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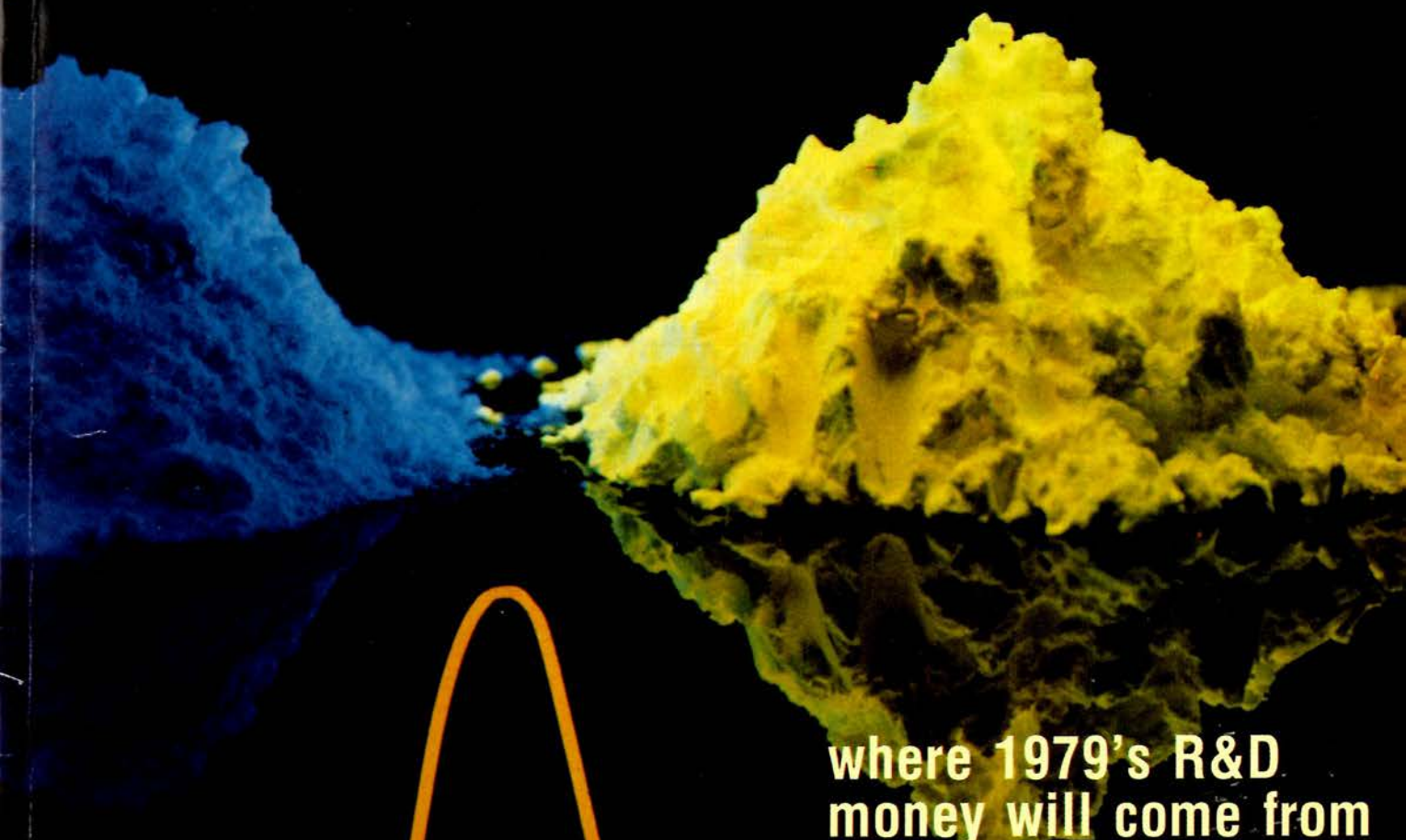## RESEARCH/DEVELOPMENT

where 1979's R&D
money will come from

energy today and tomorrow

Earl Wantland: organizing
for high technology

specificity
in quality control

putting MBE to work

news of importance
to people in R&D

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Organizing for High Technology

An interview with Earl Wantland, President, Tektronix

In visits to the Tektronix "campus" in Beaverton, OR, we've been impressed with the management philosophies of the firm's president. So we asked him to record his ideas for our readers, and one day last fall C.J. Mosbacher sat with him in his open office early one morning. The first question was what Earl Wantland's view of R&D budgets for the next year, He replied:

There won't be any changes from Tektronix' point of view. The funding of R&D is absolutely essential for any company like ours, and I believe it to be essential for any industry where technologies are the bases for the products. That's where the vitality for the future comes from. There have been major problems with some industries as they've been squeezed for profitability and have succumbed to the temptation of cutting back on R&D budgets. Over a period of time, there is just no renewal process taking place. Any specific technology has only a certain time frame of effectiveness.

Like the steel industry.

Like the steel industry. In a way, the same thing happened in the textile industry. People quit developing new machinery, new equipment, and new approaches to

making it more effective. We don't dare let that happen. I feel the level of commitment to funding R&D is very high. You may remember back in '69-'70 when we really got ourselves into difficulty as a company from the growth point of view—right at that time when the recession hit. We chose the strategy of heavy funding of R&D and lower profitability rather than to ride with the financial community and optimize profits at that time. The financial community reminded us for five or six years after that of

what we had done. But I believe it was the right thing to do.

It turned out that way. Are you holding to shorter term R&D these days, or still going to long-term, long-range projects?

We try to have a balance in our portfolio with some directly product-related activities, and a fair amount allocated to longer-term technologies. Longer-term technologies are those that are not likely to be used in products for five, seven, even maybe, ten years, but that we believe have the potential for being important and have the possibility of usefulness. We have to be working

No organization can do everything, but you can stay current with most things that . . . are most important

on a longer time scale, of course, for those kinds of things.

In addition to that, we must have a very good surveillance activity in these areas and contacts with the important work that is going on so that we know about it early. No organization can do everything, but you can stay current with most things that you think are most important.

How do you choose which projects you fund and which you don't?

It's hard to describe a process like that, but we do have some formal planning processes that systematically work through the prioritization of technology. This is in addition to prioritization of business and business units. During the course of the year, there is a process that is quite well structured where R&D personnel meet periodi-

cally with the business units and systematically go thru the technology directions and their importance for that business unit. Then our planning people in Tek Labs pull that all together, and it's reviewed by the top technical people in the company.

In other words, you keep close liaison between Marketing and R&D.

You make sure it's tied together. You don't want R&D to go off completely by itself, but you still need to have some work being done that isn't fully committed to your business units. Sometimes you're working out so far in the future that it's outside of their time horizon for their operating results.

Do you reserve a certain amount of the R&D budget for "blue sky" projects?

Well, we've not formalized the percentage, but Bill Walker (Test & Measurement Group Vice-President) and I have kind of an informal agreement about how much. He then has the job of finessing that as we move thru time, depending upon our over-all set of priorities. There are always periods of time in technology development where it is not clear what category a project is in. As a project moves closer to real use, and even when it is first being used, a lot of work remains to be done for other applications, or for advancing the technology, or improving the performance of the technology. So, a project often really falls into more than one category. There are no good clean criteria; it takes quite a bit of judgment.

You have different value scales that you apply simultaneously?

Right. It's a complex world we live in. It doesn't fall into nice, neat channels, or nice neat boxes.

Are there any specific techniques you use to measure projects? Do you use return on investment?

Not for R&D projects. What we are looking for are technologies that have inherent advantage for performance of one aspect or another of future products. If they have that inherent advantage, and you can develop the skills to really take advantage of them, then we have a good corporate position.

At Tektronix, we have a very fine assemblage of people to work out the integration of such technology with all the other aspects of product development. But at the R&D level, you're really working with science coupled with a kind of intuition about which will emerge as the more important.

You need a certain amount of scientific intuition in your corporation.

How many people do you have in your Technical Center here? In R&D?

It's roughly 10% of our people.

Do you augment that with outside people–with consultants from the academic world, for example?

To a limited degree we do. We have some outside work being done for us. Sometimes they come in for a short period of time and work with us. It's not a large portion of what we do, tho.

Do you have an exchange program of getting people back into the academic field?

We have had very few examples of that, but we have had a few.

Another point that has intrigued me about Tektronix is that it's a local company as opposed to some others in the industry that have spread out geographically. What's your philosophy on that?

Well, we first started here, and this was the home of the founder, so that's the natural part of it. We found very early that we could be successful, even tho we were not in the

you really have to optimize what you are doing. That takes something other than a serial and arm's length kind of approach.

I notice you have an open office here for yourself.

That's correct. I think that has a lot of advantages when you are trying to work out very complex sets of interactive and sometimes conflicting requirements. You need the possibility of interaction on a continuing basis, because you don't think of everything the first time. You have to come back and re-test your ideas and your assumptions, and come back again time after time. From a scientific point of view, or from a stimulation of innovation point of view, I think that mode has proved to be effective for us.

We believe that it is virtually impossible to interact when you have people who are really remote from each other. The amount of effort, the coordination it takes to bring people together then is very costly, too. So, our orientation is to stay close here.

As you can see, we have developed a very large site. We have another one at Wilsonville, which is only 17 miles away, and the new site that was recently announced is less than 25 miles away—easy travelling because it is freeway the whole distance.

If the world continues to be kind to us, we will eventually have to go farther for some of our operations. But, for as long as we can,

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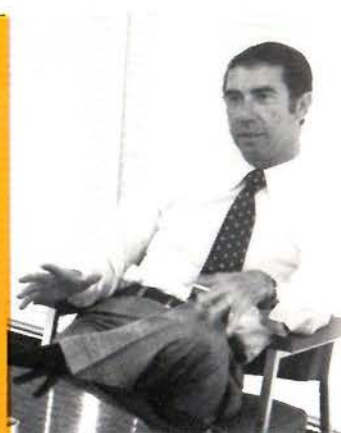
center of most scientific work that was going on. Good people and a healthy approach to the work and scientific achievement generally, so being here was not a disadvantage. At least, the advantages and disadvantages balanced out reasonably well. So, there was not much stimulus to go some place else.

The other thing, the style of the company, I think, made it important for personal interaction of a lot of different skills and individuals to better integrate—synthesize—all the different elements. All product development is an assortment of compromises— conflicting desires in the design phase—so

I think there is tremendous advantage of having R&D functions close together.

I find it fascinating that the Japanese have planned this whole scientific community and are moving government-supported research institutes into it. They purposely are doing that to structure interdisciplinary sessions . . . because it is important to integrate the disciplined society.

That poses a problem for us in this country.

The real power in what the Japanese do is that they have both the inclination and determination to set priorities as a country,

and they have a participative process of setting priorities. Of course, it is sometimes difficult to see who is more equal than others in that process, but when the priorities are set, the Japanese work in a way that is consistent with those priorities. That has a tremendous amount of power. I read some place where they have around 10,000 lawyers in their whole country. They

son has a very limited sphere of understanding and experience, and each person has a different one. If you have reasonable balance, and you can bring that balance together in a helpful, interactive, respectful way, then what comes out is a far superior conclusion. To an extent we have done that pretty well. And, I think that it is an attempt to describe oftentimes what the Japanese

**We don't stick very close
to the authority hierarchy. . .
We do seek a kind of consensus
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don't operate from a basis of law; they operate from a basis of what is appropriate. They don't have all this loss of energy in trying to find a way thru the laws and confronting people from a legal point of view.

They don't have the adversary situation we have so many times in this country. You have done much the same here, tho, haven't you, in avoiding adversary situations?

We have had a number of people draw the parallel between the Tektronix style and the Japanese style. There is some similarity between the ways we approach things.

I think you were awfully close to it in that we've never been autocratic in our approach to things. We've been very participative in our approach. Of course, I think there's pretty good understanding of who has the responsibility when push comes to shove in things. But on any specific issue, the most capable person, or the most knowledgeable person in the company, may be several levels down in the organization, and we are far more inclined to function so that *that* person is the most influential person for that particular aspect of what we are doing.

We don't stick very close to the authority hierarchy for everything we do. We do seek a kind of consensus in many, many things. It's more than just consensus; it is a mode that brings the insight of a lot of people working together to bear upon any particular issue before we come to a conclusion. In that process, a consensus emerges very often as a result.

I don't know as you'd call it a consensus-seeking process. I think it's more of an intelligent approach to working since every per-

do. They do it more effectively, and they surely do it on a larger scale. On a national scale, they represent the highest order of achievement in that arena.

The latest governmental study is examining what would enhance innovation in this country. At a conference in Washington recently everybody threw up their hands and said, "we don't really know what creates a successful new product or a successful innovation."

It's a complex, living kind of a process. It is virtually impossible to describe because it happens in so many different subtle ways.

I wouldn't have any confidence that you would get much insight from a study of that kind. It's important that you have a set of attitudes that are tolerant of new ideas; at least for a long enough period of time that they can be thoroly examined and judged rather than to discard those that don't seem to conform with convention. I think one of the difficulties comes out of a strong need for fair treatment of everybody in all circumstances. That gets translated into sameness, which means tight control on administration and very little latitude for deviation.

As opposed to the creative.

Yes, the creative element either gets so frustrated that they go someplace else, or they get suppressed to the point where they are not effective. Then, if you add to that a tendency not to fund those kinds of activities, it shouldn't be a surprise that the vitality isn't renewed. It keeps diminishing.

Sweden is a good example of that on a

national scale. For a long time, in addition to being the leaders in a social direction, they were very innovative from a technical point of view. But, gradually, this other phenomenon that I tried to describe a minute ago, suppressed the innovative element and they virtually lost their vitality as a nation. Now Sweden has terribly severe problems. I meet Swedish executives at least once a year. The last time I talked to them, they were not very optimistic about getting some resurgence to the level of the old Swedish innovations.

Latitude for the innovator is really a key idea. It's something management needs to watch continually, because there are so many other pressures toward conformity and administrative purities of one kind or another. It's not easy, but I think it's awfully important that management keep the consciousness that if you're going to continue to regenerate your vitality, new innovative ideas must be generated. I, personally, feel that it's not just required in R&D; you really need it in all functions of the organization.

Innovation is an awfully important element of effectiveness over the long term, although it's viewed as a nuisance or a disruption on a current basis. That's because it runs in the face of other things that are going on, or else it runs in the face of other things that have been the norm for a long time. Still it's important everywhere in the organization. I encourage — I try to encourage — innovation everywhere.

You keep moving people around, too.

It's important for people to have broader experiences. In my own small set of experiences, I can reflect on the number of times that I have had to completely change my position on an issue. That's a very important thing to learn — that you really don't know very much and that as you gain a broader perspective and understanding of a broader environment, you understand more the context of validity of any idea. You can't do that if you have a narrow set of experiences. If you look at any particular discipline for too long, your effective understanding is highly skewed to it.

There's another idea that I think is important — that it takes a generalist to manage an organization on any scope, but that it's also important to have been a specialist first. In fact, what's even better is to have been a specialist in two different disciplines, maybe even more. When you put together your general understanding out of some specialized understandings, the inter-relationships contribute very important subtleties and a lot of detail and complexity. But, if you come strictly through the liberal arts approach to life and stay in that mode, you end up working with intellectual generalities rather than having any real understanding of what's important.

At the same time, some people are happy as specialists, keeping up with one specific field.

It's important to have specialists in the organization who know their speciality as well as anyone possibly can. There again, you need to bring all of them together in a healthy, respectful way.

In other words, it's management's job to be sure everybody is in the right place at the right time.

And, that they are linked together. That interdependence must really be understood

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and respected — rather than thinking in terms of autonomy. I'm not very fond of the word autonomy myself. I think it became obsolete when the kings of England had some of their authority removed.

Let's turn to something else. Over the years, out of your R&D here, you've come up with a number of products that have been the basis for new companies rather than being part of Tektronix. Have you had such specific goals or has R&D come up with something that doesn't fit into what you consider Tektronix' bailiwick?

Sometimes the work in R&D is aimed at a specific product idea. Sometimes it is aimed at a specific physical function that manifests itself in a performance characteristic at the component level and is not aimed specif-

ically at a product or a market. Then ideas begin to formulate for uses and new applications. From time to time, one of these ideas is a good one, and you begin to shape a direction for it.

You know, these things evolve. When you first are working on these technologies, you don't know for sure where they're going to lead. You have only a very fuzzy idea. For example, the storage technology, which has been very important to us, was initially for low speed or low repetition rate phenomena in oscilloscope use so that you could store an image and it didn't decay. Really that was the first idea about the application, and it was an important idea. But, as the technology advanced, the idea began to be used with completely different combinations of elements; the performance levels were enhanced; and ideas for other applications developed. It was quite late in that proceeding that the idea of use as a computer output or computer terminal developed. You can see from the large Wilsonville complex how well that developed.

You don't see that in the beginning. Go way back to the beginning of the transistor. At that time people were talking about audio applications, and there was a lot of

**Venture capital...
is coming back
into the market**
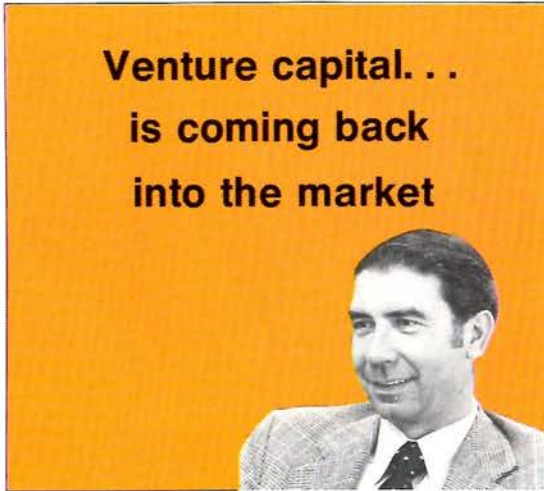
skepticism about its being useful for anything beyond that. Look at what we're doing now with semiconductors. The important thing is that these new technologies keep emerging and that we really encourage people in industry, in addition to ourselves, to continue to fund R&D and keep the vitality coming.

When you come up with something that isn't applicable to Tektronix, do you license it?

We haven't done very much of that. We have used inventions in some cases as a cross-licensing vehicle, but we don't have much active licensing. If the invention is

not likely to have any applications here, oftentimes we just give all the rights to the inventor.

And he goes off and starts a new company.

If he wants to.

One or two companies in this area came right out of Tektronix.

That's true. I think that's a very healthy thing. You know, any organization can't be all things. You always have a limited set of resources and you're forced to prioritize. One of the important things about our industry is that it still has the new entrepreneurs coming along, and they represent a very important part of the vitality of the industry.

The problem they have today is finding funds.

There seems to be a resurgence of that, too. Venture capital, as nearly as I can tell, is coming back into the market. They got so badly hit by the recession in '69-'70, followed by the change in the tax law, that it more or less disappeared. We seem to be getting a reversal of the tax law now, and the money seems to be re-emerging. That's a very positive sign.

You still need the management, the financial people, the business people to work with the innovative people. It's a rare man who's an entrepreneur with all the assets.

That's right. The true entrepreneur doesn't get to Harvard Business School usually, but he has the intuition about how money should be used and what you get back for it, in addition to the technical ideas, the product ideas. Those people are rare. Oftentimes, you do need a team that is fairly balanced. The good venture capitalist really helps the innovator type because he has business experience; he understands that element of it quite well and can really help the innovator a lot. I'm encouraged by the trend.

Is Tektronix participating in any way?

As far as being venture capitalists? That's an idea that we've talked about informally, but frankly, these last few years we've been so busy with the things that we're already doing, there really wasn't much time to think about something like that. It's not something that should be excluded, and, if the right idea came along, I think we would consider it. □

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