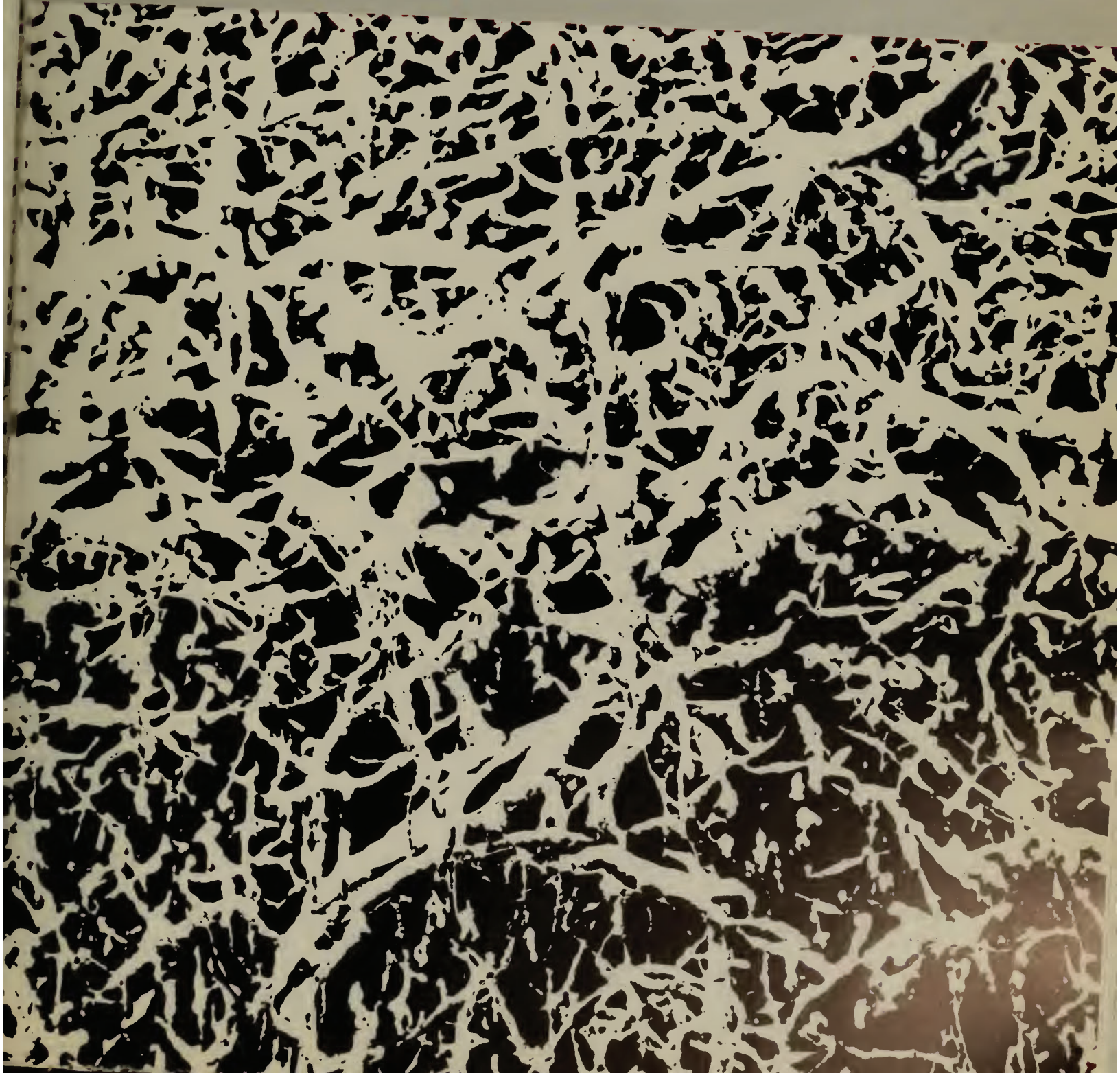


february 1974

WPI Journal



feedback

Letters to the editor are welcome. All points of view can find a forum in this section, and we encourage the exchange of ideas and opinions here. For reasons of space, variety, timeliness, and interest to other readers, we may not publish all letters received and will occasionally excerpt portions of letters, but those that do appear here are an accurate reflection of our mail.

I am forced to comment on the "WPI Journal." From a sensible publication it has become "cutesy".

The "Journal" appears to have been assembled, like the giraffe, by a committee—the freshman printing class at a slum trade school. Instead of dealing in vague opinions, let's examine a few facts.

In the past several years, publication has been advertised as four, five, or six times per year. Delivery is erratic. Some issues were either not printed or not delivered. The mailing label on the December, 1972, issue arrived detached because of improper adhesive. I have an issue labeled Vol. 74, Fall, with three small cover photos on a blue-line design on a white background (delivered December 18, 1969). I have another issue labeled Vol. 74, Fall 1970, with a U.S. map on an orange cover (delivered January 7, 1971).

Volume 76-6, page 24: "The second half of the 'Where are you?' list will be run in the August issue." Of what year? Volume 76-4, back cover: Showing the British flag above the American flag is not only bad taste but may be illegal.

The cover of the February, 1972, issue was printed on recycled paper. Well, la-de-dal If that and subsequent issues had eliminated the unused white space throughout, we could have saved a couple of forests. The ultimate stupidity was the design of the October, 1973, cover—lots and lots of wonderful white space laid out so that the address label could be pasted over the photo caption.

And in the October, 1973, editorial you tell us of a special citation? Are you sure it wasn't the booby prize?

Picky, picky, picky! Anyone who makes that remark will reveal that he knows nothing of the havoc that is created in the industrial world by simple mistakes, 6" for 6', for example. You need six-foot diameter pipe for hydro station penstocks, and you get six-inch pipe. You want supports every six inches, and the welder installs them six feet apart. A toaster manufacturer needs six-foot power cords to meet the Christmas rush and gets 100,000 cords six inches long. Remember, every mistake you make is multiplied 15,000 times.

"First-class men hire first-class men; second-class men hire third-class men." What 37th-class boob hired the 75th-class idiot who puts the "Journal" together? (And some little typist has just run into the ladies' restroom, sobbing, "I have only one pair of hands!")

I have the impression that the "Journal" is a reflection of WPI in general. They seem to be going down the drain together. Since about 1968 I have not had the slightest interest in WPI. The reputable Institute had degenerated beyond recall. Within a week after my graduation I had discovered that the WPI way was archaic and not the modern, commercial way—the result of staff negative inbreeding. By 1970, WPI was the case of the deaf, dumb, halt, blind, and idiotic leading the innocent. The institute propaganda has so informed me—constantly.

The Institute has financial difficulties? The appeals for funds could be compared to Mr. Rockefeller riding up in his Cadillac and sending his chauffeur to my door, begging alms. WPI is supposed to be training people and developing their common sense so that they can use materials and techniques effectively and economically. "Doctor, cure thyself!" However, the years have shown (unless the literature lies) that WPI cannot function and apply its assets to best advantage. Priorities!

If the nation as a whole is in trouble, a full share of the blame can be laid on the doorstep of Boynton Hall.

My greatly-reduced annual contributions have been donations to charity—mainly to pay for the subscription to the "Journal". I enjoy reading the obituaries. (And I

notice that white-space requirements now necessitate the omission of survivors.)

Please don't waste your time and postage on a reply to me; your efforts, it is evident, are sorely needed elsewhere. And don't waste postage sending me a receipt. For many decades my cancelled checks have served adequately as receipts. If WPI had sufficient business acumen within its ranks, it would not have to send forth its prominent alumni to beg. WPI is soliciting funds from me. I'm not seeking handouts from WPI. Think about that.

You say that you don't print negative letters because you get none. Now you have one. Fill up some of that idle white space. (If you're not going to use the white space, send it to the bathroom tissue factories. Rumor says they need it badly.) (It would be fitting if the present "Journal" were printed on bathroom tissue.)

Joseph W. Blaine '42
Newport, R.I.

wpijournal

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The Journal Readership Survey:

What You Had To Say

by Russell Kay

2

RESPONSES to the readership questionnaire in the August Journal indicate that, by and large, alumni seem to like the direction the Journal has taken over the past few years as compared with earlier issues. Journal readers want more news of WPI and the campus, of job and career and professional activity and possibilities, and of the application of technological skills in solving pressing current problems.

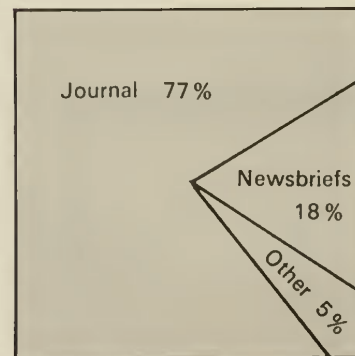
At the same time I report these conclusions, I would enter one caveat. When the questionnaire was published, the Publications Committee was hoping for a 10 to 20% response. As an example, a recent survey by Cornell University's *Engineering Quarterly* generated 25% responses. But it didn't happen here. Of the 10,588 living WPI alumni, only some 400 returned the questionnaire. The information to be presented below is based on the tabulation of 380 responses — 3.6%. The respondents closely parallel the total alumni population in terms of age distribution and geographical residence, as I will show later. Demographically, the 3.6% seem quite representative of the 96.4% who didn't answer, and this leads us to believe that their feelings and opinions are also an accurate representation of the total.

The Results in Detail

In this section I will present the results of the survey along with certain demographics and some discussion of the more involved questions. To eliminate the tired eye syndrome that inevitably comes from looking at too many figures neatly arrayed in tables (I am quite familiar with this condition after

wading through the hundreds of pages of computer printout that resulted from this survey!), the information will be presented in graphic form whenever possible. Unless stated otherwise, all figures refer to percentages of the total number of responses to each question, rounded to the nearest whole number.

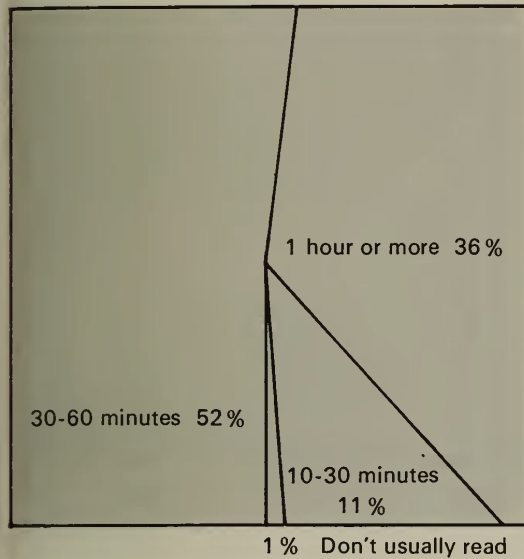
Best single source of information about WPI



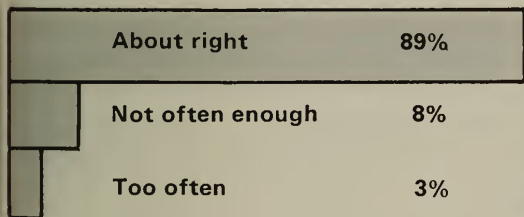
How much of the Journal do you read?

Feature articles	17	39	43	1
Alumni activity reports	22	33	38	7
Sports reports	22	22	37	19
Alumni fund reports	17	25	44	14
Class notes	34	33	32	1
Completed Careers	27	28	38	7

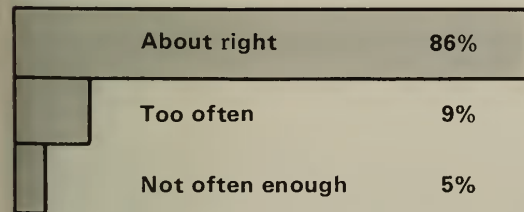
How much time do you spend reading each Journal issue?



Frequency of Journal publication



Frequency of all information from WPI and Alumni Association



The Purpose of the Journal

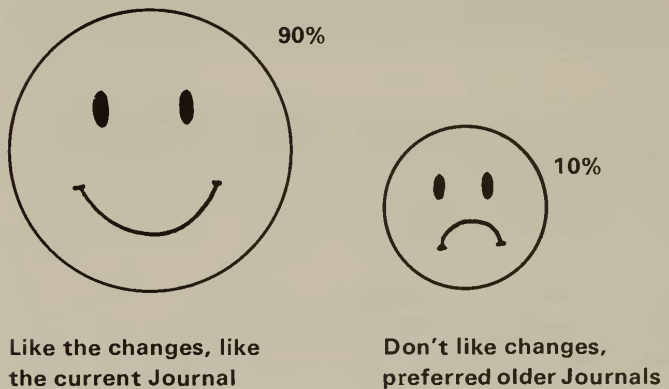
Asked to rank various items in order as main purposes of the Journal, respondents clearly indicated that alumni news was first (47% ranked it so) and campus news was second (21% ranked this first, 41% second). The stimulation of alumni participation in WPI and Association activities came further down, and the stimulation of alumni contributions was a clear last choice (32% ranked it fifth of five given choices, and 11% marked it not a purpose).

One of the key questions the Publications Committee and I were interested in was how continuing education would fare in this questionnaire, because we adopted this (and the Association's Executive Council endorsed it) as a basic *raison d'etre* for the magazine in a statement of policy published two years ago. Survey respondents, however, split very evenly on the issue: 24% ranked it the first purpose, 12% second, 24% third, 10% fourth, 21% fifth, and 9% considered it not a proper purpose of the Journal. Strongest support for continuing education came from the youngest alumni group identified (classes of '68 to '73, with 34% ranking it first) and from the oldest (prior to the class of '33, with 29% ranking it first).

Do you feel the Journal has changed over the past two years in the following areas?

	Yes	No
Types of feature articles	95	5
Editorial style of articles	86	14
Use of illustrations	78	22
Style and layout	89	11
Cover designs	95	5
Treatment of traditional departments and articles	58	42

This question did not leave any room for judgment whether the reader considered change to be good or bad. Two-thirds of the respondents wrote in comments here, or later on, that enabled us to derive the following statistic:



Degree of interest in areas of Journal coverage

The results of this question seemed to bear out the pattern shown in the previous question on purpose and the earlier question about the readership of various sections. Respondents were here asked to rank each of nine types of Journal articles and departments on a four-point scale: strong interest — interest — slight interest — no interest. While a complete tabulation is presented below, the results, briefly, show readers

	<i>Strong Interest</i>	<i>Interest</i>	<i>Slight Interest</i>	<i>No Interest</i>
Feature articles for continuing education	22	42	27	10
News of alumni and alumni activities	51	39	9	1
Biographies and background stories on prominent alumni and faculty	33	47	17	3
News of campus activities	33	47	18	3
Sports reports	17	32	32	19
Class notes	57	32	10	1
Completed Careers	26	37	32	6
Alumni fund reports	8	40	42	11
Letters to the Editor	10	39	38	13

most interested in class notes, followed closely by alumni news. Campus news and biographies/background stories on prominent alumni and faculty came next, with virtually identical distribution of answers. Next in line came feature articles for continuing education and obituaries. Bringing up the tail end, in order, were letters to the editor, alumni fund reports, and sports reports. The bottom placing of these last few becomes clearly evident in the "no interest" column.

Several patterns relating to age and area of employment show up in this question. Feature articles held strongest interest for young alumni ('68-'73: 44% strong interest) and those in education (32% strong) and research (29% strong interest); they were least interesting to the oldest alumni group (prior to '33: 15% indicated no interest). Young alumni were, by a sizable margin, more interested in news of WPI and the campus. Three areas showed a definite increase in interest with increasing age: class notes, obituaries, and alumni fund reports. The trend is particularly strong for obituaries, where 64% of the oldest alumni group indicated they read all of them in each issue, and 56% showed strong interest in responding to this question.

One curious item to emerge is that, of all job categories in this survey, those respondents in corporate management — men who presumably must know their way around money matters and figures — showed least interest in alumni fund reports — 21% said "no interest."

Have you been conscious of any differences between the Journal and Newsbriefs?

Yes	84 %
No	16 %

Who Was It Sent in These Questionnaires, Anyway?

As we mentioned before, this 3.6% sample is remarkably close to the total alumni population in age and geographic distribution. The actual figures look like this:

<i>WPI class</i>	<i>% Responding</i>	<i>% of Total Alumni</i>
'68-'73	14	21
'63-'67	14	14
'53-'62	21	20
'43-'52	16	18
'33-'42	14	13
prior to '33	21	15

<i>Residence</i>	<i>% Responding</i>	<i>% of Total Alumni</i>
Worcester County	10	15
Other Massachusetts	19	15
Other New England	18	18
Subtotal	(47)	(48)
Other Northeast	14	
Mid-Atlantic	14	
Subtotal	(75)	(67)
South	6	
Midwest	9	
Southwest	2	
Far West	7	
Outside U.S.	0.3	

The only deviations here are easily explained by common-sense reasoning. The youngest group would, naturally, be most bound up in their present and future concerns and least likely to be concerned with their immediate past. The oldest group, on the other hand, would naturally be more interested in their past; and since most of them are retired, they also have more time for such things as questionnaires.

What are they doing?

Of those who sent in questionnaires, 50% describe their jobs as supervisory, 22% as non-supervisory, 9% as self-employed, and 19% as retired. Their job areas broke down as: engineering (40%), corporate management (12%), research (10%), marketing and sales (9%), education (8%), manufacturing (7%), administration (5%), and "other" (8%).

Nearly half the respondents didn't check any of the boxes indicating extent of alumni activity.

The Comments

We gave readers a real chance to talk back to us in this survey (we even paid the postage), and most took the opportunity to mention their feelings about the Journal, about WPI, about life. . . . There were both negative and positive comments, and many seemed happy to get something off their chests. The single type of article most requested was more information on the WPI Plan. The next biggest call was for articles dealing with the applications of technology to important current problems: pollution, energy, environmental concerns, urban problems, transportation. There seemed to be great concern with jobs and career opportunities, and many wondered about the effects of the WPI Plan on these.

We print below some of the more interesting and thoughtful comments, with an occasional editor's reply to the (usually) anonymous reader.

☞ The change in WPI educational approach came as a shock to this old hand—'16—but the more I learn of it the more sure I am that it is correct and should have come earlier.

☞ The Journal is essentially a throw-away magazine, once glanced over—I don't feel you need to spend as much on a "slick paper" production. Editorial content and paper quality need not be related or dependent.

There isn't paper available much cheaper than what we now use except for newsprint.

☞ Most of the completed careers I read are about men I knew. Therefore, I would prefer that they be referred to by their

first name. "Mr." indicates that the writer never knew them personally.

☞ The continuing liberalization of curriculum at WPI away from solid engineering has steadily decreased my desire to contribute to the school. I see so many B.S. artists (that's bullshit) in engineering positions who don't know engineering fundamentals that I feel schools are teaching only surface subjects. How about Dr. Moruzzi's "learn the basics or flunk" approach? That's where I learned to pay attention to details and basics. It's the only approach that get's engineering work done . . . (*and from the same person*) . . . Newsbriefs goes into the trash immediately.

☞ When I read of the conversion of my beloved foundry into the status which approaches a ladies' lounge, my depression is so deep that I hardly care what happens at WPI. I go to the basement and stare at my old hand grinder which was born in the foundry.

The foundry is not being converted into anything which "approaches a ladies' lounge"; it is being changed into a Project Center, a place where students can work on projects (which are degree requirements), where they can construct equipment and apparatus they may need, where they can receive technical assistance. In fact, in many ways the Project Center represents a return to the oldest traditions of WPI, with emphasis on application as well as theory. To be sure, the Project Center does contain a ladies' "lounge"; after all, there will be women students using the building and they have physical needs too. Finally, when you look at your old hand grinder, think of how today's students will feel in twenty or thirty or forty years as they contemplate items—tools, apparatus, models, etc.—that they will have designed and built themselves using the resources of the Project Center. And it's a far better use for the foundry building than the Buildings and Grounds workroom and garage that it has been since 1958.

☞ How about printing job opportunities in the \$25,000 to \$50,000 category?

☞ Ways the Journal can be improved: Cease publication.

Gesundheit.

☞ The avant-garde covers leave me cold. The old "campus view," to me, was more appropriate.

☞ Liked the cover on this issue; a credit to your effort.

☞ I am not aware of any "needs" that the Journal could help to provide.

☞ I personally don't find time to read WPI material and believe it wastes alumni funds to which I donate regularly.

6

☞ The Journal is a lot of work to you for a very minimal interest to me—could be considered by some to be both a waste of time and money.

☞ Too much emphasis on contributions.

On the other hand:

☞ Keep up the high standard of your publications.

☞ The editor's job is almost a thankless task; I wouldn't want it and he has my sympathy.

☞ The "new" Journal is superb! I have no idea as to its costs, but as far as I'm concerned it's the best thing that we've ever had insofar as keeping the alumni and school together. Keep it up.

☞ Out with the Newsbriefs. More about campus and what a visiting alumnus might expect to find. Less noise about alumni babies. Try to justify why the Institute deserves our continuing financial support.

☞ Write more about WPI people—there are plenty of special, technical oriented magazines with articles of technical interest—too many to read! Why add more?

☞ It's fine to remember the past; they were great times, but that only goes so far. In addition to that, keep the information articles that educate as well coming. Alpha and Omega is an excellent example.

☞ I much prefer the old WPI Journal. Some of the technical articles are too deep for me, such as appeared in a recent issue. I don't recall the title, but it had to do with technology.

☞ The concept of continuing education as a purpose for the Journal is interesting. I think some tentative steps have been taken in this direction.

☞ I don't read the Journal to be educated; nor am I practicing as an engineer. I am interested in knowing where my friends are and what they are doing.

☞ WPI is moving in the right direction. This is the result of having an outstanding educator as administrator instead of a retired military person waiting for retirement.

But it was one of those retired military persons, President Harry Storke, who personally initiated the faculty self-study program that developed the WPI Plan.

SO, FOLKS, that's what we learned from the survey. The many suggestions for articles were appreciated and should result in more interesting reading in the issues ahead. We discovered that we were not covering some areas of particular interest to readers, such as campus news, and have moved to rectify those omissions. Thank you. And thanks, too, to John Lyons and Ed Perkins of the Worcester Area College Computation Center for their invaluable assistance in tabulating the survey results.

WPI

A brief introduction to the complexities of the little-known science of ski design

by Bryan A. Kashiwa, '73

They Ain't Skis: Barrel Staves Anymore

7

THERE ARE BETTER THINGS to do in life," said Oliver Wendell Holmes (or was it Robert Benchley?), "than to strap boards to one's feet and slide down a mountain." That is an opinion which many people would dispute. They wait eagerly each November for the onset of snow and the opening of the ski slopes.

But what about those boards they strap on their feet? In fact, they are sophisticated vehicles with carefully engineered performance characteristics and refined behavior. It is safe to say that the average skier has little awareness of the engineering considerations that go into the design and construction of snow skis. In this article I hope to introduce *Journal* readers to some of those considerations.

In hopes of giving an explicit description without getting into a discussion which will be completely foreign to the non-skiing reader, I will attempt to define a few commonly used terms in skiing and then to draw an analogy between the relatively unknown field of ski design and the more familiar field of automobile engineering.

Before getting into the definitions necessary for a discussion on skis, it can be said that the design of snow skis consists mainly in the basic isolation of variables. The ski design engineer is continuously collecting data, both in the laboratory and on the ski slope, and sorting it out in order to determine a

correlation between what is observed in laboratory testing and what is felt in on-slope performance. The experienced ski designer has a bank of performance related data — some of which can only be recorded subjectively in his mind — that allows him to determine what effects certain changes in the ski will have on its behavior in skiing; the most advanced ski designer is able to quantify these effects.

Stability and Quickness

There are two major qualities which define to a large degree the general behavior of a ski. Of course there are many other qualities which define the way a ski performs, but nothing that says more about a ski in as few words than a description of its relative stability and its relative quickness.

Stability is the relative degree to which a ski is comfortable to ride.

Quickness is the relative ease with which a ski carves a turn.

A ski is comfortable to ride if it has a solid feeling to it, meaning that as you slide along it follows a smooth path; this gives the skier a feeling of security that enables him to ski relaxed. A ski is unstable, and therefore uncomfortable to ride, if it is easily deflected in all directions both by inconsistencies in the sliding surface and by forces exerted by the skier which are not intended to change the direction of the ski. This gives the skier a feeling of insecurity and causes him to ski in a tense and stressed condition, since he must constantly work just to keep his skis aligned. Thus any given skier will become tired faster on the less stable of two different pairs of skis, for he must do more work to ski properly on the unstable pair.

A ski is quick if it carves a turn with very little effort. (Carving is an expression used to describe the turn in which the ski takes the shape of the curved path it is following, so that it "cuts" a path through the snow without sideways

The experienced ski designer has a bank of performance-related data—some of which can only be recorded subjectively in his mind. The most advanced ski designer is able to quantify these.

slippage.) A ski which is not as quick as another will require more effort to execute a turn of given radius.

Obviously there are many different degrees of stability and quickness. An experienced ski tester can rate a group of skis in order of their relative quickness and stability by skiing on them in a sequence which allows him to make one-to-one comparisons between them all. The measure that he uses in doing this is the amount of work that he must do to keep the skis aligned, and the effort he must exert in turning them. For well designed skis it is found that, within a group, the most stable ski will be the least quick and the quickest ski will be the least stable; this observation is apparent in the definitions of the terms.

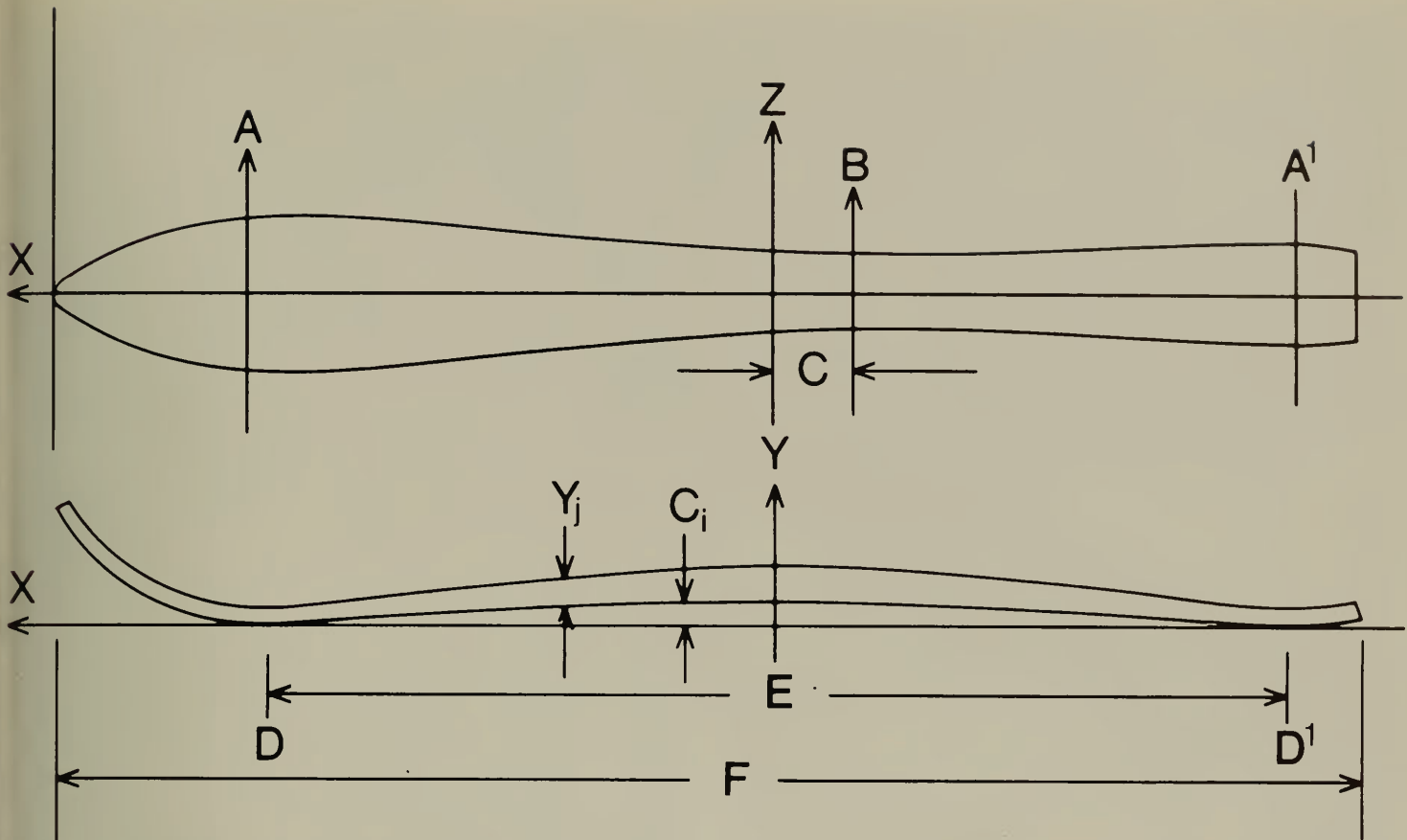
By way of analogy, consider different types of automobiles, classified in order of their riding comfort and handling qualities. At one end of the spectrum you have the large luxury cars which are very comfortable to ride in, very "stable," but are not as good in handling (in terms of turning radius, turning response, and ultimate cornering capability) as the small sporty cars on the other end of the spectrum, whose handling is much better but which do not have the riding qualities of a large limousine. Thus the automotive engineer is faced with the same situation as the ski engineer: both must strike a balance between ride comfort and good handling, and the trade-off between ride and handling, stability and quickness generates a variety of models in both fields.

The Trade-off

As we have just seen, a ski designed for maximum stability will be more difficult to turn than one designed for maximum quickness. A very quick ski will in turn be less stable, characterized by a greater difficulty in keeping the skis parallel — a difficulty magnified at high speeds. Because a ski must be deflected vertically and its linear motion changed simultaneously in order to carve a turn, a stable ski (which is not easily deflected in any direction) will be more difficult to turn than an unstable ski. A very quick ski will be easily deflected, both vertically and in a direction away from its linear motion, therefore making it less stable than a ski which requires more force to change its direction.

Now, the logical question to ask is, "Why not just build maximum stability and maximum quickness in one ski and consider it the best possible ski design?" The simple answer is that a different balance between stability and quickness is necessary for skis of different performance definitions. That is, a ski which executes large radius turns at high speeds will not easily make small radius turns at low speeds, and a ski which makes good small radius turns at low speeds will feel unstable if a large radius turn at a high speed is attempted.

In ski racing there are three events, slalom, giant slalom and downhill, each requiring skis that differ widely in their balance between stability and quickness. A slalom ski is very quick in small radius turns; a giant slalom ski is not as quick in small turns but is stable at higher speeds and in larger turns. A downhill ski is an extreme case of the giant slalom ski, made for highest speeds. Within each of these three major divisions in the stability-quickness balance aspect of ski design, there are a number of slalom, giant slalom, and downhill skis, each having its own varying characteristics. This is a result of many



Axes of a ski and some dimensions. A and A' are the widest points fore and aft, B is the waist width, C is the waist location, D and D' are the tangency points fore and aft, E is the running surface length, F is the cord length, Y_j is the thickness at position j and C_i is

the camber height at position i. The fore and aft widths, waist width and location, thickness profile and camber line, together with the mass distribution of the ski all determine the riding and turning qualities of the ski.

different ski racers having very different abilities and using very different techniques. Thus there is a whole spectrum of ski designs ranging from the quickest, smallest radius turning ski to the most stable downhill ski.

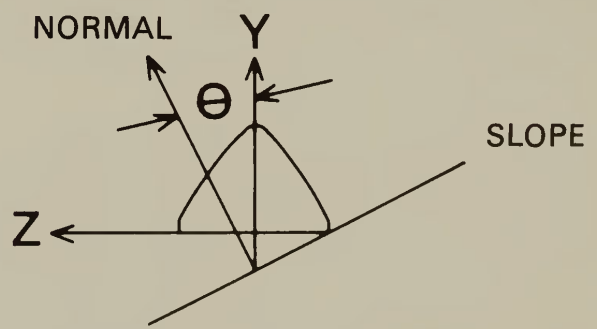
with a different twist. For a ski of a given length, the width, stiffness, weight and dampness (yes, that's what it's called) are all distributed along the length of the ski, and there is no single numerical value that can be given to these four qualities. The essence of ski design is in the manipulation of the distribution of the four variables, in finding a way to classify the differences in this distribution and in correlating all this to the performance of the ski as a system.

The Variables the Ski Engineer Works With

The analogy between the automotive design engineer's work and the ski design engineer's work can be extended still further. While both fields involve the basic performance qualities of ride and handling, such manufacturing considerations as parts fabrication, materials and assembly costs, as well as availability of materials, enter into the decisions on how to achieve certain desired qualities in the product. In addition to economic considerations, the engineer in both areas must look at physical things such as durability, fatigue life, and behavior in varying ambient conditions. In this article, however, I shall focus on the variables in design which the ski engineer has to work with in developing a ski with a given performance objective.

The following quick run-down on each variable and its influence on the general behavior of the ski will help give a rough understanding of the function of a ski, and to further define the work of the ski designer.

The engineer designing an automotive suspension system has four basic variables which he can control independently (at least to a certain degree): (1) the length and width of the wheelbase; (2) the stiffness of the springs and tires; (3) the weight of the car; and (4) the amount of damping provided by the shock absorbers. The automotive engineer has a bank of knowledge concerning the effect of these variables, both separately and collectively, on the physical behavior of the car in service. The ski designer has the same four variables, but



Angulation. A ski has a side cut so that it will bend when angulated together with a load along its Y axis. The thickness profile, which determines the stiffness distribution, must be designed to coincide with the width distribution in order that the ski can take the shape of a smooth curve at a given angulation.

1. Width and its distribution, also known as side-cut, determines the radius of turn that the ski will carve for a given stiffness distribution and angulation (see figures 1 and 2). A ski with more of the width distributed to the ends (a ski with more side-cut) will bend more for a given angulation than a ski with less side-cut. Since a ski is flexible, it will bend when angulated on a flat surface while a load is applied along its y axis. The balance or symmetry between the fore and aft sections of the ski when divided in two at mid-running surface, is an important factor to the turning ability of the ski. A ski with a tail which is too wide in relation to its tip will be difficult to turn since there will not be sufficient bend in the fore section of the ski for a given angulation. A ski which has too wide a tip in relation to its tail will turn over easily since its fore section will tend to bend much more than its aft section for a given angulation. The average or overall width itself is an important factor in determining stability and quickness, simply because the wider the ski is overall, the more effort is required to deliberately angulate the ski in order to bend the ski and carve a turn. A very narrow ski will be angulated or "put on edge" easier than a ski of equal side-cut but of greater average width.

The essence of ski design is in the manipulation of the distribution of the four variables, finding a way to classify the differences, and in correlating all this to the performance of the ski as a system.

2. Stiffness and its distribution must be considered in three dimensions. Vertical stiffness and its distribution or the resistance of the ski to deflection in the y direction, lateral stiffness or the ski's resistance to deflection in the z direction and torsional stiffness or resistance to torsional deflection about the x axis. The vertical stiffness distribution is fixed by the thickness profile and the placement and configuration of the materials of the structure. This determines in part the carving ability of the ski and therefore influences the stability of the ski and has a major effect on the quickness. A ski with a greater overall stiffness than another will be more difficult to turn, if all other factors are the same.

If you consider the ski in three equally divided segments, and its mid-segment is too soft, then the ski will be easy to turn, but if it is too soft the ski will feel unstable. If the mid-segment is too stiff, the ski will be very difficult to bend, thus requiring more effort to carve a turn. If the forward segment is too stiff, the ski will not easily initiate a turn, since this part of the ski must begin to bend before the rest of the ski, in carving a turn. If the fore section is too soft, the skier will have an insecure feeling like driving a car with soft front tires or play in the steering wheel, since the fore section is the part of the ski used for steering (in the most conventional turning technique). If the last section is too stiff it will side-slip in an arcing turn; if it is too soft, the ski will feel sluggish, in that it will not provide a "vaulting" effect at the end of the turn. Thus the balance between the strength of the ski in its various segments is important to its turning characteristics.

In addition to the stiffness and its distribution, the camber height and its distribution is an important design criterion. A ski is cambered so that there is pressure on the snow at the ends of the ski to provide steering ability. The camber height determines the amount that the ski is loaded in its flat position and how that load is distributed, for a given stiffness and stiffness distribution. Thus the camber height is a measure of the ski's apparent stiffness, since two skis of identical stiffness will appear to be different in stiffness if they differ in camber height. Both vertical stiffness and camber height control the amount of effort the skier must exert in order to bend the ski in to a given curve. If the camber and/or stiffness is too high, the ski will be very hard to turn, if one or the other or both are too low, then the ski will have poor steering qualities, and will be difficult to keep aligned and therefore unstable.

The torsional and lateral stiffness of the ski determine its ability to keep from slipping sideways in a carving turn. Since the ski is actually "scraping" the snow in the turn, one which resists deflection in torsion and laterally will provide a "scraper" with more pressure and a steeper angle to the sliding surface, especially on very hard, icy surfaces.

3. Mass and its distribution determines the ease with which the ski can be rotated about its y axis. A ski which is more easily rotated will tend to be quicker than one which is more difficult to rotate but is otherwise identical. A ski which is too massive and/or has its mass distributed too much to the ends will feel sluggish in coming out of a carved turn in addition to being cumbersome to carry around. A ski which is too light will feel insecure at high speed, since it will be too easily deflected sideways and vertically; it will not have the mass necessary to develop the momentum needed for a smooth ride.



"Bucky" Kashiwa is a product design engineer at K2 Corporation, Vashon Island, Washington, with impeccable skiing credentials. He is a former senior A ski racer, and his brother Hank, a member of the U.S. Olympic team in 1972, is currently a professional ski racer. Bucky entered

WPI in September 1970 and graduated under the WPI Plan in March 1973. His major qualifying project was a study of drag in skiing and his interactive project involved a study of creativity. He is a native of Old Forge, New York.

11

The three variables of width, stiffness, and mass and their distribution are all interrelated in determining the performance of the ski. Imbalances in stiffness can be compensated for by changes in width; imbalances in width can be changed by stiffness, or camber changes; and either or both can cause discrepancies in performance which can, in some cases, be corrected by changes in mass distribution. This is the reason there are many differently shaped skis on the market, all differing in mass, stiffness, and width but which ski in a manner comparable to one another.

4. **Dampness**, the internal energy absorbing capacity of the ski, determines in part the comfort of the ski's ride. A very damp ski will be more comfortable to ride on very hard snow and ice than a ski which has very low internal energy absorbing capacity.

Making Measurements Meaningful

These four major variables, together with related variables such as stiffness in three dimensions and camber, make a total of about nine factors that contribute to the ride and handling qualities of the ski,* and the ski engineer must find ways to sort out and define the variables in the laboratory. Before any meaningful correlation between laboratory and on-slope performance data can be made, the laboratory data must be

collected in a manner most representative of the actual nature of the ski. The engineering in ski design takes place both in determining the laboratory description of ski, and in learning qualitatively the degree to which each individual change in variable affects the performance of the ski. The effects of various changes in the ski on its behavior is something learned only through experience; from continuously collecting bits of data both subjectively and through controlled testing. The optimum method of describing the ski is also something learned only through experience, through trial and error of various methods to find which ways are most representative of the true nature and show the actual differences between skis; it is aided greatly, however, by a basic understanding of the sciences and their application in engineering. Mechanics, dynamics, beam deflection theory, and control system analysis are all necessary, in their basic theory, for the most complete description possible of a ski and are therefore prerequisites for the analytical design of skis.

**One factor which has a great influence on the performance of the ski is the binding placement; although it is not a specific design criterion, it must be considered in evaluating the ski on the slope. A binding placement change of only about 4 mm can change the turning characteristics of some skis, while it is less perceptible on skis of differing stiffness, width, and weight distributions.*

Snow and Ice

Can you identify these WPI buildings - - or parts of buildings - - in their winter uniform of snow and ice?

Answers on page 17

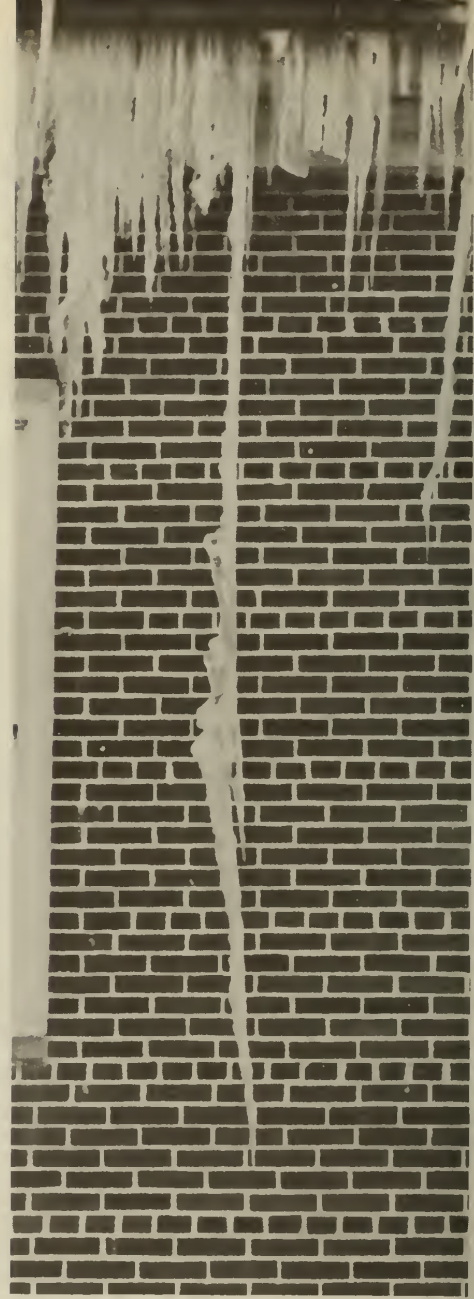






14

4



6



5



7

8



9

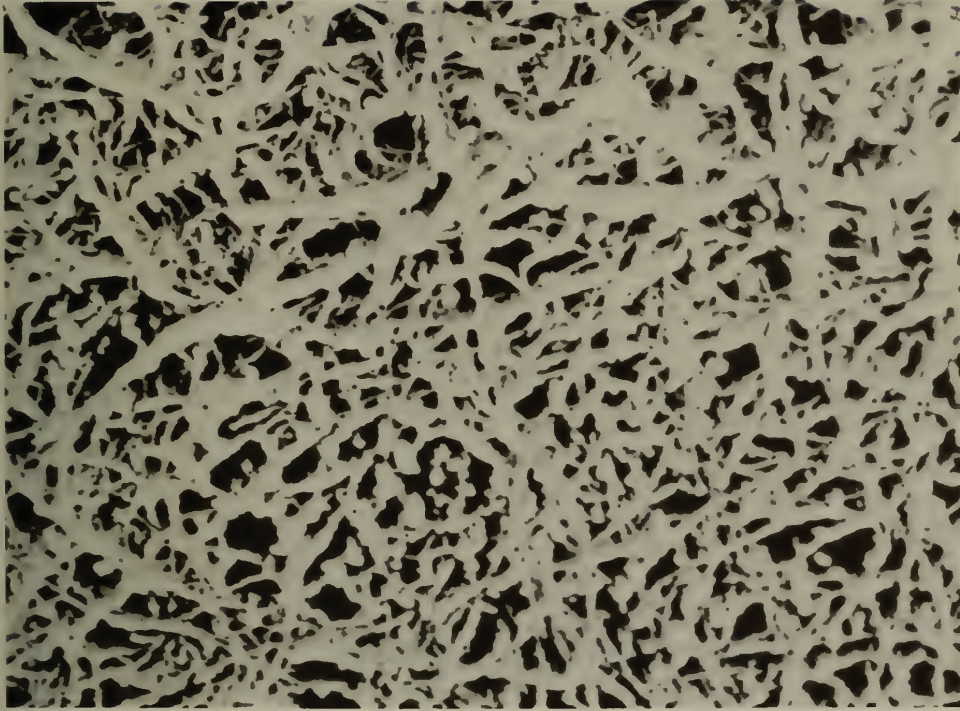




10



11



ANSWERS

1. Gordon Library — the entrance to the Computer Center.
2. What else but the icicles that grow from Boynton Hall's gothic gutters.
3. Salisbury Laboratories, with the ivy magically transformed into a spiderweb tracery of snow. Alas, the sight only lasted a couple of hours until the sun emerged.
4. A tiny cornice of ice on a concrete post in front of Kaven Hall.
5. Washburn
6. A strange and long icicle that grew from Olin Hall of Physics.
7. Earle Bridge and Boynton Hall.
8. A leaky gutter downspout at Sanford Riley.
9. One of the Boynton bombs — ready to fall.
10. Ice detail on a pier at the side of Atwater Kent.
11. Ice formation by the entrance to Boynton Hall.
12. The tracery on Salisbury, close-up. Recognize the original of the cover picture?
13. Perhaps the longest icicle in the history of Worcester, this one draped a corner of Boynton Hall near the front entrance for a few days in January.

Your Class and Others

The data on which these class notes are based had all been received by the Alumni Association before January 1, when it was compiled for publication. Information received after that date will be used in succeeding issues of the WPI Journal.

1910

The GEORGE MARTINS celebrated their 60th wedding anniversary last November 4th at a special mass offered in their honor at St. Edward the Confessor Church in Westminster, Mass.

1913

WILLIAM R. STULTS writes that he is now residing with his son at White Oak, Apt. 3A, 4156 Napier Ave., Macon, Georgia.

1922

Married: ROBERT B. HALL and Effie A. Reed on November 6, 1973 in Sanbornton, New Hampshire.

1923

RICHARD H. SHAW has retired from Allendale Mutual Insurance Co., Johnston, R.I., and is now living in Clearwater, Florida. . . . RICHARD WALBERG was recently elected chairman of the board at San Francisco Federal Savings & Loan Association. He is also chairman of the board of Swinerton & Walberg Company, a prominent construction firm which operates throughout the United States.

1926

WARREN T. WENTWORTH, who retired from General Electric Co. several years ago, is teaching mathematics, drafting, and machine design at Northeast Institute of Industrial Technology in Boston. . . . ROBERT O. WRIGHT serves as treasurer of the Indoor Gardener Publishing Company, Knoxville, Tenn. Previously he was with Valley Materials Handling, Inc., Knoxville.

1927

Last June CHARLES H. FOGG retired as chief, Hydroelectric Design Branch, U.S. Army Corps of Engineers, Dallas, Texas.

1929

LAURENCE F. CLEVELAND recently retired as a professor of electrical engineering at Northeastern University, Boston, where he has been named Professor Emeritus. He plans on traveling during his retirement. . . . The ARTHUR W. KNIGHTS have been entertaining a number of WPI alumni lately including the RICHARD A. BETHS, '27; HOLBROOK L. HORTONS, '29; and FREDERICK G. BALDWINS, '29. They write: "While we are at it—congratulations on the new JOURNAL. It even elicits praise from our Cornell son-in-law!"

1930

CARL W. BACKSTROM retired last summer as division manager of the Worcester Wire Division of National Standard Co. Currently he is executive committee member-at-large and chairman of the Citations Committee for the Alumni Association. . . . GEORGE A. MARSTON has now fully retired from his duties as a professor of mechanical engineering at Western New England College, Springfield, Mass. Previously he was dean of engineering at the University of Massachusetts.

1931

EDWARD J. BAYON has been awarded the Arthur Sydney Bedell Award by the New England Water Pollution Control Association of which he is a member. The award is presented annually to an individual who has given performance and expertise in the field of water pollution control projects. Bayon is a partner in the engineering firm of Tighe & Bond, Holyoke, Mass. . . . GUSTAV E. MANGSEN is a retiree. Formerly he was a research engineer at Greenlee Diamond Tool Co., Des Plaines, Ill. He now resides in Shrewsbury, Mass.

1932

EDWIN S. BROWN of Pawcatuck, Conn. recently concluded a 13-year career in the engineering department of the Davis-Standard Division of Crompton & Knowles. In September he was honored at a retirement party at the Pond View Country Club, where he was presented gifts by the company vice president. Brown is a past commodore of the Westerly (R.I.) Yacht Club, a past commander of the Westerly unit of the U.S. Power Squadron, and a member of the U.S. Coast Guard Reserves. Prior to joining Davis-Standard he was employed by Electric Boat and Bostitch, Inc.

1933

WILLIAM A. ANDERSON, Manchester Division electrical engineer for Public Service Company of New Hampshire, retired in October after more than 39 years of continuous service with the utility. He joined the General Engineering Department in Manchester in 1934. After serving in the Navy in World War II, he was transferred to Laconia as division electrical engineer, a position he held until 1963 when he returned to Manchester. Anderson is a registered professional engineer in New Hampshire, a member of IEEE, the New Hampshire Society of Professional Engineers, and the National Society of Professional Engineers.

ARTHUR E. SMITH, chairman of the board of United Aircraft Corp., East Hartford, Conn., is retiring January 1, 1974. He joined the company as an experimental test engineer with the Pratt & Whitney Aircraft Division in 1935. He was elected president of Pratt & Whitney Aircraft in 1967 and in January 1968 moved into senior corporate management as executive vice president. In October 1968 he was elected president of United Aircraft and four years later became chairman of the corporation. He will continue as a director and executive committee member following his retirement.

He is a director of the Connecticut Bank and Trust Company, the Savings Bank of Manchester, and the Manchester Memorial Hospital. In 1969 he was awarded an honorary degree of doctor of engineering by WPI. A former vice president of the Hartford Chapter of the Alumni Association, he also received the Robert H. Goddard Award from the Association in 1967.

1934

Presently J. BOYLSTON CAMPBELL is an editor at Pacer Systems, Inc., Fort Washington, Pa.

1935

MARK ABELSON is a staff assistant to the secretary at the U.S. Department of the Interior, San Francisco, Calif. . . . PRESTON H. HADLEY, Jr., is vice president of Gibbs & Cox, Inc., Hyattsville, Md. . . . JOSEPH A. JOHNSON, former program manager at Naval Ships Systems Command, Washington, D.C., has retired. . . . Also retired is DOUGLAS L. WATKINS, who was chief cable engineer at U.S. Steel Corp., Worcester.

1936

GEORGE L. CHASE serves as executive vice president at Ball and Socket Mfg. Co., Cheshire, Conn. . . . HAROLD F. HENRICKSON writes that he is actively retired on his farm in Holden, Mass., and cottage in Vermont, where he hunts. He also has been playing golf and fishing in New Brunswick, Me., and the Cape. Formerly he was with Pratt & Whitney Aircraft, North Haven, Conn. . . . JOHN J. O'DONNELL works as a sales representative for Underground Products, Livonia, Michigan.

1937

STANLEY HYMAN is vice president of research and development and engineering for Safety First Products Corp., Elmsford, N.Y. . . . A. HALLIER JOHNSON, now retired, is still located in Chesapeake City, Md. Previously he was a project engineer at E. I. duPont deNemours & Co., Wilmington, Delaware.

1938

ALBERT J. KULLAS holds the position of director-project management and technology at Martin Marietta Data Systems, Towson, Maryland. . . . Recently FRANCIS WITKEGE and his wife, Lorraine, visited RICHARD CLOUES and his wife in California during a nation-wide tour with their 24-foot trailer. The Witkeges gave their hosts a first-hand account of the 35th class reunion held last summer at WPI.

1942

ROY F. BOURGAULT, professor of mechanical engineering at WPI, has been elected to the Mohegan Council (Boy Scouts of America) board of directors in Worcester. . . . The School Committee of North Reading, Mass., has unanimously chosen RALPH G. FRITCH as the business affairs administrator for the town school system. His new title is Administrative Assistant to the Superintendent of Schools for Business Affairs. For 24 years he worked for the Boston and Maine Railroad. In 1963 he resigned to run

his own business, Hawkes Grinding and Tool Corp., where he served as president until 1969. After selling his business he spent three years as Director of Exhibit Production at the Boston Museum of Science. . . . WILLIAM S. JACKSON, Jr. is currently regional sales manager at E. I. duPont deNemours & Co., in Houston, Texas.

1944

ROBERT E. FAY works as a research and development manager for E. I. duPont deNemours & Co., Wilmington, Delaware. . . . WILLIAM E. POWERS, Jr. is engineering manager at Polaroid Corp., Norwood, Mass.

1945

JOHN B. McMASTER works for Chevron Oil Co., Perth Amboy, N.J. . . . RICHARD T. WALSH has been employed by Insilco Corporation, Meriden, Conn.

1946

RODNEY S. CHASE serves as manager of James H. Rhodes & Co., Long Island City, N.Y. . . . HAROLD L. SCHIMMACK is now a management consultant at the Department of Health, Education and Welfare, Atlanta, Ga. . . . FONG Z. YIH holds the post of purchasing manager for Kayser-Roth International Ltd., in Hong Kong.

1947

LEO W. GEARY is a project engineer for the U.S. Navy at the Navy Yard in Washington, D.C. . . . PAUL D. O'DONNELL, general manager of the Westinghouse Specialty Metals Division at Blairsville, Pa., was listed in the 1973 edition of *WHO'S WHO*. . . . KENNETH H. TRUESDELL was recently named manager of Systems Installation and Service at Turbo Power & Marine Systems, a subsidiary of the United Aircraft Corporation, in Farmington, Conn. Since 1969 he

Nixon to Name WPIer New Patent Chief

President Nixon announced in December his intention to nominate C. MARSHALL DANN, '35, as Commissioner of Patents. The appointment is subject to Senate approval.

Mr. Dann, who has been serving as chief patent counsel for Du Pont Co., will be taking office as the third patent chief since the start of the Nixon administration. He succeeds Robert Gottschalk whose resignation was effective last June.

A special panel headed by Dr. Ancker-Johnson screened prospective candidates for the patent post. Mr. Dann's qualifications appear to have met the panel's criteria. He is the immediate past president of the American Patent Law Association and a former president of the Philadelphia Patent Law Association. At 58 years of age he oversees the work of 90 patent attorneys in Du Pont's patent division. Associates describe him as a skilled yet not flamboyant administrator with an excellent analytical mind. His

approach is "cool, almost clinical" they say.

When asked why he wants to leave Du Pont after 38 years of service, he replied that he had been sitting in the same building doing the same thing for too long. He looks on his first government post as a challenging one.

Mr. Dann is no stranger to Washington. He received his bachelor of laws degree from Georgetown University in 1949. After receiving his BS in chemistry from WPI in 1935, he earned his MS from the University of Delaware in 1942.

As patent chief it is expected that he will play a pivotal role in resolving the rigorous opposition to reform measures now before Congress. He will also have to tackle such administrative matters as resolving the problems of the quota system for counting the work of patent examiners and moving ahead with measures to speed processing of patent applications.

had been manager of Product Support. He joined the firm in 1965. Turbo Power & Marine Systems designs, sells, installs and services a variety of gas turbine-powered electric generating stations for utility companies throughout the world.

1948

Currently W. J. WACHTER is engineering manager at Boeing Aerospace in Kent, Washington. . . . OTTO KERN has been named an associate director in the Building Services Department of Massachusetts Mutual Life Insurance Co. He joined the company in 1953 and was promoted to building engineer in 1971.

1949

RENE H. BACHAND was recently awarded the position of registered school business administrator in the Longmeadow (Mass.) public schools. The award is the highest professional status that can be attained by a practicing school business official and is granted by the Association of School Business Officials of the United States and Canada, an organization of which he is a member. Only 10 per cent of the active national membership have earned the award. Bachand is director of business services in the Longmeadow public schools, which he joined as the system's first business manager in 1960. He was promoted to his present position in 1966. . . . EDMUND B. BAKON, principal of the Chenery Middle School in Belmont, Mass., has been elected by the School Committee to the position of Assistant Superintendent for Curriculum and Instruction. He has served as principal at Chenery since 1968, when the then Junior High School was converted to a Middle School, a transition which was carried out under his leadership. Bakon won his new administrative position out of a field of 115 applicants. . . . ALFRED HAPGOOD, Jr. has joined Webster (Mass.) Lens Company as director of manufacturing. Previously he had served many years in various executive lens manufacturing capacities at American Optical Corporation, Southbridge, Mass. . . . JOHN D. SAUNIER is a professional employment counselor at Snelling & Snelling Personnel, Edison, N.J.

JAMES S. ADAMS has been appointed vice president of marketing for General Instrument's Electronic Systems Division (ESD) in Hicksville, N.Y., with additional responsibility for all marketing activities of the corporation's Commercial Data Systems (CDS) Division. Adams, who held the post of director of marketing at ESD since 1968, previously was the director of systems marketing for Sperry Gyroscope Division of Sperry Rand. Earlier, he was associated with AT & T. The ESD Division of General Instrument specializes in electronic systems for military and defense applications. The CDS Division supplies mini-computer based data handling systems for business installations.



Truesdell, '47



Adams, '49

1950

Currently Col. FRANK W. HARDING III, (USAF), serves as Director of Procurement at Rome (N.Y.) Air Development Center. . . . CHARLES O. PARNAGIAN has been appointed manager of the New York District Sales Office for Joy Manufacturing Company of Pittsburgh, Pa. Formerly he was with American Standard and Fairbanks Morse Co. . . . JOHN W. PEIRCE is vice president, Corporate Information Services, at the Foxboro (Mass.) Co. . . . RICHARD C. PIEPER works as a production manager for Lear Avia Corp., Reno, Nevada. . . . LESTER J. REYNOLDS, Jr. is presently product manager-textile chemicals at American Cyanamid Co., Bound Brook, N.J.

1951

MARK E. BAKER, a project engineer at Hamilton Standard, is presently assigned as engineering representative at the company's western region office in Los Angeles, Calif. . . . JOHN MARLEY was honored by Motorola, Inc. for a patent granted jointly to him and the company for a system design for a vehicular antiskid device. He is senior engineer for the Motorola Semiconductor Products Division. His citation included a cash award and membership in the firm's prestigious Scientific and Technological Society. . . . CONSTANTINO K. MUSTAKIS works for Gerente de Gianoli Mustakis in Santiago, Chile. . . . DONALD F. STOCKWELL is now D & E operations administrator at the Foxboro Co., Foxboro, Mass. . . . PAUL E. THOMAS serves as manager-new business development at E. I. duPont deNemours, Wilmington, Delaware.

1952

BRUCE S. CAMPBELL is assistant superintendent of construction for Stone & Webster in Westlake, Louisiana. . . . ALLAN R. THAYER holds the post of principal engineer at Raytheon Co., Sudbury, Mass.

1954

RICHARD C. LONG, SIM, has been elected assistant treasurer at Commerce Bank & Trust Co., Worcester. He is administrator of the bank's Master Charge Department. . . . WESLEY D. WHEELER was recently appointed technical director of American Bulk Carriers, Inc., New York City. Previously he was technical counselor to the Bay of Cadiz new shipyard group (NABAC) of Astilleros Espanoles, S.A. While in Spain, he presented a paper, "Shipping—How Goes It?", to the Asociacion de Ingenieros Navales of Madrid, of which he is a member.

1955

Born: to Mr. and Mrs. ROBERT H. PEARCE a son, John Robert, on November 22, 1973. The Thanksgiving baby joins his brothers, Bill 13, Michael 10, and sister, Maureen, 6. Bob is still with the USE Comm. at Fort Monmouth, N.J. The Pearces have purchased a new summer home at Goose Rocks Beach, Kennebunkport, Me., where some day "we hope to retire."

RICHARD L. GOLDMAN is a product manager at Microwave Associates, Burlington, Mass. . . . Presently BRIAN J. KELLY works for Bell Telephone Co. in Monroeville, Pa.

1956

ROBERT S. ALLEN serves as vice president of World Wide Construction Services, Inc., Wichita, Kansas. . . . ALBERT D. BATTISTA, one of the founders and part-owners of Laser, Inc., Sturbridge, Mass., has been named president of the new company. His firm purchased the commercial solid state laser and accessory business from American Optical Corp. last July. Earlier Battista was manager of engineering at American Optical Corp., Southbridge, Mass. He holds several patents on laser products and is a member of the Laser Institute of America. . . . NORMAN B. FISCHER was recently appointed director of engineering at Yale-New Haven Medical Center, New Haven, Conn. He also serves as Newsletter editor for the New England Hospital Engineers Society and as public relations representative for the Connecticut Hospital Engineers Society. He writes that one of his highest priorities is the effective implementation of clinical engineering within the hospital setting. He still maintains his engineering consultant business in Madison, Conn. . . . ROBERT H. PHILHOWER is a computer applications specialist for DuPont, Wilmington, Delaware. . . . ANTHONY V. SCANCELLEA works as technical superintendent at E. I. duPont deNemours & Co., Fairfield, Conn.

Forging for the new generation of turbine engines

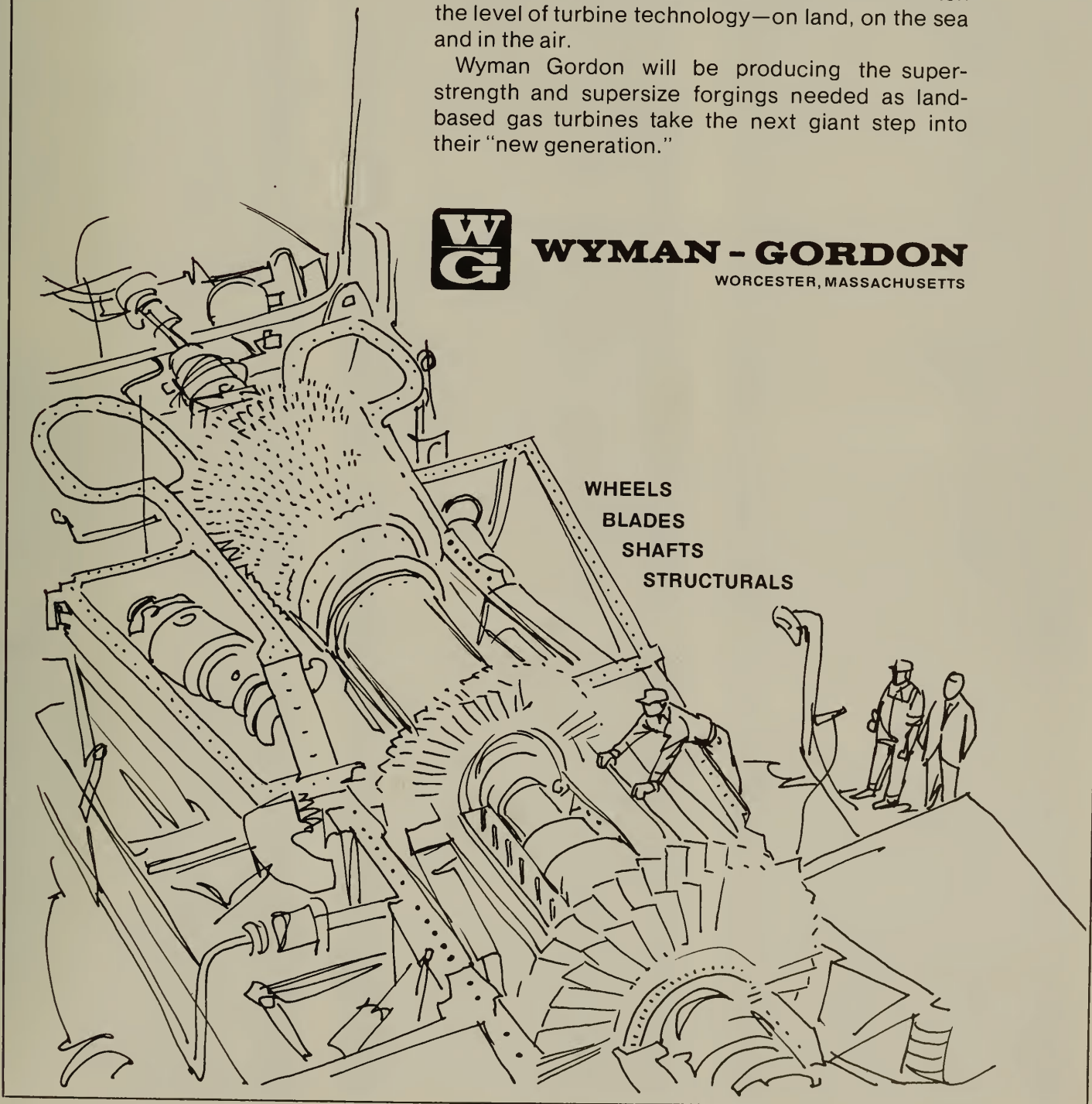
Wyman Gordon's mechanical/metallurgical skills have allowed designers and fabricators to stretch the level of turbine technology—on land, on the sea and in the air.

Wyman Gordon will be producing the super-strength and supersize forgings needed as land-based gas turbines take the next giant step into their "new generation."



WYMAN - GORDON
WORCESTER, MASSACHUSETTS

WHEELS
BLADES
SHAFTS
STRUCTURALS



Where Are You?

The Alumni Association tries to keep track of all WPI alumni, but 10,600 people make for a lot of moving around, and we don't always hear about it, and that means that a sizable number of alumni aren't getting the Journal or Newsbriefs. Last April we ran a list of some of the people for whom we didn't have addresses, and this issue completes the listing. Please help us if you know the current whereabouts of any of these alumni.

Philip L. Barbaccia 1950
 Fred A. Carmody 1950
 Frank J. DeMarco, Jr. 1950
 Gerald Fleit 1950
 Morey L. Hodgman 1950
 Robert L. Tagen 1950
 George M. Cooley 1951
 Ellsworth R. Cramer 1951
 Leon Hoogasian 1951
 Mehmet R. Ozbas 1951
 Ratanshaw K. Patel 1951
 Mustafa T. Sonmez 1951
 Dick van den Berge 1951
 David F. Wright 1951
 John D. Writer 1951
 Bernard G. Ziobrowski 1951
 Jack Y. T. Kwan 1952
 Edmund M. Luzgauskas 1952
 Lysle P. Parlett 1952
 Bernard J. Petrillo 1952
 Richard G. Schmitt 1952
 Stanley C. Andrukonis 1953
 Thomas J. Bagley 1953
 Karl H. Bissell, Jr. 1953
 Martin R. Cohen 1953
 Ernest E. Demar 1953
 Nasuh M. Malas 1953
 Hugh R. McLaughlin 1953
 David C. Morrison 1953
 Paul C. Murray 1953
 Harold G. Rackett 1953
 Philip R. Randall 1953
 Dr. Wu Mei Yao 1953
 Framrose M. Karani 1954
 James F. King 1954
 Haralambos N. Kritikos 1954
 Harold Lake 1954
 Jack K. Mackowiak 1954
 William J. Mahota, Jr. 1954
 Robert S. Nahas 1954
 Raymond M. H. Naudin 1954
 David P. Nygard 1954
 James E. Clappett 1955
 Markar A. D. Markarian 1955
 Richard C. Oldham 1955
 Antonio Aranguren 1956
 Paul A. Cnossen 1956
 Edwin J. Leonard 1956
 Juozas Orentas 1956
 Herbert P. Schoeck, Jr. 1956
 Benjamin J. Thurlow, Jr. 1956
 Thomas E. Weber 1956
 Santo M. Bramande 1957
 James F. Fournier 1957
 Thordur Grondal 1957
 Augusto Ramirez Barrera 1957
 Michael Spiegel 1957
 Benjamin G. Uy 1957
 Roger R. Billings 1958
 John F. Daly 1958

Frank K. Lind 1958
 Richard E. Lorenz 1958
 Nicholas S. Petralias 1958
 Dr. Sherman K. Poultney 1958
 Frank A. Seidel 1958
 John A. Beede 1959
 Alan E. Benson 1959
 Roberto Jaramillo, Jr. 1959
 James W. Mahoney 1959
 Davis C. McLeod 1959
 Robert W. Milik, Jr. 1959
 Harvey J. Rosenfeld 1959
 Joshua C. Alpern 1960
 Henry W. Brandt 1960
 Arthur D. Brook 1960
 Dr. Douglas E. Bryant 1960
 William M. Cannon 1960
 Gungor Dagistanli 1960
 Capt. Joseph S. Kaye 1960
 Edward D. McGrath 1960
 Kenneth Roberts 1960
 Peter H. Schneider 1960
 Maung T. Swe 1960
 Derin K. Turkomer 1960
 Ara Tutunjian 1960
 Lt. J. Warren Alford 1961
 George R. Bolduc 1961
 Kayhan Bord 1961
 Eduardo Cruz 1961
 Terry W. Donovan 1961
 James R. Duca 1961
 Suat Gonen 1961
 James Kachadorian 1961
 John W. Kappel 1961
 Swang Lee-Aphon 1961
 Richard A. Levendusky 1961
 Russell C. Lockwood, Jr. 1961
 Thomas P. Lopresti 1961
 George Matassov 1961
 Maung T. Maung 1961
 Dr. Timothy C. Meyers, Jr. 1961
 Gordon B. Phillips 1961
 Husein Y. Pothiwala 1961
 Donald E. Schaaf 1961
 Frank E. Thomas 1961
 Donald W. Wilmot 1961
 Maung N. Win 1961
 Haines J. Boyle 1962
 Robert D. Britton 1962
 Mehmet I. Can 1962
 Victor B. Castellani 1962
 Louis C. S. Fernandes 1962
 Stuart C. Gillow 1962
 Francis J. B. Goddu 1962
 Ralph H. Griswold 1962
 Captain Jackie P. Matteus 1962
 Robert G. McDonald 1962
 William H. C. Reinert 1962
 Albert M. Rockwell, Jr. 1962
 Basat H. Tilkioglu 1962
 Walter M. Adams 1963
 Paul Y. Chan 1963
 Thomas W. Greisamer 1963
 Capt. Herbert W. Head 1963
 William P. Morrison 1963
 Pundalik U. Prabhu 1963
 Gordon O. Stearns 1963
 Kendal B. Turner 1963
 Harold H. Wright 1963
 Stanley J. Andrysiak 1964
 Bernard Baron 1964
 Krishnakumar V. Chaudhary 1964
 Alan K. Cooper 1964
 Richard A. Downe 1964
 George E. Hammond 1964
 Peter C. Trombi 1964
 Paul A. Vajcovec 1964
 John T. Apostolos 1965

Arthur M. Dickey 1965
 James P. Molloy 1965
 Venkatesh B. N. Rao 1965
 Ali H. Ustay 1965
 Dilip V. Vora 1965
 Robert G. Bertrand 1966
 Satish H. Bhatt 1966
 David M. Burwen 1966
 Omer M. Cavusoglu 1966
 Shailesh V. Dave 1966
 Sharad B. Doshi 1966
 Roberto Huyke-Luigi 1966
 Ahmet G. Kozanoglu 1966
 Gerald W. Lucas 1966
 Ahmet Mavitan 1966
 Edgar P. Rundlett, Jr. 1966
 David E. Spender 1966
 Subhashchandra N. Amin 1967
 James R. Braithwaite 1967
 Athanassios H. Canatsoulis 1967
 Fernando Castillo 1967
 Mahendra K. Dave 1967
 Rein C. Freeberg 1967
 Philip R. Gaudet, Jr. 1967
 Ronald S. Gosk 1967
 Richard C. Graham 1967
 John P. Keir 1967
 Mitchell P. Koziol 1967
 Leonard J. Lamberti 1967
 Alan E. Larson 1967
 Mohmedjarid M. Malek 1967
 David R. Malley 1967
 Denis F. McQuillen 1967
 Ajit M. Mody 1967
 Rajendra M. Pandya 1967
 Mafatbhai N. Patel 1967
 George W. Pomfret 1967
 Richard A. Shaw 1967
 Vishram S. Shinde 1967
 Alan D. Wentworth 1967
 Frederick J. Eckert 1968
 Robert J. Ellis 1968
 Thomas E. Fitzpatrick 1968
 John Richard Hilyard 1968
 John D. Hoyt 1968
 Gerald G. Junevicus 1968
 Sudhir M. Mody 1968
 Hareesh S. Shah 1968
 Malay C. Sheth 1968
 Donald R. Shurtleff 1968
 Jas. P. Singh 1968
 Robert L. Smith 1968
 Robert J. Strople 1968
 Warren Lloyd Anderson 1969
 Raj K. Chauhan 1969
 Dr. William G. Clark 1969
 Steven H. Leece 1969
 Robert J. Magarian 1969
 James H. Morse 1969
 Harivadan R. Parikh 1969
 Harshad K. Patel 1969
 Rambhai J. Patel 1969
 Alfred F. Perrone, Jr. 1969
 James L. Richey, Jr. 1969
 Ronald P. Rosadini 1969
 Mohammad Vakilian 1969
 David M. Alden 1970
 Muammer Arikan 1970
 David B. Armitage 1970
 John F. Campanella 1970
 Demetrios H. Canatsoulis 1970
 Michael J. Demoga 1970
 William A. Ferranti 1970
 Jagdish C. Gupta 1970
 Andrew Ann-Shong Huang 1970
 Raymond J. Janus 1970
 Stephen J. Joyce 1970
 Steven A. Lacaire 1970

Praful V. Palan	1970
Rameshchandra N. Patel	1970
Arnon Rieger	1970
Harkant J. Shah	1970
Krishna S. Tahilani	1970
Stephen J. Barlow	1971
Jeffrey N. Berg	1971
Dr. Sharadchandra M. Dave	1971
Joseph A. Dumais	1971
Robert P. Hart	1971
Chul Kim	1971
Joseph C. Landwehr	1971
Bruce E. Leffingwell	1971
Richard F. Lukas	1971
William P. Mulloy	1971
John G. Parillo	1971
Mahendrakumar K. Patel	1971
Donald B. Seaton	1971
Paul R. Smith	1971
Lawrence J. Sniegoski	1971
Francis Soares	1971
Martin H. Wolf	1971
Gary Lee Dunkleberger	1972
Chandrakant H. Kansagra	1972
Paul Kelley	1972
Sudhir P. Patel	1972
Sureshchandra N. Patel	1972
Bertrand A. Pinel-Darrieux	1972
Alain Roux	1972
Joyce L. Caplovich	1973
Mon-Her Chen	1973
Vinod K. Sharma	1973
Sammy G. Shina	1973
Manubhai G. Thakkar	1973
Francis W. Yanuskiewicz	1973

Dr. Cohen's Slime Molds

Dr. MORREL H. COHEN, '47, Louis Block Professor of Physics and Theoretical Biology at the University of Chicago, is working with a slime mold called *Dictyostelium discoideum*, whose way of life may help scientists discover secrets of cell differentiation in all life forms.

The cycle of this fascinating mold begins when a spore lands in a suitable warm, moist place. After the case softens, a speck of living tissue emerges and enlarges into an amoeba (a single, mobile, unwallied living cell), which immediately starts engulfing nearby bacteria. The tiny amoebae divide into identical daughter cells which keep on dividing until all the available bacteria are devoured, a process which takes about eight hours.

At the onset of starvation, certain key members of the group begin to signal by releasing a few molecules of a chemical called cyclic adenosine monophosphate (cAMP) from their surfaces. When the cAMP reaches neighboring cells, two things happen. The neighbors repeat the signal and in about 15 seconds they start to move toward the original source in a jerky fashion. Initially the cell can do this only once in six minutes, but later is able to repeat the process every two minutes.

Dr. Cohen's time-lapse movies, made through microscopes, show

how the cells stream inward in swirling droves toward the source. Eventually the spiral "differentiates"—it grows into a mound with a visible tip, which becomes the control center of the mass of cells. A coating of slime forms on the mound and hardens.

As the mound starts to grow upward, the tip rises and the whole thing topples over and crawls. The creature by this time could contain 100,000 cells. It is visible to the naked eye and looks almost like a slug. As it migrates toward more favorable living conditions, the tip looks much like a flower stem, and forms into a blossom-like ball of spores setting the whole life cycle in motion again.

Dr. Cohen's particular forte is applying wave pattern equations derived in physics to this biological phenomenon. Other researchers believe their time-lapse photographs of chick embryos show similar wave action at the time of differentiation. Perhaps a parallel can be found in the diffusion of chemicals through unstirred liquids and the spread of signal from cell to cell which will help us to understand the processes required in forming a human being from a microscopic fertilized egg.

1957

Dr. CHARLES A. TYSON is project associate at the Institute for Enzyme Research, Madison, Wis. . . . D. CARL WEBSTER now serves as the director of program management at Army Tactical Data Systems (ARTADS), Fort Monmouth, N.J. Formerly he had been with the U.S. Army Satellite Communications Agency at the same facility.

1958

WILLIAM J. O'NEIL was recently appointed service manager-automation, New Jersey and Atlantic Districts, for General Electric's Installation and Service Engineering Department. He joined G.E. as a sales engineer in West Lynn, Mass. In 1966 he transferred to the Electric Utility Automation Sales Operation in Schenectady, N.Y., as a sales application engineer. By 1969 he had become an automation sales engineer in the Power Generation Sales Division in New York City. . . . NORMAN J. TAUPEKA, after having accepted a new position as electronics engineer with the project manager, Army Tactical Data Systems (ARTADS) in 1971, has since been awarded the Outstanding Performance Rating for two consecutive years. He has been instrumental in furthering the Army's goal of automating the Field Artillery through the development of the Tactical Fire Direction System. Previously he had been with the Communications/Auto-

matic Data Processing Laboratory in Fort Monmouth, N.J. His present location with ARTADS is also Fort Monmouth.

1959

Born: To Mr. and Mrs. PETER A. NELSON a son, Craig Stephen, on October 14, 1973. Craig has a brother, Scott, who is three. Pete is a senior test engineer at the Westinghouse Electro-Mechanical Division at Cheswick, Pa. He is responsible for the testing of commercial and naval nuclear canned-motor coolant pumps and control rod drive mechanisms. He has passed his professional engineer registration exam in Pennsylvania and is already registered in Massachusetts. A member of the Pittsburgh chapter of PSPE, he also serves as treasurer of the Westmoreland section of ASME.

ROBERT G. CHADWICK has been named manufacturing manager at Torrington Company's proposed new plant in Sylvania, Georgia. He joined Torrington (Conn.) Co. in 1961 as a project engineer in the bearings division. Soon after he attained the level of superintendent in local bearings production. . . . P. D. EDWARDS holds the post of plant manager at American-Standard, Piscataway,

N.J. . . . EDWARD F. McKEON works for Farm Bureau Insurance Co., Lansing, Mich. . . . ROGER E. MILLER is studying to be an Episcopal priest at Seabury-Western Theological Seminary in Evanston, Ill. . . . JOSEPH B. VIVONA serves as an administrative assistant for Fulton County in Atlanta, Georgia. He received an advanced degree from Georgia State last year.

1960

DWIGHT M. CORNELL, an engineering supervisor for Bechtel Power Corp., is temporarily on special assignment in Waterford, Conn. . . . DAVID A. JOHNSON serves as a customer relations specialist in the Graphics Markets Division at Eastman Kodak, Rochester, N.Y. . . . NATHANIEL M. JOHNSON is employed by Tilton Electronics Corp., Winnisquam, N.H., as plant manager. . . . STEPHEN LEVY, chairman of the Ocean Township Environmental Commission, has been reelected president of the statewide Association of New Jersey Environmental Commissions. . . . WARREN T. MUNROE is project engineer at Datametrics, Inc., Wilmington, Mass. . . . BERNARD J. SEASTROM works for GTE Sylvania, Inc., Need-

ham, Mass. . . . Dr. CHARLES A. STEVENS is assistant professor of industrial engineering at Virginia Polytechnic Institute, Blacksburg, Va. . . . GEORGE G. WILSON holds the position of engineering manager for GTE Sylvania, Needham, Mass. . . . Dr. THOMAS F. ZIMMIE is an assistant professor at RPI, School of Engineering, Troy, N.Y.

1961

PETER D. BEEKMAN now serves as marketing representative at ITEL Corp., New York City. . . . WAYNE F. GALUSHA is manager of peripheral products at Data General, Southboro, Mass. . . . G. LEONARD JOHNSON has been appointed nuclear projects engineer at Northeast Utilities in Berlin, Conn. In 1961 he joined the Hartford Electric Light Co. (now a N.U. subsidiary), as a mechanical engineer. He transferred to Northeast in 1966 as a project engineer for the second unit of the Millstone Nuclear Power Station in Waterford. . . . ARTHUR W. KROLL in engineering manager for Edmac Associates, Inc., East Rochester, N.Y. . . . FRANK MARRA works as a product manager at Four-Phase Systems, Inc., Cupertino, Calif. . . . EUGENE R. MORSE serves as a system performance specialist for the Federal Aviation Administration in Nashua, N.H. . . . WON K. PARK is on the board of trustees at Duk Sung Foundation, Seoul, Korea. . . . Currently DAVID W. PROSSER works as an associate air pollution control engineer for Region 6 at the New York State Dept. of Environmental Conservation, Watertown, N.Y.

1962

Born: To Mr. and Mrs. WILLIAM A. BRUTSCH a son, David William, on July 12, 1973. David has a sister, Melissa, age 6. Bill is working as a senior mechanical engineer with the Metropolitan District Commission in Boston.

Maj. JAY P. HOCHSTAIN is currently stationed with the U.S. Army Logistics Command, Ft. Lee, Virginia. . . . ROBERT E. MCINTOSH has been spending the past year in Holland. . . . PETER A. PARRINO serves as a senior engineer at Emerson Electric Co., St. Louis, Missouri.

1963

STUART D. BATSTONE is president-manager of Logos Bookstore, Framingham, Mass. . . . STEPHEN D. DONAHUE, Jr., who works for Procter & Gamble Co. as a materials handling specialist, currently resides in Gosforth, Newcastle-Upon-Tyne 3, England. . . . RICHARD A. GARVAIS now holds the position of production superintendent at Corning Glass Works (Electronics Products Division) in Wilmington, N.C. . . . RALPH D. GELLING is a patent attorney with United Shoe Machinery Corp., Beverly, Mass. . . . FRANCIS E. KENNEDY, Jr., who received his PhD from RPI last year, is now a post-

doctoral associate at RPI, Troy, N.Y. . . . Dr. ROBERT E. MURPHY has been named the director of Maryland Academy of Sciences. He will formulate plans for the Academy's move in late 1974 into the new Maryland Science Center now under construction in Baltimore's Inner Harbor Redevelopment Area. Formerly Dr. Murphy was assistant astronomer at the University of Hawaii. Earlier he worked two years as a research assistant at Georgetown, 18 months as an astronomer for the U.S. Army Map Service, and three years as a research assistant at Case Western Reserve. He joined the staff at the University of Hawaii in 1969. . . . Maj. DAVID G. NEVERS is an instructor at the U.S. Army Engineering School and is located in Ft. Belvoir, Va. . . . PHILLIP L. PARMENTER serves as a senior application engineer at Fafnir Bearing Co., New Britain, Conn. . . . WILLIAM C. ZINNO holds the position of manager of manufacturing planning at Industrial Nucleonics Corp., Columbus, Ohio.

1964

ARTHUR R. BODWELL, now a professional engineer, is employed by Damon G. Douglas Co. (General Building Contractor) in Newark, N.J. . . . RICHARD R. BROWN was recently appointed advertising/sales promotion manager of Data General Corporation, Southboro, Mass. He will be responsible for print advertising in concert with Scali, McCabe, Sloves, Inc., New York City, for collateral materials, trade shows, exhibits, audiovisual and direct mail. He joined the firm in 1970 as a public relations specialist. . . . RICHARD G. CARLE is presently a senior engineer-software, at Raytheon Co., Bedford, Mass. . . . RALPH R. GERMANN works as a pilot for Hawaiian Airlines at Honolulu International Airport. . . . Dr. EDWARD P. IACCARINO is a research engineer for ESSO Research & Engineering Co., Corporate Research Labs., Linden, N.J. . . . U.S. Air Force Capt. ROBERT S. NAJAKA has entered the Air Force Institute of Technology (AFIT) to study toward a master's degree in civil engineering. Located at Wright-Patterson AFB, Ohio, AFIT provides resident education in scientific engineering and other fields. Capt. Najaka was commissioned in 1965 upon graduation from Officer Training School at Lackland AFB, Texas. . . . EUGENE E. NIEMI, Jr., is an assistant professor at Lowell (Mass.) Technological Institute. . . . Dr. MASON H. SOMERVILLE serves as a professor of mechanical engineering at the University of North Dakota in Grand Forks. . . . DAVID T. STONE is supervisor of oil circuit breaker development at Allis Chalmers, Jackson, Mississippi.

1965

Born: Recently to Dr. and Mrs. DAVID B. LUBER their second son, Peter Andrew. In addition to his regular job at Bell Laboratories, Luber is now teaching part time at Fairleigh Dickinson University, Teaneck, N.J.

RONALD H. CHAND is the new president of Arsee Design & Mfg., Inc., Forestville, Conn. The company manufactures sintered carbide products and other power metal products. . . . NILS E. ERICKSON is a vice president at Dufresne-Henry Engineering Corp., North Springfield, Vt. . . . DAVID W. GEIGER has been promoted to superintendent of pressed metal bearings at Torrington Co. in Connecticut. He became a bearing engineering trainee in 1965. Prior to his latest advancement he was assistant superintendent. . . . Presently DONALD G. GREGOIRE serves as development engineer-manager at IBM, Electronic Systems Center, Owego, N.Y. . . . JAMES A. KEITH is a design engineer at Raytheon in Waltham, Mass. . . . WILLIAM F. NICKERSON holds the position of R&D engineer at Philco-Ford WDL in Palo Alto, Calif. . . . PAUL R. PEARSON is employed as an analytical engineer at Hamilton Standard in Windsor Locks, Conn.

Dr. HOWARD G. SACHS serves as an assistant professor at the University of Illinois Medical School, Chicago. . . . VIJAY D. SHETH is the owner of Visco Enterprise, a firm which manufactures coin-operated equipment in Bombay, India. . . . STEVEN G. SUTKER works as a sales representative at Digital Equipment Corp., Fairfield, N.J. . . . EUGENE G. SWEENEY, Jr., is presently an area engineer at E. I. DuPont's Spruance Plant, Richmond, Va.

1966

Married: PETER GRAY IV to Miss Sandra N. Hewitt in Highland, New York on October 6, 1973. Mrs. Gray is a draftsman and her husband an engineer in the engineering department of New York Telephone Company, Poughkeepsie, N.Y. Pete, who has his MSEE from Northeastern University, was formerly employed as a development engineer at General Radio Company in Concord.

Born: To Mr. and Mrs. HEYWARD S. WILLIAMS, their first child, Hugh Parry, on September 23, 1973. Williams is presently employed as chief engineer at LRC, Inc., Hudson, N.H.

ROBERT J. COATES is with the Stanley Works, Cheraw, S.C. . . . Lt. JAMES A. COCCI has graduated from the Naval Post Graduate School in Monterey, Calif. . . . WILLIAM V. COLLENTRO has been employed by United Engineers, Inc., Boston. . . . ROBERT B. DOLAN serves as a development engineer at GTE Sylvania, Manchester, N.H. . . . RICHARD L. HEALER is a senior product development engineer at the Foxboro (Mass.) Company. . . . EDWARD E. JOHNSON works as a process engineer at Oxford Precision, West Springfield, Mass. He is also attending graduate school at Western New England.

CHARLES S. KNOTHE holds the position of supervisor of data processing at E. I. duPont de Nemours, Wilmington, Delaware. . . . WILLIAM S. PETE was recently named foreman of the rear wheel bearing department at Torrington (Conn.) Co. . . . STANLEY SCHMIDT is plant engineer at Day Kimball Hospital in Danielson, Conn. . . . GERARD A. TOUPIN has been appointed

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THD at rated output	<0.5%					
IM Distortion at rated output	<0.5%					
FM IHF Sensitivity	1.9 μ v					
50 db signal to noise ratio	2.8 μ v					
Capture Ratio	1.5db					
Price	\$549.95 ²					

¹All power measurements taken at 120 volts/60 cycles, 8 ohms, 20Hz-20kHz, all channels driven simultaneously.

²Manufacturer's suggested list price which may be higher in some areas.

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To make your search a little easier, we've prepared the blank comparison chart above with spaces for some of the best-known brands and most important specs. Just take it with you to the store, fill it in, and you'll be able to tell at a glance what you get for what you pay.

We took the liberty of filling in the Sylvania column with specs for our RQ3748 four channel receiver. We did it because we know we're not the best-known name in four channel, and we didn't want you to overlook us for that reason.

Because we think the RQ3748's specs are really worth remembering.

50 watts of RMS power per channel at 8 ohms, 20-20kHz, with all four channels driven. 125 watts per channel in stereo bridge mode. A THD and IM of less than 0.5% at rated output. An FM sensitivity of 1.9 microvolts. A discrete four channel receiver with

matrix capabilities so you can use either type of quadrasonic material. And much, much more.³

We can offer so much because we have so much experience. We were one of the first in the audio field. And now we're applying all our knowledge, all our engineering skill to four channel.

Once you've proven to yourself which receiver has the best specs, move on down to that last line in the chart and compare Sylvania's price with all the others. Find out which one gives the most for your money.

We feel pretty confident you'll discover that the best-known names aren't necessarily your best buy.

³So much more that it won't all fit here. So send us a stamped, self-addressed envelope and we'll send you a four-page brochure on our four channel receivers.



GTE SYLVANIA

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Products Group, Batavia, N.Y.

assistant superintendent of pressed metal bearings at Torrington Co. in Connecticut. He started work at Torrington in 1966 as a bearings division engineer. Later he was promoted from assistant foreman to foreman, to general foreman in three different departments in less than three years.



Odell, '67

1967

EUGENE J. BALDRATE is a senior engineer at Southern New England Telephone Co., New Haven, Conn. . . . Currently ROGER V. BARTHOLOMEW, S.J. is at Spring Hill College, Mobile, Alabama. . . . HUGO W. CROFT serves as a captain in the U.S. Army and is located in Palo Alto, Calif. . . . FRANCIS L. DACRI works as a senior engineer at E. I. duPont deNemours & Co., Old Hickory, Tenn. . . . PETER J. DICKERSON has joined the Badger Co., Cambridge, Mass. . . . JOSEPH F. GOULART is with the Ford Motor Co., Dearborn, Mich. . . . Presently RONALD A. JOLICOEUR is a self-employed manufacturer's representative in Worcester. He sells industrial ventilation and air pollution control equipment.

LEON E. KRALS is now senior materials engineer for Pratt & Whitney Aircraft, East Hartford, Conn. . . . ROBERT J. LOCKWOOD, a system engineer for Raytheon, Wayland, Mass., currently provides system consultant services to the FAA at Jacksonville Air Route Traffic Control Center. . . . ROBERT R. MICHELIN is senior associate engineer at IBM in Poughkeepsie, N.Y. . . . ARNOLD R. MILLER holds the post of general manager at Electro-Craft, Inc., Dorchester, Mass. Previously he was senior sales engineer for Eagle Signal, Davenport, Iowa. Recently he published "The Automation Dilemma: Choosing a Control Technology" in *Chilton's Instruments & Control Systems*. He has also presented papers at IEEE, ISA, and SPI conferences during the past few years.

PAUL J. MILNE, who recently received his PhD from Kansas State, is now employed at Merrimack College, North Andover, Mass. . . . LEONARD E. ODELL has joined the Hartford Insurance Group's life actuarial department as an associate actuary. He will be responsible for the development of new individual life insurance products. Earlier he was with State Mutual Life Assurance Company of America and Aetna Life and Casualty where he was an assistant actuary. In 1971 he became a Fellow of the Society of Actuaries. . . . JAMES E. SHEA is a systems engineer at Raytheon in Waltham, Mass. . . . NEIL M. SHEA has been appointed a physics instructor at Holyoke (Mass.) Community College. Currently he is working toward his PhD at RPI where he also earned his master's degree. . . . PAUL G. TRUDEL works as a senior engineer at Bechtel Power Corp., Houston, Texas. . . . ELLIOT F. WHIPPLE is a first-year MBA student at Wharton School of Finance (University of Pennsylvania) in Philadelphia.

1968

Married: ROBERT J. GALLO to Miss Candace Costantino on November 3, 1973 in Torrington, Connecticut. The bride is a registered nurse at Charlotte Hungerford Hospital. The groom is a civil engineer with the State of Connecticut Public Utilities Commission. . . . DAVID B. MORRIS to Miss E. Diane Francis on October 7, 1973 in Upton, Massachusetts. Mrs. Morris is a kindergarten teacher in Lancaster. Her husband is a process engineer at Foster Grant in Leominster, Mass.

Born: To Mr. and Mrs. THOMAS J. PERARO a son, Christopher Thomas, on October 6, 1973. Tom, who is with Aetna Life and Casualty, Hartford, Conn., is working on his MBA at the University of Connecticut.

MICHAEL C. ANNON is with Stone & Webster, Boston. . . . ALBERT J. ATTERMEYER works at Norfolk Naval Shipyard, Portsmouth, Va. . . . ROBERT A. BALDUCCI will be assistant to the chief engineer at Torrington Company's proposed new plant in Sylvania, Georgia. He has worked as an industrial engineer for Torrington (Conn.) Co. since 1968. . . . PAUL G. BEAUDET is office engineer at J. A. Jones Construction Co., Charlotte, N.C. . . . DAVID P. CROCKETT serves as a sales engineer for Buffalo Forge Company in Cleveland, Ohio. . . . RONALD E. DANIELSON is a division manager at Danielson Flowers, Shrewsbury, Mass. . . . JEFFREY A. DECKER works as a senior appraiser-real estate investments at Prudential Insurance Co., New York City.

Presently H. PAXSON GIFFORD is supervisor-International Fuel Oil Movements for Texaco, Inc., New York City. . . . STEVEN C. HALSTEDT, who graduated from Amos Tuck School (Dartmouth) last year, is now a securities analyst for Travelers Insurance Co., Hartford, Conn. . . . Lt/jg RICHARD W. HEDGE is currently stationed with the Coast Guard in New Orleans, Louisiana. . . . JOSEPH F. HILYARD serves as director of corporate publications at Safety Electronics, Inc., Durham, N.C. . . . FRANK R. JENSEN is a technical support specialist at Digital Equipment Corp., Maynard, Mass. . . . ROBERT G. KOHM holds the position of group supervisor in production at DuPont Pigments Dept., Newark, N.J. . . . ROUMEN B. KORDOF, an associate of the Denver branch office of Connecticut General Life Insurance Company, has qualified for Honor Table, the company's highest honor for its field sales representatives. Honor Table membership is awarded to those whose professional skill in serving clients places them in the top 10 per cent nationally in performance among the company's career agents. Ron's specialty is in overall financial planning design for corporate business owners.

GEORGE H. LANDAUER is president of GDC Medical Electronics, Richmond Hill, N.Y. GDC is the instrumentation division of Generator Development Corp. . . . RICHARD H. LANG works as associate maintenance engineer at New England Power Co., Lebanon, N.H. . . . ROBERT MEADER now serves as a senior planner in the Fall River (Mass.) Planning Dept. Previously he was a planning specialist at Fall River Model Cities Agency. He and his wife, Betty, are the parents of a son, Robert, age 2½. . . . GEOFFREY P. TAMULONIS is with ITT in Ramsey, New Jersey.

1969

Born: to Mr. and Mrs. Jeffrey C. Knapp their first child, a son, Lindsey Clark, on August 1, 1973. Jeff, who is with LTP Enterprises, recently designed and helped to build the Knapps' new home in Rye, N.H.

JAMES P. ATKINSON works for the Metropolitan Area Planning Council in Boston. . . . DONALD E. CASPERSON is presently using the new LAMPF accelerator facility at Los Alamos, N.M., for research leading to his PhD in physics at Yale. . . . JOHN E. CONNELL, Jr., serves as an analyst programmer at Aetna Insurance Co., Hartford, Conn. . . . JOHN B. CZAJKOWSKI is a staff assistant at Bergere, Providence, R.I. Last year he received his MBA from Western New England College, Springfield, Mass. . . . CHARLES T. DOE works at State Mutual Life Assurance Co., Worcester. . . . JOSEPH E. DORAN, Jr., recently received his BSEE from the University of New Haven. He is vice president of Doran & Johnson Mfg. Corp., North Attleboro, Mass. . . . JAMES W. FOLEY is with Bell Labs., Murray Hill, N.J. . . . DOUGLAS J. GEORGE is currently with George Associates, Inc., Needham, Mass. . . . STANLEY J. GOLDMAN lectures on constitutional law and civil rights at Northeastern University, Boston. . . . JOEL P. GREENE has become associated with Anderson & Pentland, Attorneys at Law, Worcester.

PETER T. GROSCH is studying for his MBA at Emory University, Atlanta, Ga. . . . CHARLES D. HARDY, Jr., holds the post of senior design engineer at National Steel, San Diego, Calif. . . . Presently RICHARD H. GURSKE is project manager at VTN Consol, Inc., Irvine, Calif. . . . THOMAS M. GWAZDAUSKAS works for Artisan Industries, Inc., Waltham, Mass. . . . Air Products & Chemicals, Inc., employs ARTHUR T. KATSAROS as a senior process engineer in Allentown, Pa. . . . KENNETH W. KOPKA is now general foreman of grinding at Torrington Co., Torrington, Conn. Formerly he was assistant foreman of secondary operations. He joined the company in 1969 as a bearing manufacturing engineer. . . . DANIEL P. LORUSSO works in computer design at General Electric, Pittsfield, Mass.

ERIC H. NICKERSON holds the position of senior design engineer, connector products, at Texas Instruments, Inc., Attleboro, Mass. . . . PAUL V. NORKEVICIUS is studying for his MBA at the University of Massachusetts. . . . BIDYUT K. RATH serves as a designer with Stone & Webster, Boston. . . . DONALD W. RULE teaches as an assistant

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at the University of Connecticut. . . . ROBERT J. SCOTT is a planner for the city of Virginia Beach, Va. Recently he received his MRP from Cornell. . . . FRANCIS W. SKWIRA works as a proposition engineer for General Electric Co., Steam Turbine/Generator Marketing Dept., Schenectady, N.Y. . . . DAVID W. SWENSON is employed as a development engineer at Western Electric Co., North Andover, Mass. . . . THOMAS F. TAYLOR works for General Electric Co., Lynn, Mass.



Smialek, '70

CHESTER J. NAPIKOSKI is with EBASCO Services, Inc., Glenrock, Wyoming. . . . RANDY SABLICH serves as contract manager at Grumman Aerospace Corp., Bethpage, N.Y. . . . ROBERT L. SMIALEK, supervising engineer, Kemper Insurance Group of Rolling Meadows, Ill., was recently recognized at the Insurance Institute of America National Annual Awards Luncheon in Chicago for having achieved the highest grade among all those who took the Institute's Management Studies 41 examination during the May 1973 examination series. . . . ROBERT W. SOFFELL, who is located in Parma Heights, Ohio, is currently a development engineer for the Carbon Products Division of Union Carbide Corporation. . . . JAMES H. VERGOW works as a manufacturing engineer at Texas Instruments, Attleboro, Mass. . . . PAUL C. WILSON is a graduate assistant at the University of Connecticut in the Metallurgy Dept.

1970

Married: RICHARD DIAMOND to Miss Barbara Marten on October 21 in Plainview, L.I., New York. A graduate of BU, the bride is a speech therapist in the Uxbridge (Mass.) school system. The bridegroom is affiliated with Peter Lumber Corp., Worcester. . . . GEORGE L. FISLER and Miss Shirley J. Shove in Milford, Connecticut on November 2, 1973. Mrs. Fisler is a senior at Southern Connecticut State College, New Haven. Her husband is a computer programmer analyst at Bridgeport Hospital.

Born: To Lt. and Mrs. JOHN JOLLS, a son, John Richard, on November 18, 1973 in Honolulu. Jack missed the great event since he sailed November 8 on the USS Seadragon for an extended duty tour in the Pacific.

CHARLES J. ANDRESON serves as a graduate assistant in WPI'S Civil Engineering Department. . . . ROBERT A. ANSCHUTZ is with G.E.'s Knolls Atomic Power Lab., Schenectady, N.Y. . . . JOHN T. BOK works as a sales engineer at Allen Mfg. Co., Bloomfield, Conn. . . . JOHN P. DEMASE received his MSME from RPI last year. . . . BERNARD J. DODGE has been named associate projects administrator at WPI. Recently he returned to this country after spending two years with the Peace Corps in Sierra Leone, South Africa, where he served as a secondary school mathematics teacher and librarian. . . . JOHN W. GEILS, Jr., and his nationally-known J. Geils Band, performed at Boston Garden last November. . . . DONALD W. HARDING works for Granger Contracting Co., Worcester. . . . ROBERT R. MATTSON, who received his MSME from WPI last year, is presently a team manager at Charmin Paper Products, Mehoopany, Pa.

1971

Married: BRUCE W. BENNETT and Miss Sadie E. Taylor on October 20, 1973 in Rhode Island. Mrs. Bennett graduated from South Kingston High School. After attending WPI her husband graduated from Plus School of Business in Providence. . . . CARLTON E. CRUFF to Miss Linda M. Scieller on October 19, 1973 in Waterbury, Connecticut. ROBERT PACE served as best man and CREGG McWEENEY was an usher. The bride graduated from the University of Connecticut. The groom is serving in the U.S. Army Reserve. . . . GLENN A. TUOMI and Miss Debra A. Gavin in Vernon, Connecticut on October 13, 1973. Mrs. Tuomi is a Becker graduate and also attended Cardinal Cushing College, Brookline, Mass. The bridegroom is employed by the Barry Division of Wright Line, Inc., Worcester.

JOSEPH P. BELLINO is with General Electric Co., Schenectady, N.Y. . . . PAUL J. BIENICK works at Stone & Webster Engineering Corp., Boston. . . . FRANCIS J. CALCAGNO has been employed as a securities analyst for Irving Trust Co., New York City. . . . ARTHUR A. JACKMAN teaches at Keefe Tech., Framingham, Mass. . . . JOHN C. JOHNSON is chief of the bioinstrumentation branch, Bioengineering Division, U.S. Army Aeromedical Research Laboratory, Fort Rucker, Alabama. . . . PHILIP M. JOHNSON was recently employed as a coatings development chemist for optical products at Omnitech, Inc. (a subsidiary of Gentex Corp.). . . . 2/Lt. TIMOTHY C. JOHNSON has completed a nine-week air defense artillery officer basic course at the Army Air Defense School, Ft. Bliss, Texas. Last year he received his MS degree from Ohio State University in Columbus.

DOUGLAS A. KEILY now works at Combustion Engineering, Inc., Windsor, Conn. . . . WILLIAM G. LIGHT received his MS in chemical engineering last year from the University of California in Berkeley. He is now working for his PhD. . . . CARL T. NELSON is a development engineer at 3M Company, St. Paul, Minn. Recently he received his BSME from Kansas State University. . . . DONALD P. ST. MARIE works for Camp, Dresser & McKee, Boston. . . . ROBERT M. SINICROPE teaches mathematics at Milton Academy, Milton, Mass. . . . MARTYN H. STRONG is with KAPL, Schenectady, N.Y. . . . CALEB H. THOMAS, Jr., serves as a design engineer at Formation, Inc., Cherry Hill, N.J.

1972

Married: RICHARD L. LOGAN and Miss C. Lorraine Mullaly on August 18, 1973 in Worcester. Mrs. Logan is a graduate of Worcester State College and teaches in Framingham, Mass. The groom is a graduate student at Northeastern University. . . . JOHN C. MODZELEWSKI to Miss Christine Ann Sorenson on October 27, 1973 in Manchester, New Hampshire. The bride graduated from St. Vincent Hospital School of Nursing. She is a registered nurse at St. Vincent. Her husband is employed by the Department of Public Works in Worcester.

KENNETH C. ARIFIAN, EDWARD C. CLUKEY, BRUCE M. ETESON, DAVID HAYHURST, JAMES V. LACY, and ROY LINDBLAD are all doing graduate work at WPI. . . . CHARLES L. DESCHENES is with Frank Morrow Co., Providence, R.I. . . . MICHAEL J. EMERY serves as a process engineer at E. I. duPont de Nemours, Camden, S.C. . . . THEODORE A. FREDERICKS is employed as a mechanical design engineer at Collins Radio Co., Richardson, Texas. . . . WILLIAM D. GOODHUE teaches chemistry at North Chelmsford (Mass.) High School. . . . VAHE KRIKORIAN works for Xerox Corp., Webster, N.Y. . . . PAUL LACOUTURE is an associate engineer at New England Telephone in Boston. . . . Raytheon Co., Waltham, Mass., employs DAVID J. MCGORTY as an associate engineer.

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FRANK D. McMAHON works at Good-kind & O'Dea in Clifton, N.J. . . . Currently JOHN A. MINASIAN is a sales engineer at Data General Corp., Southboro, Mass. . . . GEORGE A. OLIVER holds the position of research scientist at Ford Motor Co., Dearborn, Mich. . . . RANDALL D. PARTRIDGE is with Mobil Research & Development Corp., Paulsboro, N.J. . EDWARD SCHRULL is studying for his MS in nuclear engineering at the University of Arizona in Tucson. . . . Lt. STEPHEN A. WILKINSON commands a Water Purification Detachment for the U.S. Army Corps of Engineers at Fort Bragg, N.C.

1973

Married: DENNIS R. BELIVEAU to Miss Judith E. Barcheski in Fairfield, Connecticut on November 3, 1973. Mrs. Beliveau was a secretary with Harvey Hubbell, Inc., in Bridgeport. Her husband is a manufacturing engineer with G.E. in Auburn, N.Y. . . . DAVID S. BOWEN to Miss Jeannine M. LaBrake in Portland, Me., on September 29, 1973. The bride has been employed by W. T. Grant Co. The groom works for Travelers Insurance Co., Hartford, Conn. . . . CHRISTOPHER A. BRODERS and Miss Bonnie J. Sandy on September 22, 1973 in Shrewsbury, Massachusetts. The bride was a bank teller at Worcester County National Bank. The bridegroom works at Texas Instruments, Inc., Attleboro, Mass. . . . LEO BUCHAKJIAN, Jr., to Miss Elaine H. Triggs on October 20 in North Brookfield, Massachusetts. Mrs. Buchakjian is a registered nurse in the Surgical Intensive Care Unit at the Memorial Hospital, Worcester. Her husband is studying for his MSME at MIT.

Married: MARK J. CICHOCKI and Miss Kathy L. Beardsley on October 20, 1973 in Bridgeport, Connecticut. The bride attended the University of Bridgeport. The bridegroom is production control administrator with the General Electric Co. . . . MICHAEL DeCOLLIBUS to Miss Cheryl Nilles on November 10, 1973 in Sudbury, Massachusetts. Mrs. DeCollibus is a Becker graduate. Her husband is an industrial engineer at Raytheon

in Andover, Mass. . . . FREDERICK C. LEVITSKY and Miss Marcia A. Rossik in Auburn, Massachusetts on October 20, 1973. Mrs. Levitsky was employed in the IBM department of Johnson Steel & Wire Co. The groom works for General Dynamics Corp., Groton, Conn. . . . JOEL S. LOITHERSTEIN and Miss Dianne B. Boyer last fall in Brookline, Massachusetts. The bride is a graduate of Northeastern University, Department of Allied Health. Her husband is doing graduate work at WPI.

Married: WILLIAM H. MAWDSLEY and Miss Beverly Ann Carr on August 4, 1973 in Shrewsbury, Massachusetts. Mrs. Mawdsley is a senior at Worcester State College. The bridegroom is an actuarial assistant at State Mutual Life Assurance Co., Worcester. . . . ROBERT G. NELSON, Jr., to Miss Janice A. Kazak on October 20 in Springfield, Vermont. Mrs. Nelson, a secretary, graduated from Becker. Her husband is a graduate student at WPI. . . . EDWARD F. PECZYNSKI, Jr., and Miss Christine M. Laskoske in Meriden, Connecticut on November 3, 1973. Mrs. Peczynski teaches in the Meriden public schools. Mr. Peczynski is an assistant engineer at Northeast Utilities Service Co. in Berlin. . . . ROBERT S. VEITH to Miss Lucinda Ann Stirlen on September 1, 1973 in Wilbraham, Massachusetts. The bride is a student at Springfield Hospital School of Nursing. The groom is employed by Thomas Taylor and Sons in Hudson.

BRUCE J. BAKER is a process engineer at DuPont in Towanda, Pa. . . . JAMES R. BUELL serves as a sales service representative at Wyman Gordon, Grafton, Mass. . . . DAVID L. BURKEY, THOMAS A. MIKOLINNAS, and ROSALIA SCHLAEN are all graduate assistants at WPI. . . . PAUL A. CHRISTIAN is a graduate student in the chemistry department at Stanford University in California. . . . JOHN F. CIRIONI has been employed by Foster Forbes Glass Co. . . . CHARLES A. DiMARZIO works for Raytheon Co., Sudbury, Mass. . . . DAVID HUBBELL is a student at Boston University Medical School. . . . DANIEL KAZARIAN serves as an intern for the Defense Dept. at Rock Island, Ill. . . . Torrington Co., Torrington, Conn., has employed DAVID A. KULCZYK as a manufacturing engineer in needle research.

PHILIP MEDIEROS has been named chief of nuclear test trainee and support at the General Dynamics Corporation, Groton, Conn. . . . MARK MOORADIAN is a graduate student at Harvard University. . . . WILLIAM J. NIERANOWSKI teaches mathematics in Milford, N.H. . . . LEONARD REDON, who works in the product development department at Eastman Kodak, was featured in a Kodak advertisement in the October 8, 1973 issue of *C & EN*. . . . PHILLY M. SADRI is with the Simplex Time Recorder, Gardner, Mass.

Completed Careers

JAMES E. SMITH, '06, founder and for many years president of the National Radio Institute in Washington, D.C., died in McLean, Virginia on September 30, 1973. He was 92.

The school, which has enrolled nearly a million students, is said to be the oldest home study electronics school in the nation. It was founded in 1914. Mr. Smith was president from then until 1956, when the school was bought by McGraw-Hill publishers and he became chairman of the board.

After graduating from WPI as an electrical engineer in 1906, Mr. Smith went to Washington to teach electrical engineering at McKinley High School, where he built a receiving station in 1910 and introduced wireless radio to public schools.

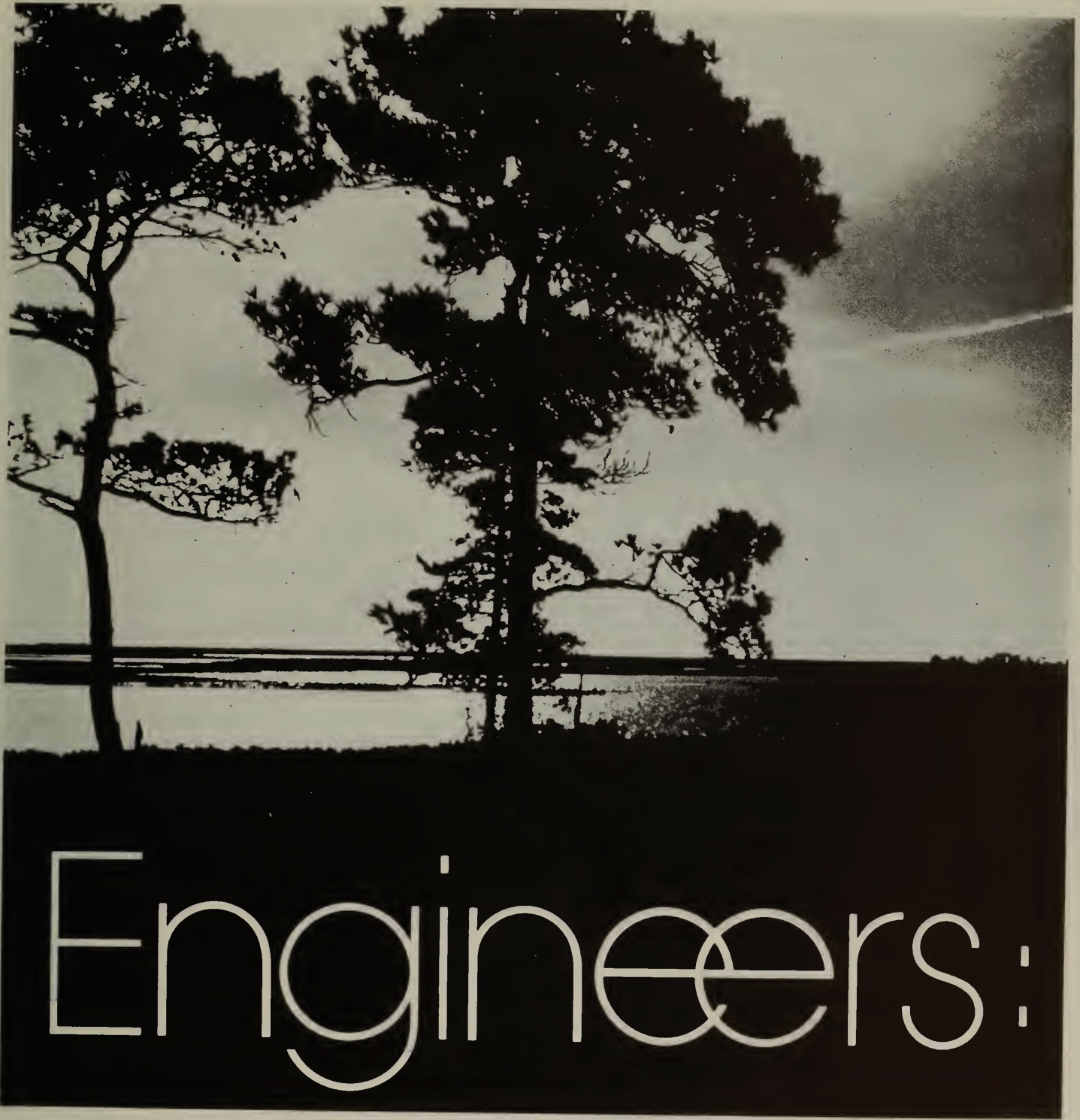
In 1917, when the United States entered World War I, he became director of radio instruction at Howard University where he trained 800 wireless telegraphers, many of whom joined the Army Signal Corps.

For his outstanding professional achievement Mr. Smith was given the Robert H. Goddard Award in 1965, and in 1969 he received an honorary doctor of engineering degree from WPI. He was also cited by the National Home Study Council Hall of Fame and given the International Knight of Achievement award.

He belonged to AIEE, IRE, and Phi Sigma Kappa. He also was a Fellow of the Radio

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Club of America, chairman of the advisory board of the D.C. area YMCA and president of the Round Table of Washington. He was past president of the Washington, D.C. chapter of the Alumni Association. He was the father of J. Morrison Smith, '37.

JOHN BARNARD, '13, a retired investment broker, died November 4, 1973 in Weymouth, Massachusetts.

He was born March 8, 1891 in Worcester, and graduated from WPI as an electrical engineer in 1913. Until his retirement in 1955, he was an investment broker for F. S. Moseley Company of Boston. At the time of his death he was serving as a trustee of the company.

Mr. Barnard was a member of the Union Club of Boston, a former president of Rogerson House, Boston, and a member of the executive committee of the New England Deaconess Hospital. He belonged to Skull and Theta Chi Fraternity.

ASA HOSMER IV, '14, died September 30, 1973 at Hartford (Connecticut) Hospital. He was 81.

Born in Baldwinville, Mass., he went to work for the Factory Insurance Association of Hartford after graduating from WPI as a mechanical engineer in 1914. He lived in Charlotte, N.C. for 32 years successively as inspector, engineer and as southern field manager for the Association. He was transferred to the Hartford office as a senior engineer in 1951.

While in Charlotte he was prominently identified with the insurance and engineer groups and was a president of the Charlotte Engineers Club and chairman of the local section of the ASME. He was a registered professional engineer in North Carolina. He retired in 1959.

Mr. Hosmer belonged to the Old Guard of West Hartford.

FRANCIS T. McCABE, '16, of Cambridge, Massachusetts died on November 18, 1973 at the age of 79.

After studying at WPI, he received his BS from the University of Maine and his EdM from Harvard University.

For a number of years he served as a teacher of physical science and head of the department at Rindge Technical School, Cambridge, Mass. He was a member of ASME, MAAT, and SPEE.

JAMES C. WALKER, '16, a life trustee and former executive vice president of WPI, died October 28, 1973 in Pinehurst, North Carolina. He was 79.

He was a native of Amesbury, Mass. In 1916 he graduated as a chemist from WPI. During World War I he served in the U.S. Navy as an ensign in the Balloon Corps. Until 1929 he was associated with the American Woolen Co. From 1929 until 1960 he was with Sandoz, Inc., New York City, an international chemical company. At his retirement he was executive vice president and chairman of a company management committee.

In 1961 he was appointed executive vice president of WPI and served 13 months. During that time he was interim president, between the terms of Arthur Bronwell and Harry Storke.

Mr. Walker was a member of Sigma Alpha Epsilon Fraternity and a charter member of the American Association of Textile Chemists, Colorists. He received an honorary doctor of science degree from WPI in 1957.

CLYDE T. HUBBARD, '17, died on November 23, 1973 in Boston at the age of 80.

Following his graduation from WPI as a civil engineer, he joined the Bell Telephone Co. of Pennsylvania. From 1924 until his retirement in 1953 he worked for the New England Telephone & Telegraph Co. He retired as division plant engineer-Western Division.

Mr. Hubbard belonged to Theta Chi, Tau Beta Pi, the Telephone Pioneers of America, and the Tech Old Timers. He was a professional engineer in the state of Massachusetts.

PHILIP H. SHERIDAN, '17, died October 6, 1973 in St. Petersburg, Florida.

He was born in Grafton, Mass., on May 16, 1895 and later studied at WPI. For many years he was with Crompton & Knowles Loom Works, Worcester, where he served as assistant foreman.

MYRON D. CHACE, '21, died on October 18, 1973 in Arlington, Massachusetts.

He was born in Worcester on February 20, 1897, and graduated in 1921 as an electrical engineer from WPI. From 1922 until 1962 he worked for the New England Telephone & Telegraph Co. where he retired as a general toll engineer.

Mr. Chace was a member of Phi Sigma Kappa Fraternity. He was a registered professional engineer in the state of Massachusetts and a member of the Telephone Pioneers of America.

MAURICE KORNBLUT, '22, passed away on November 18, 1973 at his home in Ansonia, Connecticut. He was 73.

A native of Ansonia, he later attended WPI and graduated from New York University Law School in 1921 following service in World War I. After being admitted to the Connecticut bar, he practiced law in Ansonia for 52 years. Twice he was the prosecuting attorney of the City Court.

Active in the former Ansonia Jewish Community Center, he was also past president of B'Nai B'Rith.

LEON E. HADLEY, '23, of Fitchburg, Massachusetts, passed away on September 30, 1973.

He was born on May 4, 1901 in Leominster, Mass. He studied mechanical engineering at WPI. For many years he worked as an estimator at Simonds Saw & Steel Co., Fitchburg.

Mr. Hadley was a member of Phi Gamma Delta Fraternity.

NORMAN A. BERGSTROM, SR., '25, passed away very suddenly of a heart attack on October 1, 1973 in New Jersey. He was 72 years old.

He studied electrical engineering at WPI. In 1963 he retired as a supervisor in the Long Lines Dept. at the American Telephone & Telegraph Co. in Princeton, N.J.

DANIEL A. HOWE, '25, died November 23, 1973 at his home in Needham, Massachusetts. He was 68.

He was a mechanical engineering student at WPI. For many years he was employed by Stone & Webster in Boston. He belonged to Theta Chi Fraternity.

WILLIAM F. RONCO, '25, passed away on September 22, 1973 in Mt. Kisco, New York.

He was born on January 17, 1903 in Clinton, Mass., and later became a student at WPI. For many years he was in the electrical business in Mt. Kisco.

EDMUND F. ROTHMICH, '34, of Worcester died as the result of injuries sustained in an auto accident last October.

He was born on August 16, 1913 at Schenectady, N.Y. In 1934 he graduated as a civil engineer from WPI and joined Riley Stoker Corp., Worcester, where he was employed as manager-customer service department at the time of his death.

Mr. Rothmich was a member of Theta Chi Fraternity and ASME.

KINGSTON C. SMITH, '35, passed away during open-heart surgery at Yale-New Haven Hospital on May 28, 1973 in Connecticut.

He was born on September 25, 1911 in Rockville, Conn., and received his BSEE from WPI in 1935. During his career he was affiliated with New England Power Service Co., Curtiss-Wright Corp., Monsanto Chemical Co., and Gouverneur Talc Co. For many years he was with Sikorsky Aircraft, Stratford, Conn., where he held several positions including those of plant electrical engineer and plant mechanical engineer.

Among the organizations of which he was a member were Lambda Chi Alpha Fraternity, AIEE, and AIME. He was a past president of the New Haven Chapter of the Alumni Association.

JOSEPH P. MANNA, '46, a long-time resident of Duquesne, Pennsylvania, died on September 5, 1973.

He was born on December 22, 1920 at Franklin, N.J. After graduating as a mechanical engineer from WPI, he joined Joseph E. Seagrams & Sons from 1947 to 1952. Later he served as supervisor-fuel and instruments for U.S. Steel at the Duquesne (Pa.) Works.

Mr. Manna belonged to ASME and ISA.

ROBERT A. SHEIMAN, '71, was killed while on duty with the U.S. Army in an auto accident in Stuttgart, Germany on June 20, 1973.

He was born on April 21, 1949 in Rochester, N.Y. He graduated as a chemical engineer from WPI and belonged to AICE.



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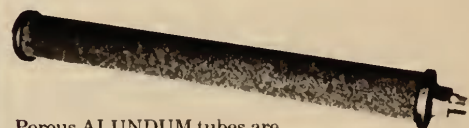
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