Almaden Research Center/Summer 1987

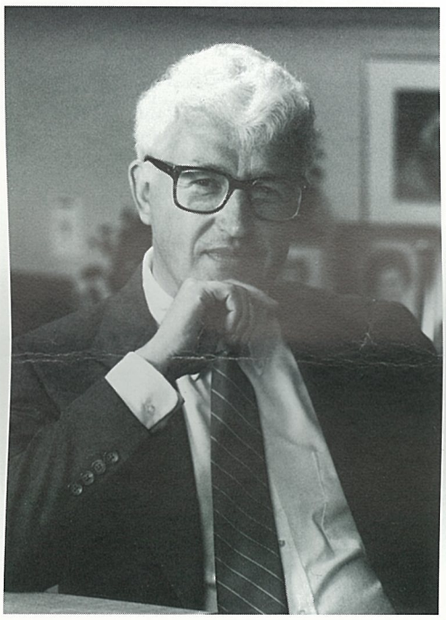
IBM

Almaden Views

Pushing the Limits

From the Laboratory Director

A Feeling of Community



As I have said to a number of you over the past several months, I am quite delighted to be here at Almaden and to be working with you. The laboratory is a most impressive team, and I relish the opportunity to work with you in furthering common goals for advancing scientific and technological innovation. I am particularly looking forward to meeting more of you individually and to understanding more about your work.

Achievements emanating from Almaden are truly impressive, particularly in their range and variety, which represent a diversity of the laboratory's areas. More than a few of these achievements have been assisted by the efforts of what I believe is a superlative support organization, one of the best in any research laboratory today.

As a new stand-alone facility, we are able to enjoy many amenities and conveniences particularly suited to the nature of our work. Not the least among these are the building's outstanding location and features, including the cafeteria and other myriad independent site services. The price of that independence is the responsibility that each of us has for everyday attention to those elements that characterize independent sites — security, environmental controls and the full panoply of what it takes to keep a laboratory humming efficiently.

The times are indeed exciting. The laboratory's growing reputation for innovation in technology and science, recently most dramatically exemplified by the phenomenal breakthroughs in superconductivity, is but one measure. Others, more elusive, yet significant for the laboratory, include our effectiveness in responding to business needs, our ability to increase our efficiency and to maximize available resources in a period of constraints and to do so while pushing forward technically and scientifically. I am confident we will be able to retain the feeling of community in the laboratory as we assume a larger set of site-related obligations. I look forward to working with you toward both these ends.

Juri Matisoo
Director,
Almaden Research Center;
Research Division Vice President, Storage

Almaden Views welcomes your comments and story suggestions. Please contact the editor at tie-line 457-1284 or IWATA at ALMVMB.

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ON THE CREST OF A

MEGATREND

Superconductivity—just a year ago, it was an esoteric arm of physics. Today, the field is a scientific superstar, thanks to an IBM Zürich breakthrough and the concerted efforts of the entire Division. Here, the ARC perspective:

Imagine a world with superfast trains that noiselessly glide on invisible magnetic cushions, supercomputers the size of PCs, simple magnetic devices that can detect minute brain abnormalities, electrical transmission lines from solar power panels in a Nevada desert to Maine residents in the dead of winter. Unfortunately, this world is not the one in which we live, but the world of the ultracold—absolute zero—the coldest temperature known—where certain obscure metals lose all electrical resistance and "superconduct" electricity. At this temperature, these "superconductors" carry electrical current without power loss and can generate huge magnetic fields. Although certain superconductors are used for special purposes, such as in linear accelerators and medical imaging equipment, they must be cooled to within a few degrees of absolute zero (0° Kelvin or -460° Fahrenheit) with liquid helium, a refrigerant that is expensive, rare and difficult to work with.

"For years, many of the exciting applications for superconductors were merely physicists' dreams," says Paul Grant, Almaden magnetism and collective phenomena manager. Grant has been involved in superconductivity research off and on since the 1960s. "The materials and the temperatures were simply not practical for widespread applications, and the field of superconductivity was more or less played out."

Then, in April 1986, the picture changed entirely and suddenly, thanks to a startling breakthrough by Georg Bednorz and IBM Fellow Alex Mueller at the IBM Zürich Research Laboratory. The researchers discovered a totally new class of compounds that became superconducting at record-breaking temperatures. One of these compounds, a mixture of lanthanum, barium, copper and oxygen, became superconducting above 30° Kelvin, surpassing the previous record set in 1973 for a niobium-germanium compound that became superconducting at 23° Kelvin. Although this advance may not seem like a lot, it was a quantum leap forward in a field characterized by half-a-degree temperature increases once a decade.

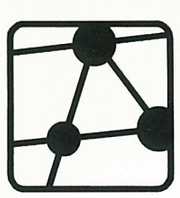
After the Zürich researchers' results appeared in a German physics journal, the word spread rapidly to physics research groups around the world, including Almaden and Watson Research Center in Yorktown. Although the news was initially met with a fair degree of skepticism, doubts soon vanished as researchers duplicated Zürich's results and reported even higher temperatures with variations of the Zürich material. As an added bonus, the new compounds were ceramics and, compared to metallic superconductors, were relatively inexpensive and easy to make. As a result, many groups quickly initiated superconductor research efforts and began to report improvements almost daily.

After reading of the Zürich discovery in an internal company progress report in December, Dan Auerbach, manager of physical science, asked Grant to visit Zürich and find out firsthand what was going on. Grant returned, as his manager Ed Engler recalls, "a man possessed" and soon collected a core group of researchers to investigate the materials, with more people signing on every day.

"One day in the middle of January, Ed Nazzal walked into my office and dropped some material on my desk," says Grant. Nazzal is a physical science researcher. "I asked him what it was, and he said it was the Zürich material. He had read their report and figured out how to make the material overnight."

While Almaden's physical science department has been well known for its work in organic superconductors, this effort had recently been refocused into thin-film deposition work. Mike Ramirez, an engineer in Grant's low-temperature physics lab, recalls, "When Paul returned from Zürich, we were busy outfitting a molecular beam epitaxy chamber for thin-film measurements. We dropped what we were doing and began to dig out all of the old superconductivity equipment we had stored away."

Expertise for taking the measurements was also readily available. "We were lucky. Jose Vazquez had used all of the equipment before to take the measurements on the organic superconductors," Ramirez says. In addition, Stuart Parkin and Kevin Roche lent their expertise, newly acquired in magnetic thin-film research, in making critical physical measurements.



Unfortunately, it was not as easy to gear up the synthesis effort. "We were used to dealing with organic materials," reports Victor Lee, a chemist with 10 years' experience on the organic superconductor project. "We had to locate ovens, order chemicals and build equipment to begin working with

Chemists Ed Nazzal (left) and Victor Lee use mortar and pestle to blend yttrium, barium and copper, three components of the 90K superconductor. Researchers have produced samples of nearly 1,000 variations of the basic formula.

these inorganic systems." Jesse Salem, who had recently transferred to physical science from central scientific services, worked to get the ovens and controllers operating practically overnight.

The group's ability to get up and running quickly can be attributed in part to strong management and administrative support. "We had same-day turnaround for many of the special parts the model shop made for us, and other groups, such as purchasing and finance, made it easier for us to get what we needed quickly," Ramirez reports.

The Almaden group spent January and February refitting instrumentation, running tests on the Zürich material and providing samples to colleagues in Yorktown. Then, in mid-February, rumors began to surface about a variation, discovered by Paul Chu at the University of Houston, that became superconducting at temperatures above 90° Kelvin—comfortably within the range of liquid nitrogen, a much more economical and convenient coolant than liquid helium.

"Discovering materials that could be superconducting when cooled with liquid nitrogen was a tremendous breakthrough for potential applications for superconductors," Grant reports. "Liquid nitrogen is essentially liquid air. You make it from air and, as it evaporates, it goes back into the air. It's plentiful, inexpensive and easy to work with."

The Almaden group switched gears and began to test variations of the Zürich material, hoping to discover the liquid-nitrogen-range superconductor. The long hours spent in the labs became even longer. Somewhat strangely, no one seemed to mind. Says

The materials and the temperatures were not practical, and the field of superconductivity was more or less played out.

Engler, manager of materials science and chief chemist on the project, "I've worked on projects before where I've had to ask people to stay late. With this project, I've never had to ask; people work long hours voluntarily."

At the end of February, a preprint of a paper Chu submitted to *Physical Review Letters* revealed that his superconductor was a mixture of yttrium, barium and copper oxide. Upon learning of this result, the Almaden group mixed up the material, let it bake overnight and tested it. Unfortunately, the material turned out to be a super resistor instead of a superconductor. After some more fiddling with preparation conditions, the team decided to let the next run of the material cool down slowly before removing it from the oven.

Describing one early-morning experiment, Ramirez recalls, "The day didn't start off very well. I had a hard time getting the measurements started. All of a sudden I saw the resistance start to drop to zero around 90° Kelvin. I didn't believe it, so I heated the sample. Once it passed 77° Kelvin (boiling point for liquid nitrogen) and stayed superconducting, I knew we had something. With a big grin on my face, I called Paul at home and asked him if he was going to sleep all day."

Later, Grace Lim ran an X-ray analysis on the material and discovered that there was more than one phase, or crystalline arrangement of atoms, in the material, explaining why only a small percentage of the sample was actually superconducting. Lim, Rick Savoy and Robby Beyers began analyzing the material to identify the specific superconducting component in the mixture. Savoy's microprobe analysis revealed two major elemental compositions in the black and green mixture—one yttrium to two bariums to three coppers (or 1-2-3) and two yttriums to one barium to one copper (or 2-1-1).

Beyers, who has been responsible for coordinating Almaden's characterization effort, used a transmission electron microscope (TEM) at Stanford to identify the structure of the black phase. "I took 32 of the 36 exposures I had without much success of tilting the microscope properly around the

Grant returned, as his manager Ed Engler recalls, "a man possessed..."

crystal. With four exposures to go, I found that I could tilt the microscope. The two patterns I obtained at the end of the roll of film turned out to be the key patterns for determining the structure of the superconducting phase."

Physical Scientists Rick Savoy (seated), Grace Lim and Robby Beyers discovered the exact component ratios to make pure 90K superconductor.

Beyers returned to Almaden well past midnight to develop the film. The next morning he analyzed the patterns of the unit cell—the fundamental atomic structure of the material. This information, along with some new X-ray measurements by Lim on variations of the Y-Ba-Cu composition, led the analytical team to propose that the black phase was the 1-2-3 compound and the green phase was the 2-1-1 compound. They caught Engler on his way home and asked him to mix up the starting powders in these ratios.

Engler recalls, "The most exciting moment for me during these last few months was when I pulled the samples out of the oven and one was black, and the other was brilliant green, just as we guessed they would be."

The group quickly confirmed that the black phase was pure superconductor. As it turned out, they were probably the first group in the world to isolate, identify and synthesize the pure high-temperature superconductor. "Considering where we had started—with no ovens, crucibles and other inorganic tools—this effort was a tremendous achievement for our relatively small group," Engler says. "Our competition was much larger research groups who had worked with inorganic superconductors for decades. I think our success can be attributed to the smart way we went about the materials science work."

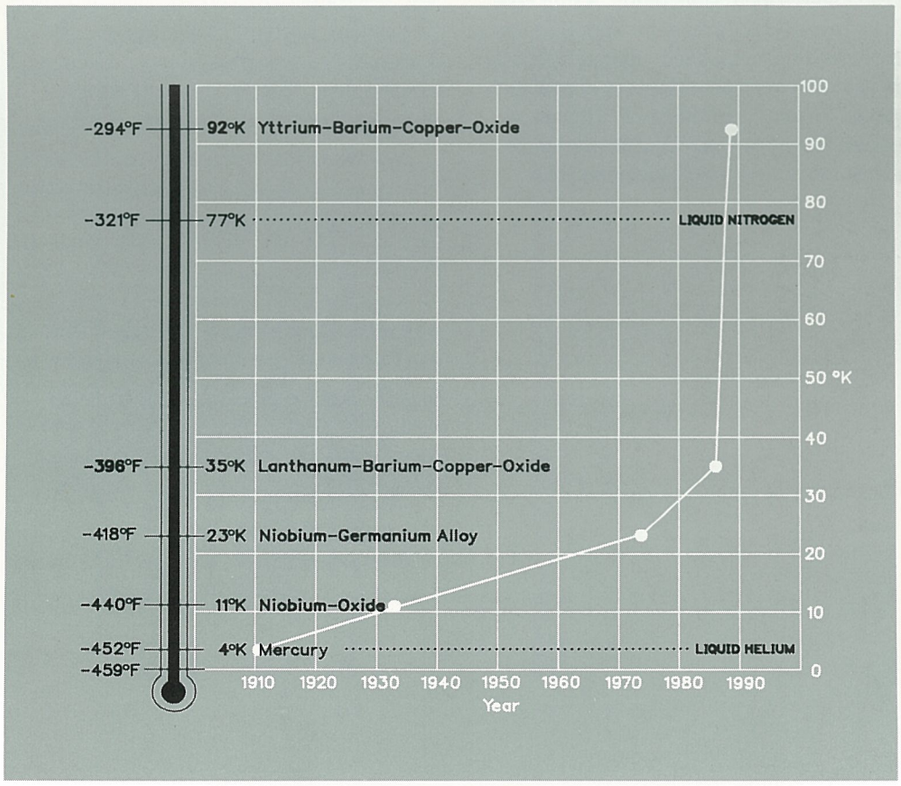
"With this project, I've never had to ask; people work long hours voluntarily."

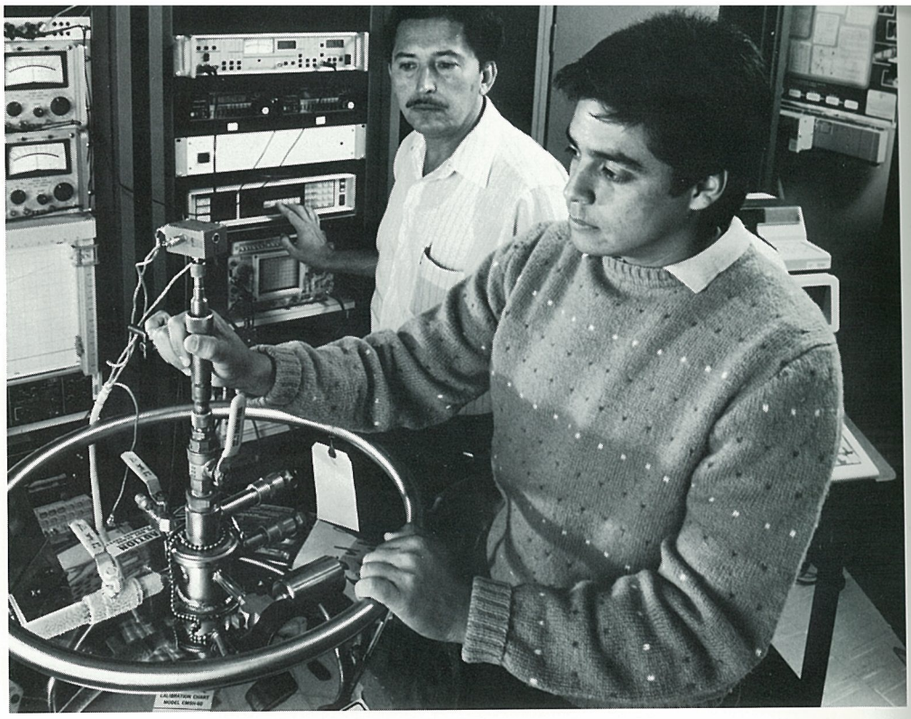
As a bonus to cracking the structure, the group also discovered the tricks to making it properly. If samples are cooled too rapidly, much lower and broader transitions are obtained. Only by slow cooling were sharp 90° Kelvin transitions achieved.

The group quickly wrote up their results and Grant hand-delivered the paper to *Physical Review Letters*. The information was passed to Yorktown colleagues at an internal IBM meeting on superconductivity. "Using our data on the structure and synthesis of the pure superconductor, they were able to make the world's first thin films of the pure material overnight," he says. Grant presented the work days later at a special all-night session on superconductivity at the March American Physical Society meeting, now often called the "Woodstock of physics."

Researchers Stuart Parkin (foreground) and Kevin Roche use a liquid helium cryostat to measure the change in transition temperatures for superconductors in high magnetic fields.

Achievements in superconductor transition temperature.





For speed and convenience, Researchers Michael Ramirez (foreground) and Jose Vazquez test superconductor samples in liquid helium.

Since March, the Almaden group has made other important contributions. They have discovered superconductivity in a number of compounds in which they have substituted elements for yttrium and barium.

Also, the group discovered that the material was very sensitive to synthetic conditions, particularly oxygenation, leading them to the discovery that controlling the amount of oxygen is crucial in maintaining superconductivity. Almaden's structural studies have revealed that the material undergoes a change in atomic configuration as the material cools, again underscoring the importance of controlling preparation conditions.

Grant reports, "A key question yet to be answered is how certain preparation conditions cause superconductivity." Along with Yorktown's Rick Greene, the Almaden team recently discovered trace superconductivity in lanthanum copper oxide, the parent compound for the Zürich material. This unexpected result may provide clues about the superconductivity mechanism and may help explain some of the reports of trace superconductivity in the yttrium/barium/copper oxide material at temperatures approaching room temperature.

Whether further breakthroughs at higher temperatures, even room temperature, are in the cards remains to be seen. "We are always looking. Based on recent history, it would be foolish to discount the possibility," Grant reports. "If you had told me a year ago that we would see superconductivity at 90° Kelvin, I wouldn't have believed it."

Although the researchers are looking for room temperature superconductors, just as are many other groups, presently they are concentrating on applying special skills and equipment toward understanding the materials, controlling the synthesis and exploring fabrication questions. Engler foresees the work settling into a more planned and less reactive stage. "We are trying to assess what our particular strengths are and what

"All of a sudden I saw the resistance start to drop to zero around 90° Kelvin…"

we have to do to have a viable effort. We don't want to be just one of the crowd."

In particular, the group is building on the strong materials science capability developed over the last few years at Almaden through collaborations with universities and other IBM groups. For example, Beyers is working closely with Tom Shaw, Yorktown, on TEM studies, and Stuart Parkin is working with Tom Worthington of Yorktown on SQUID

"If you would have told me a year ago that we would see superconductivity at 90° Kelvin, I wouldn't have believed it."

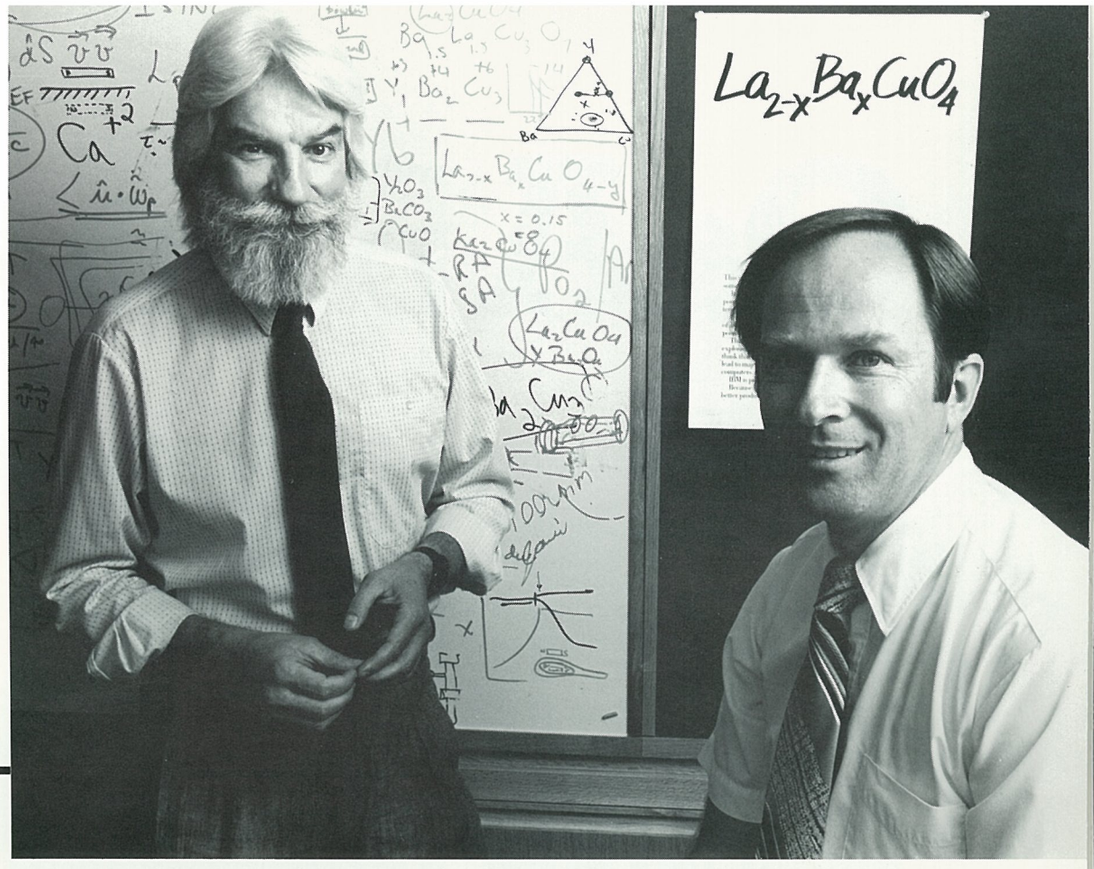
magnetometry studies of crystals of the pure superconducting material.

Closer to home, Engler reports collaborative efforts with Wayne Young and Steve Hughes in GPD's materials lab. "They have excellent analytical tools, as well as expertise in ceramics," he says. He believes that Almaden's experience working on storage devices with GPD may pay off in applications for superconducting electromechanical devices.

No matter what applications fall out of the recent discoveries, Engler believes that the Zürich breakthrough provides a lesson in the payoffs for perseverance and dedication. "While everyone else said the field was dead, Mueller and Bednorz followed their dreams in a deliberate fashion," he says. "While I think the discovery can be attributed in part to IBM's willingness to permit wild ducks to pursue their ideas, I think most of the credit belongs to their perseverance."

Flying trains, superconducting microchips and resistance-free power transmission may always remain the stuff science fiction is made of. Nevertheless, thanks to the discovery of these nondescript ceramic wafers, the prospect that these dreams may one day become reality has never been stronger.

—Judith B. Gan



From My Perspective

Paul Grant

To appreciate how scientists feel about the tremendous developments of the past nine months, let me share with you what we felt was a major breakthrough in superconductivity back in the '70s.

In 1973, Rick Greene (now with Yorktown) and I began working in what became the conducting organics program in San Jose. We were searching for new mechanisms of superconductivity in organic materials, something that might lead to higher critical temperatures — the sort of breakthrough Zürich made last year with copper oxide ceramics (inorganics).

After considerable work, we discovered superconductivity in a polymer — polysulphur nitride. The critical temperature was 300° measured in milliKelvin units! Then, after a year's work, we made monumental progress in doubling that to 600° milliKelvin — still hovering near absolute zero (–460° F).

When I think about how excited we were about that, it's difficult for me to describe how I feel about how far we've come. I never expected to see this great leap forward in my lifetime — maybe little hops of a degree or two every decade — but nothing like a 70° leap in less than a year.

I don't think too many of us who have worked in superconductivity were surprised by popular discussions of levitated trains and zero-resistance power lines. After all, we have talked about these sensational applications for decades. Yet now, for the first time, I believe they may be within reach.

Ed Engler

This has to be one of the most exciting times to be a scientist — and an IBM scientist, in particular. Last year's superconductor discovery by our colleagues, Georg Bednorz and Alex Mueller, has set off an explosion of scientific activity that has captured the public's interest and imagination.

I have never witnessed anything quite like it. The competition and rapid unfolding of new discoveries have been intense and carried out on a worldwide scale. This was a new effort for us at Almaden when we started in January. Yet, by the end of March, we were recognized as one of the leading research groups working on these materials.

The key to our success was not just in doing outstanding technical work, but in doing it faster than everyone else. In this sense, the whole laboratory was instrumental in making this a successful program. Time was of the essence, and many individuals at ARC put in that extra effort to help move our program along. From getting a facility change done in record time to run an oven, to expediting an order for a key chemical, to machining a special piece of equipment as we stood by — these and many other examples are what made the difference.

I believe our recent successes in this field are truly a labwide accomplishment, one in which all of us at Almaden can take some satisfaction and pride in.

Q&A with *Dan Auerbach*

While high-temperature superconductivity has been in the limelight for many months, it is just one of many scientific areas under investigation in the Almaden physical science function. In this Q&A, Dan Auerbach discusses the status of the function's activities, comments on future directions and reflects on his first year as manager of physical science.

Auerbach joined the IBM San Jose Research Laboratory as a physical science research staff member in 1978. After two managerial positions in the function, he was named to his current position in June 1986.

Auerbach's research interests center around the dynamics of gas surface interactions, including the determination of potential energy surfaces, the study of energy transfer processes and the investigation of the detailed mechanisms of chemical processes on surfaces. Recently, he has also been involved in developing a highly parallel computer for molecular dynamics and other computer simulation techniques.

Auerbach received a Ph.D. in physics from the University of Chicago in 1971. Before joining IBM, he held research positions at the University of Chicago and the Institute for Atomic and Molecular Physics in Amsterdam and served on the faculty of the Johns Hopkins University. He is an associate editor of *Chemical Physics Letters* and a Fellow of the American Physical Society.

Q How would you describe the mission of physical science?

A Simply put, our mission is to run a broadly-based science research program. We focus primarily on areas of science that underlie IBM technology, particularly those which are emphasized here at Almaden. In these areas, we have a broad spectrum of activities, including basic science research, involvement with technologies for future products, research aimed at long-range future technologies and "fire-fighting" efforts to deal with current problems, some of these even related to current products.

I find it useful to think of the department as a bridge between the world of science and the world of IBM. Both are very large, as is the gap between them sometimes. To bridge the gap, we try to put together programs which span the whole range of activities, and we maintain high visibility at universities and in professional societies. This enables us to keep abreast of new ideas and to have access to the best people coming out of universities. We play an important role in recruiting top scientists for the company.

Besides these activities, we do research in other areas of science where, by virtue of some unique capability or skill, we feel we can make an important contribution.

Q Would you give us an example of this kind of research?

A Sure. Consider how our interest in IBM problems can apply to problems in fields as "far out" as astrophysics. We're interested in energy transfer and chemical reactions at surfaces because these processes underlie many of the company's important technologies. In astrophysics, an important issue is how molecules are formed in the universe, especially hydrogen. It is believed that hydrogen molecules are formed by reaction of hydrogen atoms on interstellar dust, but there is a mystery about how the hydrogen escapes from the dust particles after formation. Although this is an astrophysical issue, it is closely related to problems in surface science related to energy transfer and energy disposal at surfaces. We hope to apply what we learn in an IBM context to help solve this mystery in astrophysics.

Q What would you say are the major areas of research in your function?

A We have several broad areas. In our materials science group, we focus on the properties of magnetic thin films, optical materials, molecular materials and, more recently, high-temperature superconducting materials. In the surface and interfacial science group, we study surface structure and interactions and processes on surfaces, including interactions stimulated by various forms of radiation. We also study liquid/solid interfaces (electrochemistry) and the fundamental aspects of friction and wear (tribology). The micro, surface and analytical science group does individual research and has a responsibility to the entire laboratory to provide service and collaborative research in X-ray analysis, electron microscopy, microanalysis and electron and ion spectroscopy. In addition, we have some smaller efforts, such as computational science and an exploratory parallel processor project.

Q To what extent do your groups interact with other departments here?

A We have many strong interactions with ARC groups, especially in storage technology, where we are investigating magnetic issues for heads and disks, head/disk interactions, tribological issues, stiction and friction and optical recording materials. We plan to increase collaboration with the I/O area, and we'd like to strengthen our interactions with the polymer group.

Q Is there a particular niche for Almaden's physical science activities compared to the other Research Division sites?

A In terms of science, it's best to characterize the roles as a set of overlapping concerns. Of course, historically, each lab has developed its own character and set of strengths. For example, in surface science, we have strengths related to chemical processes on surfaces, while Watson Research Center has more expertise in surface physics, particularly related to semiconductor surfaces.

There are clearer lines in terms of technological concerns. For instance, we are more concerned with storage and I/O issues, while Yorktown is more focused on semiconductors and logic and memory devices. Again, there is still some overlap.

Q Would you say there is a healthy competition or more of a collaborative atmosphere, particularly in some of these overlapping areas?

A While one could always wish for improvements, I think we have seen an increasing amount of communication and collaboration among the labs. For example, the recent work in superconductivity began

in Zürich and has flourished here and at Yorktown. Early on, we made materials that were used in Yorktown for physics experiments. We were the first to identify the structure and establish the stochiometry of the superconducting phase of the 90K superconductor, which in turn led to the ability to make bulk superconductors. This information was passed to colleagues in Yorktown and used very quickly by them to make the first superconducting thin films. Throughout the last several months, researchers have been traveling among the sites to collaborate and share equipment.

Q Looking at current resource constraints, how optimistic are you about making improvements or expanding your programs?

A Although we have been very creative in dealing with these constraints, there is only so far you can go in doing more with less. For us, the restrictions on hiring are the most serious because, in order to maintain a vital science department, you need an influx of new people. However, I'm optimistic because science has very strong support in IBM, up to the top levels of the Corporation. If we come forward with good ideas, I'm confident we'll get the necessary resources.

Q Are there new directions in the function?

A New initiatives include the construction of synchrotron beam lines at the Stanford Synchrotron and, of course, our work in high-temperature superconductors. We are also focusing our efforts in large-scale computation to provide marketing support for the IBM 3090 vector facility, where our science work could play an important role in interesting potential customers in this machine.

I'd like to see stronger ties to technology groups, particularly in the I/O and polymer areas. In science, I'd like to place a stronger emphasis on high-risk, high-payoff science. We sometimes take too few risks in choosing the projects that we do. We are good enough to be able to afford taking more risks.

Q Superconductivity has certainly been an exciting development during the last several months. From your perspective, how would you assess Almaden's position in the field, and what would you say are the management challenges in directing such fast-breaking research?

A We certainly have been one of the key players. Besides the contributions I mentioned earlier, we're also working on application possibilities.

In directing the work, we've tried to maintain a network of internal criticism so we don't end up putting a lot of resources into the wrong area. However, the attitude has generally been if someone has a reasonable idea, we will pursue it as quickly as possible. The main management challenge is to maintain the proper balance between this program and our other programs. Since this is probably the major scientific discovery of this decade, it would be difficult to think that we wouldn't have a long-term effort in this area. So, a challenge will be to find which other projects will have to, of necessity, go slower or be abandoned.

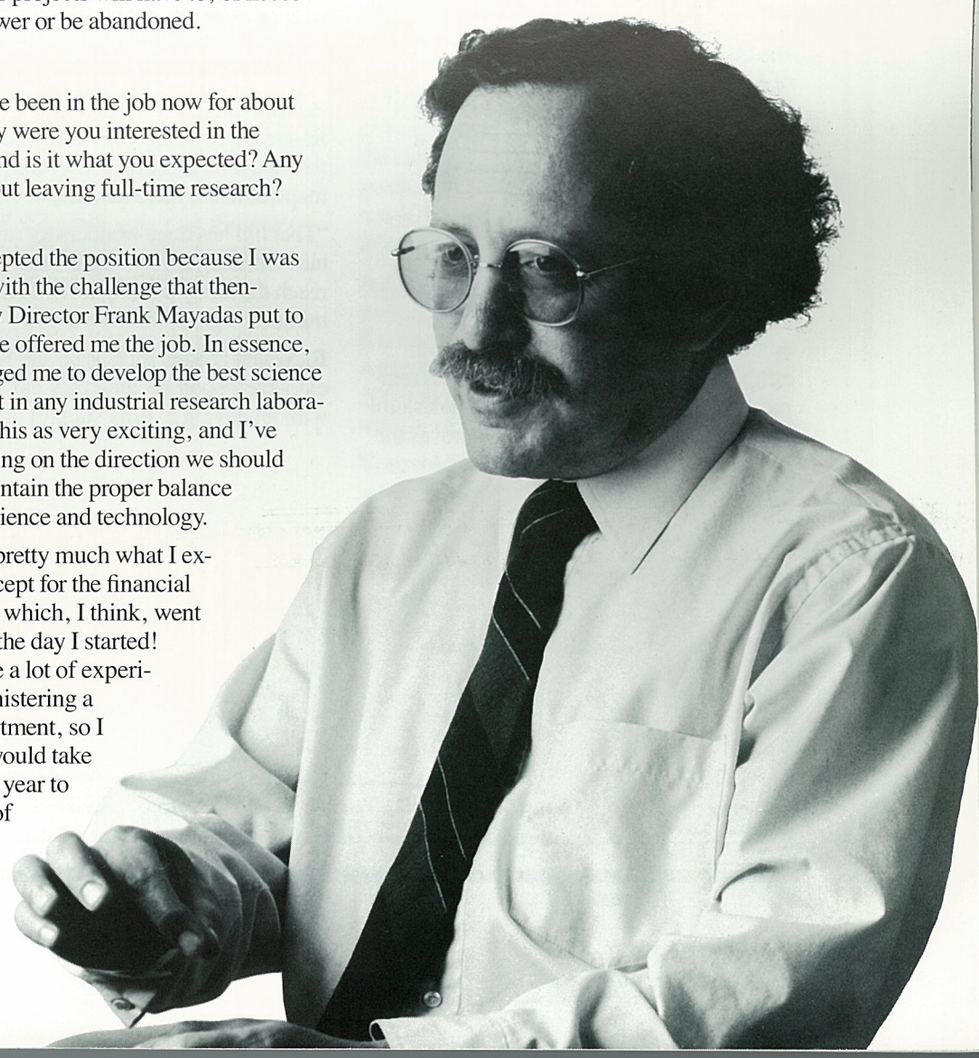
Q You've been in the job now for about a year. Why were you interested in the position, and is it what you expected? Any regrets about leaving full-time research?

A I accepted the position because I was intrigued with the challenge that then-Laboratory Director Frank Mayadas put to me when he offered me the job. In essence, he challenged me to develop the best science department in any industrial research laboratory. I see this as very exciting, and I've been working on the direction we should take to maintain the proper balance between science and technology.

The job is pretty much what I expected, except for the financial constraints which, I think, went into effect the day I started! I don't have a lot of experience administering a large department, so I figured it would take me about a year to get on top of things — and it has. I see a personal involvement in doing science as an important part of my job, so I still find some time for my research. Though I've been disappointed by missing some interesting developments in molecular beam scattering work, I'm sure there will be other developments that I can participate in sometime in the future.

Q If you had three wishes for physical science, what would they be?

A Three more wishes. No, seriously, my first wish would be for a major contribution to science — the kind of contribution which results in a Nobel Prize or similar recognition. Similarly, I'd like us to make a real breakthrough which would have an enormous impact on IBM technology, something which would result in a real competitive advantage. The third wish, and this is something which is more under our control, would be to make physical science an even more stimulating and rewarding place to work for all those in the department.



Performa Plan

Almaden's Athletes Limber Up at the Lab

Celebrating a triumphant climb up the hill are, from left, Gary Keller, Guy Lohman, George Swenson, Paul Gendler, Richard Pasco, Bradford Wade and Don Bethune.

Due south of Lake Tahoe and north of Yosemite National Park, high in the rarefied air of the Sierra Nevadas, Bradford Wade and Gary Keller took on The Death Ride this summer and survived.

As its ominous name suggests, this bicycle ride is not for the faint-hearted, though in reality it's more physical challenge than hazard. Bicyclists begin in the alpine town of Markleeville and, setting their own goals, cover up to 115 miles and 13,000 vertical feet of mountainous terrain in a single day. (By comparison, local Mt. Hamilton rises 4,200 feet.)

Keller, an I/O science and technology engineer, traversed 50 miles and climbed 3,200 vertical feet, while Wade, a computer scientist, broke a personal record with an ambitious 72 miles and 7,500 feet. Both attribute their success to a daily fitness regimen that burns calories, controls cholesterol levels, keeps muscles taut and improves the cardiovascular system. It also gets them to the lab on time.

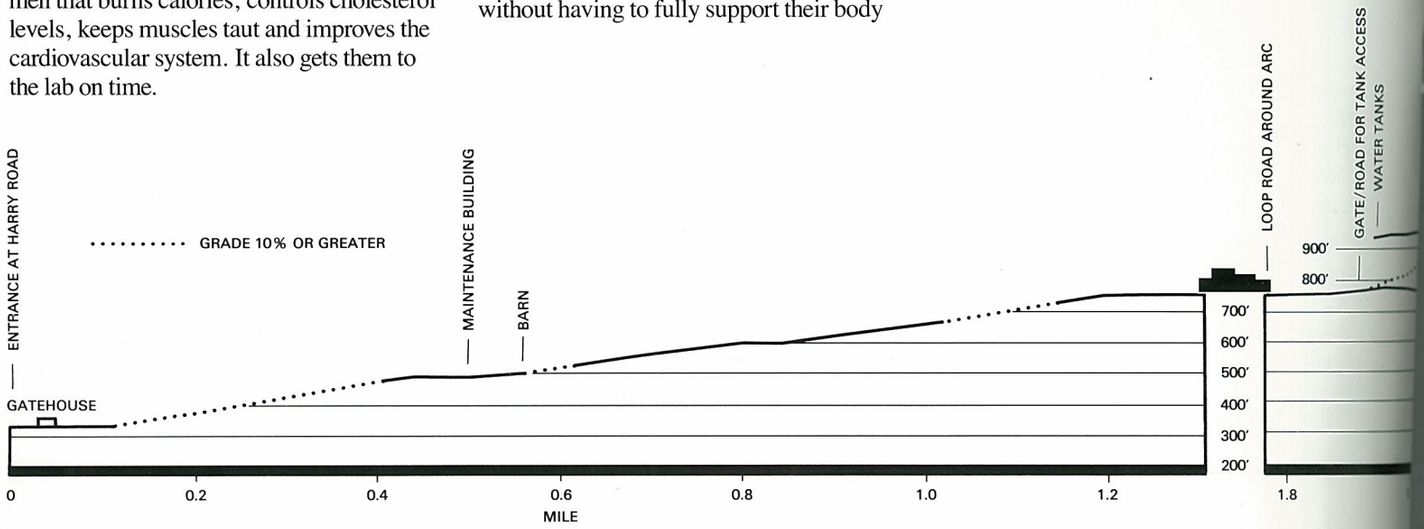
Wade and Keller are among dozens of Almaden employees who bicycle to work, jog or walk ARC's access roads, run the hilly trails surrounding the lab or who otherwise take advantage of Almaden's rural setting for physical fitness and fun.

"The ride to work is ideal," says Wade, who logs 16.5 miles on his bike commuting each day. "In the morning, I cover seven miles of flat roads, enough for a good warmup." He then gears down and heads up the Harry Road side of the access road, ascending 400 feet in a mile and a half. (See the profile map below for more details.)

"That hill has done wonders for my mountain-climbing ability," adds Wade, who can reach the lobby parking lot in a zippy seven minutes.

Bicycling zealots such as he and Keller extol their sport because they can exercise without having to fully support their body weight. Because the bike does this, cycling is less stressful on the spine and lower joints than jogging or aerobics, which involve repeated pounding. Sustained cycling, as other forms of vigorous exercise, improves the efficiency of the heart and lungs, tones muscles and helps shed pounds. According to the American Heart Association, a 150-pound person bicycling at 12 miles per hour burns about 410 calories an hour.

Indeed, Computer Scientist Jim Gilliam took up bicycling to lose weight and enjoyed it so much he not only cycles to work now, but he regularly rides up and down the Bernal Road hill during lunch for added exercise. He credits cycling and a dietary program for helping him lose 40 pounds in three years.



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Glen Langdon, who recently retired from computer science, claims to have lost over an inch in the waistline from cycling to work. I/O science and technology's Paul Gendler rides because it's therapeutic for his back problems, and Rich Pasco, computer science, cites ecological and economical benefits of commuting by bike.

While these reasons may motivate you to dust off the old ten-speed and pedal to work tomorrow, there are a few points to remember.

"This is not a trivial hill," says Keller, referring to both sides of the access road. "You'll need a mechanically-sound bike with a good range of low gears and reliable brakes. But I think making it to the top depends far more on the physical condition of the rider than the bike. Pace yourself, and if you're in any kind of pain, hop off and walk."

Like most sport enthusiasts, cyclists clearly have their preferences when it comes to equipment (Wade one day hopes to own a bicycle frame tailored to his body measurements, for example). Yet all serious riders agree that a helmet is mandatory.

"Simply put, my head is too important to my existence," says Guy Lohman, a computer scientist who cycles up Bernal Road, the longer and steeper side of the hill. Lohman considers a standard, hard plastic bicycling helmet an absolute must. "You pick up pretty good speed coming down those curves, so even a minor spill can be serious. I think my heartbeat is faster going downhill than it is pedaling up!"

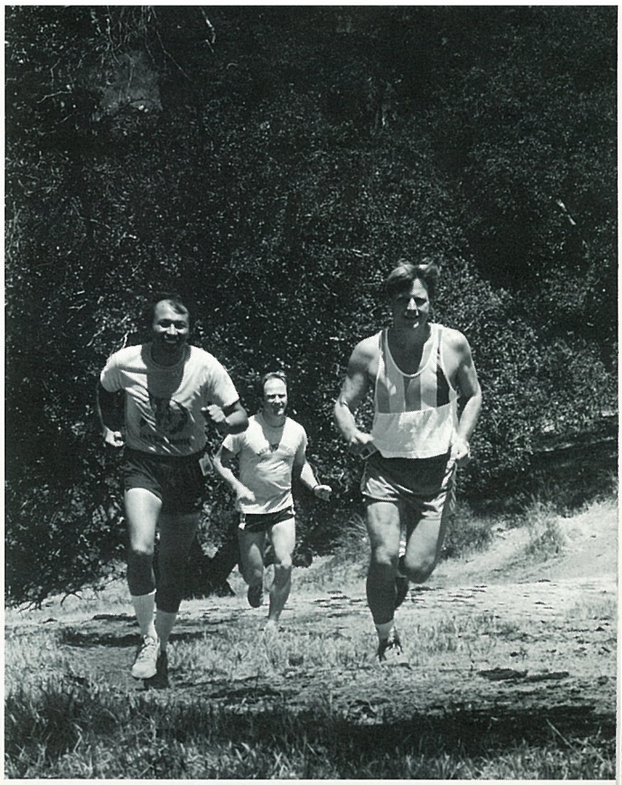
Cyclist Don Bethune's heart skipped a beat or two last fall when he collided with a deer near the Harry Road gatehouse, an experience that confirmed for him the need to exercise caution coasting downhill. Riding home at dusk, Bethune's headlight revealed a deer standing in the middle of the road. With little time to brake, he says he "tried to move over, but the deer stepped into my path, then turned at the last moment. I struck him with my left knee."

Fortunately, Bethune maintained his balance, and the deer, though knocked down and stunned, wasn't seriously injured. Bethune's advice to others, including motorists: "Take it easy on the hill, especially at night. Bicycle headlights are essential for riding after dark because they help others see you, but they're not very effective in helping you see the road."

If you're the type of athlete who prefers putting one foot, rather than one pedal, in front of the other, jogging or walking during lunch may be for you. Many employees take advantage of the miles of unpaved trails that fan out over the ARC site and 1,200-acre Santa Teresa County Park.

"We're very fortunate to work next door to a park," says Ed Engler, manager of materials science. Weather permitting, Engler runs about six miles every day, preferring dirt trails to pavement because they're easier on the joints. He follows the utility road near the Bernal Road gatehouse, past the water tanks on the hill and traces the ridge line overlooking Santa Clara Valley.

"How many people can run through oak groves and see deer, coyotes and eagles in the middle of the business day?" he asks rhetorically.



From left: Verdell Horselooking, Ed Engler and Dave Bernard head for the hills at lunch.

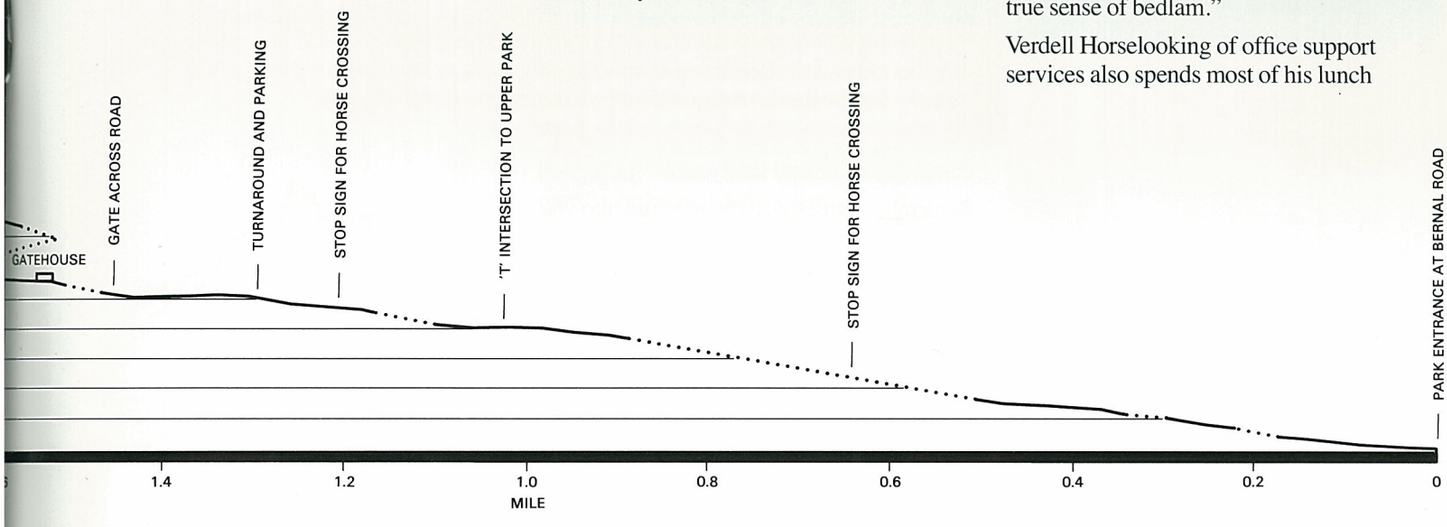
Though you might think such rigorous physical activity would leave you tired and sleepy in the afternoon, runners claim it has just the opposite effect.

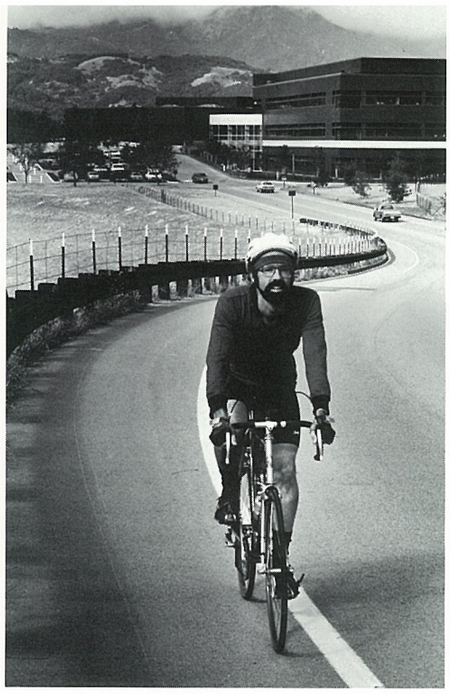
Says Dave Bernard, facilities environmental programs manager, "Besides the beautiful scenery and fresh air, running gives me a chance to detach from business for a little while. It helps me deal with stress, and I come back feeling refreshed and more alert."

Bernard's usual four-mile route takes him to the car turnout near the Bernal Road gatehouse, along the hilly trail curving south, behind the correctional facility and, in a wide loop, back to the building.

A dedicated runner, Bernard most recently participated in the Dog's Best Friend 5 Kilometer Race with Cato, his Labrador retriever. "There were 300 runners and their 300 dogs," he recalls. "It was bedlam in the true sense of bedlam."

Verdell Horselooking of office support services also spends most of his lunch





Bradford Wade cycled 72 miles and climbed 7,500 vertical feet of mountains in one day this summer.

breaks running through the hills, but not for the aesthetics alone. Horselooking has ridden "bucking broncos" in rodeos since he was eight years old, and he says hill running strengthens his legs for bareback riding, as the sport is formally called.

"Hanging on to the horse for the required eight seconds is only a small part of bareback riding," he explains. "Scoring is based on how high you keep your legs around the horse's neck while you're being jerked around. That's the tough part. Strong legs give you better leverage to kick high and hold on to the horse."

Horselooking last mounted a bronco in 1985, and he hopes to be ready for this summer's rodeo at the California State Fair in Sacramento.

Unpaved trails may be ideal for Horselooking's specialized training, but some Almaden athletes, such as Computer Scientist Alice Kay, prefer running on asphalt and concrete. Kay regularly competes in two- and four-mile foot races, which are run on roads, and has won her category in a number of events, including the IBM Club-sponsored Greenhills Run. During lunch, she is usually found striding along the Harry Road side of the hill or in the neighborhood near Camden Avenue; her route totals five miles.

"Running downhill on the road places more than the usual stress on your legs and joints, so you have to take it easy," says Kay, who runs because it gives her a chance to "mull things over and get a better perspective on the day." She says running at ARC is convenient, thanks to the smooth, uncrowded roads and the building's shower and locker facilities, located on the first floor of the spine between wings C and D.

To prepare for a run, Kay limbers up with stretching exercises and finishes with a "cool down" period of slow walking and controlled breathing. A good pair of running shoes is essential to support the feet and ankles, and they help absorb the impact of running on pavement, she says.

Coming on the heels of the running boom is yet another fitness craze some Almaden athletes are trying: walking. Not your casual after-dinner sauntering, this strain of walking has been coined "aerobic walking" and "exercisewalking" because it requires a minimum two- to four-miles-per-hour pace (120 steps per minute roughly equals 4 miles per hour, depending on your stride length).

Aerobic walkers step lively and walk tall. Their heads are high, backs erect, arms swinging for rhythm and upper-body toning. To maximize cardiovascular effects, they stride at this energetic pace for at least 20 minutes.

"I started walking because my running ability is somewhat limited by knee problems," says Kim Seales of computer science. "Walking still provides plenty of exercise without jarring my joints, and it gives me some time outdoors."

Whether it's aerobic walking, running, cycling or some other activity, most Almaden athletes agree that exercise should be fun, not painful. "The type of exercise you select is not as important as the fact that it should be enjoyable," says IBM Physician Peter Lichty. He stresses that if you have questions about certain activities, you should consult your personal physician.

Of course, exercise, like most things in life, is relative. A 20-minute aerobic walk around the building may be just as challenging to you as The Death Ride was to Bradford Wade and Gary Keller.

Says Wade, "There's a quote about exercise that goes something like, 'Whenever I get the urge to exercise, I lie down until the feeling passes.' I pretty much agree with that. If you don't find an activity you enjoy, you won't keep it up. I'm glad I found bicycling." ≡

—J.C.I.

Exercising Caution

Though most Almaden athletes enjoy close-up views of ARC's wildlife while exercising, one critter you'd want to observe at a distance is the rattlesnake. Gopher snakes, rattlesnakes and occasional king snakes are native to the site, but rattlesnakes are the only poisonous variety.

Being cold blooded, snakes adjust their body temperatures to the environment by seeking a comfortable habitat. In cooler months, they look for sun-warmed surfaces, so avoid rock piles and be cautious in the parking lots and on the roads. In the summer, they will most likely be found in cool, damp vegetation and shady areas.

Remember: rattlesnakes want to run into you about as much as you want to run into (or onto) them. They'll generally leave you alone if left alone.

Giving Nature a Helping Hand

J.P. Wilson is a member of the Almaden Research community who is out standing in her field. That is, except for those times she's in her barn. Confused? This is J.P.'s story.

On the morning of April 8, facilities protection officers at the Harry Road gatehouse received reports from incoming employees that a cow lying in an adjacent field was in trouble. The cow, struggling on its side, appeared to be giving birth with great difficulty. Knowing that a part-time rancher worked in facilities maintenance, the officer called the department. Frank Wilson, since retired from facilities maintenance, took the call.

"In my 30 years with IBM, I had never been confronted with a situation quite like that one," he says. "Fortunately, John Morgan was in my office at the time."

Besides working for the department as a subcontract journeyman carpenter, Morgan owns a 380-acre farm on which he has raised cattle. "When Frank explained the situation, I knew we didn't have much time," he says.

Morgan, Wilson and Pat Conner, who was also on hand when the call came in, rushed by truck to the field. "We saw the cow lying with her feet in the air. I thought we were too late," Wilson says. Noticing the cow's head moving slightly, the three jumped the fence and hurried to the muddy bog where the cow lay.

Two calf's legs protruded from the womb, indicating a potentially disastrous breech delivery. Explains Morgan, "When the legs come out first instead of the head, the birth is considered breech and can be dangerous to the calf and mother because the animal is unable to push itself out properly."

Helping hands (from left): John Morgan, Pat Conner and Frank Wilson with cow and newborn calf.

Morgan clambered into the mud and began to tug on one of the legs, but to no avail because the calf was unusually large. Wilson and Conner then grabbed the other leg, tugged and, with their combined strength, pulled the calf from the womb. She was barely breathing.

"Had we arrived ten minutes later, both the cow and calf would have died," Morgan believes.

While most calves weigh about 80 pounds at birth, the dark brown female weighed nearly 125. Her relatively enormous size and weight was apparently caused by her unusual breeding, a cross between an Angus cow and a larger Santa Gertrudis breed bull. Complicating matters further, this was the cow's first delivery.

Moved by the unusual experience, Morgan bought the calf from her owner on the condition that she could grow up and graze on ARC's hillsides. The three men named the calf J.P. Wilson after the three "veterinarians" who helped deliver her.

"J.P. got off to a rough start, and I wanted to make sure she had a nice home," Morgan says of the resilient heifer. "I can't think of a better place for her than the fields of ARC."

—Brenda M. Brown

The cattle that dot the hills around ARC do more than provide a pastoral backdrop. They are also helping the facility in very practical ways.

Three portions of ARC's more than 600 acres are leased to a local rancher for use as grazing, and anywhere from 40 to 100 cattle are on the property nine to ten months of the year.

"Not only do the cattle eat grass, thus reducing fire hazards," says Al Erickson, manager of facilities and administrative services, " but they also slow the growth of the chaparral that cover the hills." This thick, thorny bush poses a fire danger and inhibits the growth of other important vegetation in the area. Erickson estimates that without the cattle controlling new growth, the chaparral would spread and surround the entire facility within ten years.

Humanized Help for Computer Questions

The user services team (from left): Tim McMurray, Tom Hutton, Sharon Lee, Rosa Hwang and Dave Sosa. (Not pictured: Alex Miller)

Imagine it's your first day at ARC (perhaps it really is). You're staring blankly at the Personal Computer sitting on your desk, wondering where they've hidden the power switch. Or, if you're familiar with PCs and mainframe terminals, you may be curious about ARC's particular host systems—after all, there are four of them. Maybe you're a researcher contemplating a way to connect your PC to lab apparatus to make experimentation more efficient and accurate. What should you do?

You might consider calling one of the computing facility groups devoted to helping users caught in such situations. Besides providing all of ARC's mainframe systems, the computing facility maintains a number of groups and services aimed at ARC computer users and their diverse needs. At ARC, computers are used for simulation, computation, controlling instruments, gathering data, publishing, communication and word processing.

Perhaps the most visible of these groups is called, appropriately, user services. The department is staffed with "consultants," each of whom specializes in a certain area of computer use such as MVS/TSO, CAD/CAM, VM/CMS, text processing, computer graphics and programming languages, including REXX, FORTRAN and PL/I.

According to Tim McMurray, VM/CMS consultant, "Our aim is to help users learn what they need to know about computers to suit their particular jobs."

One way user services seeks to do that is by educating the over 800 ARC users. The department publishes various mini-guides, such as the *Computing Facility User's Guide,* which contains an overview of services. Another periodical, the *Computing Facility Bulletin,* contains up-to-date information about new and ongoing services and is mailed to employees quarterly. All publications are available in the documentation stockroom, G1-812.

For more direct, two-way communication with users, the group conducts monthly and weekly seminars. These sessions cover popular topics that consultants get many questions about. "The intent of these seminars is to teach what you need to know so you can immediately go back to your office

PC professionals (from left): Paul Bradshaw, Jaci Rohr and Ray Holland. Bradshaw and Holland provide specialized PC workstation support; Rohr is PC store coordinator.

and apply what you've just learned," says Tom Hutton, user services manager.

Publish or Perish

The old adage "publish or perish" hits home with many of ARC's scientists. Those who may be looking for help in producing technical papers can find it through the publishing systems group.

"In a sense, scientists live and die by their publications, so they're understandably concerned with the appearance of their material," says Mike Kay, publishing systems manager. "It's our job to provide tools for scientists to use to produce quality papers and presentations."

The group supports ten different kinds of printers, ranging from simple line printers for producing program listings to a photocomposer for camera-ready output. Users access these printers through a single easy-to-use command, and most documents can be previewed on the author's terminal.

According to Kay, one notable change in scientific publishing is that more and more of the editing and preparation of the work is done directly by the author. To address this trend, the group provides tools that make it easier for the author to produce quality material.

"With fewer people in the path, things usually go much more smoothly." says Kay. "Our objective is to streamline the path, without losing quality in the process. To do this, we provide tools that are conceptually easy to understand, yet powerful in their ability to adapt to new needs and technology."

Personal Computing

With nearly two PCs for each ARC employee, the computing facility devotes much of its resources to supporting the compact machines. The hub of this support is the PC store, located at G1-905.

"The PC is unique in that users can build computer environments customized for their every need," says Jaci Rohr, senior administrative specialist for the store. "We provide the software, components and the know-how to help users set up PC environments."

The PC store looks much like a mini version of a retail computer store, complete with a demonstration area for trying out new machines and software. For example, Models 50 and 60 of the new Personal System/2 family are currently on display.

Boxes of application programs are displayed in glass cases, and the store maintains a library of educational software which employees may borrow. Compact PC Convertibles are also available for employee checkout for use at home or while traveling on business.

A service center in the rear of the store stocks hundreds of components for customizing PCs. In addition, the store provides an installation and repair service and, of course, consultation.

Lab Automation

Besides in offices, PCs have found a home in laboratories where scientists use them to automatically control apparatus or to gather, store and analyze data.

Lab automation is not new. The IBM 1800, System/7 and Series/1 computers were used widely in the late 1960s, but the refrigerator-sized machines were expensive and often had to be shared by several laboratories. Programs also were not available to automate equipment, so scientists had to do the programming themselves.

The solution? A PC equipped with the LABS-PC package, which collects, stores, plots, prints and analyzes data.

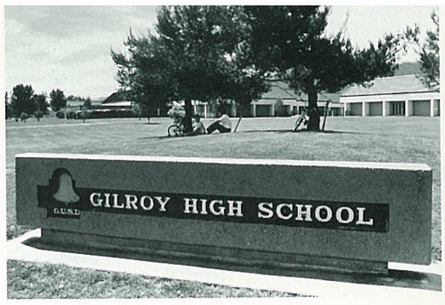
According to Claudia Munce, an associate programmer with the sensor-based computing group, "LABS-PC offers a shell in which 90 percent of the data acquisition programming is completed for you. Essentially, you tailor the program to fit the specific instruments in your lab."

The latest version of LABS-PC, released June 1, is faster, more flexible and easier to use than previous versions. In addition, version 5.0 allows scientists to program in Pascal and IBM "C" as well as BASIC, allowing more programming flexibility.

Whether or not it is your first day at ARC, virtually every Almaden employee uses or depends on a computer each day. And, when you find yourself in a computing quandary (and sooner or later, everyone does), think of the computing facility's host of services. They're ready to help.

Programmers Bromley Clegg and Claudia Munce help Engineer Maggie Best (seated) automate polymer test equipment with LABS-PC software.

- Questions about host systems, VM, MVS, printers or other general topics? Call operations at 7-2525.
- Questions about the PC? Call the PC store at 7-2600.
- Questions about how to automate your laboratory apparatus? Call Ernie Alger at 7-2624.
- Questions about text processing? Call Sharon Lee at 7-2711.
- Questions about the local high school ARC recently "adopted?" Turn the page.



Almaden Research Adopts MESA Gilroy Chapter

Assisting MESA to a New Plateau

When Michael Ramirez poured a cup of boiling liquid nitrogen onto the dark chip of material, the results were met with oohs and ahhs from the students gathered around the lab bench at Gilroy High School. The science students were observing an experiment few people anywhere in the world had seen firsthand—a magnet levitating above a chunk of high-temperature superconducting material.

Yet Ramirez, an engineer in physical science, was visiting Gilroy High to do more than demonstrate the spectacular ceramic. As one of nine IBMers on the newly-formed ARC MESA advisory board, Ramirez wanted to give Gilroy MESA students an idea of what IBM researchers really do.

MESA is an acronym for Mathematics, Engineering and Science Achievement, an organization formed in 1970 to encourage and assist minority students in pursuing scientific and technical degrees. Its founder, UC Berkeley Professor Wilbur Somerton, launched the organization in response to industry demand for qualified minority graduates in technical fields. Somerton's research indicated that many minority high school students who were eager to attend college had difficulty meeting college entrance requirements.

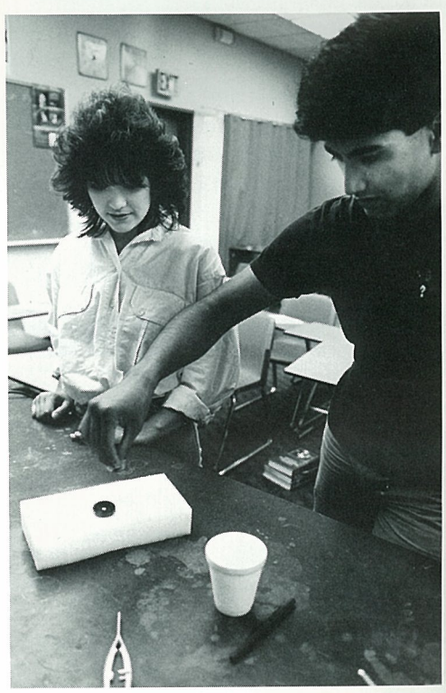
MESA was formed to specifically address the needs of black, Mexican-American, Native-American and Puerto Rican students. The programs, which provide tutoring and guidance for advanced math and science students, are based in junior and senior high schools throughout California. Similar programs are in place in Colorado, New Mexico, Washington, Oregon, Kansas and Utah.

MESA critically depends on private sector funding and support from companies such as IBM. Last year, Almaden Research Center formally "adopted" the 20-member MESA chapter at Gilroy High School, located about 25 miles south of the center.

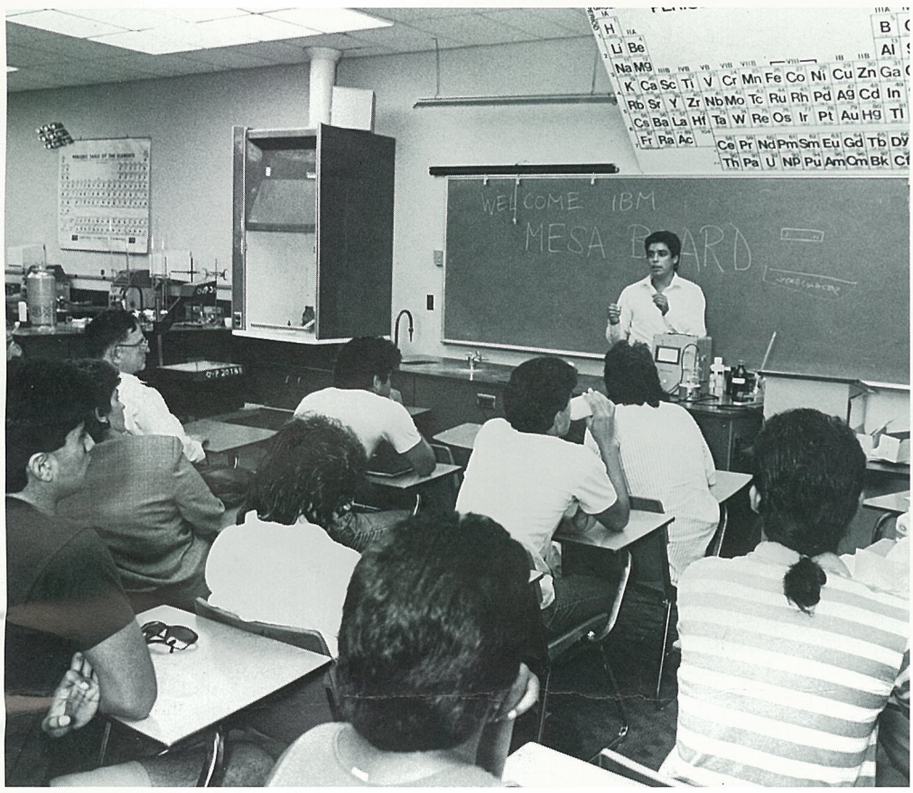
"Because Gilroy High school has a significant number of Hispanic students and a strong MESA chapter, we were eager to get involved," explains Teddy Sue, equal opportunity specialist. "At the high school level, our lab could positively influence and encourage students to obtain science and math educations and realize their full potential."

Barbara Brawn, manager of integrated computer-aided engineering, and ARC MESA advisory board member, agrees that the Gilroy chapter was an appropriate choice. "It turns out that among the minority population in the Gilroy area, only a few students choose to pursue careers in the sciences," she says. "By adopting the Gilroy MESA program, IBM can bring an individual focus to efforts to change this disparate picture."

As part of its "adoption" of the chapter, IBM provides tutors and speakers for meetings and $1500 worth of scholarships for Gilroy students to take advanced math courses during the summer at Gavilan College, a community college near the high school. According to Dave Pribyl, Gilroy science teacher and the chapter's advisor, summer courses are especially important in preparing for college science programs. "Students need Algebra, Algebra 2, Geometry, Trig and Calculus," he says. "That's five math courses, and four years to take them in. That's why we encourage our students to attend summer school."



Two Gilroy High School MESA students try their hand at superconducting magnetic levitation.



Physical Scientist Mike Ramirez addresses MESA students and members of the ARC MESA advisory board at Gilroy High School.

This summer, the advisory board is planning tours of the Almaden facility and a "shadow day," during which students will be teamed up with researchers one-on-one to learn about ARC firsthand.

This kind of direct interaction between MESA students and IBMers is important, says Ron Harlan, personnel administration manager and a board member. "MESA develops an environment in which students can be motivated to achieve the rewards of education that they may have never thought possible; it also provides a social unit that fosters competition and enthusiasm to excel," he says. "At the same time, ARC can stimulate excitement in these students and function as a good corporate citizen by helping education at the grass roots level."

Students are not the only ones excited by the interaction MESA provides. "When that magnet levitated above the superconductor, I saw many of the students' faces light up," says Michael Ramirez. "Sparking that kind of interest is not only gratifying, it's also a lot of fun." ≡

—Brenda M. Brown

Benefits Brief

Special Eyewear for VDT Users

Having problems seeing the video screen through your bifocals? Find yourself periodically changing the distance between you and your terminal? You may be reimbursed for special glasses to solve the problem.

Who's eligible? You are, if you need special glasses to work with a VDT and spend more than 20 percent of your time at a terminal.

For instance, bifocal lens wearers are often forced to tilt their heads up to read a VDT screen, which sometimes causes discomfort after long periods of time. A pair of special glasses may alleviate the problem.

To receive special glasses, obtain a prescription from your private optician. (The cost of the eye examination would be covered under the IBM Personal Health Account.)

Then, call 6-5612 to make an appointment to be fitted for glasses at building 005 at the Cottle Road site. The glasses, whose cost would be covered by the company under this program (as opposed to the Personal Health Account), would then be ordered from a corporate supplier and would be available for pickup in about two weeks.

One caution: eyewear purchased *without* prior management approval is *not* reimbursable. For more information about the program, see your manager or contact Rae Downey, Almaden benefits administrator, at 7-1314.

THREE DECADES OF SUPPORT FOR FUTURE COLLEGE GRADS

How can 4 plus 374 plus 3,919 somehow equal 30? It's easy. Take 4 outstanding children of ARC employees, add 374 other children of employees, plus 3,919 students from years past. The result: 30 years of academic excellence maintained by the Thomas J. Watson Memorial Scholarship Program.

Established in 1957, the program is a memorial to the company's founder and the qualities reflected by his life. It recognizes and honors academic excellence among students who are children of IBM employees by providing financial assistance toward college costs.

Initially, 25 Watson Scholarships were awarded annually. Through the years this number has increased, and this year, IBM awarded 378 scholarships from an applicant pool of over 2,900.

Becoming a Watson Scholar is not easy. Selection is based on standardized tests, secondary school achievement, leadership qualities, extracurricular activities and high school recommendation.

This year's four ARC Watson Scholars, André Cheng, Melissa Economy, Sean Philpott and Chris Wade, exemplify the qualities the program has promoted in three decades.

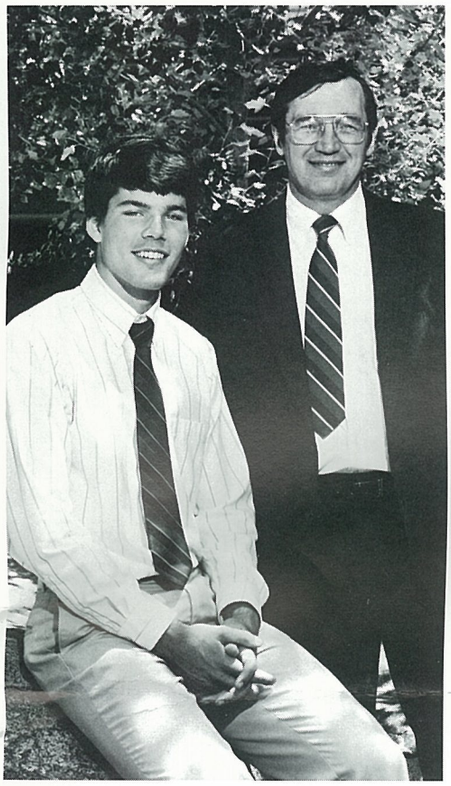
MELISSA ECONOMY

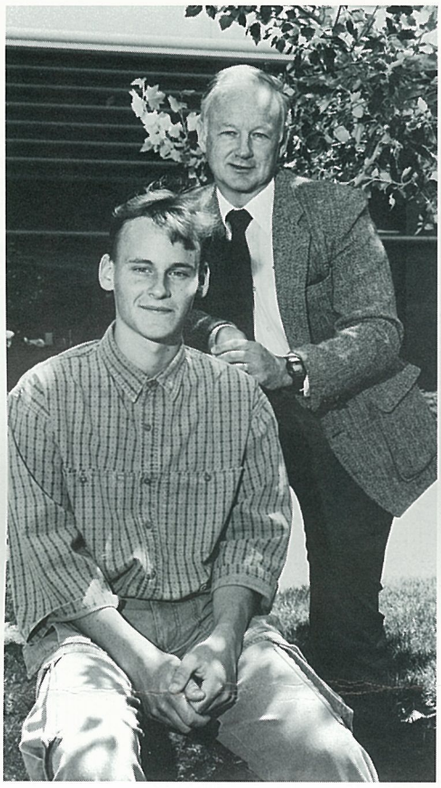
"I spread myself thin," admits Melissa Economy, daughter of James Economy, manager of polymer science and technology.

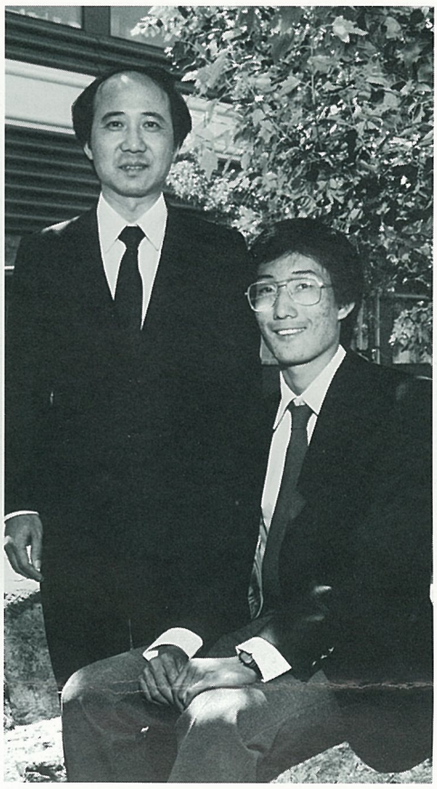
Student government at San Jose's Leland High School, cheerleading, piano and modeling have kept Melissa hopping most of the time.

But such a busy schedule doesn't faze her. "I think it is important for people to do as much as they can to be well-rounded," she says. Melissa is not only a piano player with twelve years' experience, but she is also a cheerleader and teaches cheerleading through the Almaden Valley Youth Association. In addition, she sometimes models in local fashion shows.

Melissa looks forward to attending Carnegie-Mellon University, where she begins general studies this fall.







CHRIS WADE

When he's not tossing a basketball around, Chris Wade, 1987 Los Gatos High School valedictorian, unwinds by working out at a local athletic club. Chris, who hopes to play basketball at UC Davis, has a bit of experience: he played the sport as a child and worked up to becoming a member of his basketball team throughout all four years of high school.

Besides sports and athletics, Chris is drawn to science. After enduring an intensive summer chemistry class at San Jose State University last year, Chris' curiosity about the subject grew. "The course was interesting, yet difficult, and when it was over, I was anxious to learn more about chemistry and chemical engineering," he says.

Chris, son of Charles Wade, manager of materials analysis, will study chemical engineering at UC Davis in the fall.

SEAN PHILPOTT

"I spend a lot of my free time playing tennis," says Sean Philpott, a graduate of Live Oak High School in San Jose.

Sean's activities at Live Oak included membership on the varsity tennis team and playing the clarinet in the marching band.

Sean finds his IBM PC AT computer essential for his hobby: programming. And there will be more to learn about programming when he begins his studies as a computer engineering major at UC San Diego.

Getting a head start on the fall, Sean is at UC San Diego this summer, working on a molecular database for dynamic calculations for the university's chemistry department.

Sean is the son of Michael Philpott, manager of surface, thin film and plasma science, and stepson of Jean Chen, graphics.

ANDRÉ CHENG

With all of André Cheng's activities, it is hard to imagine when he finds time to study. Besides playing badminton, André is a flutist and a member of the El Camino Youth Symphony. André, son of David Cheng, who is on a leave of absence from storage and I/O manufacturing research, is a 1987 graduate of Gunn High School in Palo Alto.

André's work as a laboratory assistant at the Veterans Administration Hospital Diabetes Research Laboratory in Palo Alto sparked an interest in biophysics. "I think biophysics is ideal for me because it combines my three interests: math, physics and medicine," he says.

This summer, André will travel to New York to work at the Chinatown Federal Savings Bank as a computer programmer. In the fall, he will attend Harvard University and major in biophysics.

SPEAK UP!

Can the Freon

I'm concerned about industrial use (and IBM's in particular) of chemical products like Freon, which are widely regarded as threats to human health due to depletion of the ozone layer in the earth's atmosphere.

Freon TP-35 solvent is stocked here for use as a general purpose solvent and appears to be one of the ozone-depletive chemicals.

If scientific reports regarding the hazards of these compounds are even potentially true, I would expect Research management to be sensitive to the environmental issues concerning their use and look for substitutes with less potential for long-term danger. Has anyone thought about this?

Let me assure you that we are sensitive to the environmental issues associated with the use of chlorofluorocarbons (CFCs). In fact, IBM is participating in electronics industry efforts to better understand how CFCs are used and to identify possible substitutes and timelines for adopting such substitutes. This effort is coordinated at the corporate level through the Semiconductor Industry Association and the American Electronics Association in cooperation with the Environmental Protection Agency.

By way of background, CFC 113 agents, such as Freon TP-35, are used by the electronics industry as a replacement for more toxic and flammable agents. Their properties of low-surface tension, lack of reactivity to metals and ability to form effective cleaners with other solvents are unmatched by any alternatives we're aware of. CFC substitutes with comparable properties are unattractive because they contain inherent risks to both human health and the environment.

At Almaden, Freon TP-35 emission reductions may be possible through conservation. And, as a result of your writing, we will implement procedures whereby users are informed of our concerns and are encouraged to use alternatives whenever possible.

I hope this helps to keep our Freon TP-35 usage to an absolute minimum while we await further scientific evidence of safe and reasonable substitutes.

Special Not So Special

After seeing the nice posters on June 17, I planned to watch the Charles Kuralt TV special which IBM claimed to be sponsoring. The only CBS channel I receive is KPIX, Channel 5. When I tuned in at 8 p.m., I saw a baseball game, not a Kuralt special. I tried other channels, but did not find the program.

Is it going to be shown at another time? Why didn't the bulletin board announcement and the poster, which I checked to see what I might have overlooked, mention what channel to watch rather than just to tune in to CBS?

I believe IBM should determine exactly on which station(s) and at what times its programs will be shown. Accurate information should appear in bulletins.

I also want to express my concern that IBM is spending its money on false and misleading advertising. I'm enclosing an ad from the June 21 *San Jose Mercury* that says the Kuralt special will be shown "Tonight at 11:45 p.m. on CBS." I do not normally stay up that late to watch TV, so I set my VCR to record the program. It was not broadcast at that time.

I'm certain IBM's intention is to create a favorable public image by sponsoring such programs. When advertising creates a demand that is not satisfied, however, I believe the opposite result will occur.

I'm sorry for the inconvenience and frustration you've experienced in trying to watch the Charles Kuralt special. Here's what happened:

The program was originally scheduled for Wednesday, June 10, at which time KPIX Channel 5 agreed to bump a baseball game that was to be aired before the Kuralt program. CBS then rescheduled the special to Wednesday, June 17, but KPIX refused to bump that evening's baseball game, choosing instead to run the program at 11:45 p.m. on Sunday, June 21. The corporate advertising department, which had ordered Bay Area newspaper advertisements for June 17, now rescheduled them to run on June 21.

However, the June 17 baseball game ended earlier than KPIX had expected, so they joined the Kuralt program at 8:12 p.m., apparently just minutes after you tuned in. Corporate advertising then cancelled the newspaper ads in the *San Jose Mercury* and other Bay Area papers, but, due to an oversight, the *Mercury* ran the June 21 advertisement anyway.

Corporate advertising distributed generic "tonight on CBS" posters to communications departments throughout the U.S. so they could be posted the day the local CBS affiliate planned to run the special. Our communications department contacted KPIX and was told the program would run on June 17. The posters and a bulletin board announcement ran at Almaden based on that information.

As you note, the bulletin should have specifically mentioned the local station for employees' convenience, and we will try to do so for future programs.

While the problems associated with the Kuralt special were indeed unfortunate, I hope you can see from this summary that there was no intent to run false or misleading advertising.

The above Speak Up replies were signed by Juri Matisoo, laboratory director.

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