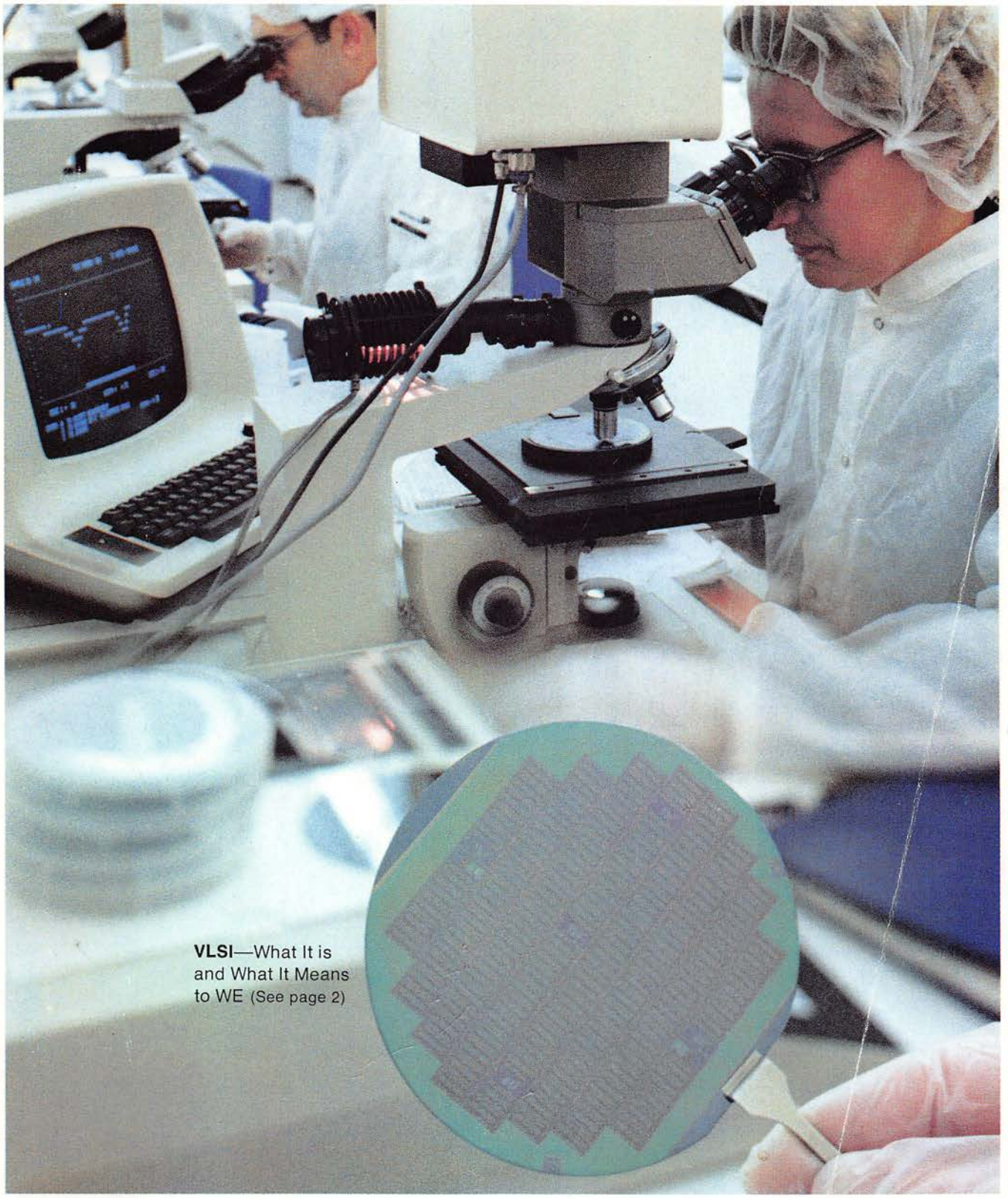
WE

MARCH-APRIL 1981



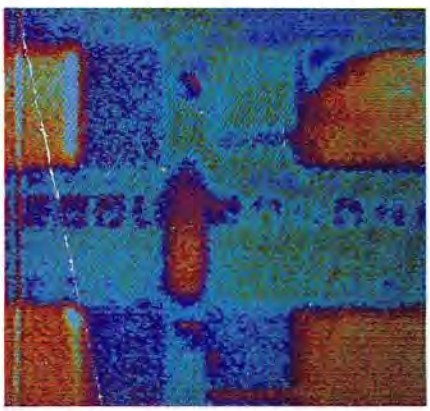
VLSI—What It is and What It Means to WE (See page 2)

What's New

The Northern Illinois Works has a new cost saving infrared camera system for locating defects in circuit packs.

The diagnostic testing system consists of a camera, liquid nitrogen to provide a stable base for temperature comparison and a cathode ray tube to display the image seen by the camera.

Generally, there are four types of problem-causing shorts in circuit packs: defective components, foreign debris, solder bridges and internal multi-layer board defects. Early data collected with the new system indicate that components are more



Marcus Onate with infrared camera that provides color monitoring. Shorts show up as white spots.

frequently defective than the boards themselves.

When a circuit pack is forwarded for diagnostic testing, it is positioned in a fixture in front of the infrared camera, and power is applied. While monitoring the display and the power meters, the operating technician slowly increases current to the shorted circuit. This current raises the temperature of the shorted area, which appears as a light spot on the display unit.

An orangewood stick is used as a pointer. The short then can be marked with an arrow sticker. To look at the defect more closely, the technician places the extension ring on the lens of the camera and positions the camera so that an area 1 ¼ inches square around the problem area may be viewed.

If both sides of the board must be seen to locate a defect, a specially designed fixture is used to flip the circuit board from one side to the other.

Using the camera, 95 percent of the defects were repaired. The implementation of the infrared camera system for diagnostic testing realized a substantial cost reduction savings during its first year of use for semi-conductor store circuit packs alone. WE

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Western Electric

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ON THE COVER: Process checker Jacquie Younger and engineer Fran Ehret examine VLSI chips under a microscope in the MOS clean room at Allentown Works. Our cover story begins on page 2. Photo by Len Stern.

By Saul Fingerman

These little chips are having a profound impact on the electronics industry

VLSI

From the outside, the Allentown Works looks just like any other postwar Western Electric plant. Girded on three sides by tree-lined parking lots, its sprawling yellow-brick walls blend harmoniously into the peaceful Pennsylvania landscape, and only the seasons seem to change. Inside, however, it's a different story. Those yellow-brick walls envelop startling changes that represent a massive incursion into the future—changes that are making Allentown unrecognizable to many visitors.

The wide open spaces so characteristic of Western Electric plants are gone, filled in by enormous high-walled *clean rooms* whose eerie, yellow lights, white-gowned personnel and futuristic equipment would make ideal sets for science fiction movies. Equally redolent of science fiction are the products being made here. They are huge aggregations of electronic circuitry, incredibly condensed onto tiny chips of silicon not much larger than an aspirin and considerably thinner.

Fittingly enough, in this age of acronyms, they are collectively known as VLSI, which stands for very large scale integration. In a less technical vein, the letters could also stand for very large scale impact, for their effect on the Bell System—indeed the world—is only just beginning to be felt. Allentown is currently making only about a half a dozen different types of VLSI chips, and some of the clean rooms that have so dramatically altered its interior landscape are still under construction. It is a beehive of activity, all of which seems to be saying *transition.*

In a real sense, Allentown has been in a state of transition from its beginning. It went on-line in 1947, the same year the transistor was invented at Bell Labs. Ironically, although its original purpose was to be a high-volume producer of vacuum tubes, it was Allentown and its people that introduced the transistor into mass production.

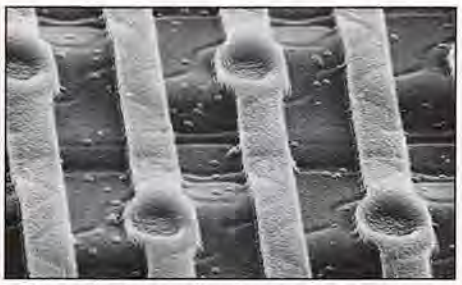
That was in 1951, but the real impact of this new technology wasn't really felt until the 1960s when it was learned how to make many transistors at one time on a single piece of silicon, each transistor only a few thousandths of an inch big. Like the vacuum tubes they superseded, the transistors could perform many vital electronic functions. They could generate a signal, or amplify it, or switch it on and off or store it as a bit of memory.

In time, it was learned how to make equally minuscular capacitors and resistors on silicon chips. Now, many of these elements could be connected together to make more complicated monolithic circuits—that is, complete circuits on a single piece of silicon. These were the first true integrated circuits, or ICs for short.

On the average, every year since then, we have doubled the number of components per chip. By the early 1970s, we were making chips with what people thought of as remarkable amounts of circuitry—namely 40 to 100 components. Retrospectively, this is known as small scale integration. By the late 1970s, we knew how to put more than a thousand components on a single chip. We were in a new era with a new name—LSI for large scale integration. And visionary people were beginning to realize there was no end in sight.

Today, we are well into VLSI. We are making chips with over 150,000 components, and there's still no end in sight. In fact, Bell Labs is already looking into the design of chips with over one million components on them.

Even more impressive is the massive outpouring of creative intelligence that led to all this. VLSI is, after all, the creation of a small army of scientists and engineers, many of them at Bell Labs and Western Electric. One such is Bill Frankfort, Manager, Engineering Silicon Integrated Circuits, at Allentown.



Microphotograph of metal contact strips on a 64K RAM. Each strip is much smaller than a human hair.

Frankfort makes it clear that VLSI was the result of evolutionary rather than revolutionary processes. "There's no great clap of thunder, and you're in a VLSI world," he says. "You get here in orderly stages. You keep improving processes, decreasing feature sizes and so on. No one single thing gives you VLSI."

Dinesh Mehta, Engineering Manager, Metal Oxide Integrated Circuits, for Allentown, puts it more succinctly: "We got here starting with the transistor," he says, "and it's been a long, hard road."

Mehta's *here* is a good place to be as evinced by one of Allentown's first VLSI chips—the 64K dynamic RAM. That mouthful can be broken down as follows: The *K* stands for 1024 (2^{10} actually), meaning it can store over 65,536 bits of memory. *Dynamic* means its memory has to be electronically "refreshed" every few milliseconds, and *RAM* stands

An automatic processing line for silicon wafers in the BIC clean room. Laurine Dietrich (foreground) loads machine while Jim Kamyniski adjusts controls. Picture was shot through yellow glass window.

Name tags on some of the clean-room smocks for the bipolar clean room.

Grouped on steps of one of Allentown's new clean rooms are three of the men who helped design them—Boyd Tong, Pete Zogas and Walt McCormick.

for random access memory, meaning any of the 65,536 bits can be accessed in any order, without having to sequentially scan through other bits as is the case with tape memories.

Both Frankfort and Mehta reflect Allentown's justifiable pride in the fact that, although a lot of semiconductor manufacturers are just beginning to market 64K RAMs, Allentown has been shipping substantial quantities during all of 1980. In fact, we make more of them than the rest of the world put together.

An article in the September 15, 1979 issue of *The New York Times* entitled, "The Fight Over Computer Chips" noted that the semiconductor industry would have 64K RAMS available by late 1980. When the article appeared, Allentown had already been shipping early production quantities for about a year.

To do its job properly, a 64K memory chip actually has about 152,000 components — many of these being used to get information into and out of the chip. And even this number doesn't tell the whole story. Many redundant memory cells are included on the chip as working spares. These can be cut in by an ingenious laser repair process to replace defective cells if necessary. This unique repair capability is a great help in increasing yields—a major target of all semiconductor manufacturers.

"Early yields are fairly low with

any new device," says Frankfort, "but continue to grow as we engineer our way up the learning curve. The laser repair technique was part of this process. In short, the more devices you make, the better you get at it."

Like all integrated circuits, VLSI chips are batch fabricated. That is, over a hundred of them are simultaneously processed on a single silicon wafer. The wafers are 100 millimeters in diameter (about four inches) and many of them are put through the numerous VLSI processes simultaneously. Each wafer is then sliced into a hundred or more individual chips. Thus, thousands of VLSI chips can be fabricated at one time. Couple this with the fact that each chip may be a complete electronic system, such as a microcomputer, and you begin to understand the economic allure of VLSI technology.

Norma Bloss prepares to load a tray of silicon wafers into a diffusion furnace. Microprocessors control and monitor the entire process.

The most obvious advantage of VLSI is the size reduction it makes possible in equipment. In 1965, for example, the call store of a No. 1 ESS used something called "ferrite-sheet" memory. In some larger installations, the call store occupied 104 feet of equipment frames. Today, using the 64K RAM—or even its predecessor, the 16K RAM—we can provide the same amount of memory in just a few feet of rack space. What's more the new memory will be faster, cheaper and use less power.

In addition to size reduction, VLSI offers some less obvious advantages. The electrons that animate electronic circuits, whizzing from one component to another, are very fast—almost as fast as the speed of light. Nevertheless, they travel at a finite speed, and, if they have to course through long lengths of wire—as they do in hard-wired circuits made up of discrete components—things happen much too slowly for today's computer-driven world. Now, if the interconnecting paths can be held to microscopic lengths, as they are on VLSIs, the electrons don't have as far to travel, and they can achieve their vital operations at phenomenal speeds. In the 64K RAM, for example, data can be retrieved in about 170 billionths of a second.

> "What VLSI really means is that we can create new communications features, capabilities and services ..."

Still another major advantage of VLSI is its reliability. Having complete systems and subsystems on a single chip eliminates the need for tediously wiring and connecting thousands of components and the potential errors and defects that often accompany such work. In addition, VLSI components age much better than discrete components.

Bob Duchynski, another VLSI engineering manager sums it all up. "What VLSI really means," he says, "is that we can create new communications features, capabilities and services that couldn't be provided with other technologies." He offers the Dimension® PBX as an example. "All of its calling features are software controlled. This means doing things with memories and microprocessors that used to mean a whole roomful of equipment, but can now be done with only a few chips. This gives us a tremendous cost advantage."

The only fly in the VLSI ointment is the extreme difficulty of making defect-free chips. The dimensions of some transistor features and of all the metal interconnecting paths are 3.5 microns or less. That's three and one-half millionths of a meter. If this doesn't tell you much, pluck out one of your hairs and look at it. It's about 80 microns, or over 20 times as large as the typical feature on a VLSI chip. In so small a universe, dust particles can be as devastating as huge boulders. An invisible five-micron particle falling across two adjacent connecting paths can cause a catastrophic short circuit that can turn a chip into junk. Since a VLSI chip with a couple of hundred thousand components may also have over half a million connecting paths, it's easy to see why clean rooms are taking over so much of Allentown's floor space.

What makes a clean room so clean is something called *vertical laminar* flow. Air is forced through extremely fine filters in the ceiling in vertical sheets straight down to a perforated metal floor at a velocity of 90 feet per minute. After go-

ing through the floor, the air goes through a second set of filters and is sent back up to the ceiling to begin the cycle again. Every 12-foot area is monitored, setting off alarms when airflow stops or temperatures vary by more than one-half degree Fahrenheit.

Checking a silicon wafer of VLSI chips are Theresa Neupauer, Tom Oswalt and Walter Held. The scene was photographed through window of the MOS clean room. Oswalt's beard is masked by snood to satisfy regulations.

Allentown's clean rooms are known as *Class 100*, which means they can have no more than 100 particles (of anything) between one and five microns in size in every cubic foot of air. One frame of reference that may give you some idea of what this means is cigarette smoke. The particles that make up these noxious clouds average 10 microns in diameter, and there are billions of them in every cubic foot of smoke. Hospital operating rooms offer another interesting comparison. Although they seem to be as clean as clean rooms, they're not. Compared to a clean room's atmosphere, the air in the average operating room is loaded with particulate matter. In any case, the needs are dramatically different: hospitals try only to filter out living matter like microbes. VLSI clean rooms must filter out inanimate matter as well.

In addition to particles in the air, there are other, more subtle causes of defects, such as minute contaminations in chemical solutions. Thus, clean-room water goes through the most extensive purification process used by *any* industry, and chemicals are purchased in ultrapure form. Even these supergrade chemicals are sometimes further refined at Allentown.

Caution is always the watchword. If a silicon wafer is accidentally bumped, it will shower nearby wafers with thousands of silicon particles. Further, the people who might do the bumping are themselves major sources of particulate matter, hence they are enveloped in surgical gowns and hats. The ideal VLSI room, according to Bob Duchynski, would be fully automated. Western Electric is, in fact, trending in that direction and has already introduced several automation techniques to minimize contact between people and product. In one wet chemical process, a trayful of wafers is loaded into one end of a totally enclosed processing line; a button is pushed, and the processed wafers come out the other end.

There are two sets of clean rooms at Allentown, one for each of two different VLSI technologies. Signs with four-foot-high lettering identify them: One says MOS and the other, BIC. Ed Labuda, Engineering Manager — Bipolar Integrated Circuits, reminds us that MOS is short for metal oxide semiconductor and BIC stands for bipolar integrated circuit. They are simply two different configurations and structures that require different processing and lend themselves to different applications. The MOS transistor structure for example, is well suited to mass memory applications, such as the 64K RAM. BIC transistor structures, on the other

hand, lend themselves to applications requiring high-speed switching. Bob Visco, Manager VLSI Planning, has an excellent analogy: "It's like bridges," he says, drawing one in the air with his hand. "There are many kinds — suspension, draw, trestle and so on. Each one is best for a certain kind of application, but they're all bridges." To complete the analogy, Visco points out that bridges transport vehicles while transistor structures transport electrons and/or holes.

A tour through a clean room by a trayful of wafers takes many weeks. During this time, the myriad features of each chip are etched into, and sometimes deposited onto, the wafers. VLSI chips—particularly bipolar chips—are essentially multilayer sandwiches, except that more material is carved away than is added. Some VLSI chips have as many as 13 levels, each of which requires separate processing.

The micro features of VLSI chips are achieved by projecting their outlines through pattern masks onto a layer of photoresist material that is sensitive to the wavelength of the light or energy source being used. At present, the masks are thin sheets of glass with chrome patterns, and the energy source is ultraviolet light. Both of these are limiting factors that will have to change with time. The problem is that as the size of mask features approaches the wavelength of the light source, pattern resolution, or sharpness, falls apart because of a phenomenon known as diffraction. In short — things begin getting fuzzy — an intolerable situation if larger scale integration is ever to be achieved. To overcome this problem, Bell Labs and WE engineers are investigating other combinations of masks and energy sources, such as x-rays and electron beams which have very short wavelengths.

Another problem with achieving microscopic feature sizes is something called "undercutting." The wet chemicals (acids) used to etch device features into the silicon wafers are *isotropic* in their action —meaning they carve away the silicon and other materials in a horizontal direction just as quickly as they do in the desired vertical direction. This results in still further blurring of features. The solution is a dry process called *plasma etching*. Instead of wet chemicals, it uses gases ionized by high voltages to neatly carve out VLSI features with clean-cut vertical walls with little or no etching in the horizontal direction.

All of these processes require the very best state-of-the-art equipment, so it's not surprising that VLSI fabrication spells high capital investment. A fully equipped clean room can run into the tens of millions of dollars, and the costs will probably grow as feature sizes shrink.

Dinesh Mehta, Ed Labuda and Bob Visco in front of the new MOS clean room. Mehta and Labuda are responsible for engineering MOS and BIC VLSI chips. Visco has been planning for the new facility in Orlando, Florida.

Happily, the results more than justify such expenditures. Take the echo canceller chip — one of the VLSI chips now being made at Allentown. It is used in the Bell System network to overcome the an-

noying echoes that can occur in all telephone circuits, particularly over long distances. The first application has been in satellite circuits, which are 45,000 miles long and make good echo control mandatory. A single VLSI echo canceller board replaces seven component-laden printed-wiring boards that cost ten times as much. This kind of cost improvement is typical of VLSI technology.

The echo canceller is representative of custom designed VLSI chips in that it is a special-purpose Bell System product for which there is no industry equivalent. This very "specialness" makes it representative of the way VLSI is heading. As these chips become more complex —more like complete systems— they also become more distinctive, or even unique, so that each will serve only one particular system. Memory chips, on the other hand, are more universal and can serve many kinds of systems, which is why so many semiconductor manufacturers are making them.

Memory chips serve another function in the world of VLSI manufacture. They are often used as a kind of process control. When a new processing line is being set up, memories are usually the first chips to go through—primarily because they are the easiest to test. As Dinesh Mehta puts it, "When you're testing memories, you know exactly what to look for. A bit of memory either exists or it doesn't." This makes it easy to determine which memory cells aren't working, and a little analysis will then tell you what caused that particular cell not to work. With something like the echo canceller, you can tell if the chip is functional or not, but it's very difficult to locate exactly which transistor is bad.

Department Chief Howard Tooker, an old Allentown hand who helped usher in the transistor 30 years ago, offers another VLSI chip as an example—the MAC-4. This remarkable product is a complete computer—memory and all—on a single chip. Incidentally, that's the difference between microcomputers and microprocessors: Microcomputers have "on-board" memory; microprocessors do not.

Tooker, whose group serves as interface between Bell Labs VLSI development and Allentown manufacture, says, "When it comes to testing, the 64K RAM and the MAC-4 are worlds apart. You can check the 64K just by putting a pattern signal into it and seeing if the pattern is perfectly reproduced. It either is, or it isn't. But with the MAC-4, it's almost impossible to test it for everything it can be used for. There's just no way you can exercise every instruction set, so we pick the ones most likely to be used. Even then, if an instruction doesn't work, that doesn't tell you where the problem is on the chip."

"Designing a chip with 40,000 components is like playing chess with 40,000 pieces."

If testing VLSIs is difficult, you might expect that designing them is infinitely more so — and you would be right. It takes a host of engineers and many man-years of painstaking effort to design a good VLSI chip. Their end product may be no larger than your fingernail, but it will perform tasks that used to take a whole roomful of equipment, or, increasingly, tasks that simply couldn't be done without it. Just as VLSIs probably couldn't be manufactured without the help of computers, they probably couldn't be designed without such help. As one Bell Labs designer put it, "Designing a chip with 40,000 components is like playing chess with 40,000 pieces."

In terms of its impact on our day-to-day existence, the ubiquitous microprocessor is probably number one on the hit parade. The toy industry alone offers substantial proof of its popularity. In 1977, the electronic toy market was $21 million. By 1979, in just two short years, it jumped to $480 million. As yet, there are no figures available for the auto industry, but all you have to do is watch the TV commercials to see how these tiny chips are taking over the cars in everything from emission control to telling time. A recent newspaper article said there is every reason to believe the world semiconductor market will grow from $10.4 billion in 1979 to over $45 billion by the late 1980s, and many people believe that figure is low.

VLSI's impact on the Bell System will be equally dramatic. The chips are already finding their way into many Western Electric products, and, within a few years, they are bound to be all pervasive.

"The devices we're making now," says Bob Visco, "are just the first of what will be a long string of VLSI chips. We'll see these devices turning up in almost every kind of equipment Western Electric makes —and they'll make that equipment more cost effective while enhancing its performance.

Which is why everyone is forecasting substantial growth for the Electronic Components Division and why Western Electric will be building another, more modern, Allentown in Orlando, Florida.

Visco, who calls his title of "Manager, Engineering VLSI Planning" a euphemism for Orlando planning, is exuberant about this, as yet, unborn plant. "It will be our leading edge, volume producer of VLSI," he says, "and we're designing it from the ground up to be a VLSI factory."

Looking ahead, Visco sees great things in store for VLSI and beyond. He has no intention of falling into the error pointed out by Mike Thompson, the Executive Director of the Allentown Bell Labs, who said, "The one consistent error made in forecasting the direction of silicon technology has been that of expecting too little of the future."

He might have added that, in the future, the transistor will be remembered not so much for what it did as for what it led to.

REACHING

Why do people climb mountains? For the sheer love of it

By Jane Moulton

Photos by Jim Painter and Bruce Cox

"Reaching the top is, of course, what you aim for," says Jim Painter, a twelve-year veteran at the Pittsburgh Service Center, "but everything you experience along the way is really what's most important."

Jim is not referring to his career —his occupation as an electrical engineer for WE's Eastern Region, but his avocation—getting to the tops of mountains. In particular, Jim is interested in major mountains (20,000 feet or higher, by definition) such as Mt. Huascaran in Peru, which he visited for the second time last summer.

Above—John Nosworthy forges ahead on some of the upper mountain's tougher terrain.

Standing 22,205 feet, Mt. Huascaran is the highest of some 100 peaks in the Peruvian Andes' Cordillera Blanca (White Range) and one that climbers have found exceptionally difficult to conquer.

"I've always enjoyed the outdoors," says Jim, "skiing, camping, those kinds of things. Then I tried kayaking—just on a weekend trip a local shop was running — and I loved it." His pursuit of kayaking led naturally to an introduction to other people who relished active outdoor vacations away from the city as much as Jim did, and led him eventually to the Explorers Club of Pittsburgh.

About eight years ago, he took a survey course in mountain climbing given by Dr. Ivan Jirak at a local university. "He really inspired

THE TOP

Above—WE's Jim Painter, left, discusses the terrain of Mt. Huascaran (pictured left) with Tony Karczewski, center, and John Grunick before their climb up the 22,000-foot Peruvian peak.

me to climb," says Jim. "He's 55 years old and he's gone on major climbs every summer since he was 20, so he has considerable knowledge of the field."

Now an accomplished climber himself, Jim led his own ten-member expedition to Huaras, Peru, in July. Like many climbers, he chose South America for his expedition because it's inexpensive, relatively quick and easy to get to, and because the mountains themselves are readily accessible. "In Alaska or the Himalayas it can take you two to four weeks just to get to the base of the mountain," he says. "But a major climb in South America can be done in an average three-week vacation."

The Pittsburgh team, which included Jack Brinjak, who also works at Western's Pittsburgh Service Center, spent several months preparing for the seven-day trek up Mt. Huascaran. Jim ran five miles a day, as did some of the others, and most climbed daily to the top of a 34-floor local university building in training for the rigorous ascent up the glacier-covered mountain.

No light undertaking for anyone, the trip had particular meaning for Jim, who lost three friends in a tragic accident during his first climb up the same peak in 1978.

"That year, four members of a seven-person expedition had climbed to the third camp at 15,000 feet," Jim recalls. "At that point I was forced to turn back, like most of the others before me, because of altitude sickness." The three others went on to the summit, but never returned.

One man's body was found several days later, frozen after an obviously lengthy fall from the summit. Unable to find his two partners, the rescue team eventually had no choice but to assume they had also died of similar

Above—Climbers relax in the sun and lightweight tents after unloading sixty-pound backpacks to set up camp for the night. Meanwhile, at right, it's just another day for native villagers at the marketplace in the town of Huaras.

causes.

"After that, to go back was more taxing mentally than physically," says Jim. "I did a lot of soul searching after that accident and I was very depressed, naturally, but I finally decided I enjoyed climbing enough to go back to it." The next year Jim returned to South America to test himself on several smaller peaks.

This time, however, it was back to Mt. Huascaran in Huaras, a Peruvian village that has become as dear to Jim's heart for its warm, colorful people as for its challenging mountain range.

"I taught myself some Spanish, so that's made it easier for me to communicate and make friends during my visits," he says. As group leader of the expedition that ability to communicate and Jim's contacts came in handy. "When you don't know an area or speak the language you tend to pay more at larger hotels and lower quality restaurants simply because they're the easiest to find," says Jim, "but if you know someone like my friend Pepe you can get a room for a dollar a night. It isn't the most luxurious, but it has a view that would knock you out."

Even more important, he adds, it allows you to get a feel for the people and their culture.

"The people are very poor for the most part, but they're very friendly. It's fascinating," he says, as he enthusiastically talks about the distinctive hats Huascaran's men and women wear to identify their tribes, their indestructible shoes of straw and rubber soles made from old cut-up car tires, and children he's played jacks with on the dirt floors of thatched-roof huts.

Neither Jim nor any of the members of his expedition reached Mt. Huascaran's summit, but what held them back is nothing less than a story in itself.

Of the ten, only Jim and three others were able to climb as far as high camp at more than 19,000 feet. "Everyone doesn't climb together as many people may think," explains Jim. "It's not ten people abreast going up the mountain. We climb alpine style, for starters, which means we carry all our own gear, usually about 60 pounds of equipment and food."

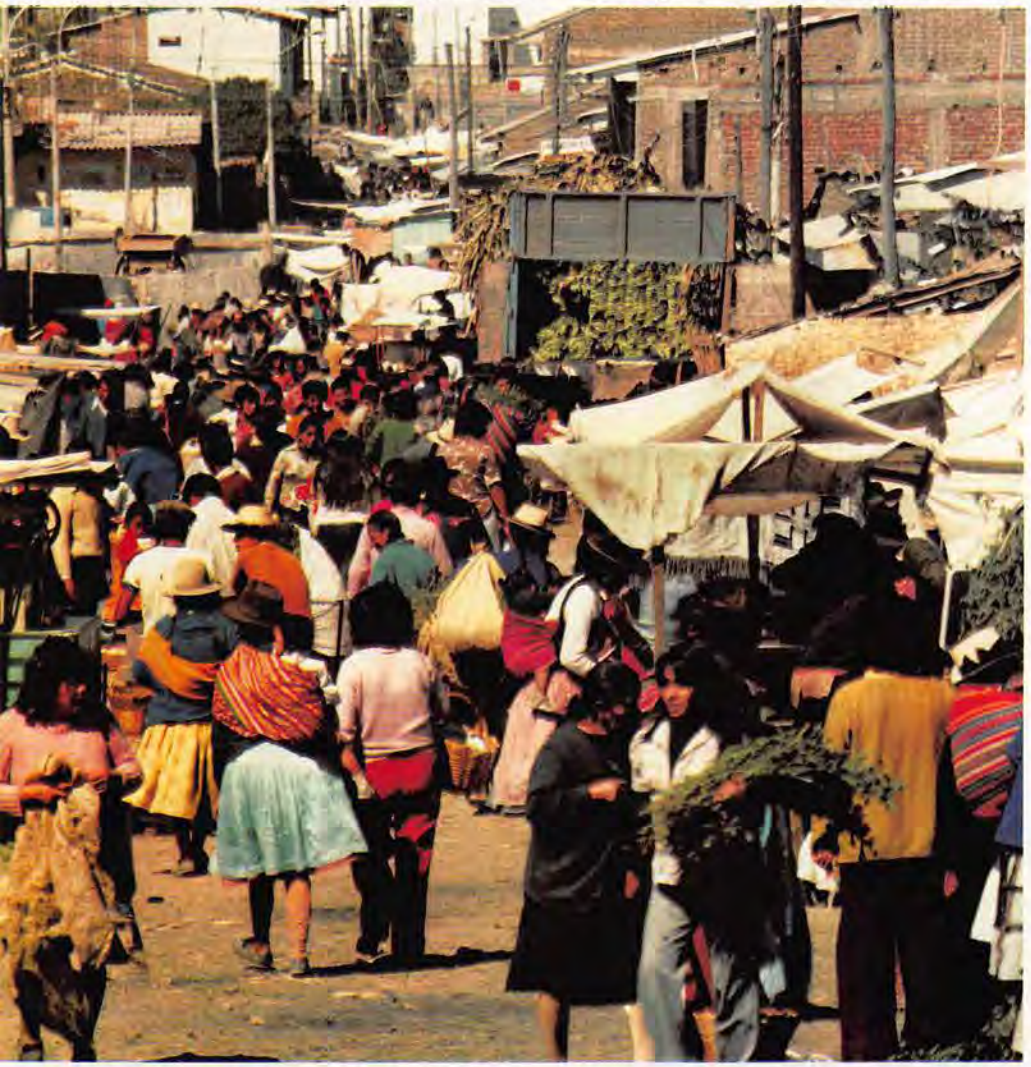
Another climbing method common among Europeans and in the Himalayas, allows for porters who are hired independently to carry the climbers' gear. Going alpine style, you always send a team of two or three people ahead with extra gear to scout the route and find a campsite for the next night. Then they come back down to join the group.

"So you're never climbing continuously up; it's constant back and forth," says Jim. "And all along people have to travel somewhat individually — never alone, but in smaller groups according to their own ability and their reaction to the altitude.

"It's not at all unusual," he continued, "for even experienced climbers to have to turn back before reaching the top because of

pulmonary edema or cerebral edema." Both illnesses are forms of what's commonly known as altitude sickness brought on when a negative reaction to the thin air at high altitudes causes fluids to accumulate in the lungs or brain, respectively.

On their way to high camp, Jim and his partner came upon a climber from another expedition who was suffering from both. A marathon runner from the state of Washington, the ailing climber had already been on his back for two days, his condition unchanged even by the treatment of a physician who was part of his four-person contingent.



"The doctor was giving him drugs," says Jim, "but the only thing that can save someone from possibly drowning internally is to get him to a lower place where the air is richer in oxygen. He was semi-comatose by the time we met up with them, and the rest of his team was too shocked and exhausted to be of much help."

Nightfall was approaching and the Pittsburgh climbers had few supplies with them. "We were carrying light loads up to find a spot for high camp, so we only had some of our equipment and a single flashlight," Jim says. "We didn't have much choice but to improvise as best we could to maneuver the man down to safety as quickly as possible." No easy task in the best of conditions, carrying someone — in darkness much of the time — down the glacier-covered mountainside proved an unforgettable experience.

"It's hard enough in daylight to maneuver the ice and crevasses yourself," says Painter, "but trying to do it in the dark while you're carrying a sick person in a sleeping bag is *really* tough. And he was barely breathing. I kept expecting him to die any moment."

But he didn't. Seven hours and 3,000 treacherous feet later, they met an expedition of French climbers, who, along with a member of the Pittsburgh team, took over the rescue. In 48 hours, the victim was being treated successfully at a hospital in Huaras.

During the Pittsburgh team's vacation, seven other people did die of altitude sickness or from falls on their way up Huascaran. "The people in our group who got ill were lucky — and sensible," says Jim. "They returned to base camp as soon as they felt sick.

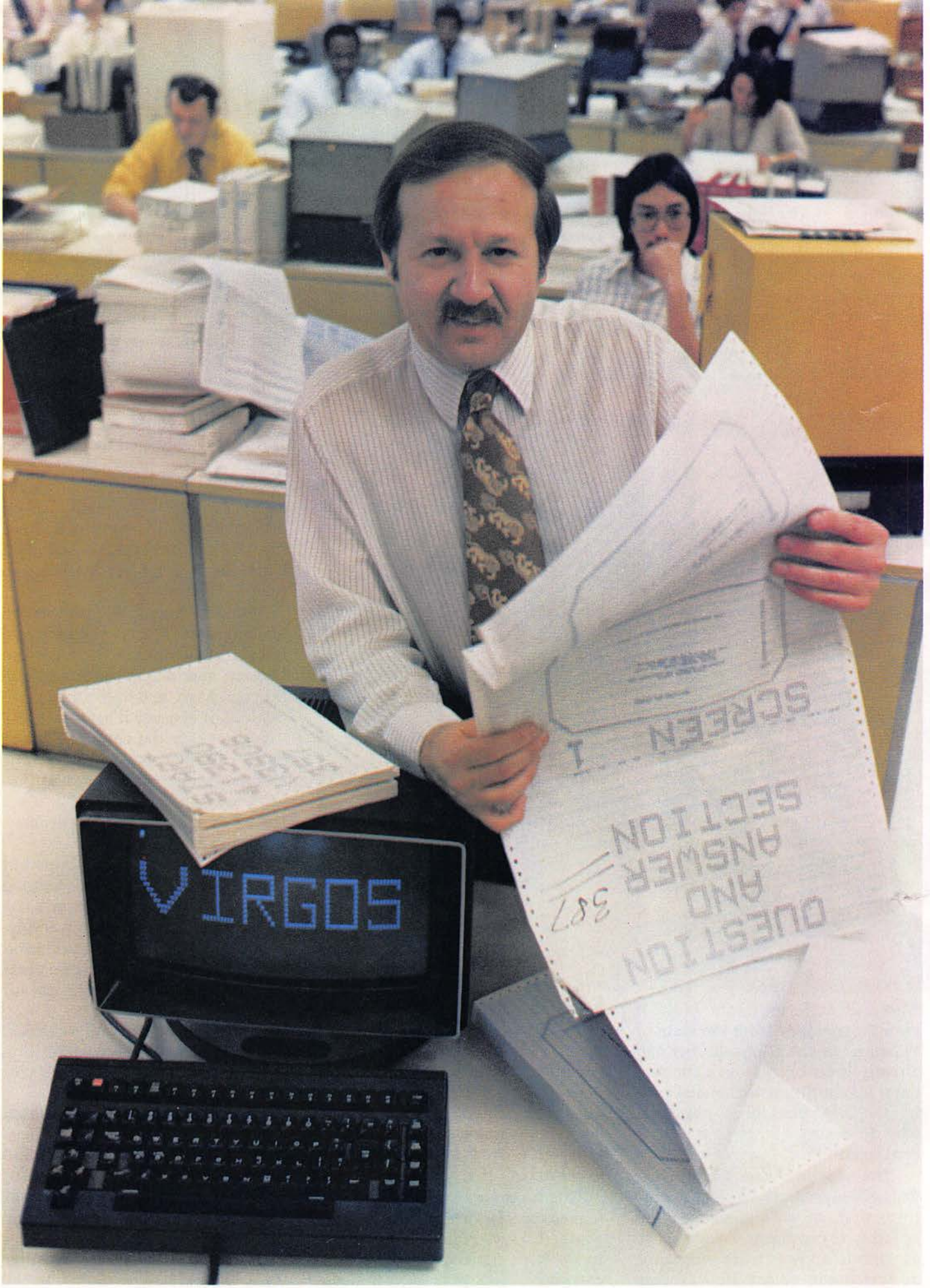
"We went back up," he says "but another group was ahead of us on our approach to summit and we ran short of daylight, so 2,000 feet from the top we were forced to turn back."

Though reaching the peak is the ultimate goal, it's not at all the sole reason for climbing. Nor do Jim Painter and his adventurous colleagues have a death wish. "We don't do it because it's dangerous," says Jim. "On the contrary. We're quite careful to avoid dangerous situations and we're confident that we know what we're doing. It's a test of our skills and experience. It's exhilarating.

And, it's tough to explain, but there's a real camaraderie among the group. Climbing is always reliant on team spirit; we're very dependent on one another's skills and strengths, so there has to be a great deal of trust among members of the group."

The group had already climbed nearby Mt. San Juan, which is a smaller peak, as "a warmup" for Mt. Huascaran.

"Naturally we were disappointed we didn't reach the top of Huascaran," says Jim. "But we would only have been on the summit for a short time. The whole trip was really enjoyable and exciting, and the mountain will always be there when I want to go back for another try."


VIRGOS
SCREEN 1
QUESTION
AND
ANSWER
SECTION

VIRGOS

By George Gray
Photos by Joe Gazdak

A giant step toward mechanization of Bell Sales Engineering

Left — Joe Sobolewski, a 23-year man in switchboard engineering, poses beside a VIRGOS terminal with printout on a 1A ESS job. Below — Wycessa Ransom, expediter, and Darby O'Brien, Engineering Associate, confer on placing an order using a subsystem of VIRGOS known as Horizon® Order Entry System.

Last year 10-million production hours of engineering effort were put forth by the Bell Sales Divisions. The work was performed by some 5,000 men and women who make up the regional equipment engineering organizations nationwide.

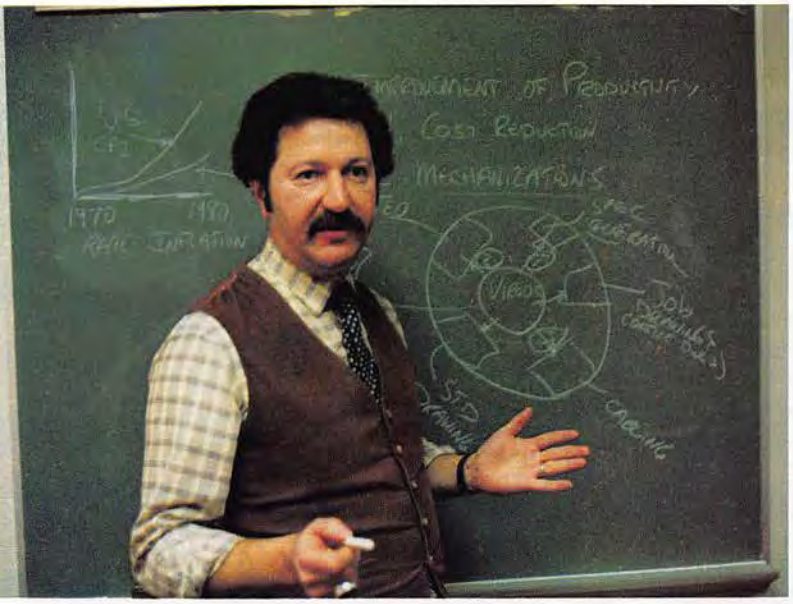
While the numbers of people in these line engineering organizations have not changed substantially in the past few years, the volume of work has increased and inflation has played havoc with costs.

Systems Equipment Engineering (SEE), which is 80 percent or more of the Bell Sales Engineering effort, is one of the five basic functions that Western performs for the operating telephone companies—along with manufacturing, installation, distribution and purchasing.

On major items like new central office switching systems, the telephone company sends Western an order that may run 120 pages. This order specifies the location and the type of equipment wanted in fairly general terms, along with the various service offerings that they want to provide. Each of these telephone company jobs is custom engineered to the needs of the area served. It would be prohibitively expensive to provide every possible option in every office. The phone company therefore provides an outline order on what it will need for this particular facility immediately and what it plans for growth in the next few years.

When that order gets to Western, it has to be expanded to manufacture and purchase the literally millions of items that will go into, say, a new 1A ESS. The order has to fit into manufacturing schedules at the various plants. Sufficient raw materials have to be ordered. Cable has to be made to order. Instructions have to be prepared for the installation crew. Lots of these activities are repetitious from job to job, but still someone has to sit down and work out all the detailed specifications and drawings and cable tags for each of the thousands of jobs we work on each year. This is the job of line engineering.

Almost since computers first began to be used in Western Electric, work got underway to mechanize the routine of spec writing. For crossbar switching systems, ESS, and step-by-step, for example, there were extensive manual and computerized input forms developed that the line engineering organization would fill out using information from the telephone company order plus their own knowledge of system requirements and updates on new products from Bell Labs. All of this longhand



Above — Les Kington, Bill Carlucci and Bill Andrews bring 75 years of spec detailing experience to CRMS, an adjunct of VIRGOS. Left—Functional Planner Gene Stopeck.

copy would go to key punch, then to the computer room, and, in about two weeks, the engineer would get back a package of specs. The system was in no way self checking, so that if a pencil slipped and you made an error, it would be two weeks before it showed up.

In the past year a new system called VIRGOS (Video Interactive Regional Generation of Specifications) has been implemented for most ESS jobs at all Regions. The project to develop the necessary software for VIRGOS was begun in Northeastern Region in the spring of 1977 and the first tests were run a year later. By the fall of 1979, Northeastern Region had developed master programs for a variety of functions formerly done by off-line computer forms. Savings were accrued where VIRGOS aids gave engineering personnel an ordering mechanism which also complemented their logic. Additional savings were realized down the line. Key punch, for example, has been virtually eliminated.

According to Joe Serrao, North-

eastern Region project management chief who has been involved in introducing new computer programs at Northeastern Region, VIRGOS now covers most electronic switching systems as well as some support systems for central offices. In 1981, additional power, cable and toll support systems will be added plus microwave radio. In 1981-82, a VIRGOS program will be developed for the new #5 ESS. At the moment, a version of VIRGOS known as HOES (Horizon® Order Entry System) is being used for Horizon PBX's.

Below — Bill Carlucci uses computer graphics to input data that will later be plotted mechanically.

While the original development work associated with VIRGOS was done in Northeastern Region under the former organizational structure where each region had functional responsibility for one aspect of Bell Sales engineering, since March of 1980, Service Line Planning and Management (SLPM) has been brought together under Bob Cowley in a separate General Manager organization. SLPM is behind the drive to get national systems to replace individual ones that grew up locally in each region.

Gene Stopeck, Senior Engineer in Functional Planning, emphasizes that VIRGOS is a first step in the mechanization of systems equipment engineering. The next step will be to feed telco order information and office history into the memory banks. Then all manner of specialized projects can be developed, on the style of the current CRMS (Cable Routing and Measurement System) or RWLS (Regional Wiring List System).

"The main thing about VIRGOS," says Stopeck, is that we've gotten the engineers to work in an interactive system, where they can interface directly with the computer.

In Northeastern Region there are now 31 VIRGOS terminals — actually Dataspeed® 40 teletypewriters. They are located all through the building in the engineering departments so that SEE personnel have ready access, although each user needs to establish his identity or need to know before the computer will talk to him.

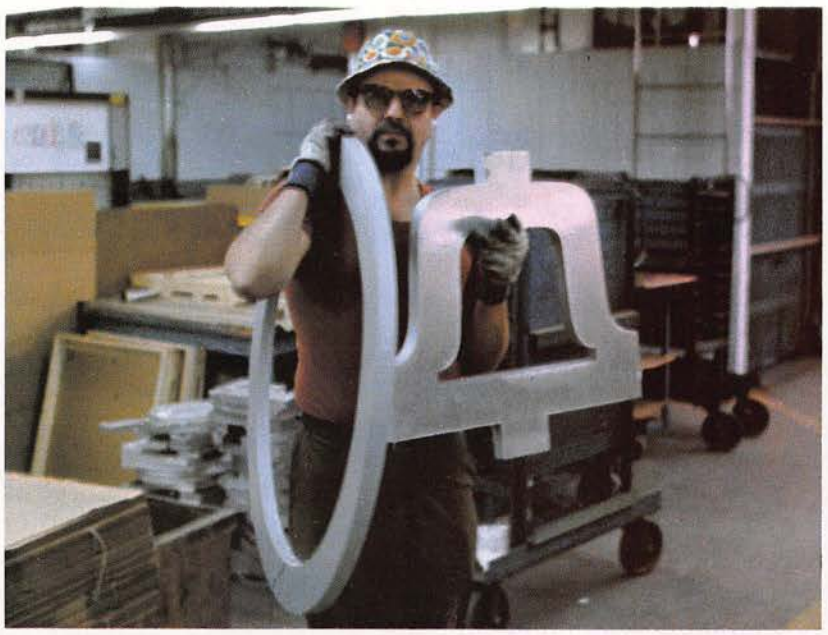
Once the engineer tells the machine the job location and type of spec he's writing, questions flash up on the CRT screen. Using the telco order, plus his own knowledge and analysis, the engineer hits a "Y" for yes or an "N" for no or types in code numbers or quantities. The computer then follows a logical progression, asking additional questions based on the last reply. If the user fails to answer a question or puts in something extraneous, lights flash and the error has to be corrected before the user can proceed.

Unlike the two weeks it used to take to get specs back from the computer room, the engineer now has them the next morning—and they are usually without error.

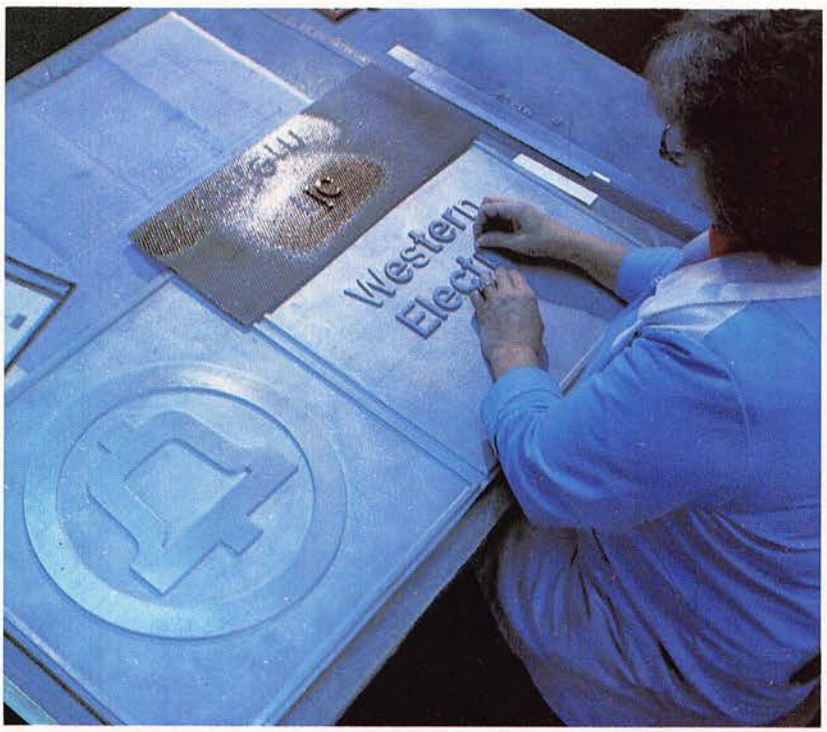
In addition to VIRGOS there are other projects, all with long acronyms for names, which are also impacting on the SEE environment. One of the most interesting is CRMS (Cable Routing and Measurement Systems).

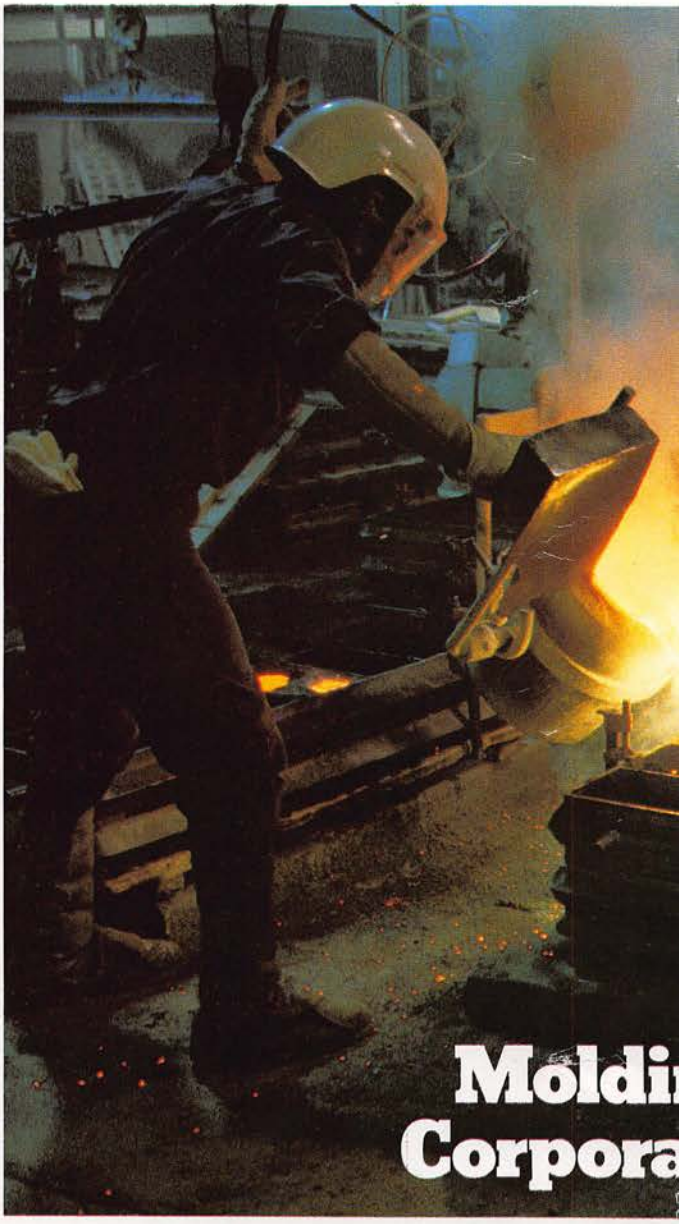
Historically, this was a manual function that involved running a measuring wheel over scaled plans. Now, once the basic configurations are fed into the computer, the optimum runs are figured out electronically and an automatic plotter draws the lines the cable should follow. The computer can tell you if a route is blocked by too much cable already in place or if a critical pile up is imminent. The savings to the phone company in copper have been substantial.

VIRGOS is the keystone in Bell Sales' long range plans. Once VIRGOS is in place, many engineering support functions can be mechanized and eventually all information about telephone company plant will be centralized in giant data banks. "That is still a long way off," Gene Stopeck says, "but with VIRGOS we're entering a whole new era." WE



Above—The Bell symbol may be heavy with meaning, but cast in aluminum, its components are toted around effortlessly.





Above—Handling their fiery cargo gingerly, workers pour molten metal into a sand mold of the Bell logo. Left—Letters cast in Bell System type are lined up by eye on a pattern.

ng the te Logo

By Roger Greene
Photos by Chuck Lewis

Here's how they make those metal logos you see on the outside of all Bell System buildings

When you hear the word "foundry," what comes to mind? Giant furnaces spewing forth molten metal into vast, bubbling vats? Red-hot sparks flying as the seething metal is poured into huge molds, forming the outsize parts for the machinery of industrial America? Workers straining to remove the newly molded parts when the metal has cooled?

These are all scenes you might conjure up. But not everything cast in a foundry happens on such a large scale. In fact, at the Matthews International Corporation foundry in Pittsburgh, Pa., there is finely detailed, relatively small-scale work going on, a good part of it done by hand, by skilled metalworkers with years of experience.

The object of their attention is a symbol that's very familiar though you've probably never given any thought to how it's actually made. That symbol is the Bell logo, heart

Above—The pattern vanishes under a finely-sifted layer of green sand. Once compacted, the sand holds the logo's shape tenaciously.

Right—With the pattern removed, the two halves of the sand mold are clamped back together, forming a cavity for the molten metal.

of the Bell System's corporate identification program. Versatile as we are at Western Electric, we don't manufacture the actual logo ourselves.

Keeping the Bell System supplied with enough logos to go around is no mean task. There are literally thousands of buildings owned or leased by AT&T, Long Lines, Bell Labs, Western Electric, and the 23 operating companies, and practically all of them have Bell logos and other identifying signs either on them or nearby.

Since 1969, when the Bell System adopted the current logo style and lettering, Matthews has made thousands of reproductions in aluminum and bronze, ranging in diameter from six inches to eight feet. On occasion, even larger ones have been fabricated, but those have to be cut, shaped and welded, instead of being cast. Matthews also casts most of the plaques and free-standing letters that help identify Bell System buildings all over the country.

When Western Electric contracted with Matthews in 1969 for the manufacture of Bell System logos and signs, that company was already a leader in the identification field. In addition to the sign products produced by its Architectural Division, Matthews also makes product marking equipment that use indenting, embossing, printing and etching methods; printing plates to reproduce designs on corrugated or flexible packaging; and bronze products for the cemetery industry, including memorial plaques and cremation urns. An indication of the high-quality work Matthews can produce is found in the company's Classic Bronze product line, which consists of limited editions of fine art bronze statuary cast by the "lost wax" process.

Western Electric gets involved primarily at the beginning and end of a Bell order that's placed with Matthews. The telephone compa-

nies, or other units of the Bell System, send their orders to our Service Centers. The orders are then written up using number-coded ordering information, and forwarded to Matthews. Once every three months or so, an inspector from our Purchased Products organization visits the foundry to check on the status of the work being done. When the order is filled, billing is also handled through Western. In between, there's some skilled and fascinating work that goes into the making of our logos and building signs.

The mold into which molten metal will be poured is made of tightly compacted olivine sand. Sand is first compacted around an aluminum pattern, which is then removed before the molten metal is poured. The aluminum patterns are standard ones, made from original layouts supplied in 1969 by the designers of the Bell logo, Saul Bass & Associates.

Standard patterns are re-usable. After twelve years of making Bell System signs and logos, almost every pattern is already on hand.

Logo patterns are ready to be used as is, but plaque patterns must first have letters set up on them. Selecting letters cast in special Bell System type, the set-up person puts them on by hand and lines them up by eye. Shellac is used to adhere the letters to the plaque. After it sits for a while and the shellac gets "tacky," an inspector proofreads the plaque, moves and adjusts any letters as necessary, and then heats the letters with a Bunsen burner. This evaporates the alcohol in the shellac and settles the letters firmly in place.

Now the pattern for the logo or plaque moves into the foundry for casting. A wooden "ram-up" board, somewhat larger than the pattern, is set on the ground. The molder, who will be working on the logo all through casting, places the pattern on the board, and sets one section of a metal frame on it. This is called the "drag." After he wedges the pattern in, to prevent rocking, he applies a chemical compound on it to keep sand from sticking.

Next, using a "riddle," which is like a big sifter, he shakes "facing sand" all over the pattern. Then he shovels sand into the frame until it's full, and uses a pneumatic "rammer" to compact the sand. After smoothing it out, he places a bottom board on top of the compacted sand, clamps it on, and, using an overhead crane, flips the whole thing over.

He next removes the original board, which is now on top in order to expose the underside of the logo. Placing the second part of the frame, called the "cope" on top of the drag, he again goes through the procedure of shaking, shoveling and compacting sand into the frame. Pouring holes are cut into the sand. Then, removing the clamps and briefly lifting off the cope, he loosens the aluminum pattern with a mallet, and removes it.

What's left are front and back impressions of the Bell logo in solidly-compacted sand, surrounded by metal frames. When the cope section is lowered again and clamped back onto the drag section, the sand mold is ready for pouring.

Molten aluminum is poured at about 1300°F, while bronze is poured at about 2300°F. Ladles full of molten metal are poured simultaneously into the cavity in the sand through two pouring holes, on either side of the cope. When the metal begins to spill off in a shower of orange sparks, the mold is full.

Once the logo or plaque has cooled, it's taken out of the flask to be cleaned and polished. Bronze logos have to be sandblasted clean. Edges have to be smoothed. Letters have to be tooled clean, and plaques drilled and tapped. Often, the logo has been ordered in brown or black, in which case it will be painted. Finally, it has to be securely crated, so that it won't sustain any scratches or dents in shipping.

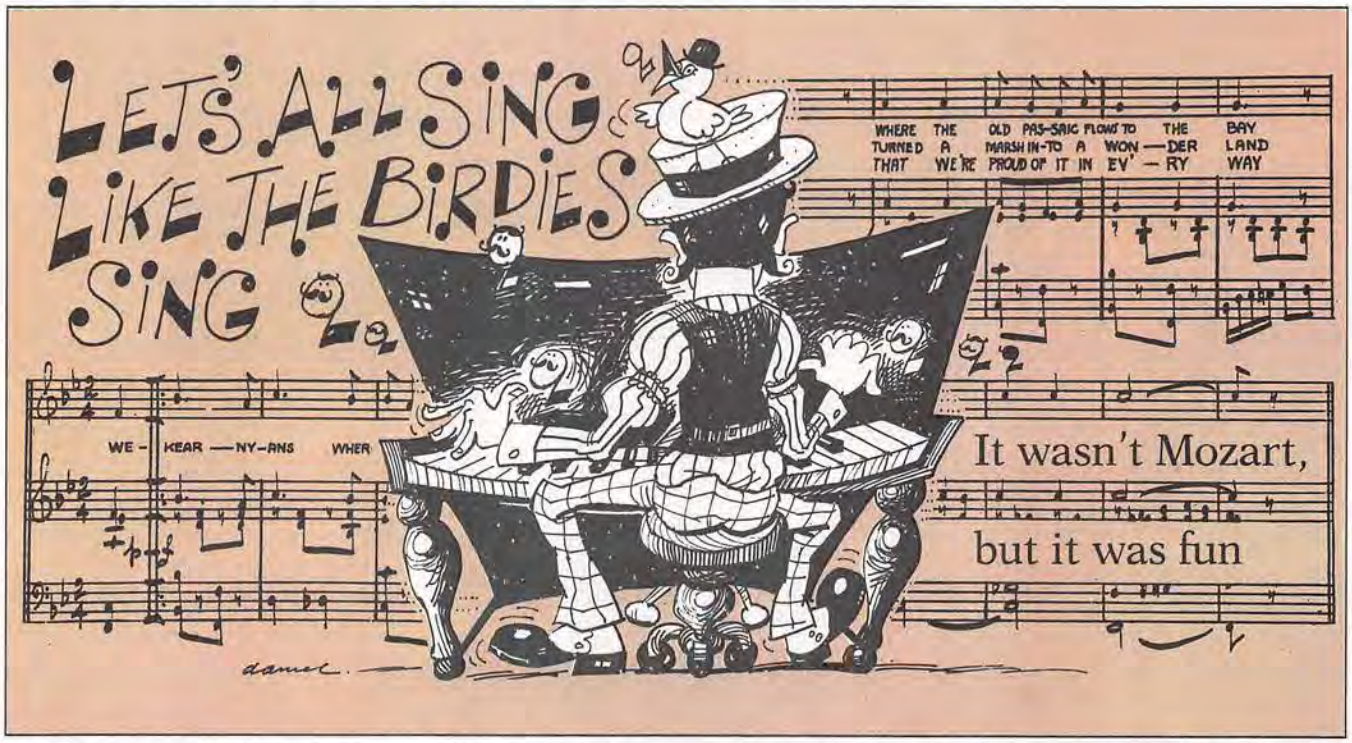
Looking at a Bell logo on a phone building facade, or at a sign sedately marking one of our WE locations, who would imagine its humble beginnings? From lowly sand and fiery metal, words and symbols are given shape to speak our name to all who approach. WE

We don't go in for community singing much anymore. Even at ballgames and service-club luncheons, the singing of the national anthem or *America the Beautiful* is usually performed by a professional — to luke-warm applause that often starts eight bars before the singer is finished.

We think it's a shame, because community singing in the old days was a lot of fun. Good, cheap entertainment.

What brings this up is a letter we received recently from John Boos, a senior engineer at Southwestern Region in Ballwin, Mo. Did we know, John asked, that Western Electric used to have its own song?

It was an intriguing thought even though it turned out to be not entirely correct. The song he sent us (see back cover) was actually published and copyrighted by the Hawthorne Club in 1931. The number



of copies actually sold in the depths of the Depression is not available in the archives. The music was by W. J. Ferguson and the words by R. H. Epstein, both Western Electric employees at the time.

Let us stand right up and loudly sing
To a tune that's bright and gay,
And let our smiles and laughter ring
As we shout the Charley way.
Oh! Hawthornites all hear the call
To each other rise and say:
We'll fight our might for Charley
In the good old Hawthorne way.

Chorus

Hello Charley Western in the morning.
Hello Charley every night.
Hello Charley in the springtime
When the sun is shining bright
Hello Charley in the winter.
Hello Charley in the fall.
Hello Charley is our password
Almost any time at all.

How the Hawthorne song came to be written is anybody's guess, but the reason may have been because Kearny already had one. "We Kearnyans," words and music by Henry Stricker, Jr., an employee, was written the year the plant opened.

We're from Kearny and we spend the day
Where the old Passaic flows to the bay.
Out where the cattails in the breezes sway
And where our hearts are always gay.

Chorus

Wekearnyans wherever we go
Always play the game.
We play it hard but we play it square,
As we make our bid for fame.
Proud of the name our vic'tries have won.
Proud of the strength with which it was done.
With all our might we fight.
We never give up.
We're out to win.
Wekearnyans.

It continues for several more verses, but we'll spare you that. It seems likely that Baltimore and maybe some of the larger distributing houses had their own songs too, but there are none in our files.

What we did find in digging into the archives, spurred by John Boos' query, was that just before and through World War I, community singing was very big in Western Electric. While we didn't have a theme song, like the one on the International Lady Garment Workers Union commercial, we did have an official WE toast:

Tune: "Old Gray Bonnet"

Come all and fill your glasses
With the wine that surpasses,
And we'll toast the good old W.E.
With our hearts rejoicing,
And our feelings voicing,
We will ev-er loy-al be.

We found the toast in an old WE songbook. There were lots of mimeographed songsheets without dates, but there were also printed booklets dating from 1913

to 1921, complete with company logo and a stationery supply number: 2 E-13-2-75. You could apparently order conference song books from stationery the way we order plastic binders or lined pads for a meeting today.

Most of the parodies in these books poke fun at the company's sales force. It would appear that the sales side of the house was more prone to song than the manufacturing side. Here's one from 1913:

The Salesman's Plea
Tune: "Take Me Out to the Ball Game"
Oh, please send me to Hawthorne,
Let me see them make phones.
Show me the switchboard and cable shop,
I'll walk 'round till I'm ready to drop.
And then let me eat at the Lunch Club,
With Talking Points fill my dome,
And I'll sell! Sell! Sell to beat Hell!!!
When I come back home.

All of this brings us back to our reader's questions. Why don't we have them anymore and how did we come to have them in the first place? Those are tough questions with deep social roots. It's only when you start digging that you come to realize how clear a mirror popular songs are of a particular period. They can tell you a lot more about the average person than a big thick treatise on national events. It's hard to believe now, looking back from the cynical '80s, but people back then really meant what they sang. While there may have been an element of fun, the sentiments were genuine.

From all we have been able to find out, community singing did reach a peak in this country during the second decade of this century. Groups met weekly — just to sing. These were informal groups — not an organized chorus or glee club, although there were plenty of those as well.

Singing was widely used at all types of gatherings — church socials and industrial meetings. It got people into a relaxed, participative mood. If people have their mouths open in song, they can't grouse about the arrangements. And a good fight song could rouse people to action, particularly if you had a good song leader. Here's a WE fight song from that era:

Tune: "Come, Josephine, in My Flying Machine"
Hark! to our slogan for Nineteen and Twelve.
It is this: "More Bizz!" "Larger Bizz!"
Sales without profit we'll cut off the docket,
But — "Get the Bizz!" "Lose no Bizz!"
Gauged by the op'rating ratio
We'll make good? Well, I should say so.
"Get Larger Business for Nineteen and Twelve."
Watch our sales — go up! Hooray!

Maybe it's easier to follow with a piano or guitar accompaniment. These parodies grew out of burlesque in the days before burlesque meant strip tease. In that era, burlesque just meant broad humor and exaggeration. Here's another gem:

Tune: "Capt. Jinks of the Horse Marines"
I'm Captain Swope of the Sales Commit'
I run this good electric ship.
I drive my men with the crack of the whip.
I'm Captain Swope of the Western.
Zip, bang, away we go
More coal, steam's low,
More speed — not so slow
That's the way I test em.

Gerard Swope was a vice president of Western Electric in charge of non-Bell sales from 1913 until 1918, at which point he resigned to become president of General Electric International and later of the parent company, General Electric.

Many of the songs in these old books had a patriotic flavor. Others were work songs — sea chanteys and river songs. They had lots of rhythm, simple lyrics, lots of repetition. You didn't have to be very good to follow along. One of the books, a relic of a sales conference on the West Coast in 1911, carries this note — honest:

"If you can't sing, make a sound like a seal."

Here's another from 1913 that has no musical tune for reference. Possibly they all knew it by heart

We hustle with a vengeance,
For "The Western" all the year.
And we don't let up a minute
That's the reason we are here.
So we'll lift our voices gladly
And with joyous hearts we'll sing
All the good old songs and some new ones,
Till we make the welkin ring.

We remember the declining days of the community-sing craze when we were growing up during the '30s. We sang in school assemblies. We sang around bon fires (which also have disappeared) for the "big" game. We sang in college dorms at supper time and at church socials. We also sang in the army during WWII. Every USO and base Rec Hall had a battered piano and hardly a night would pass, even in combat zones, when someone wasn't picking out "Melancholy Baby" and soon a group would be harmonizing to "Moonlight Bay" or the "Wiffenpoof Song."

I still sing in the shower and occasionally when I'm driving alone. To quote an old saying: "I sing beautiful, but it comes out rotten." Why don't we sing in groups any more? Your guess is as good as mine.

More stringent copyright laws are certainly a factor. You can be sued for mimeographing copyrighted music and lyrics without permission of the copyright owner. And if you have to go out and buy songbooks, the cost goes up. In the old days there was virtually no out-of-pocket expense in typing up songsheets.

The urbanization of America is probably another factor. Community singing, with its strong reliance on folk songs and work songs, has closer ties to the farm than to the suburbs. As a nation we have become more sophisticated. We have more money to spend on entertainment. We've become a nation of spectators rather than participants. And community singing has been one of the victims of that trend.

Finally, they just don't write songs like that any more. Here's one last one — from the good old days:

E yip I addy I ay, I ay,
E yip I addy I ay,
We don't care what the deal may be
We're there with the goods for the W.E.
E yip I addy I ay, I ay,
We all feel like yelling hurray, hurray!
Oh, the Western stands pat
And we're all glad of that
Yip I addy I ay.

G.G. WE

20 Questions

WHAT DO YOU KNOW ABOUT BENEFITS?

ANSWER TRUE OR FALSE

1 You've been employed by Western Electric for six years. You suffer a hernia and are out for a total of nine weeks. You receive full pay for all the time you are out, in addition to payments for most of the charges for hospital and medical care.

2 If you are eligible for a service pension, but die before filing any retirement papers, your spouse receives a death benefit, but loses all claim to your pension.

3 If you should die as a result of an on-the-job accident, your beneficiary would receive a benefit equal to three years' pay.

4 An employee's wife went to the dentist for the first time since her coverage became effective. As a result of the examination, which the plan paid for in full, she had to have 10 teeth filled—for which the dentist charged $190. The plan paid $59; she had to pay $131.

5 You need 10 years' service to get three weeks vacation?

6 If the dental bill for any one member of your family exceeds $500 of covered dental plan benefits, during a given year, the Company will pay up to that amount and no more, regardless of circumstances.

7 No matter when you enroll, group life insurance requires no medical examination for employees on roll.

8 The maximum lifetime benefit payable for orthodontia is $1,000 for each eligible individual.

9 You take early retirement. You have to pay the premiums on your health insurance until you pass age 65, at which point you come under the medicare supplement expense plan.

10 The health insurance plans take care of most expenses when you have a medical emergency.

11 There is no provision in the benefit plan for insuring the life of a spouse or dependent child. That you have to do on your own.

12 You suffered a mild heart attack on the Sunday before you were to leave on a two-week vacation and were rushed to the hospital. Although you were brought home in a few days, you had to rest and could not go on the planned vacation trip. Since you started on vacation at the close of business on Friday, you lose your vacation.

13 Your son has been seriously injured in a motorcycle accident and needs a blood transfusion. The blood can be obtained free of charge from the WE blood bank, even though you haven't previously contributed blood to it.

14 When you were a kid, your nose was broken in a football game and it wasn't really set properly so that it's now a little crooked. The health insurance plan will pay your hospital and medical expenses if you want to have it straightened.

15 You have an unmarried child age 20 who is a full-time student. He or she can be included under your basic hospital surgical-medical coverage until the end of the year of the 23rd birthday or upon termination of studies.

16 After you retire and pass age 65, you're on your own as far as paying for any health insurance over and above Medicare.

17 When you retire, your hospital and medical insurance stops at the end of the following month.

18 The LTD (long term disability) plan applies only to management employees.

19 You are age 40 and your annual salary is $16,220. You pay $3.40 per month for additional supplementary insurance which provides you with $34,000 of life insurance coverage under the company group life insurance program.

20 Only your spouse may be named as a beneficiary to your group life insurance.

ANSWERS

1 True. If you are absent from work because of illness or an off-the-job injury for longer than seven calendar days, benefits start on the eighth calendar day of absence based on your service. In your case, you'd receive full pay for up to 13 weeks, half pay for the next 39 if you are out that long.

2 False. If you have completed 15 years service and leave a surviving spouse, an automatic survivor annuity will be paid monthly to the survivor for the remainder of his or her life in the amount of one half the computed pension reduced by 10 percent (computed as though a survivor annuity had been elected).

3 True. The company would also pay *two* times your basic group life insurance coverage. Your basic coverage is equaled to your annual pay rounded to the next higher $1,000. In addition, the company would pay up to $500 toward funeral expenses.

4 True. Fillings are Type B services and are paid under a schedule. The schedule allowed $109 (for 14 surfaces), but it was necessary for the patient to satisfy a one-time $50 deductible. All future claims will be paid without the deductible as long as the employee remains continuously employed by the Bell System.

5 False. Effective January 1, 1981, employees with seven years of Bell System net credited service became eligible for three weeks vacation.

6 False. Effective January 1, 1981, the maximum calendar year dental benefit was increased from $500 to $750 for each employee and eligible dependent.

7 False. Your insurance is effective the day after you complete six months' service and have enrolled. No medical examination is required unless you delay enrolling for supplementary coverage more than 31 days after becoming eligible. In that case, supplementary coverage will not become effective until you provide evidence of good health satisfactory to the insurance company.

8 True. This maximum is separate and distinct from the plan's $750 calendar year maximum.

9 False. While you are a regular employee—and after you retire with a service or disability pension—you and your eligible dependents continue coverage under the company health insurance plans.

10 Generally, this is true. The plan pays the hospital in full for medical emergencies within 72 hours after the onset of sudden and serious injury, such as asthmatic attack, stroke, convulsions, shock, acute coronary, hemorrhage, coma or severe nose bleeding.

11 False. Effective July 1, 1981, enrolled employees will be eligible to purchase life insurance coverage for spouses and dependent children for $5,000 and $1,500 respectively. The total cost to the employee will be $1.80 a month regardless of the number of individuals covered.

12 False. You would be placed on sickness disability benefits as if you had been working and vacation would be rescheduled. Should the illness occur in one year and continue into the next year vacation will be rescheduled provided you were able to return to work before April 1 of the following year.

13 True. Whenever you or your eligible dependents require blood or blood plasma for transfusions, the blood processing charge made by many hospitals for blood that is provided through a community blood program or a recognized blood donor program—such as the company blood bank—will be covered under your insurance plan.

14 True. Hospital and Surgical-Medical benefits are available when cosmetic surgery is required as a result of trauma (such as a football injury), infection or other disease of the involved part. Also to correct birth deformities or a functional defect resulting from congenital disease or anomaly.

15 True. Unmarried full-time student children under 23 years old will continue eligibility under the health insurance plan. Unmarried dependents age 19 and over who are full-time students may maintain coverage under the plan as a sponsored dependent. Employee will be required to pay the full premium through payroll deduction. Sponsored coverage is available through end of year that child attains age 23.

16 False. The company provides Medicare supplementary health insurance over and above Medicare coverage for retired employees age 65 and over, and eligible dependents age 65 and over of active and retired employees.

17 False. At and during retirement your hospital surgical medical coverage and major medical coverage continues without interruption. Retirees enrolled in HMOs (Prepaid Plans) may also be able to continue the HMO coverage they had as active employees.

18 False. LTD provides additional benefits to both salaried and represented employees with six or more months of service.

19 True. The company pays the full cost of your basic coverage, which is your annual basic pay raised to the next $1,000. You pay 20¢ per month for each $1,000 of supplementary coverage or $3.40 per month. As an option to this supplementary coverage which is equal to your basic coverage you may purchase *additional*, supplementary insurance equal to one half or one times your basic coverage.

20 False. You may name as your beneficiary any person, or your estate, or any association legally entitled to hold property, or any corporation except Western Electric. You may name more than one beneficiary if you wish, and you may change your beneficiary at any time by completing a form for that purpose.

RATING

19-20 Sure you didn't peek? **15-18** Admirable
10-14 Average **Under 10** Better study your pamphlets

Architect's rendering of our new facility in Orlando.

OUR NEWEST

On May 15, 1980, Don Procknow announced that Western Electric had signed an option agreement to purchase 350 acres of land in Orange County, Florida near the city of Orlando. The actual purchase took place in January 1981, following agreements among Western, Orange County, the State of Florida and the EPA on the utilities and services we would require.

A 700,000-square foot plant will be built on the site to manufacture very large scale integrated circuits (See "VLSI," page 2). The plant is expected to be completed by early 1983 and will begin production in 1984. It will be a campus-style complex of five buildings, all single story except for a three-story office building.

Why Orlando? Paul Matt Jr., General Manager, Corporate Engineering, Plant Design and Construction, explains: "We were attracted to Orlando by the labor pool, the excellent air and ground transportation and the educational facilities."

In his announcement of the purchase, Mr. Procknow went further: "We like Florida, we like the Orlando area and what it has to offer, and we like the enthusiasm of the people here. We're looking forward to a long and mutually beneficial association."

The enthusiasm he touched on is so intense in Orlando it is probably deserving of another, stronger word, and nobody in this sunny city doubts that the association will be mutually beneficial.

Jim Harris, County Administra-

The two biggest things that ever happened to Orlando are Disney World and Western Electric

Photos by J. Walter Miller

HOMETOWN

tor for Orange County is happy to tell you why: "The two biggest and best events in Orlando's history have been Disney World and Western Electric." Voluble, yet soft-spoken, Harris is not given to hyperbole. When he says that Western Electric's move down to Orlando is the biggest and best thing to happen since Walt Disney opened his fantasy land ten years ago, you know he means it. Since

Left — Western Electric was big news in Orlando, and suspense ran high until all papers were signed. Right — Jim Brown, President of Orlando Central Park looking over Western's newly acquired site.

almost everyone else you talk to says some variation of the same thing, you also know the whole town means it, too. It's partly our good neighbor reputation preceeding us. It's also a question of economics and the area's future.

Metropolitan Orlando pretty much exists on tourism. In the year 10 A.D. (After Disney), it has the largest aggregation of tourist attractions in the world and attracts the largest number of tourists. Fourteen million people visited Disney World last year. Hotel/motel rooms have grown from less than 5,000 in 1969 to well over 32,000 today. Not surprisingly, 50 percent of the local work force are in the service/tourist industry. According to Harris, this staggering figure will rise to an even more staggering 65 percent by the year 2000 if present trends continue. This is more than twice the national average.

"And that," says Harris, "is a lot of eggs to put in one basket. What's more, it makes us vulnerable to gasoline crunches like the one in 1973. So we decided to make a major effort to attract clean light industries. Western Electric is the bellwether of that effort, and we expect others to follow your lead."

Harris notes that Florida was able to attract 72 companies in 1980. But all of them together don't add up to Western Electric in terms of size, money and employment."

"We really wanted you," he adds, "and we did a couple of things to attract you that were never done in the history of Orlando."

One of those things was to dedicate funds to extend an access road to the Western Electric site. The state will put up half the money and the County Commission will put up the other half.

The second thing done was to guarantee Western Electric two-million gallons a day of effluent into the local sewage and water treatment facilities. This entailed an enormous amount of cooperation between state, local and even federal agencies.

It also required a lot of good will. "You know," says Harris, "I've made nearly a hundred speeches since it all started, and I've never heard a single critical comment or question about your folks coming down here.

"This is a watershed event," he adds as we take our leave. "Orlando will never be the same again. It will be better."

Jim Bullion, Executive Director of the Chamber of Commerce

"It used to be called Rattlesnake Lake, but we had to change the name ..."

echoed Harris' enthusiasm. "I think it's fantastic!" he said and added an interesting sidelight. He expects Western Electric and the companies that follow to help end what he calls the "Orlando Brain Drain."

"We raise a lot of bright kids here, and, after we educate them, they don't have any place to go. Now our kids won't have to leave Orlando for High-Tech employment."

The education Bullion refers to can be pretty extensive. Nearby University of Central Florida has grown considerably since it opened its doors to 184 students in 1968. Enrollment is now over 1,600 and the school offers both undergraduate and graduate courses in many engineering disciplines as well as the liberal arts. The area also has several other four-year and two-year colleges as well as over 100 elementary, junior high, private and parochial and high schools.

Many people have come here to retire, while many others have come down impelled by the incoming tide of new industries. People who have been here for a while are proud of it and even tend to be a little proprietary about the area's many advantages. One old timer, noting my New York subway pallor, told me to help myself to some sun. As he started to walk off into palm-lined Eola Lake Park, he turned and, apropros of nothing, said with obvious pride and a thin New Jersey accent, "I've been here since 1953." A real native!

One of the few genuine natives we talked to was newly elected Mayor Bill Frederick. Like Orlando itself, Frederick is young, attractive and friendly. Even before being elected, he was deeply involved in solving the sewage problem and spoke to several people about it, including some of former President Carter's men. A forward looking man, he finds the prospect of Orlando becoming another "Silicon Valley" very appealing. "When I was growing up around here," he says, "agriculture was runaway the biggest industry we had—tomatoes, oranges, grapefruit and things like that."

As for Western Electric's coming down, he became a little more formal: "Western Electric's move foreshadows a major change in the economic structure of this community. It suggests a major change away from yesterday's tourist-oriented form to one emphasizing clean, high-tech industry. It represents a welcome diversification that will yield great benefit to the working people of Orlando."

"Orlando is a big city," says Roy Harris, Executive Vice President of the Industrial Development Commission of Mid-Florida, "but it is still basically a small town. You can go anywhere in the Orlando area in about 20 minutes, so a person can work and live anywhere he wants.

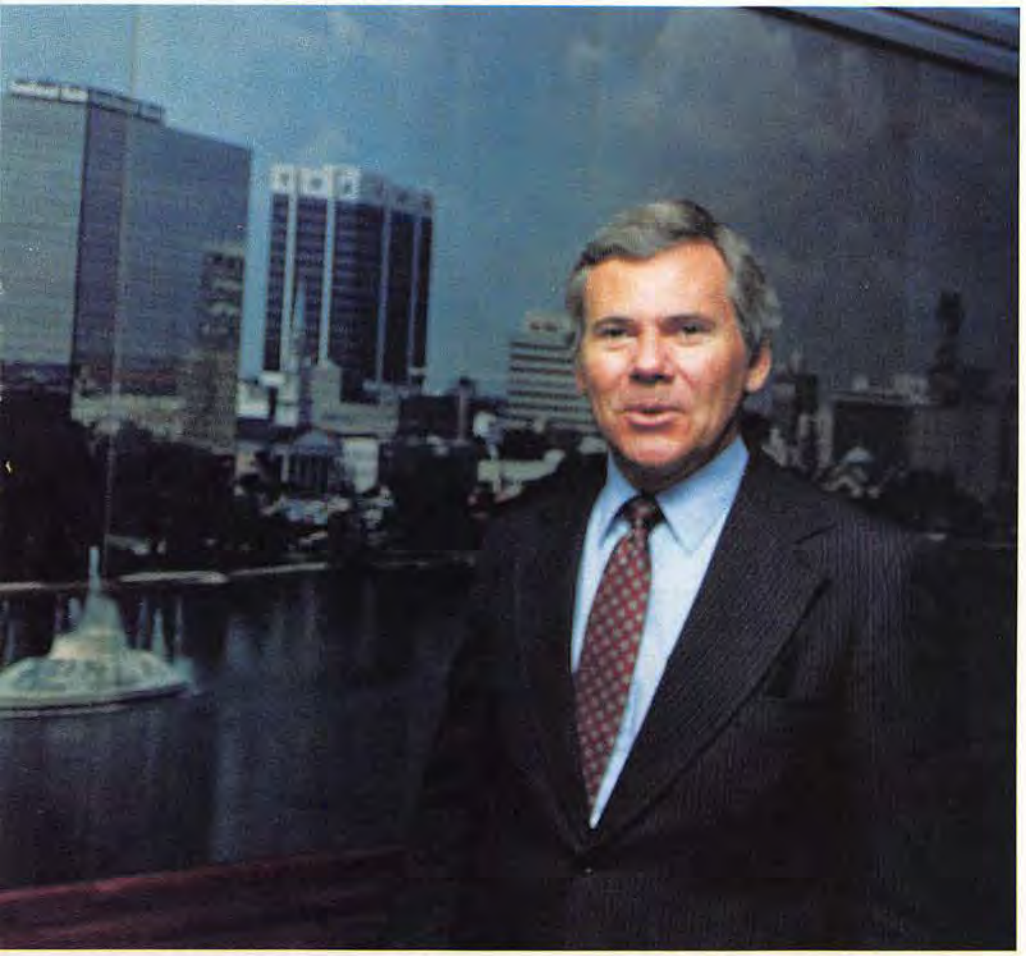
Orlando's history wouldn't fill a library, but it does have a little. It was a campground for soldiers during the bloody Seminole Indian War of 1835 to 1842, and its name probably goes back to that period. According to one account, the city was originally called Orlando's Grave in memory of young Orlando Reeves, a sentry killed by raiding Indians as he stood watch one night early in the war.

In the fifties, Orlando started to grow along with the John F. Kennedy Space Center at Cape

Canaveral 50 miles away. Electronics, engineering and defense manufacturing firms, including Martin Marietta began moving into the area. In 10 years, the population doubled, making Orlando the fifth fastest growing metropolitan area in the country.

The real boom began in 1971 with the opening of the 43-square mile Disney World 20 miles southwest of Orlando. Larger than Manhattan Island, this self-contained world entertains over 1-million visitors a month, employs approximately 13,000 people and spends over $1-million every week for goods and services.

About seven or eight miles east of Disney's Magic Kingdom is the Western Electric site. It is situated in one corner of a 4,300 acre development known as Orlando Central Park. Jim Brown, a native of Dallas "and proud of it," is President. He has a wry sense of humor, all offered deadpan. Pointing out his office window to lovely Lake Ellenor, he says, "It used to



takes you South to Miami in 4½ hours, and the Beeline Expressway takes you directly to the East Coast and Kennedy Space Center in less than an hour.

The Western Electric site is even more centrally located. It is two miles east of SeaWorld, eight miles east of Disney World, five miles west of Orlando International Airport and seven miles southwest of downtown Orlando. S.F. WE

Left — Against panoramic view of his city's skyline, Mayor Bill Frederick talks about Orlando. Below — Roy Harris, one of the men who helped clear the way for Western Electric, offers a lesson in local geography.

be called Rattlesnake Lake, but we had to change the name to attract customers." It could also have been called Alligator Lake, because these long-snouted reptiles are also here.

Not that Orlando Central Park is all wilderness. Some 1,200 of its 4,300 acres are already occupied by 350 companies employing more than 10,000 people. None of this growth has been helter skelter. Jim Brown and his Orlando Central Park have won a number of awards for planning, landscape beautification and environmental concerns. "But," he says, "the real award is having companies like Western Electric come down."

The park's popularity is at least partly due to its location virtually in the center of the state. It is bordered and crossed by four of Florida's major highways. Daytona Beach on the East Coast and Tampa to the West are only a 60 and 90-minute drive via Interstate 4. The Florida Turnpike, which bisects Orlando Central Park,

Of Parking, Pools and People

By Clay McLean
Photo by Marty Labno

It took some effort, but Hawthorne's car pool program is a huge success

The Hawthorne Works has a ringside seat when it comes to public transportation. It is served by 10 city and suburban bus lines, sits across the street from a subway-elevated line, and is a short walk from a Burlington Northern Railroad commuter station.

Still, nearly one-third of its employees participate in Hawthorne's car pool program—one of the Company's most successful.

With so much public transportation so readily available, it would appear unlikely that Hawthorne would even *want* to back a pool program, let alone *need* one. Yet, Hawthorne's employees, much like the rest of America, have found it difficult to kick the automobile habit. Consequently, the plant's parking lots were assigned beyond capacity and employees found themselves on waiting lists that contained over a thousand names.

Hawthorne management began to deal with the problem in the late 1960's when its work force was larger than today. Surveys indicated that its two largest parking lots were overwhelmingly—75 percent and 90 percent—occupied by vehicles that carried only one person to and from the premises.

Of course, gasoline then cost less than 50 cents a gallon and few people fretted much about the possibility of shortages. Several attempts to encourage car pooling to solve the space problem and reduce pollution fell pretty much on deaf ears. Employees who already had been assigned parking privileges were content, and everybody else seemed to blame pollution on everybody else.

Undaunted, Hawthorne's Plant Security organization decided to try the "scratch my back and I'll scratch yours" approach to the problem. The Company's scratch: we'll restripe the parking lot, which will provide more parking spaces. Among them, we'll dedicate some of them solely to car pools. Employees, in order to use those spaces, would have to create car pools of at least four persons.

Within that second scratch lay the rub: few employees were interested in rounding up three other people, so car pool spaces went begging. That created the awkward situation of having employees on waiting lists for parking spaces while pool spaces stood vacant.

So, it was back to Square One. Hawthorne management had begun to ask itself what it would take to convince employees of the wisdom of car pooling. In mid-1974, a couple of events proved to be fortuitous in providing an answer. First, the Arab embargo of oil shipments occurred, causing shortages that led to nerve-wracking lines at gas stations and wallet-emptying rises in fuel prices. Second, an expanse of land on the Hawthorne tract was available when some manufacturing buildings were razed.

The Works management decided to build a 350-car parking lot on the site. Among those spaces would be a bloc dedicated to car poolers. The trickle of requests grew to a dribble as some conservation-minded employees began to see the light.

Still, Hawthorne employees were not showing the interest that management had hoped for. Massive publicity, the offer of premium parking spaces to car pools—nothing worked. Something was missing.

In 1975, Hawthorne dismantled its foundry building, literally paving the way for another 350-car lot —with 130 designated car pool spaces — to open in 1976. At the same time, slumping business conditions reduced Hawthorne's work force to below 9,000. The two events combined to ease the parking snarl, but did not alleviate it. And, while the addition of 130 new car pool spaces in a highly desirable area on the tract should have been a plum for employees, they largely went begging. There was still a waiting list for employees who wanted to park in company

This view of Hawthorne's newest parking lot clearly shows one of the Works' early problems. The rear portion of the lot is filled to capacity while dedicated car pool spaces (center left) await assignment.

lots, but the car pool program had to be more successful to accommodate them.

The turning point was the spring of 1977, when the Public Relations and Plant Security organizations hit upon the idea of matching employees who might wish to begin car pools with like-minded coworkers who live near them. This concept was embodied in a "Car Pool Ride Board," a regular feature in the Works' monthly publication, the *Microphone*. Employees were asked to provide their work and home locations, and indicate what shift they worked. This was to be accompanied by a work phone number where the employee could be reached. Thus, other employees who lived in their general vicinity could contact them, and they would in turn approach the Plant Security organization for a car pool parking sticker.

At the same time, Hawthorne management decided to re-examine its four-per-car requirements for pool privileges. It was determined that maybe three was a more desirable number.

With the easing of that qualification, along with new poolers created by the Car Pool Ride Board, Hawthorne's program made substantial progress. In fact, through 1980, more than 200 messages have been printed in the *Microphone*.

Today, the plant employs some 7,000 people, yet more than 2,000 are presently in car pools ranging in size from three to seven persons. Less than 50 await assignment in pool parking spaces, and most of those await vacancies in a specific lot.

Works management estimated that car poolers and mass transit riders make up 50 to 60 percent of its work force. Even so, Hawthorne is continuing to look for ways to increase ridesharing among its employees. WE

1881
STAGER'S YEAR

ANSON STAGER

When General Anson Stager died in 1885 in Chicago, the *New York Daily Tribune* devoted a full column on the front page to his passing. Then as now, front-page obituaries were unusual. It only helps to point up that he was a celebrity of national significance.

Although it rated only a short phrase in his obituary, from 1869 until 1881, Stager was the principal owner of the business that became Western Electric. He had the title of President; however, he drew no salary and had no office on company premises. The operating head of the business, who had various titles until he became president in 1886, was Enos Barton.

Barton is generally regarded as the founder of the business, and its guiding spirit during its first half century. But Stager made extremely vital contributions to the business, particularly during 1881.

Anson Stager was a man of many parts; one of them was Western Electric

In order to put those contributions in perspective, a brief review of the company's early years may be in order.

In the fall of 1868, Enos Barton was a 26-year-old telegrapher, in charge of the Western Union office in Rochester, N.Y. Western Union was an industrial giant, even then, but it was having financial problems. The country was experiencing a recession.

As part of its cutbacks, Western Union was getting rid of a repair shop it operated in Cleveland. The company had two other shops — one in Ottawa, Illinois, and another in New York City. The manager of the Cleveland shop, one George Shawk, had bought the equipment and started an electrical supply business. Earlier he had patented a burglar alarm, which he hoped would make his fortune.

Shawk was a good craftsman but uneducated and rather frightened at being on his own. He was looking for a young partner with sales skills and some money. Barton was the man he settled upon.

As part of Western Union's financial cutback, Barton had been told that his pay was going to have to be cut 10 percent. This was rather a blow to a young man planning to get married. It was, in fact, the

straw that broke the camel's back.

He had some money saved up for his marriage and his mother mortgaged the family farm to provide another $400. In all, he paid $1,300 for a half interest in Shawk's business. The first ad for the new firm, Shawk and Barton, appeared in the January 1869 issue of the *Journal of the Telegraph.* The precise date of the start of the new business is not available in the archives, but it seems reasonable that it was January 1.

The major customer of the young firm located on the top floor at 93 St. Clair Street was a professor Elisha Gray. Gray was an inventor and the bane of Shawk's existence. Gray wanted the workforce, which numbered about six men, to devote all of their time to building models for his inventions — on speculation. Shawk was sure that Gray was going to bankrupt them. And he wasn't far wrong.

In the spring, Shawk decided he had had enough. He sold his half of the business to Professor Gray. To get the money to buy his way into the business, Elisha Gray had gone to Gen. Stager, at that time one of Cleveland's leading businessmen. He was General Manager for Western Union in all of the country except the East Coast. He had been Abraham Lincoln's chief communications officer during the Civil War as head of Military Telegraphs and he had been a key figure in making the telegraph a national service.

Stager is the man who talked the railroads into allowing the telegraph company to use their right of way for their pole lines. He also persuaded them to allow telegraph construction crews to travel by train to worksites free. In return, the railroads got to use the telegraph.

Elisha Gray had invented an automatic printer for the telegraph. He sold an interest in his patent to Stager for several thousand dollars, which he used to buy out Shawk.

By mid-summer, Shawk's warnings proved correct. The two young men, Gray and Barton, were broke.

To try and find a way out of their dilemma, they called on Gen. Stager again to try to sell him some other inventions. Stager came up with a counterproposal: If the young men would move their business to Chicago, where he was being transferred, he would become a silent partner. He had confidence in Gray's inventiveness and he knew young Barton as one of the best telegraphers in the country.

ENOS BARTON

The young men quickly agreed. It was a bonanza for them to move in one step from virtual bankruptcy to affiliation with one of the richest, most successful businessmen in the country. In August, Stager advanced them $500 to rent a shop in Chicago. Barton took a little time off in November to get married, but before the end of the year they were permanently settled in the windy city. But they continued to lose money and Stager continued to bail them out — to the point where he soon owned 70 percent.

The young firm got a big boost in 1871. It had escaped the great Chicago fire and helped provide electrical supplies for the rebuilding that immediately followed. Western Union was cutting back further on its repair operations, and the Ottawa Shop in Illinois, a facility not unlike the one that Gray and Barton started in, came on the market. Unlike the Cleveland shop, however, Ottawa had more up-to-date equipment and some valuable telegraph designs.

A plan was worked out by Norman Williams for the establishment of a new firm to be called the Western Electric Manufacturing Company. According to Williams, a young attorney who handled legal matters for Stager, the new firm would consolidate the Ottawa Shop of Western Union and the downtown Chicago shop of Gray and Barton. Following the merger, the new firm would take over the entire supply and repair business for Western Union in the Western part of the United States.

Western Union was to receive a third of the stock of the new company, in payment for the Ottawa shop. The investment was carried on their books as worth $35,000. Stager would get a third and the rest would be held by Gray, Barton and a number of Western Union office managers in various cities from Pittsburgh to St. Louis.

The business was located in a small section of a building on Kinzie Street in Chicago which Gen. Stager had put up on speculation after the fire of 1871. Soon, it added a street-floor shop and a basement. In a very few years, WEM occupied the entire building and purchased it outright from Gen. Stager.

Most of this success took place before the invention of the telephone in 1876. In fact, Elisha Gray left the business about 1874 to work on his own version of the telephone. His part in business was acquired by Milo G. Kellogg, son of the man who provided the mortgage money that got Barton started.

Most of the company's business during those early years in Chicago came from Western Union. There was also some business in signaling equipment for the railroads, burg-

lar alarms, gas lighting for theaters and annunciators for hotels and large private residences.

In the summer of 1877, Stager was one of the first men that Gardner Hubbard, Alexander Graham Bell's backer and father-in-law, approached in trying to sell the telephone. Stager turned it down and later kicked himself: "They wanted $100,000," he is reported to have said, "and I probably could have gotten it all for $75,000."

But Stager soon had his own company, Western Electric Manufacturing, working on an "improved" telephone, using inventions of Elisha Gray, Thomas Edison and George Phelps. By the end of 1878 not only were they making phones but also switchboards, and two young men from Western Electric, Francis Welles and D. H. Louderback, were traveling the Midwest, setting up telephone operating companies in major cities. In most of these companies, Stager was listed as president and a major shareowner.

In 1879, the Bell interests in Boston brought suit, for patent infringement against Peter A. Dowd, who was setting up telephone companies in Massachusetts with the backing of a Western Union subsidiary.

This was the first of some 600 suits involving the Bell patents over the next 18 years, but in many ways it was the most important one, although it was settled out of court. Practically everybody in American Bell and Western Electric was called upon to testify, including Bell, Hubbard, Watson, Stager, Barton and Gray.

Both Elisha Gray and Alexander Graham Bell had filed for a patent on a telephone only hours apart on the exact same day. Although neither one at that moment of filing had a working model of his invention, they filed different forms. Bell filed a normal patent application while Gray filed a caveat or notice of intent, which is no longer used.

Largely on the basis of the technicalities, the Western Union lawyer recommended that his company settle the suit and withdraw from the telephone business.

A committee was set up, including Gen. Stager among its members, to bring about a consolidation of the telephone companies owned by Western Union with those of American Bell. The settlement came late in 1879 and the actual consolidations during 1880.

One of the largest of the new consolidated telephone companies

ELISHA GRAY

was Chicago Telephone, formed from Stager's American District Telegraph Company and the Bell Company located across the street. Anson Stager was named president of the new firm.

He was also within a short while, simultaneously president of Southern Bell, Western Edison Electric Light, and the Central Union Telephone Company, made up from the small Western Electric backed operations in Iowa, Illinois and Indiana. However, at the beginning of 1881, he was still vice president, a director and General Manager of Central Region for Western Union, but that career was fast drawing to a close.

At the same time that the Dowd case was underway in Massachusetts, Western Union was battling a competing nationwide telegraph company that had been formed by financier Jay Gould. Gould was a much more formidable opponent than the young telephone company. He and William K. Vanderbilt, the controlling stockholder in Western Union, had been battling each other for years.

There is some evidence to suggest that one reason for the rather hasty settlement of the Dowd case was a rumor that Gould was buying up Bell franchises in an attempt to gain control of the telephone business and the out-of-court settlement might keep Gould out of the telegraph business. The famous settlement of 1879 was a two-way street — not only was Western Union forced out of the telephone business for the duration of Bell's patents, American Bell was shut out of the telegraph business for the same period.

The behind-the-scenes battle for control of Western Union had been going on all through 1880, and in January of 1881, Vanderbilt decided he had lost enough. He called Gould to his newly completed mansion on Fifth Avenue in New York and told him he was withdrawing. Over the next few months he sold off all of his stock and much of it was acquired by Gould and his close associate, Russell Sage.

Anson Stager, who had been Vanderbilt's chief lieutenant in the West, resigned as vice president and director of Western Union, but he was left in the rather awkward position of having one of his companies, Western Electric Manufacturing, still controlled by Western Union.

This brings up another thread in the fabric. For several years, Theodore N. Vail, general manager of American Bell, had been attempting to standardize central-office equipment so that offices in one town could be joined together with those in other towns. At this time there was no long distance service. Telephone service was provided by a franchise holder in a

relatively small area, although some of the company names were very grandiose.

Charles Williams in Boston, whose Mr. Watson had built Bell's models and assisted in the early experiments, was a relatively small shop. They had put on more hands, but they had neither the manpower nor financial resources nor technical know-how, to supply all of the central office gear needed all over the country.

Although American Bell's stock had risen sharply in value following the Western Union settlement, they also lacked the know-how and cash needed to establish a large manufacturing firm.

Stager's company, Western Electric Manufacturing, with plants in Chicago and New York, was 10 times the size of Charles Williams in terms of employment. In the spring of 1881, it acquired Gilliland Electric in Indianapolis, which was probably the next largest electric firm in the country at the time. Gilliland had a license to manufacture certain products for Bell franchise holders. It's not certain whose idea it was, that American Bell acquire Western Electric Manufacturing, but some old letters in the archives imply that it was Theodore Vail.

It fell upon Stager, however, to get Western Union to agree to sell. He did this, not without some grousing, in the late spring of 1881. At the time, Western Union was involved in another major court battle that was making headlines as one financial titan after another testified.

In fact, Western Electric Manufacturing, was relatively small potatoes, compared to the millions of dollars involved in the lawsuit. WEM was now on the books as worth $50,000. American Bell offered $150,000 for it and the offer was accepted. During one of the worst heat waves in New York's history, Vail traveled to New York with a satchel full of cash and came back home with Western Union's 1,000 shares of WEM.

No mention of the purchase ever made the press. Western Union's president, Norvin Green, had requested that nothing be said until he informed his Board. But a few days later, President Garfield was shot and this swept everything else off the front pages for the rest of the summer—even the spectacular telegraph lawsuit. Dr. Green was happy for the respite from the publicity spotlight.

Part of the agreement between

THEODORE N. VAIL

Vail and Stager concerning Western Electric was that American Bell would go into the deal only if it could be assured that it would have control of the supply company. While the 1,000 shares of Western Electric Manufacturing Company that they had acquired from Western Union gave them a substantial interest, it was not yet controlling.

The control was provided by setting up a completely new company, to be formed by merger of three firms. Since the plan bears a strong resemblance to the one drawn up by Stager's attorney, Norman Williams, for the original WEM, it seems likely that Williams designed the second one also.

In the spring of 1881, American Bell acquired an option to buy Charles Williams, Jr., the Boston firm that supplied Bell telephones. Western Electric Manufacturing had acquired a 61 percent interest in Gilliland. The proposal was that the three concerns be merged and that, in exchange for exclusive rights to supply the franchised Bell companies, 20 percent of the stock of the new company would be given to American Bell.

In August 1881, Stager sold 200 shares of his own stock in WEM, to American Bell and it was these shares that gave Vail the control he desired. Now, there was no way anyone else could acquire control.

The organization of the new company was discussed through several drafts going back and forth between Chicago and Boston during that long hot summer. The complications centered around a number of patents that Western held. Western was also involved in another way with some of the same people in setting up a telephone factory abroad.

Ezra Gilliland, whose plant WEM had acquired in Indianapolis, was in Antwerp, Belgium, negotiating with International Bell, whose principal stockholder was Gardner Greene Hubbard, Bell's father-in-law.

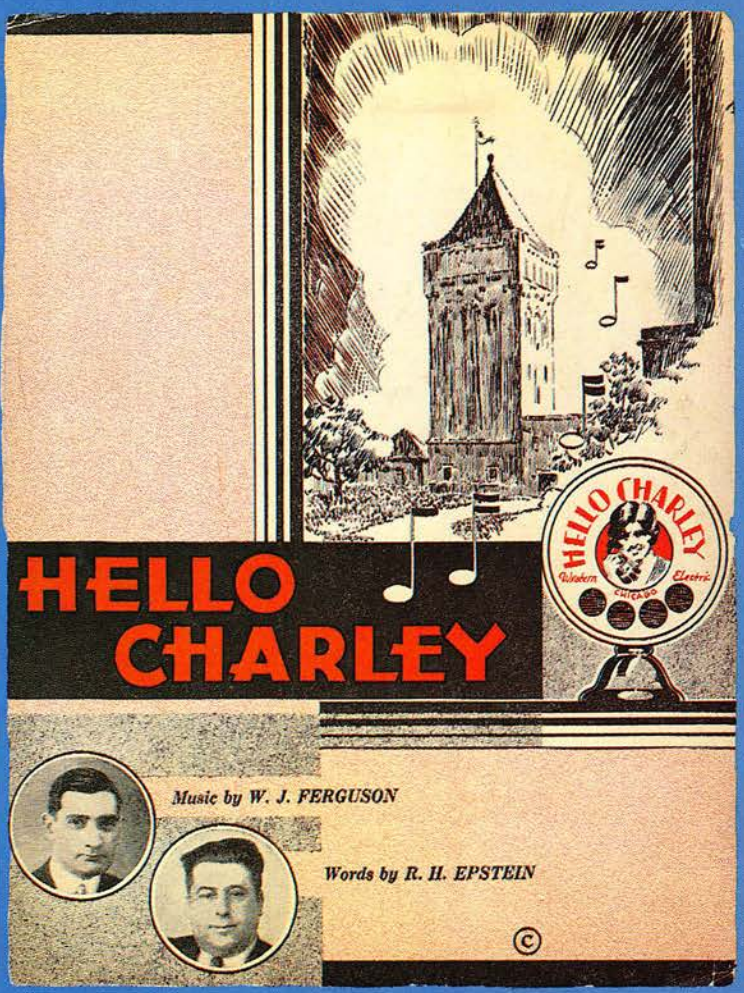
Both struggles came to a conclusion around the same time. The new company, Western Electric Company (Illinois) was incorporated November 26, 1881. At the Board meeting on December 10, Stager was formally elected president; Barton, vice president; and Stafford Lynch, a Stager associate from his Army days, was secretary. At the same time Francis Welles, the young man who had set up WE telephone companies in Iowa, Illinois and Indiana, and who introduced the phone in Australia, left for Europe to become manager of the new plant in Antwerp.

All of this was prelude. On February 6, 1882, the new firm signed the manufacturing contract that made Western Electric the sole supplier of approved equipment to the telephone companies. WE

Dust off your piano, clear your throat and let's go back in time for some rousing Western Electric "fight" songs. Here's a sample:

We hustle with a vengeance
For "The Western" all the year.
And we don't let up a minute;
That's the reason we are here.

That's what they were singing at some Western Electric locations in 1913. If you don't believe it, turn to page 20.



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