Jerry Murch is colorful character

Tek work a breakthrough for racing addict

By DON LEIGHTON

(Editor's note: This interview is one of a series with Tek's chief engineers and scientists. The Chief Engineer/Scientist designation represents the highest level in Tek's six-step career path for engineers and scientists.)

Jerry Murch has known the exhilaration of earning a front row starting position for a West Coast championship sports car race. And he's known the agony of seeing smoke pour out from under the dash of his Datsun 280ZX and having to pull out of the race on the pace lap.

He recalls with pride the 1980 racing season when he entered eight races in the Trans Am circuit and finished in the top ten each time. But he acknowledges with mixed feelings that third place was his best finish: "It would have been nice to win one." He's known the "magic of mating metals" to build a six-cylinder engine that cranked out over 400 horsepower.

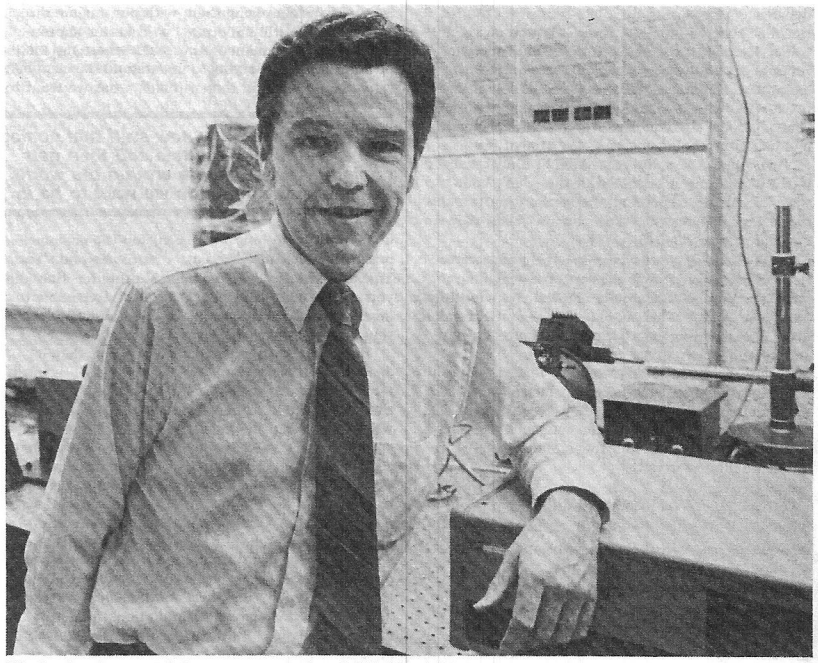
Jerry has known the intellectual stimulation of a college professorship, of fascinating discussions with other academics, of doing research that earned him world recognition in his field, of lecturing to august bodies of colleagues, of writing books about his research, of having articles published in "The Journal of Esoteric Information" (he quipped, knowingly).

But those past experiences have taken a back seat to the excitement Jerry now experiences at Tektronix. ("Like a kid in a toy store," if *Tekweek* ever used cliches.) These days he's getting his "kicks" from seeing theoretical laboratory research he did at Portland State University put to real use in Tektronix products. He's also involved in additional research as head of Tek's Human Factors Research Group (part of Tek Labs).

Jerry's research specialty has been color vision and how humans perceive color. His coming to Tektronix in 1980 was a key influence in the addition of color displays to Tek products to help customers more easily differentiate information. In his broader field of human engineering (ergonomics) he has influenced the physical design of products, from simple knob placement to overall design (as with the 4100 Unicorn series terminals).

Jerry is involved with how we see light and its various colors. He's not concerned with cosmetic color analysis or the psychology of why pink jail cells have a pacifying effect on prisoners. Nor can he explain why your Uncle Harry wears purple socks. "It's probably because your Uncle Harry is weird," Jerry jests.

His approach has been to treat the human being as a system and to treat whatever the human is interacting with in the environment as a system, and



What color do you paint your race car, Jerry? "Highly visible."

"Look, I'm really sorry, but I'm just having way too much fun here to give it up."

to try to link the two together. "That's why it's exciting every time we find out a little bit more about the way the sensory system works. It gives us one more tool to use in making the link between the person and the machine."

He had been doing research on human color vision for about 15 years, mostly trying to understand the fundamental principles of how the color system in the eye works. "I didn't understand the system completely, of course, but I felt I understood enough about how the system works to start applying some of that knowledge."

While at PSU, he had done enough consulting work at Tek to realize that the company was on the threshold of the color world. When he made the switch to Tek in 1980, much of his first assignment was to help determine how Tektronix should use color.

He approached the task with a question: "How can you take this basic knowledge of how the visual system works and apply it to improving the interface between devices and human beings?" He not only shared what he knew with the people in Wilsonville, but he put together sort of a road show and went to other divisions as well. He talked to them about the advantages of going to color displays. Together with Tek's engineering capabilities, the new emphasis on color from the visual perspective aided IDG in the transition into almost total color graphics. Such information also helped in the development of the avionics color display, the color shutter, and the first color logic analyzers and oscilloscopes.

"After having done basic research for years and years, I could finally see all that theoretical stuff manifest in real products—products designed better than anybody else's on the market because of the work I had done and had been able to apply to the development of those products. That was exciting!"

He says using color effectively is just part of making use of what we know about the human sensory system to improve the link between devices we build and human beings. "Because 80–90 per cent of the information most of us receive comes through our visual system, we are interested in total image quality, not just color."

One thing they are looking at is the needs of display images in relation to the application. Does the image displayed on an oscilloscope, for example, need to have the same characteristics as an image on a logic analyzer or graphics terminal? "If we understand how the eye works, we can engineer the display to optimize the link between the display and the user without over-engineering and unnecessary cost."

Most of his first two years here were devoted to the visual interface, and his group still has a lot of work going on in that area. But what he, himself, is working on more now is the cognitive interface, or cognitive ("knowledge") engineering. "We want to be able to take advantage of the way we think, how we catalog a body of knowledge that we've accrued in learning a skill. I see cognitive engineering as a form of knowledge harvesting, how we can efficiently get knowledge and plant that into a system so that it links naturally to an individual."

If you watch mechanical engineers, he explains, you'll find that during the design process they develop a whole series of assumptions about the thing they are building. They file those things away, manipulate them, change them as the process goes on. As they develop their task, they tie into the mental model of the device they are building. "If we can somehow

"Unfortunately, most of us have this preconceived notion that psychology is the sort of touchy-feely stuff where people sit around and tell you why they hate their mother."

capture those mental processes, we can make it easier for these people to make use of computer aided engineering systems."

In solids modeling, for example, a mechanical engineer with no computer experience may take 6–8 months to make a full transition from traditional tools to computer aided engineering system. "That's a major investment. If we can find a way in our products to just cut that time in half, the cost savings to the purchaser of that system would be tremendous and it should give us a terrific market edge.

"So what we're trying to do is develop tools that allow us to literally get inside somebody's head to see how they are thinking about their job, and take those skills and translate them into the actual application package. That's exciting because, although we know a lot about human vision, we don't know a lot about how people really think."

Jerry says he thinks of cognitive engineering as the meat, or "solid" part, of artificial intelligence. In contrast, most AI work deals with the "soft" side, learning how to manipulate abstract concepts.

"What we may see eventually are design systems that are generic in many ways. What we'll do is download software based on who is going to be using the system. Mechanical engineers and architects, for example, may use similar design processes, but they speak different "languages." If a system is being used by the architect, a software program that speaks "architectese" would be downloaded into the computer.

"If we succeed, all that stuff the designers would normally carry in their minds would be immediately available because the system knows the way they are looking at the problem. It's like the old analogy of the ultimate computer knowing what you want before you know it. If we do our job right, we should be able to come very close to that. The system will be doing the job in concert with the person."

Jerry says the Human Factors group, as part of Tek Labs, tries to couple their work closely to the divisions, to help with their immediate needs, but they are also trying to be their eyes and ears for where the world is going in the future, looking ahead five to ten years. "Some of the things we are looking at appear to be far out, and they are, but it's amazing how many of those far out things actually manifest themselves in our products. And they are the things that will make us better than the other guys five years from now. If we weren't doing that, we'd be just another systems house packaging available technology.

"Being part of the Tek Labs environment, trying to stimulate that environment, trying to drive it a little, to get people to think about things, has been a lot of fun."

What Jerry calls a "strange background" led him to his particular field of study. He started out in physics and became interested in optics and the nature of light. Then he decided he'd like to really understand what happens when someone sees things using light, so he started studying neurophysiology. "That was great fun, learning about synapses and all that stuff." But there was something missing. He understood basically how light is emitted, quantum mechanics, neurophysiology, some fundamental things like that, but he wondered what it all meant. So he turned to psychology. When he received his Ph.D. it was with a dual major (physics and experimental psychology) and a minor (physiology).

(continued on next page)

Area Reps schedule Murch

Jerry Murch will talk about human factors engineering (ergonomics) at the August Area Rep Conference. For more information, see story on page one.□

Murch—

(continued from previous page)

At Portland State, he was part of the psychology department and he set up a lab, funded by the National Science Foundation, to do research on color vision. He taught courses in things like visual perception, experimental psychology, research design, and, of course, human factors. He's still doing some teaching, such as a class in human factors, with about half the students from the psych department and half from the engineering department.

"Psychology," says Jerry, "is kind of a neat subject in the sense that in academia, if they don't know what to do with something, they make it part of the psychology department. That may also mean they don't understand it, either.

"Unfortunately, most of us have this preconceived notion that psychology is the sort of touchy-feely stuff where people sit around and tell you why they hate their mother. Whereas, in fact, it's a much broader discipline, broad enough to encompass physics, physiology and vision, in my case."

As part of his consulting work, he taught people at Wilsonville about colorimetics, which is a formal system of color specifications they weren't very familiar with at the time. In the course of teaching and interacting with the engineers, he became more and more interested in the problems they were working on.

Initially, he had no idea he would really leave academia since giving up over 10 years as a college

"Based on the number of invitations we get on a monthly basis to talk to various groups, it may well be the number one such lab in the world."

professor isn't something academicians take lightly. But in the course of the teaching and interacting with the engineers, he became more and more interested in what they were working on. "This was a really neat group of people, with interesting ideas. And they were applying their ideas in tangible ways, producing better products.

"But when the offer came to join Tek full time in 1980, I made the transition in the most cowardly way possible—I took a year's leave of absence from the university to work in Wilsonville in IDG's advanced technology group." At the end of that first year he told the university, "Look, I'm really sorry, but I'm just having way too much fun here to give it up."

He still feels that way: "It's really terrific that I get paid to do stuff that's exciting, that's intellectually stimulating all the time. The only problem is that I never really turn it off. As an example, I had a good discussion last night with one of our people about cognitive engineering, and I was all fired up. Then I woke up really early this morning with an idea. I could hardly wait to get in this morning to tell the others about this idea I had.

"The fact that someone like me, whose background isn't traditional engineering, can be a chief scientist at Tektronix is recognition of the fact that we know we've got to be tops in so many different areas. We can't get by just doing a better job of engineering than other companies. We've got to be able to look at the leading edge of technology, and the leading edge is diverse."

Jerry explains his approach to product development: "There was a time when we could say we were engineers building scopes for engineers, the kind of customers who would take the back cover off to marvel at the beautiful construction before ever turning it on. It didn't matter to those people that the instrument might be difficult to use because they were already sold on it.

"We may still have some customers like that today, but the vast majority are never going to take off the back cover. In fact, many of our customers won't understand how a product works. What they want is a tool, and that tool had better work for them. So, rather than impressing them with our engineering skill, which is still important, we'd better impress them with performance. And that's where my kind of thing comes in—trying to understand the customer. Once we understand the customer, what we want to

"We're generating new stuff that comes out in Tek products and then gets copied by other people around the world. That's exactly the mode we want to be in."

do is build something we can put on the customer's desk that will cause the customer to respond. 'Yeah. That's it. That's what I've been waiting for. How did you people ever know that?' We have to be able to do that without the customers even knowing themselves what they really want.

"If you ask customers what they want, they'll describe today's state of the art, and they'll want it for 50 cents, when, in fact, that may not be what they need. When I query customers, it's not about what they think they need, but what they will be doing. Then I can extract what they need from that."

Jerry is proud of the Human Factors Research Group: "At the risk of sounding conceited, I think we definitely are one of the top color application research groups in the world. And we're dedicated not just to research, but to producing products as well. The color logic analyzers, for example, are cited by other researchers as examples of well-engineered products, both from product and human factors sides.

"Based on the number of invitations we get on a monthly basis to talk to various groups, it may well be the number one such lab in the world. Understand, of course, I'm not talking just about myself, but our group. We have an outstanding group. And we're fortunate to have a number of people who can handle these speaking requests, for it's important that we do that. It demonstrates that Tek is, in fact, in a leadership position. When people think of applying principles of human vision to products, we want them to think of Tektronix. And that is happening. I'm very proud of that because that's what I hoped to accomplish with our research in Tek Labs."

"When people think of applying principles of human vision to products, we want them to think of Tektronix. And that is happening."

They still have people working mainly with color and display quality, but they've added cognitive psychologists and mechanical engineers for their work in cognitive engineering. One thing they have in common is basic understanding of human factors. Beyond that, they are a bunch of specialists within that broad area.

"Because we're part of Tek Labs, we're not looking to just apply a body of knowledge. We're generating new stuff that comes out in Tek products and then gets copied by other people around the world. That's exactly the mode we want to be in."

Being part of Tek Labs provides the group with many resources, but it also creates a lot of work because they, in turn, are a resource for the entire company, and they work with almost every division. As a result, they put in some really long days.

Jerry admits that professional recognition has its pluses: "Obviously, over the years, a number of people must have thought what I said was worthwhile. And it is sort of exciting to get into that position. Another thing I have to admit is that it really is sort of fun to be recognized as an authority, because then you get to implement the things you've wanted to do all along. The probability of being listened to increases because of a successful track record. That's nice.

"One thing I really like about Tek and really disliked about academia, however, was the business of titles and officialdom. I never really liked being called 'doctor' or 'professor'. When I got to Tek, I really liked the fact that everybody was on a first name basis. 'Boy,' I thought, 'this is an environment I'm really comfortable in.' It means that you're not defined in terms of a set of academic credentials. You're defined in terms of what you do and what you contribute, so everyone within the system is contributing in their own way and they are recognized for their contribution."

Along with the pluses of professional recognition, Jerry mentioned one negative—having to sit through long introductions. "When I go outside to speak, it sometimes shocks me now when people launch into long introductions. I figure I'm going to tell them good stuff, and they can decide whether it's good or not, without the introduction. If what you have to say is important, you don't need any introduction."

Jerry has cut back on auto racing the last few years, partly because it has become "ludicrously expensive

"What we're trying to do is develop tools that allow us to literally get inside somebody's head to see how they are thinking about their job, and to take those skills and translate them into the actual application package."

and time consuming," and partly because he's "having too much fun at Tektronix." But he does have a couple of rides lined up this year.

He still enjoys doing his own work on the car. "It's a good escape from my Tek work, which is mostly mental." He builds his own engines, though he has the machinist work done outside.

"If I'm trying to put something together where tolerances are thousands of an inch, I concentrate on that," Jerry explains. "It's a nice way to sort of cleanse the mind of all the other things I think about. I'll probably stay involved in the mechanical part for a while.

"There's nothing more exciting than building an engine from scratch and then putting it on the dynometer and revving it to top rpm. There's a mystic art in there, a magic mating of metals. I built an engine a few years ago that put out over 400 horsepower in a six cylinder engine. I was really proud of that sucker. It blew up, of course, but it was exciting."

Although he's not doing as much racing, when nice weather comes along he still gets the urge to dust off the car and get it ready to roll again.

When he was teaching, there was no problem switching back and forth. He could spend the whole summer racing. But now that racing is just a hobby, he finds he can't let it get in the way of things he's doing here. "That's really where my excitement is and where I'm having the most fun. The trouble with racing is that there are deadlines for races, and now I find I would really rather be doing something else than getting ready for a race."

He had an offer this year to go to Daytona, Florida, for a 24-hour endurance race and just be part of the team of drivers. "I've done a lot of those endurance races and enjoyed them. But when I got this latest offer I remembered how tired I was after the last endurance race, and decided I'd rather not go. I also decided I'd rather be working on the stuff here at Tek. That was a real breakthrough for me because racing is addictive. I was so proud of myself for actually being able to turn down the chance to drive."□