAND. . . . JOHN GRANT is with the sales office of Cambion (Cambridge Thermionic Corp.) in Cambridge, Mass. He had been with Digital Equipment Corp., Maynard.

EDWARD L. GRIFFITH, JR. is now with Emcon Associates in California. He works in the field of waste management. . . . RICHARD M. GROSS received his PhD from the University of Utah in June. This fall he will serve as a research engineer at Dow Chemical Co., Midland, Mich. . . . STEPHEN W. HAMMOND works for the Morris County Dept. of Public Works, Morristown, N.J. . . . PAUL HAYNER holds the post of estimating engineer at Spaulding & Slye Corp., Boston. . . . GREGORY T. HOPKINS is with Mitre Corp., Bedford,

Mass. . . . RONALD L. JONES was recently appointed sales engineer for Jones' Enterprises, Inc., in East Hartford, Conn. Previously he was with Kelly-Springfield Division of Goodyear Tire & Rubber Co. . . . JAMES P. MILLS works as a nuclear project engineer for General Dynamics, Electric Boat Division, Groton, Conn.

STEPHEN F. NAGY serves as a systems sales application engineer at the Foxboro (Mass.) Co. . . . MATTHEW T. NECLERIO is plant engineer and general manager of Paramount Wire and Harness Co., New Haven, Conn. He is also working for his MBA at the University of New Haven. He has had several articles published in various medical journals. . . . JOEL F. O'ROURKE teaches at Holy Name High School, Worcester. . . . STEPHEN O. ROGERS holds the position of plant production supervisor at DuPont in Denton, N.C. . . . Presently THOMAS SEMPREBON is vice president of his family's business, Calmont Beverage, in Barre, Vt. Formerly he was with Goodyear. . . . ROBERT S. TEMPLIN is an attorney-at-law in Haddonfield, N.J. . . . PETER R. WALSH serves as a field engineer for General Electric in Millburn, N.J.

## 1970

*Married:* Lt. DANIEL B. BENTLEY (U.S.A.) and Miss Dianne M. Budney on March 30, 1974 in Auburn, Massachusetts. The bride attended Holy Family College in Philadelphia, Pa. and received a BA degree in mathematics from Worcester State College in January. Lt. Bentley recently returned from a tour of duty in Turkey.

ROBERT B. CALLAN is with Wang Laboratories, Inc., Worcester. . . . DONALD A. COLANGELO holds the post of transportation planner, at Harland Bartholomew & Assoc., Memphis, Tenn. . . . CHRISTOPHER J. COWLES is senior systems analyst at Programming Methods, Inc., GTE, New York City. . . . VICTOR J. DENNIS works as a forms analyst for Hartford Insurance Group, Hartford, Conn. . . . WILLIAM A. FERRANTI, who is with Factory Insurance Assoc., is located in Waitsfield, Vt. . . . DOMENIC F. FORCELLA, JR. has been nominated for the 1974 Jaycee Distinguished Service Award in Plainville, Conn. He is recognized for his concern for the environment, participation in governmental affairs, and his political involvement.

HOWARD V. GOLDBERG is employed at Kennecott Copper, Lexington, Mass. . . . ROBERT W. GRADY is a field engineer for General Electric Technical Services Co., Schenectady, N.Y. Currently he works as an overseas technical advisor on G.E. gas turbines. . . . ERIC W. HENRY is studying at College of the Atlantic in Maine. . . . SHELDON KATZ serves as a computer programmer at Hoffman LaRoche, Cranbury, N.J. . . . PAULA LEE holds the post of principal engineer at Lockheed Electronics, Plainfield, N.J. . . . RICHARD T. LLOYD is with G. T. Schjeldahl Co., East Providence, R.I.

FRANK D. MEOLI works as a sales engineer at Eastern Fire Door Co., Inc., West Haven, Conn. . . . GREGORY O. MOBERG is a research engineer at Eastman Kodak Company, Rochester, N.Y. . . . GEORGE P. MOORE, who received his JD from Suffolk University, is a self-employed attorney in Worcester. . . . KENNETH W. OBERG now works for Narragansett Electric, Providence, R.I. He is also a WPI evening graduate student.

GERALD E. PIEPIORA is a sales engineer for Freemire & Assoc., Inc., Baltimore, Md. . . . RICHARD B. ROCK, who has received his professional engineer's license in Pennsylvania, works at United Engineers and Constructors, Inc., Philadelphia. He is in the nuclear power plant field. . . . ROBERT A. ROSENBERG serves as manager, special services, at Tahoe Donner, a 4,000-acre resort community in the California Sierras at Truckee. His responsibilities include community relations, working as local marketing coordinator, special projects manager and being responsible for setting up the Property Service Company for the parent company, Dart Resorts. . . . STEPHEN A. TUREK is a graduate student at the University of Connecticut, Storrs. . . . PHILIP C. WARREN is a staff engineer in the plant engineering department at Nashua (N.H.) Corp. . . . JUAN F. WEISZ is currently a graduate teaching assistant at Northeastern University, Boston. . . . PAUL C. WILSON, a PhD candidate at the University of Connecticut, has been awarded the \$750 Michael Perry Memorial Scholarship of the Hartford Section of the American Welding Society. His research focuses on welding and casting of metals and he will use the award to support a portion of his studies of weld metal solidification in electrosag welding.

# 1971

*Married:* CHARLES E. BROADHURST and Miss Shireen Rahavy on February 1, 1974 in Blackstone, Massachusetts. Mrs. Broadhurst graduated from Endicott Junior College in Beverly and is employed by the Blackstone Valley National Bank. She is also "Wendy the Weathergirl" on radio station WMRC, Milford. The groom is assistant branch manager of the Blackstone Valley National Bank in Millbury. . . . JAMES W. REGAN to Miss Joan H. Huesner on February 16, 1974 in Worcester. The bride is a registered nurse at Memorial Hospital. Her husband is a civil engineer for Zoppo Construction Co., Norwood, Mass. . . . ROBERT A. WOOLLACOTT, JR. to Miss Nancy J. Marchak on May 11, 1974 in West Hartford, Connecticut. Mrs. Woollacott, a Becker graduate, is a secretary with Henry Schadler Associates, Architects, West Hartford. The groom, who is with Curtis 1000 in West Hartford, is an MBA candidate at the University of Connecticut.

HAROLD B. ALTER is a graduate student in the City and Regional Planning Department at the University of North Carolina, Chapel Hill. This year he receives his MRP. . . . RICHARD A. ARENA serves as a foreman at U.S. Steel Supply, Brighton, Mass. . . . DON A. BACKLUND is an insurance and real estate broker with R. E. Backlund Insurance Agency, Inc., Rehoboth, Mass. . . . WILLIAM R. BELOFF is employed at Soil & Rock Instrumentation, Newtonville, Mass. . . . AVANISH I. BHAGAT is an MBA student at the University of Bridgeport in Connecticut. . . . CHARLES C. BLAKE is with GM Detroit Diesel, Detroit, Mich. . . . BRUCE N. BOSSERMAN is a graduate student at the University of Connecticut in Storrs.

ROBERT M. BYRNE works as an assistant engineer at Hartford Electric Light Co., Wethersfield, Conn. . . . THOMAS R. COPP, product engineer in Simonds' research and development department, Fitchburg, Mass., was profiled in the May 3rd issue of *Simonds Spotlighter*. Tom, who has been with the company since 1972, analyzes the problems occurring in marketed products which are not performing properly. He then develops a program to improve product performance. Currently, with the aid of a new dynamic testing machine, he is working to improve the fatigue resistance of the backing material used for a carbide tipped bandsaw. . . . JAMES F. CRITTENDEN is an engineering trainee at Packer Machine Company, Meriden, Conn. . . . WILLIAM S. DELIS works at Combustion Engineering, Windsor, Conn. . . . ROBERT C. DUGGER, JR. serves as an accountant trainee at Acnat Corporation, East Hartford, Conn. . . . RICHARD E. DYNIA works for Monsanto Co. in Bloomfield, Conn. . . . JAMES R. FAY is a structural engineer for the U.S. Army Corps of Engineers, Waltham, Mass. . . . MICHAEL J. GITLEN holds the post of operations auditor at E-B Industries, Inc., Simsbury, Conn. . . . NORMAN E. JOHNSON is a process development engineer for General Electric, Mt. Vernon, Indiana.

MICHAEL J. KAJEN is a graduate student at WPI. . . . JOHN J. LARAMEE works at New England Telephone in Framingham, Mass. . . . Dr. RICHARD P. LINDSAY, a senior research engineer at Heald Division, Cincinnati Milacron, Worcester, was a featured speaker at the 13th Abrasives Conference held in Philadelphia in June. His topics were: "Chatter-Free Grinding Time," "Evaluating Grinding Fluid Performance," and "Factors Affecting Borazon CBN Grinding Systems." He has worked extensively in the research and development of grinding systems and machine hardware. He is widely published in technical books, professional journals, and trade magazines. . . . SCOTT T. McCANDLESS works for Environmental Research & Technology, Lexington, Mass. . . . W. ROBERT MELVILLE is a facilities engineer at Rochester Products/General Motors in Rochester, N.Y. He is also studying for his MBA at Rochester Institute of Technology.

DAVID P. MURPHY works for the Fairfax (Va.) county government. . . . THOMAS A. PANDOLFI is on the professional technical staff at Princeton University. . . . DONALD K. PETERSON has been promoted to investment analyst at the State Mutual Life Assurance Co. of America in Worcester. He joined State Mutual in 1973 after graduating from Dartmouth's Amos Tuck School of Business Administration. . . . Currently JOHN G. PLONSKY is a graduate student at the University of Massachusetts. . . . ABBAS A. SALIM works for Martin Marietta Corp., Denver, Colo. . . . LAWRENCE SNIEGOSKI is completing requirements for his master's degree at Fairleigh Dickinson College, Rutherford, N.J. . . . DENNIS J. STABA is with Combustion Engineering, Windsor, Conn. . . . DONALD TANANA, now a warehouse supervisor for Clairol, Inc., in Glendale, Calif., is attending USC in the MBA evening program. . . . RICHARD V. TINO, JR., who is a quality improvement engineer at Polaroid Corp., Waltham, Mass., was married July 8, 1973 to Miss Clare E. Snow of Easton, Mass. . . . URMAS A. VOLKE is a design engineer with Dynamac Inc. (consulting engineers) in Natick, Mass. . . . STEVEN C. WATSON is the outside plant manager at New England Telephone Co., Fitchburg, Mass. . . . TRENT GERMANO works for Parsons, Brinckerhoff, Tudor and Bechtel in Atlanta, Ga. The Germanos has a daughter Kristen, who is a year old.

# 1972

*Married:* GLENN E. CABANA and Miss Denise T. Robichaud April 21, 1974 in Methuen, Massachusetts. Mrs. Cabana is a secretary. The bridegroom is with Western Electric in North Andover. . . . Lt. JOHN A. WOODWARD to Miss Nancy D. Roden on March 9, 1974 in Pensacola, Florida. The bride is a senior at Montevallo University in Alabama. Her husband is serving with the U.S. Marine Corps at Cherry Point, N.C.

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RALPH A. BLACKMER is with Astra Pharmaceutical Products, Inc., Worcester. . . . CHARLES R. CAIN, JR. is a graduate student in the electrical engineering department at WPI. . . . SAMUEL T. DAVIS is foreman-MMP Program at General Electric in Danville, Illinois. . . . JOSEPH V. GOTTA serves as a production controller at Ludlow Corporation, Holyoke, Mass. . . . ROBERT A. GRANT is an assistant engineer at Howard, Needles, Tammen & Bergendoff, Boston. . . . Currently CHRISTOPHER L. HATCH is an associate engineer at New England Telephone Co., Framingham, Mass.

JOHN M. CUTH works as an associate engineer at Raytheon Co., Portsmouth, R.I. . . . GARY A. FOOTE is an analyst/programmer at Aetna Life & Casualty, Hartford, Conn. . . . JEFFREY S. HUNTER works for Riley Stoker Corp., Worcester. . . . ROY A. LINDBLAD holds the post of equipment engineer at Lane Construction Corp., Meriden, Conn. . . . DOUGLAS MACH is with General Instruments Corp., Chicopee, Mass. . . .

LARRY J. PRICKETT is a process engineer at du Pont-Spruance, Fibers Division, Richmond, Va. . . . KENNETH S. PRIGGEN works at United States Gypsum Co., Stony Point, N.Y. . . . MARCELLO A. RANALLI is with NAB Coronado, Coronado, Calif. . . . KEITH F. SIMONS serves as a design engineer at Morgan Construction Co., Worcester. . . . 2/Lt. BRUCE M. SZYPOT, a member of the millimeter wave radar team from the Army Ballistic Research Laboratories, Aberdeen Proving Ground, Md., is also a coach. He coaches the first-place Colts team in the 9-13 year old division of the Junior Basketball League. Bruce joined the Recreation Services Youth Activities basketball program last season and coached the Colts to a second-place spot in the League. While at WPI, he served as coach to a team of 13 and 14-year-olds. RICHARD S. TUMOLO presented a paper, "An Experimental Determination of

Listeners' Ability to Detect and Decode Simultaneous Messages on the Basis of Pitch," before the psychological acoustics section of the Acoustical Society of America in New York last April. Presently a graduate research assistant at the University of Massachusetts, his work is supported by the National Institutes of Health. This summer he receives his MS in electrical engineering. . . . Terry Steam Turbine Co., Hartford, Conn. employs ROBERT F. WEIR. . . . RICHARD E. WILLEY holds the post of publication specialist at Norton Company in Worcester.

## 1973

*Married:* Miss KATHLEEN A. COYLE to Mr. Gordon S. Nichols on January 5, 1974. The bride is employed as an analytical engineer at Hamilton Standard, Windsor Locks, Conn., where her husband serves as a cost engineer. . . . GEORGE P. GOSSELIN and Miss Glenna Marshall in Falls Village, Connecticut on April 20, 1974. Mrs. Gosselin attended Anna Maria College and graduated from the Yale-New Haven Nursing Program. Mr. Gosselin is employed by Travelers. . . . PETER B. WEBER and Miss Ann Marie Schonning on January 12, 1974 in Worcester. The bride is a senior at Worcester State College. The groom is associated with his father at Allied Metal Products Co.

ERIC BERGSTEDT is a product engineer at Norton Co., Worcester. . . . JEFF E. BLAISDELL has been appointed building inspector in Upton, Mass. He is a project engineer with the George B. H. Macomber Co. . . .

STEVEN M. BUBA has been employed as director of computer operations at United Restaurant Equipment Co., North Smithfield, R.I. . . . JOYCE L. CAPLOVICH, who has been with WICN (radio) in Worcester, plans to join VISTA shortly. . . . HAN-TEE (HSI) CHEN is a research assistant at Rutgers Medical School, Piscataway, N.J. . . . RICHARD D. CRISPINO serves as a project engineer at Combustion Engineering, Inc., Windsor, Conn. . . . Currently THOMAS P. DAGOSTINO is a design engineer with Tektronix, Inc., Beaverton, Oregon.

THOMAS J. DUTKIEWICZ works for Northeast Utilities, West Springfield, Mass. . . . WILLIAM S. ELLIOTT is presently working for General Electric at South African General Electric, New Castle, South Africa. Previously he had spent five months in France at one of the world's largest steel mill complexes near Marseille. . . . RICHARD T. GARGLIANO is a development engineer at Hercules, Hopewell, Va. . . . 2/Lt. ADRIEN L. GAUDREAU, JR. (USAF) is now stationed at L. G. Hanscom Field, Bedford, Mass. . . . JOHN F. GIBSON has been teaching religion, mathematics, and science to elementary and high school students at Above Rocks, St. Catherine, Jamaica. He is a novice for the Society of Jesus, New England Province, and is studying at Weston College of Theology, Cambridge, Mass. . . . STEPHEN GREENBERG is at The U.S. Navy Nuclear Power School, Mare Island, Calif. . . . JOSEPH J. MAGRI works as a loss prevention representative for Liberty Mutual Insurance Co., Boston.

MICHAEL E. MERKLE has been employed as a design engineer at Taylor, Wiseman & Taylor, Moorestown, N.J. . . . AMERICO V. PASQUAZZI is a research assistant in the EE department at the University of Rhode Island in Kingston. . . . BILL C. PENNEY is a cardiovascular technician at St. Vincent Hospital, Department of Cardiology, Worcester.

BERTRAND PINEL-DARRIEUX is with Siibela in Paris, France. . . . NANDUBHAI M. PRAJAPATI serves as a mechanical designer at Mikropul Canada, Ltd., Bramalea, Ontario, Canada. . . . DANIEL H. PRIOR is now with Massachusetts Electric Co., Hopedale, Mass. . . . STEPHEN R. SLAVICK is a junior engineer in the main office of the New York State Department of Transportation, planning and research bureau. . . . 2/Lt. RICHARD F. SLIWOSKI is with the 8th (Army) Infantry Division in Dexheim, Germany, where he is a platoon leader in Company B of the 12th Engineer Battalion.

GREGORY L. STAMPER is now an ensign in the USNR where he serves as a student naval aviator. He is located in Kingsville, Texas. . . . MANUBHAI G. THAKKAR serves as a quality assurance supervisor at Royal Industries, Mississauga, Ontario, Canada. . . . ANTHONY R. URJIL is a sales trainee at Morse Chain, Ithaca, N.Y. . . . JOSEPH J. VALLERA is an engineer-advance products/generator advance engineering, for General Electric Co. in Lynn, Mass. . . . ROBERT R. WOOD works as an application engineer at Ingersoll-Rand, Wellesley, Mass. . . . GEORGE E. YESOWITCH teaches science for the North Smithfield (R.I.) School Department.

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**PHILIP L. SIBLEY, '04**, of Pasadena, California died recently. Born on May 27, 1883 in Westfield, Mass., he later graduated as a mechanical engineer from WPI. During his lifetime he was associated with E. P. Noyes, Standard Plunger Elevator Co., Otis Elevator Co., Sinclair Motor Co., and Henry Hunting Book Store. From 1926 until 1939 he was with G. Lawrence Stimson Co. in Pasadena.

**ROYA A. FITCH, '05**, died on February 28, 1974 in Potsdam, New York. Born on July 12, 1881 in Hopkinton Mass., he later became a student at WPI. In 1905 he graduated as a civil engineer. His entire professional career was devoted to structural engineering.

In 1905 he was employed at the Pennsylvania Steel Co. at Harrisburg, Pa. He also held positions with Virginia Bridge and Iron Company, Roanoke, Va. and the Department of Structures of the New York Central Railroad where he was employed from 1909 until his retirement in 1949.

**ALBERT G. BELDEN, '07**, the retired manager of Research and Engineering of the Grinding Machine Division of Norton Company, died in Worcester on March 30, 1974.

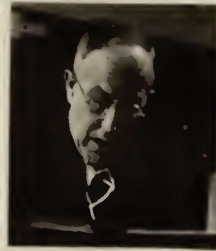
He was born on June 5, 1885 in Lenox, Mass. In 1907 he received his mechanical engineering degree from WPI. During his career he was with O.K. Tool Holder Co.; Pneumatic Scale Corp.; Mfg. Equipment & Eng. Co.; Heald Machine Co.; and United Shoe Machinery Corp. He retired from Norton in 1950 after 38 years of service. While at Norton, he was responsible for over 30 grinding machine patents.

Mr. Belden belonged to the American Society of Tool & Manufacturing Engineers. He was a registered professional engineer in Massachusetts.

**ROBERT C. BLISS, '07**, of Bedford, New York died on February 17, 1973. He was 88.

A Worcester native, he was born on November 13, 1884. After studying at WPI, he was self-employed for several years and then joined the Travelers Insurance Co. Later he was an industrial engineer at Remington Rand, Inc.

**ARTHUR J. KNIGHT, '07**, who taught civil engineering at WPI from 1910 until 1957, died in Worcester on June 1, 1974. He was 89 years old.



A Worcester native, he graduated from WPI as a civil engineer in 1907. For three years he was a resident engineer for the Northern Pacific Railroad before returning to WPI as an instructor in 1910. In 1916 he became an assistant professor and superintendent of buildings and grounds. He was made acting head of the civil engineering department in 1956. In 1957 he retired from teaching, but he continued working with the school plant and was named Professor Emeritus, C.E. and Consultant for Building Planning.

Prof. Knight supervised the construction and renovation of a number of campus buildings including Kaven Hall and Olin Hall. He was treasurer of the Athletic Association and a member of the Athletic Council from its founding in 1915 until 1968. He was a member of the Consulting Committee on Development and Building.

In 1960 he was awarded a citation which read in part: "there is some of 'A.J.' in every facility constructed at Worcester Tech over the last 50 years." The students honored him by dedicating the *Peddler* to him in 1956, and in 1963 WPI's athletic field became known officially as the A.J. Knight Athletic Field.

Prof. Knight, who was also active in traffic planning in Worcester, was a member of the Worcester Society of Civil Engineers, the Boston Society of Civil Engineers, MSPE, ASEE and AAUP. He was a past vice president of the Northeastern Section of ASCE and belonged to Sigma Phi Epsilon, Sigma Xi, and Skull.

**HERBERT P. SAWTELL, '08**, died in Worcester on March 1, 1974. He was 89.

Mr. Sawtell was a sales engineer at the former Leland-Gifford Co., where he worked for 47 years before retiring in 1959.

He was born in Clinton, Mass. on December 23, 1884. After graduating as a mechanical engineer from WPI in 1908, he worked at Bath Grinder Co. and Sullivan Machinery Co. before joining Leland-Gifford in 1912.

He was a member of the Tech Old-Timers Club, and a charter member and past master of Rose of Sharon Lodge of Masons. He was a 32nd degree Mason, a member of all Scottish Rite Bodies, and the Massachusetts Consistory in Boston.

Mr. Sawtell was the father of Edward A. Sawtell, '36.

**CHARLES G. LIDSTROM, '09**, died April 18, 1974 in Mt. Vernon, New York. He was 92 years old.

In 1949 he retired as a civil engineer from the New York City Board of Transportation. Previously he had been associated with Rodman, New York City; the Catskill Aqueduct Board of Water Supply, City of New York; and the Sewer Construction Department in Brooklyn.

He was born in Worcester on Nov. 26, 1881 and graduated from WPI in 1909. A professional engineer and land surveyor in New York state, he was also a member of the New York City Municipal Engineers.

**FRED L. HEWES OF** Old Bridge, New Jersey, class president of the Class of 1910, died on March 12, 1974.

He was born on December 9, 1889 in Westfield, Mass. After graduating from WPI as a civil engineer, he worked for Fred W. Marks in Worcester and for the Harris Co. in New York City. Later he was with Turner Construction Co., Donald Hewes, and M. Shapiro & Sons. He also ran Fred L. Hewes Construction Co. in New York City, retiring in 1958.

Mr. Hewes was a member of Tau Beta Pi and Sigma Xi.

**RAYMOND E. KELLEY, '10**, of Harwich, Massachusetts passed away on January 31, 1974 at the age of 85 following a long illness.

A native of Greenwich, Mass., he graduated as a civil engineer from WPI in 1910. After graduation he spent two years in Santo Domingo and Puerto Rico on railroad surveys and narrow gauge work for transportation of sugar cane from plantations to the sugar mill. Upon his return to the states, he spent 30 years in Hartford, Conn., first with Architects & Engineers and large construction companies.

Later he founded his own building and contracting firm which he headed for 22 years. After his retirement, he bought four old houses in succession which he restored while living in them.

Mr. Kelley was a member of Theta Chi fraternity.



**PHILIP C. FOSTER, '14**, editor of *Foster's Daily Democrat*, Dover, New Hampshire, died in Dover on February 10, 1974. He was 81.

He was born in Dover on February 19, 1892 and later studied at WPI. From 1911 to 1913 and from 1935 until his death, he had served as editor of the *Democrat*. He also had been in the newspaper business in Sheraton, Wyoming and Old Orchard Beach, Maine, and in the printing business in Portland. For several years he published directories in Portland and Springfield, Mass. During World War II, he was with Sylvania Electric Co. in Dover.

Mr. Foster was a trustee of the Woodman Institute in Dover and during the last ten years spent much time rearranging and recataloging the Institute's displays and records. He was a director of the United Appeals Drive and a member of the South-eastern New Hampshire Mineral Club, the Smithsonian Associates, the Maine Mineralogical Society, and a past president of Typothetae. He was a life member and former president of the Lifelong Colonists.

**CLINTON C. HUBBELL, '14**, of Norwalk, Connecticut passed away last winter at the age of 84.

He was born on November 8, 1889 in Wilton, Conn. For many years he served as a civil engineer and surveyor in Norwalk. In the 1920's he developed the Hubbell Marine Cooler which enabled Ford auto engines to be used in boats.

During his career he was associated with the Connecticut Co., New Haven; Goodhue & Hubbell, Norwalk; and Nash Engineering Co. He also served as assistant city engineer in Norwalk and with the U.S. Army in France during World War I. He belonged to the Fairfield County Engineers Association.

**EDWARD T. JONES, '14**, died in Salem, Oregon on January 27, 1974. He was 84 years old.

Born on August 1, 1890 in North Adams, Mass., he later graduated from WPI as a civil engineer. From 1914 to 1916 he worked for the Public Service Commission in New York. After a stint with the New York State Highway Dept., he spent two years as a lieutenant in the Corps of Engineers and saw duty with the A.E.F. in France during World War I.

From 1919 to 1937, he was plant engineer and then manager and vice president of Stevens & Thompson Paper Mill in Greenwich, N.Y. He was next associated with the Brown Co., Berlin, N.H., and from 1945-57 was project engineer with Chas. T. Main, Inc., Boston, where he specialized in paper mill design, including plants in Mexico and Brazil. Following his retirement in 1958, he devoted himself to genealogical research, producing 21 volumes and monographs.

Mr. Jones belonged to Sigma Phi Epsilon fraternity, the Technical Association of the Pulp & Paper Industry, and ASCE.

**WALTER E. SPICER, '14**, of North Palm Beach, Florida, passed away on March 7, 1974. He was 83.

He was born in Boston on March 9, 1890. He graduated from WPI as an electrical engineer in 1914. Following graduation he joined Worcester Consolidated Street Railroad Co. Later he was with United Electric Light Co., Springfield, Mass.; New England Power Co., Worcester; U.S. Ordnance Dept., Springfield; Turner Falls Power Co., Westfield; Ludlow (Mass.) Mfg. Associates; and the Clark Thread Co. and the Heller & Mertz Co., in Newark, N.J. In 1959 he was retired from the American Rayon Corp., Elizabethton, Tenn., after 30 years of service.

Mr. Spicer was a member of Phi Sigma Kappa fraternity.

**DWIGHT E. ALLEN, '15**, passed away on April 3, 1974 in Bradenton, Florida. He was 82.

He was born in Northboro, Mass. on April 11, 1891 and graduated as a chemist from WPI in 1915. From 1918 to 1957 he was employed as a chemical engineer by the Carborundum Co., Niagara Falls, N.Y.

In 1963 he moved to Florida where for the last seven years he and Mrs. Allen have been residents of Bradenton Manor, a Presbyterian retirement home.

**ALBERT H. DERVIN, '15**, of North Canton, Ohio, died on April 3, 1974

He was born on October 28, 1893 in Clinton, Mass. After studying civil engineering at WPI, he became an assistant sales manager at Worcester Pressed Steel. Later he was general sales manager at Canton (Ohio) Forge & Axle Co. and district manager for Endicott Forging & Mfg. Co., Endicott, N.Y. He also served as a district manager for Worcester Pressed Steel Co. and Dollin Corp., Irvington, N.J.

Mr. Dervin belonged to the Pressed Metal Institute, Drop Forging Institute, and American Die Casting Institute.

**CARL F. PALMER, '15**, died January 13, 1974 in Lowell, Massachusetts.

He was born in New Bedford, Mass., June 14, 1892 and received his BS in electrical engineering from WPI. He was a member of old Delta Tau fraternity and Tau Beta Pi honorary. In 1915 he joined the electrical power test section of General Electric, Schenectady. For many years he was engaged with the Locks and Canal System of Lowell, Mass. as chief engineer, and with John A. Stevens Consulting Engineering of Lowell, Mass., in charge of electrical design.

In later years, he was associated with Central Maine Power and Chas. T. Main of Boston specializing in power plant design, his last work involving the Niagara Power Plant. He was a registered professional engineer in Maine, New Hampshire, Massachusetts, Rhode Island, and New York. In 1961 he retired to his farm in East Pittston, Maine, where he was active in Maine Historical Society work.

**PHILIP N. COOKE, '16**, retired vice president of Norton Behr-Manning Overseas, Inc., died February 16, 1974 in Clearwater, Florida. He was 79.

A native of Worcester, he graduated as a mechanical engineer from WPI. In 1916 he joined Norton as a sales engineer. From 1920 until 1946 he served as a sales manager and managing director of Norton Co. of Canada, Limited. In 1946 he returned to Worcester as manager of the foreign division and in 1951 he was elected vice president in charge of abrasives products for Norton Behr-Manning Overseas, Inc. He retired in 1953 after 37 years with the company.

After his retirement he moved to Florida where he helped to form the firm of J. W. Hornbrook, Inc., which built luxury homes in the Clearwater area.

Mr. Cooke, a past president of the Hamilton, Ontario (Canada) Chamber of Commerce, was the father of Kenneth G. Cooke, '48.

**HAROLD C. LEONARD, '16**, of Baton Rouge, Louisiana, died in May of 1973.

He was born in Worcester on October 14, 1894 and graduated as an electrical engineer from WPI in 1916. In 1919 he received his MSEE from Union College. A naval veteran of World War I, he also was associated with General Electric Company and the Submarine Boat Corporation.

During his lifetime he was with Stone & Webster in Boston and Virginia; served as general superintendent of the El Paso Electric Company; and worked for the Gulf States Utilities Company where he retired as executive vice president and director in 1959. Later he founded the Leonard Agency (Insurance) in Baton Rouge.

Active in civic and business activities, he was president of the United Givers Fund and of the local chapter of the Society of the Advancement of Management. He helped found the Baton Rouge Port Development Association, served as president of the South-eastern Electric Exchange, and received the Andrew M. Lockett Civic Leadership Medal from the Louisiana Engineering Society.

**RAYMOND W. T. RICKER, '16**, of Philadelphia, Pennsylvania died on April 5, 1974.

He was born on September 21, 1895 in New Durham, N.H. After graduating from WPI as a chemist, he joined du Pont de Nemours & Co., Wilmington, Del. During World War I he served as a lieutenant aviator with the Signal Reserve Corps in France.

Later he was with McGraw Hill Co., New York City; Hames Electric Protection Co., New York; and Brown Instrument Company, Philadelphia. He was advertising manager of the Autogiro Co. of America, account executive for Watson & Co., and a member of the advertising department at Minneapolis-Honeywell Co., Philadelphia upon his retirement in 1960.

Mr. Ricker belonged to the National Industrial Advertisers Association, Lambda Chi Alpha, and Skull.

**DONALD T. CANFIELD, '19**, of West Lafayette, Indiana, professor emeritus of electrical engineering at Purdue University, died on February 22, 1974.

Prof. Canfield was born in Brooklyn, N.Y. on Sept. 25, 1895. He graduated as an electrical engineer from WPI, where he belonged to Phi Gamma Delta fraternity. During World War I he was a second lieutenant in the Air Corps. Later he was with Jencks Knitting Machine Co. From 1921 until 1964 he served on the electrical engineering staff at Purdue University. He also worked as a consultant for Duncan Electric Co. for many years.

He belonged to Sigma Xi, Tau Beta Pi, Skull, Eta Kappa Nu, and Scabbard and Blade. A registered professional engineer in Indiana, he also was a member of ASEE, AIEE and NSPE.

**EDGAR R. JONES, '19**, of Framingham Center, Massachusetts, died on March 21, 1973.

He was born on March 14, 1894 in North Smithfield, R.I. After graduating from WPI as a mechanical engineer, he joined Mohawk Carpet Mills, Amsterdam, N.Y. He was with the Roxbury Carpet Co., Saxonville, Mass. from 1927 until 1942 and from 1947 until 1960 when he retired as chief plant engineer. From 1942 until 1947 he was employed by Jones & Lamson, Springfield, Vt.

During World War II, while with Jones & Lamson, he was associated with the Office of Scientific Research and Development-National Defense Research Committee, Washington, D.C. He worked on a secret project (which was also being undertaken by Canada and England) to help develop a projectile that would pierce a 9½ inch steel plate at a 45° angle and be capable of blowing up a German tank. He designed and set up a range that was reportedly one of the best in the country. The project was a success and he was awarded a certificate in appreciation of exceptional service.

After retiring in 1960, Mr. Jones, who was a registered professional engineer, became a self-employed consultant. He was a member of Phi Sigma Kappa.

**HOSMERR. KIMBALL, '19**, of East Boothbay, Maine, died on February 8, 1974.

He was born on Sept. 19, 1898 in Jersey City, N.J. In 1919 he graduated with a BSEE from WPI. During his career he was with General Electric, Fort Wayne, Ind.; Forbes & Meyers in Worcester; B. F. Sturtevant Company, Hyde Park; Sundh Electric Co., and the Clark Controller Company of Cleveland, where he served as New England manager and district manager for many years. In 1955 he became a self-employed manufacturers' agent with his own firm, Hosmer R. Kimball, Inc.

**PAUL M. ABBOTT, '20**, died on January 4, 1974 in Boca Raton, Florida.

He was born on August 16, 1897 in Terre Haute, Ind. After graduating from WPI, he worked for a while as a general electrician. He then became advertising manager for Motion Picture News. For two years he was with McGraw Hill Publishing Co. in the New England area. In 1932 he became a partner in Sutherland-Abbott Advertising Agency, Boston, Mass.

Mr. Abbott was a member of Theta Chi fraternity.

**AUGUSTUS L. DUTTON, '21**, died on February 28, 1974 in Winchester, Massachusetts. He was 76 years old.

He was born on September 22, 1897 in Lowell, Mass. After studying electrical engineering at WPI, he went on to Lowell Institute and MIT. Later he was with Lowell Electric Light Co. and Walter B. Foster Co., Hingham, Mass. For 38 years he was employed as a professional engineer at Boston Edison. He retired in 1962.

Active in Masonic circles, Mr. Dutton was also a former director of the Reading (Mass.) Red Cross and past president of the Wakefield Retired Men's Club. He was a life member of the National Heating Association.

**LESTER S. EASTMAN, '22**, died at his home in Lancaster, Pennsylvania on April 23, 1974. He was 74 years old.

In 1964 he retired as sales representative for Norton Co. (Worcester) in its Eastern Pennsylvania Division.

Born in Worcester on August 1, 1899, he graduated as a civil engineer from WPI in 1922. After graduation he was a construction engineer for the City of Worcester for three years. From 1925 until 1964 he was associated with Norton Co.

Mr. Eastman belonged to the Worcester Society of Civil Engineers and ASTM.

**CARLETON S. PERKINS, '22**, passed away on February 19, 1974 in Hyannis, Massachusetts. He was 73 years old.

A native of Boston, he later became a student at WPI. During his career, he was with Electrical Research Products (a subsidiary of Western Electric Co.); and Altec's electronics Division, which during World War II assembled, tested, and installed highly complex gunnery training devices. In 1962 he retired as vice president and general manager of Altec's electronics Division.

Mr. Perkins was a former town official in Plymouth, Mass., where he served as a member of the Finance Committee, chairman of the Water Commission, and a member of the Sewage Treatment Construction Committee. Later he was a member of the Yarmouthport Finance Committee and the chairman of the Capital Outlay Committee, which he organized.

**HALSEY A. GALLUP, '23**, of Norwich, Connecticut died March 25, 1974 at the age of 73.

Retired teller of the Hartford National Bank & Trust Co., Norwich, he was also a former trustee and Treasurer of the Otis Library and treasurer of the Gallup Family Association.

A Norwich native, he was later a student at WPI. During World War II he served in the U.S. Air Force.

**RANDOLPH A. HOLTON, '25**, of Worcester passed away suddenly on January 12, 1974.

He was born in Worcester on May 9, 1902, later becoming a student at WPI. For many years he was owner and manager of R. A. Holton Co., Worcester. He had also worked for the New York, New Haven & Hartford Railroad.

**RUSSELL F. BARKER, '26**, passed away on December 18, 1973 in Atlantic City, New Jersey at the age of 69.

He was born in Leominster, Mass. On July 10, 1904 and graduated as a mechanical engineer from WPI. During his career he was with Sullivan Machinery Co., Armstrong Cork Co., Atlantic Sewerage Co., Philadelphia Storage Battery Co., Day & Zimmerman (consulting engineers), Campbell Soup Co., Wright Aeronautical Corp., and E. R. Squibb & Sons. For 17 years he was associated with the Continental Can Co. of Wilmington, Del. and he later joined the Public Housing Authorities of Pleasantville and Atlantic City.

Mr. Barker, a member of Sigma Alpha Epsilon, belonged to the Delaware Society of Professional Engineers, and was a past president and charter member of the Delaware Chapter of the American Institute of Plant Engineers. He also belonged to the South Jersey Chapter of AIPE, the executive board of the New Jersey Society of the Sons of the American Revolution, the Huguenot Society of New Jersey, the Descendants of the Colonial Governors, and the Atlantic County Historical Society. He was a past secretary of the Philadelphia chapter of the WPI Alumni Association.

**WILBERT T. MOORE, '26**, founder of Moore Survey & Mapping, Shrewsbury, Massachusetts, died on April 22, 1974 in Worcester. He was 69.

Until his retirement in 1970 he was chairman of the board of directors of the company. A registered professional engineer and land surveyor, he was also a member of the American Congress on Surveying and Mapping and a past president of the Central Massachusetts Region of Massachusetts Association of Land Surveyors and Civil Engineers.

He was born in Huntington, Mass. on September 8, 1904. After studying at WPI, he worked as an engineer with the Massachusetts Department of Public Works for 20 years.

In 1946 he founded W. T. Moore & Son, which later became Moore Mapping & Survey Corp. From 1951 to 1959 he took leaves of absence to direct survey work at U.S. Air Force bases in Greenland and Spain for the consulting firm of Metcalf & Eddy, Boston.

Mr. Moore belonged to the Worcester Society of Civil Engineers.

**LESLIE T. MILLER, '29**, of Baltimore, Maryland passed away on December 30, 1973.

He was born on August 9, 1908 at Townsend, Mass. In 1929 he received his mechanical engineering degree from WPI. He was employed by the Wright Aeronautical Corp., Paterson, N.J., and the Glenn L. Martin Co. in Baltimore, where he served as a power plant engineer. For a number of years he was an executive assistant at Johns Hopkins University, Baltimore. He belonged to Theta Chi and Sigma Xi.

**CLYDE K. CARPENTER, '30**, of Beach Haven, New Jersey died last August.

He was born on October 17, 1906 at Norwich, Conn. and later studied civil engineering at WPI. For over 30 years he worked for Western Electric Co., Kearny, N.J., where he served as department chief of industrial engineering. He belonged to Theta Chi fraternity.

**WARREN R. PURCELL, '30**, a Raytheon official and a former instructor in physics at WPI, died February 3, 1974 in Newton Falls, Massachusetts. He was 64.

Born on July 30, 1909 in Woonsocket, R.I., he later graduated from WPI with a BS in electrical engineering. While studying for his master's degree in physics at WPI, he served as an instructor.

Early in his career he was associated with Westinghouse Corp. and the Aetna and New York Life Insurance companies. Later he was the manager of quality control of the lighting division of the Sylvania Corp. plant in Danvers, Mass.; director of quality control at Brown Co., Berlin, N.H.; and a staff consultant of Rath and Strong, Boston. At the time of his death he was a corporate director of quality assurance at Raytheon Corp., Lexington, Mass. Previously he had been a quality control manager of the Raytheon plant in Lowell.

Mr. Purcell, a member of Sigma Alpha Epsilon, was a fellow of the American Society of Quality Control and had served as director and vice president of the society. He was a founding member and first chairman of the Boston Chapter of the society. The author of many articles on quality control, he also had been on the staff of the department of continuing education at the University of Connecticut for 25 years.

**HAROLD T. CUTLER, '31**, died suddenly in Washington, D.C. on May 4, 1974. He was 65.

A native of Fitchburg, Mass., he graduated as an electrical engineer from WPI in 1931. From 1933 until 1964 he was employed by the Chesapeake and Potomac Telephone Co. in Bethesda, Md. During his career he served as outside repairman, central office repairman, test man, and service engineer. In 1964 he retired as commercial representative.

Mr. Cutler, who was past president of the Washington, D.C. chapter of the Alumni Association, was a member of Alpha Tau Omega fraternity.

The Reverend **WALKER T. HAWLEY, '31**, died on March 20, 1974 in Brattleboro, Vermont at the age of 65.

Last February he retired as executive secretary of the Boston-based Board of Pastoral Supply of the United Church of Christ, a position which he had held since 1968.

He was born in Gardner, Mass., on June 10, 1908. In 1931 he graduated from WPI as a mechanical engineer and in 1934 he graduated from Andover Newton Theological Seminary. Prior to his latest position, he had served as pastor at Congregational or Federated churches in Dummerston, Greensboro, Manchester, and Middlebury, Vt.

Rev. Hawley was a past trustee of Burr and Burton Seminary, Manchester, Vt.; past director of Otter Valley Special School, Middlebury; and past chairman of the Camp Commission for the Vermont Congregational Conference.

A member of Theta Chi fraternity, he was the brother of C. Freeman Hawley, '23; the uncle of Bradford F. Hawley, '51; and the cousin of Frederick H. Knight, '28.

**ALBERT J. MAGEE, '33**, passed away on June 26, 1973 in Worcester.

He was born in Worcester on August 8, 1912. After studying at WPI, he received his BSCE from Northeastern University. The major portion of his career he served as a lead field engineer for the foundation consultants, Mueser, Rutledge, Wentworth & Johnston of New York City. Larger projects included: Albany Mall, Denver Mall, a Columbia River bridge (early 60's), and some assignments at Cape Kennedy and Wyman-Gordon (massive press foundations).

Mr. Magee, who was a founder of the Auburn (Mass.) Sportsman's Club and an army veteran of World War II (New Guinea), was the brother of John E. Magee, '33.

**P. ERNEST SALMINEN, '35**, died in Worcester on February 20, 1974 at the age of 61.

He was born in Worcester and studied at WPI. For 37 years he was a project engineer at Morgan Construction Co.

Mr. Salminen was a former chairman of the Leicester (Mass.) Recreation Committee. He belonged to the Worcester Engineering Society.

**ELWYN A. MURDOCK, '36**, died of a heart seizure on May 3, 1974 in Hamden Connecticut after he and his wife were held at gunpoint during a robbery at their home-operated antique shop.

Police have been seeking their last evening customer, a well-dressed man in his 30's, who forced the couple into the basement where he tied them up and handcuffed them to chairs. Shortly after being bound, Mr. Murdock suffered the seizure. He died later after his wife freed herself and both were taken to the Yale-New Haven Hospital.

He was born on May 1, 1914 in New Haven, Conn. After studying at WPI, he became associated with the C.W. Murdock Co. as a civil engineer and later became owner of the company. He was also an appraiser and insurance adjuster and had been employed by the Leo Bronson Co.

**ROBERT S. DENNING, '37**, passed away on March 2, 1974 in Hartford, Connecticut. He was 60 years old.

He was born in Worcester on June 28, 1913. After attending WPI, he became the inventory manager at Webber Lumber & Supply Co., Fitchburg, Mass. During World War II he served as a captain in the U.S. Army. Later he was branch manager of the Manchester (Conn.) warehouse of Gregg & Son, Framingham, Mass. At the time of his death he was assistant manager of Brewster Lumber Co., Hartford.

**STANLEY L. HYMAN, '37**, of New York City passed away on December 2, 1973. He was 58.

A native of New York City, he graduated from WPI in 1937 as an electrical engineer. During his career, he was associated with Westinghouse Electric & Mfg.; served as a Lt. Commander in the U.S. Navy; and worked as a manufacturers' representative. At the time of his death, he was vice president of Safety First Products Corp., Elmsford, N.Y. He was a member of the National Fire Protection Association.

**JOHN M. GRAY, '38**, of Sea Cliff, New York, passed away on July 28, 1973.

Born on August 10, 1907, he later studied electrical engineering at WPI. He was president of the Aircub Corp., Sea Cliff, N.Y., a firm which produced the Skinner Baby Box, a partly soundproof plexiglas-enclosed chamber used for isolating babies up to two years of age.

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