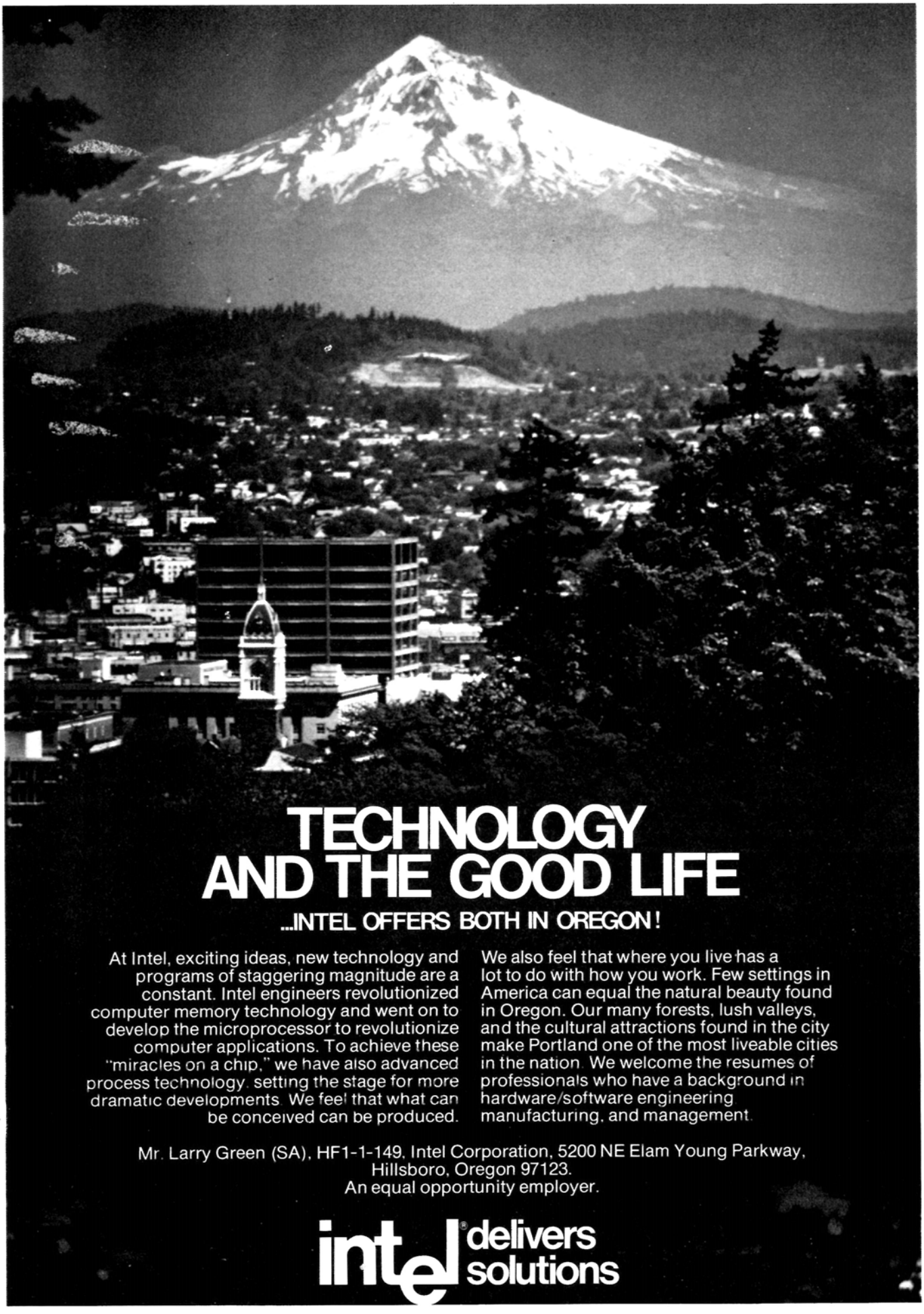

TECHNOLOGY AND THE GOOD LIFE

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Almost to its surprise, Oregon, goal line of the great westward migration, is emerging as a high technology province.

Oregonians are still alive who entered the state in canvas-roofed ox wagons. Oregon Trail ruts still furrow some eastern counties; grooves still scar standing Douglas fiq trees, burned when Conestogas were snubbed to them, roping down the Cascades.

A state with a dozen wilderness areas, in the west it has forests to the high-tide mark, and in the east, mustang overpopulation. It is defined by the Pacific Ocean, the volcanic Cascade Range, and the violent Snake and rolling Columbia rivers.

And in the four of its counties, electronics is the business of the biggest employer.

World technology is measured and shaped by the instruments streaming from Tektronix shops. The computer industry watches introductions of Oregon-designed, Oregon-built Intel microcomputers as if they were moves in a world championship chess game—which they may be.

Oil tankers and fishing boats alike navigate by Oregon-built Morrow Loran computers. The western world builds it nuclear reactors with Oregon zirconium, and its high-speed aircraft with Oregon titanium.

Surgeons circumvent cardiac problems with multiple bypass techniques that orginated in Oregon, and many of the pacemakers or pain-blankers they implant are made in Oregon. And the nation's grocers use Oregon-made laser checkstand scanners to read prices and inventory data.

Before the end of the century, high technology will displace forest products as Number One employer, predicts the Bonneville Power Administration, power planner for the region. The forecast is credible, particularly after a drive along Interstate 5, the north-south link with the California and Washington industrial hubs, where the "spec" warehouses are clustered at every population center.

High technology manufacturing for a world market isn't new to Oregon.

What's new is the entry of a number of highly visible California manufacturers, large and small, compounding the growth and multiplication of native companies. The Californians, pinched at home by their own bigness, have been looking increasingly to the Pacific Northwest for expansion and a less jaded workforce, and escape from housing costs that make it difficult to attract young professionals.

The California entries include some of the biggest, but most are small and consider themselves growth companies.

A kind of Mason-Dixon line runs across the middle of the state. Below it, electronics plants spiritually face south, and their products are likely to be subassemblies to be flown or bused to California.

Above it, the output tends to stand alone, competing directly on the world market without further handling. Even Intel and Hewlett-Packard, the biggest California employers in the upper half, operate there as autonomous profit centers, with their own R&D and marketing roles.

HIGH-TECH PIONEERS

Early federal research played a key part in electronic and metallurgical development—not unlikely, since more than half of Oregon's real estate is in federal hands. Studies at the University of Oregon medical school in Portland also were productive.

The laboratory seeds sprouted in a distinctive population of resourceful native scientists and radio enthusiasts, often ham operators, hungry to make a living at their developing art without migrating to more industrialized states. Oregon was limited by dependence on rural resources, and had only a low "carrying capacity" for service industries, yet her riveting beauty and hardy style of life were hard to leave.

Benignly neglected by the forest-farm-fishery establishment, the high-tech pioneers concentrated on specialty markets and reached international stature with precision products that often were unknown at home.

Radio Specialties Corp. was organized in the 1930's by a man who quit high school after he'd taken all the electrical courses. The first contract was for two-way radios for the U.S. Forest Service, whose laboratory in Portland had been designing them since the early '20's. The company still makes a frequency-modulation deviation meter that is a standby around the world according to Gale Sells, the founder, who is now retired.

Tektronix was conceived in a Portland appliance-repair shop by a Reed College-educated physicist with a visionary partner who had passed up college to get more quickly into radio, which he saw remaking civilization. They put the first synchronized oscilloscope on the market in 1946, and launched a new generation in waveform analysis.

Howard Vollum, the physicist, had worked on oscilloscopes with a University of Oregon medical experimenter, and then for the Army Signal Corps.

Electro Scientific Industries began in Portland during World War II making impedance bridges on defense contract, and was taken into the commercial world in 1950 by Douglas Strain, a Caltech engineer who preferred Portland to Los Angeles for his family. He first saw Portland while assigned to the Forest Service radio labs for the Office of Science Research and Development, designing a warning network to deal with submarine-launched Japanese balloon-borne firebombs.

Exact Electronics, an early Tektronix spinoff, is believed to have been the first maker of the versatile signal source called a function generator. Recently merged into Dynatech Corp., it specializes in analog signal sources for laboratory use. Dynatech is moving it from coastal Tillamook to Carson City, Nev., where it has other plants.

The roots of Oregon's exotic-metals primacy don't go that deep.

The U.S. Bureau of Mines built a regional laboratory in a vacant college in agricultural Albany in 1943 that quickly grew to strategic importance.

A pilot plant for the new Kroll zirconium-manufacturing process was built there in 1950, and produced zirconium tubing for the submarine test reactor at Idaho Falls, Idaho, and then for the pioneer nuclear submarine, the U.S.S. Nautilus. Commercial production was spun off by the Bureau, and the first contract was won by the Wah Chang Corp., an international metals trader and processor.

Wah Chang Albany is now a Teledyne Corp. subsidiary, and believes it is the western world's major producer of zirconium, titanium, columbium and hafnium.

Other specialty metal processors opened at Albany later. The laboratory was closed in a 1971 budget reduction, and some of the companies failed to survive that decade, but Oregon Metallurgical Corp. produces large amounts of titanium, titanium alloy and zirconium castings. Another titanium company, recently formed, is not in production.

SHAPED BY NATURE

Geography has ruled Oregon's economy since before statehood in 1859.

Tenth largest state in size, it is the 29th in population. Half of the workforce and 40 percent of the 2.6 million Oregonians live in the three Portland metropolitan counties. (The metropolis also spills across the Columbia River into Vancouver, Wash.) Most of the remaining residents either share the north-south Willamette Valley with Portland or live in two other valleys, the Rogue and Umpqua, directly to the south.

As a result, the out-of-doors still is large in Oregon life. While evidence of

Oregon

mankind is seldom lacking, whether farms, roads or logging traces, solitary landscapes are frequent and wildlife is close to hand.

The western one-third of the state is wetted generously by incoming Pacific storms compressed against the Cascades. Thickly forested, mainly with Douglas firs, that region has formed much of the standard image of the state.

East of the Cascades, Nature's domination is clear. Craggy mountains, jagged canyons, lonely basin-and-range high desert are set off in some areas by vast wheat ranches, or in others by the green circles of irrigated potato or alfalfa fields.

Below the surface, or sometimes armoring the surface, are the Columbia River Basalts, volcanic flows that covered hundreds of thousands of miles up to a mile deep in Miocene times, and according to current theory may be screening large oil and gas deposits.

What does this do for high technology? Not a lot, at first glance. A country made for naturalists and hikers, it lacks the scholarship and professional elbow-rubbing that attract first-rate physical scientists and engineers, say some observers.

"Where is your high-tech bar in Salem, where the computer people all go for a drink after work?" asks former Stanford Research Institute staffer John H. Wensley, founder of August Systems, a microcomputer manufacturing firm 60 miles from Portland at the state capital.

"An M.I.T. person would have culture shock here," says Ken Patton, general manager of Hewlett-Packard's plant in McMinnville, an hour from Portland. His 170 employees make medical resuscitation systems and special high-speed industrial X-ray units used for freeze photography of bullets speeding through gun barrels, shaped-charge explosions and similar short-lived, violent phenomena.

Patton, a Purdue mechanical engineer who was transferred to Oregon from Massachusetts, says he now would be reluctant to take his family away from the state.

Typical of Hewlett-Packard, he has his own research and development and marketing operations, with 40 or more engineers and some physicists.

The plant and process were acquired by H-P from a company headed by its inventor-developer, Dr. Walter P. Dyke, a physics professor from nearby Linfield College.

CULTURE SHOCK

Patton's qualms about culture shock are shared by many in the business, and in academia. They say quality technical education and research opportunities are necessary if outstanding minds are to be attracted to the state so that its manufacturers can compete in the world marketplace.

"Most graduates will tend to take jobs near their campuses," is a theme heard frequently in discussions of the problem. References to the M.I.T.-Harvard axis, and Prof. Frederick Terman's nucleating role in the Silicon Valley phenomenon are also common.

One national, two state and at least four private educational institutions, all near Portland, are working at separate improvement programs and also talking about coordinated curricula for a broad appeal in electronics, computer and biomedical sciences.

They include the Health Sciences University, Portland State University, Reed College, the University of Portland, Pacific College, the Oregon Regional Primate Research Center and an unusual applied-research institution, the Oregon Graduate Center.

At the Health-Sciences University, which includes the state's medical, dentistry and nursing colleges, a building project for an Institute for Advanced Biomedical Research is underway. A program to line up private funds for endowed clinic and science chairs, general endowments and research fellowships has been organized, with a blue-chip board of overseers headed by Robert B. Wilson, chairman of the board of Weyerhaeuser Co., the timber giant.

Dr. Leonard Laster, president of the university, says the research institute will materially improve a school that has produced a long line of research benefits despite chronic underfinancing and lack of space. He points to world stature for achievements in heart surgery, unclogging arteries, stroke research, arrythmia, sleep disorders, kidney transplants, cornea replacement and many other fields.

At the Oregon Graduate Center, Pres. F. Paul Carlson is carving out an educational institution with an applied-research charter. OGC was organized in 1969 by industrial and civic forces who felt the need for research facilities and leaders close to the users of regional technology.

The center offers graduate degrees in applied physics and electronic science, environmental science, chemistry and biochemical science, materials science, computer science and engineering.

Carlson is basing his school's charac-

ter on close working ties with industrial research leaders. Intel, Tektronix, Electro Scientific Industries, Weyerhaeuser Co., Southern Pacific, Hughes Research Laboratories, Honeywell Laboratories, Battelle Memorial Institute, Omark Industries and Bethlehem Steel Corp. are among the participants.

His site is near several high-technology office campuses including those of Intel and Tektronix. It is back-to-back with the Oregon Regional Primate Research Center, one of seven national biomedical research institutions supported by National Institutes of Health grants, working with resident monkey populations. Carlson aims at a close, synergistic linkage where workers and academicians share scholarship and enthusiasms, he says.

Portland State University Science Dean William Paudler, a chemist, says he came to the school last year aiming to help turn it into a major urban institution, at the same time coping with an explosive increase in science and math enrollment.

A passionate believer that the rural land-grant college is obsolete, Paudler is pressing for funds to improve what he says is already an impressive research program at PSU, with distinguished work in fish biochemistry, coal chemistry and liquefaction, blood pressure abnormalities, chemistry and earth sciences. He is expanding the mathematics and computer sciences offerings.

Oregon's chancellor of higher education, Dr. Roy E. Lieuallen, agrees that more programs are needed, and at a higher level, at Portland. He blames the state Legislature for withholding funds, and for setting salary levels that cannot compete with private offers to faculty members.

The state's University of Oregon and Oregon State University, both some distance south of Portland at Eugene and Corvallis, repectively, have sufficiently broad programs and simply need more money he said.

But the industry isn't waiting on legislative budgeters. Tektronix's Vollum and John D. Gray, the board chairman of Omark Industries who brought the chainsaw to maturity and revolutionized logging, have set out on an endowment campaign to energize the private campuses.

With sizable personal challenge grants to Reed College, Oregon Graduate Center and the Biomedical Research Institute, they have mounted a regional support drive that has made important differences.

"They helped us make a transition," says Pres. Paul Bragdon of Reed.

"Business needs the colleges more now than when we (he and Gray) started," says Vollum. "The technology wasn't as sophisticated or expensive then."

Far to the south, near the California border at rural Klamath Falls, another technological element in the state system of higher education has a peculiar claim to fame.

The Oregon Institute of Technology, with more than 1,000 students in its electronics and computer technology courses, educates them for two- and four-year science and engineering degrees, ready to step up to test benches.

John Lund, head of engineering technologies, says half the students are local, 90 percent are from somewhere in Oregon, and they don't want to leave the state. "They turn down good starting offers in the Midwest, Texas and California in the $16,000 to $24,000 range, even though we encourage them to get out and get some experience," Lund says.

The unusual aspect of their education, however, is not related to curriculum or job offers.

Their classrooms and labs are completely geothermally heated, and Lund, the associate dean, is an acknowledged expert in the arcane technology of the direct use of moderate-temperature goethermal energy.

The Klamath Basin has well-known hot water aquifers that draw their heat from magma cells 15,000 to 20,000 feet below ground and then are deflected closer to the surface.

As associate director of the Geo-Heat Center of OIT, the national clearinghouse for direct-use technology, Lund has traveled to China, New Zealand, Iceland and France as a consultant to national agencies, and is helping a local group develop a geothermally heated industrial park alongside the OIT campus.

They hope it will be taken by high-technology companies.

ELECTRONICS BIG FOUR

Oregon's electronics landscape is dominated, but far from controlled, by four big names: Tektronix, Intel, Hewlett-Packard and Floating Point Systems.

All have made waves in science and technology, lifting them to new plateaus and at the same time making their founders wealthy.

Tektronix has been the state's principal seedbed, drawing talented specialists to the Portland region who from time to time would spin off their own ventures, and frequently furnishing their capital.

Dozens of companies, including Floating Point Systems, were bankrolled in the beginning by their founders' Tek profit-sharing accounts. Some have attracted direct investment by Tek executives.

Tektronix was opened in 1946 by Howard Vollum, his longtime partner

the late Jack Murdock, and three others. In five years, when the firm had grown to 100 employees, IBM buyers told Tek management they would soon have 2,000 and drew laughs, but facts overran the prediction. By 1972 there were 8,300 employees, and the number tripled in the last decade to 24,000.

It is the largest employer in two Oregon counties. It presently has three Oregon manufacturing campuses and three more blueprinted, plus one in Vancouver, Wash., and offshore plants in Japan, The Netherlands, the United Kingdom and the Isle of Guernsey. Net 1981 sales were 1.06 billion dollars.

The product range has been aggressively expanded into growth areas during the past decade. The catalog is headed by an impressive series of microprocessor and microcomputer support instruments, data communication testers, semiconductor testers and logic analyzers.

A range of computer display terminals and desktop computers with graphic displays and software is offered, along with display monitors for OEM and end-use customers. Television and cable instruments are listed, and radio-frequency spectrum analyzers.

At the bottom of the catalog is the instruments division, still producing oscilloscopes, calibration standards, signal processors and other laboratory essentials.

SHADOW OF TEK

If Tektronix was important as a reservoir of trained people and of capital, it also cast a big shadow with its style of business—unostentatious, almost anonymous in the community—its main Beaverton campus, of rolling fields and stately oaks, didn't carry the company label for more than a decade.

Vollum says the omission was calculated. "I think the big advantage that the West had and still has to a degree was a lack of factory heritage," he said recently. Factory heritage contains built-in management-labor conflict, he said, and restrictive views of mutual responsibilities.

Tek's original workforce basically was of farm stock, people who were certain they could accomplish any task they were set to, said Vollum, whose father homesteaded near Portland. He and Murdock set a high value on that attitude.

They never seriously thought of setting up the company outside Oregon, according to Vollum, because there was no place they would rather live. Later, analyzing their position, they saw that customers don't really care where an instrument is made, but simply whether it works.

"Freight wasn't a problem, and you introduce a product at a national show, where the user can tell fairly quickly if it does the things he wants it to."

INTEL ARRIVES...

A newly-arrived Textronix neighbor named Intel has been reshaping the computer industry with microprocessors produced in nearby Hillsboro.

In the mid-1970's the Santa Clara memory giant saw its growth and quality threatened by Silicon Valley crowding and workforce conditions, and decided to spread out to Oregon and Arizona.

The company now occupies three "campuses" in Oregon's Washington County, within minutes of Tektronix, Electro Scientific, Floating Point and a mass of other high-tech groups.

Complete with their own research and development staffs, they are carrying a major part of Intel's race against all rivals, domestic or foreign.

The Oregon plants produce the entire Intel line of singleboard computers, including the workhorse 8086 and 8088 microcomputers, and are churning out a stream of new products. "The new System 86/330, Intel's first fully integrated microsystem, was designed and developed here," said Keith Thompson, director of systems operations for the company.

He also pointed to the iAPX 432 family of 32-bit micromainframe processors, a set of microprocessor chips with the computing ability of a midsized mainframe computer. It is expected to have applications in telecommunications, online office systems, computer-aided design and simulation units, multiuser business systems, and factory automation and control.

Other computer products include the iSBC 88/40 process-control computer, and a line of In Circuit Emulators (ICE) for use by microprocessor designers.

Intel's memory-chip operations are also based in Washington County, churning out about 100 products with sales of "hundreds of millions of dollars a year," according to general manager Scott Gibson. Seven or eight new products are due out this year, including two 64K Random Access Memories. One is a "second generation 64K RAM" with eight separate 8,000-bit memories. "We're also working on our 256K RAM, just like everyone else," he added. "We

expect them to consume all the land and facilities we now have," he said.

SPINOFF COUNTRY

Just a few minutes drive from either Intel or Tektronix in Washington County, Electro Scientific Instruments (ESI) occupies a science park in the community of Cedar Mill, with 600 employees and a 30 percent annual growth rate.

Founder Douglas Strain, who invented a vacuum-tube electrometer while in high school in the 1930's, has brought the company across a mind-boggling span.

The first product was an impedance bridge, a variation of the classical 1833 Wheatstone circuit.

Present-day bestseller is the Microlase wafer processor, a computer-controlled laser trimmer that tunes integrated circuits to design specification by etching their microscopic components. The Microlase laser also can disconnect faulty microcomponents and "rewire" with built-in spares. Circuit modifications are also possible with the Microlase. The work is servopositioned with a tolerance of 2.5 microns.

Down the street in the same science park is the inevitable spinoff, P/M Industries Inc., with the inevitable job shop. There, longtime ESI engineer Paul F. Parks, Sr. makes his own line of less complex laser machine products, offers custom laser-trimming services for makers of microelectronic circuits, and also offers laser-machined ceramic substrates for short-run projects.

FLOATING POINT SYSTEMS ET AL

Perhaps more than any other industry in history, electronics and computers are a spinoff technology. Scientists, engineers and perceptive workers at several levels see an undeveloped opportunity in their employers' business and they split away to start their own company—often after having offered the idea to the employer and gotten his blessing.

When former Tektronix sales engineer Norm Winningstad needed to expand outside membership on the board of his Floating Point Systems (FPS), he persuaded Tektronix President Earl Wantland to take one of the chairs.

FPS makes array processors—auxiliary computers that increase the number-handling speed of standard computers and minicomputers so they can take on extremely complicated calculations.

Typical users are oilfield geophysical surveyors, meterologists, petroleum recovery engineers, astrophysicists and the operators of CAT-scanners, the X-ray tomography image reconstruction process that creates three-dimensional images of human internal organs.

IBM and Digital Equipment Corp. both market Floating Point equipment, and FPS also has its own international marketing system.

Headquarters is in Beaverton, across the road from the main Tektronix campus.

Another Tektronix spinoff in Beaverton—there are many—is a cable-technology firm called CableBus Systems Inc.

Founded by former Tektronix engineer Cliff Schronk and partly financed by Tek founder Vollum, the company makes digital communications devices that operate on narrow radio-frequency bands over community cable networks.

Their first products are aimed at the residential-security market, but they are also supplying computerized hospital tv systems that can distribute special medical educational programs to individual patients, preempting the entertainment receivers. CableBus also is working on digital voice cable systems for municipal fire departments, and is discussing continuous telemetering of household electricity so power companies can reduce peak loads by giving customers preferential rates for shedding load at critical times.

It is also discussing an arrangement with the city of Portland for smoke detectors in every home, connected to a central fire department dispatcher.

INFORMATION ON DISPLAY

The information-display division of Tektronix is spawning impressive descendants of its own, capable of attracting the venture capital they need.

Just now coming to market, they may be a new generation.

In Hillsboro, close to Intel, Dr. Gene Chao, former director of applied research at Tektronix, organized a color graphics company called Metheus Corp., that just began delivery of the first Omega 400 color graphics systems.

Chao recruited his key people from Intel and Tekronix both, and got the system to market just seven months after incorporation.

His series of high-resolution advanced computer graphics systems is aimed mainly at original equipment manufacturers and sophisticated end users, with emphasis on price.

The cost will be controlled, Chao says, through "aggressive use of the latest Large Scale and Very Large Scale Integration technology, using 64K RAMs, ECL logic and high-speed bipolar microprocessors."

High resolution, fast displays will have vector drawing rates of one million pixels per second, and sell for less than $15,000.

They are aimed at cartography, graphic arts including newspaper layout, computer-aided design and process control applications.

Mentor Graphics Inc. is a nine month old computer-aided engineering sys-

HIGH TECHNOLOGY PARKS

Three new Oregon high technology real estate developments are underway, two of them education-linked and one reminiscent of Stanford Research Institute.

The Oregon Graduate Center, near Portland, has assembled a 175-acre project including part of its campus for phased development by research-dependent companies.

The research and real estate plan is part of the strategy of OGC Pres. F. Paul Carlson for an intensely creative campus with his faculty and graduate students, hobnobbing synergistically across the lawn with industry's gurus, or convening symposia with the scientists of nearby Tektronix, Intel or Electro Scientific Industries.

Carlson's design shows two million square feet of clustered but separate buildings on an open campus. He will encourage advanced energy conservation with solar heating, cooling and lighting, waste-heat recovery, geosource heat pumps and computer-controlled energy management.

And a neighbor just north of the Graduate Center has unveiled a 200-acre high tech development, Rock Creek Industrial Park. The venture, headed by Standard Industrial Insurance Company, will have 1-to-100-acre sites and be operated as a planned unit development.

Standard Insurance previously developed Tanasbourne, a nearby "new-town" with associated commercial and light industry zoning.

Three hundred miles southward, just above the California border at rural Klamath Falls, the 125-acre College Industrial Park development has been laid out alongside the campus of Oregon Institute of Technology, overlooking Upper Klamath Lake.

The project will be geothermally heated, as is the OIT plant. The heating venture is managed by Dr. John Lund of OIT's Geo-Heat Utilization Center, a national clearing house for non-steam geothermal energy data.

OIT was sited in the first place to take advantage of a geothermal aquifer that traverses the northern neighborhoods of Klamath Falls, which is in a mountain basin along the eastern flank of the Cascade Range, south of Crater Lake.

Developers expect the location on major highway and rail routes, with commercial air service, to be attractive to high-technology developers drawn by the pool of skilled OIT technician and engineer graduates. Klamath Falls presently has some small computer and electronic companies, but no major ones.

tem-maker with 20 employees: three hold M.B.A. degrees, another is an Arthur D. Little alumnus, and still another was the head of the Tek graphic-display division.

Their simulators will depict a structure without the need for building a prototype—"an absolute necessity with the coming shortage of designers," says Pres. Tom Bruggere. First shipments of the independent desktop workstations are scheduled for fall, even though no product announcement will be issued until June.

"We have every expectation of becoming significant," said Bruggere. "Smallness is just a development state.

"It is possible to create a product in Oregon that will attract high-quality investors," he said. "We've done it.

"We didn't leave Tektronix with a product idea, but with a marketing concept," he said. "Our customers will buy a system—hardware, software, peripherals, consultation and documentation."

Spunoff companies can generate their own spinoffs, in turn, and so it is with Floating Point Systems.

In the same industrial park as Mentor Graphics, a shiny new "spec" warehouse development more than half-filled with computer firms, are two young companies specializing in accessories and services for Floating Point equipment.

APTEC Computer Systems is a year-old creation with a contract from Control Data Corp. to making floating hardware for the Cyber System 1700 minicomputer. They have developed an array-processor timer and a FORTRAN complier that simplifies writing array-processor programs. They also have acquired rights to the original FPS product, the floating-point hardware to increase a computer's computational speed.

Former FPS production-line manager Woodrow Wittmayer is president.

GYPSY TECHNOLOGY

The almost gypsy-like portability of small high-tech operation sometimes gives it curious, improbable settings in Oregon, whose typical town has less than 25,000 residents. (Only three Oregon cities have more than 50,000 residents; Portland with 363,000, Eugene with 87,500 and Salem with 73,000).

Some examples:

In Southern Oregon near the community of Kerby, in a 12-foot-by-24-foot plywood house on the slopes of Eight Dollar Mountain, with four microcomputers served by 1,350 feet of Romex electrical conduite from the nearest power line, lives the fabled personal-computer programmer Paul Lutus.

Lutus brought in the commercial power after he was unable to develop enough hydrogeneration on his land. He also uses it for a satellite television receiver he seldom watches. He has a collection of 1,000 books, and a Cessna 172 airplane which he bought for cash one day. Lutus says he rode his bicycle to the airport, handed the dealer a personal check for $21,000, and cherished the reaction when a phone call established its validity. Among Lutus' royalty-earning works is AppleWriter, the popular word-processing program for Apple microcomputers.

On the coast west of Kerby, at the fishing harbor of Brookings, Martin Palmer operates TVRO Systems Inc., a computerized satellite antenna system supplier that has never made a sale in Oregon, but placed fifteen systems in Germany last year and does most of its business with East Coast luxury condominiums.

In Portland, in a handsomely-restored commercial building in the shadow of the city's "suicide bridge," Oregon Software Inc. produces a Pascal II language compiler for DEC PDP computers, and is developing programs for the new Motorola 68,000 microprocessor. The firm is a "programmers' programmer" with worldwide trade. DEC and Honeywell have been recent big customers.

And in Klamath Falls, in brick-walled industrial space built when sawmills were the dominant technology, is physicist Art Merkl's Inventron Industries Inc.

Merkl pulled the 23-employee shop out of Los Angeles to find a more stable workforce. "People in LA auction themselves off every six months to the highest bidder." His children like the schools, he sails and waterskiis on Oregon's biggest lake, and manufactures ultrasonic level-control systems using an 8085 microprocessor with noncontact ultrasonic gauging in tanks and other enclosures.

In the rural town of Sweet Home, in the auriferous foothills of the Western Cascades, White Electronics Inc. makes a leading metal detector.

At Salem, the state capital, 60 miles from the nearest harbor, Morrow Electronics Inc. manufactures fathometers, Loran navigation computers and plotters, electronic fish-finders and handheld underwater sonar units for divers. Morrow has just introduced a lightweight Loran navigator for general aircraft that gives instant headings to any of 200 airports specified by the user.

Founder-President Ray Morrow Jr., educated as a game warden, left a Santa Clara Valley engineering job to return to Oregon and set up the company with $3,000. "I went out of here with the first 20 units in my truck and had to get cash for them, and did," says Morrow. He makes a point of using all-domestic components. Morrow learned the business from his father, an amateur radio operator who manufactured Morrow communications receivers in Salem in the 1940's and '50's.

Chairman of the Board at Morrow is former Citibank executive Ted Achilles, who left the Manhattan bank after setting up an Oregon outpost for it.

August Systems Inc., "The Can't Fail Computer Company," is another Salem firm in the bootstrap tradition.

Founder John H. Wensley quit the staff of Stanford Research Institute, and he and four partners sold their price-inflated Palo Alto homes for start-up financing.

Their "fault-tolerant" technique uses inexpensive Intel 8086 microprocessors in triplicate at the heart of process-control systems. All three monitor the process, and if they disagree, a "vote" is taken and the majority prevails.

A typical installation was in a large electrochemical plant where an August Systems unit selects a power source from among several different-priced, interruptible supplies. The power operates a weeks-long process that cannot survive interruption.

A Salem software house, Relational Systems International, recently published a universal personal-computer program by which inexperienced operators can quickly create special custom programs. They call the product PEARL (Producing Error-free Automatic Rapid Logic) and compare it to VisiCalc, a well-known free-form financial program.

Not all smalltown Oregon operators are small. Two of them are the biggest private employers in their counties.

Hewlett-Packard's personal computer and calculator divisions are on a 140-acre campus at Corvallis, home of Oregon State University. The workforce of more than 2,500 is the largest in Benton County. Fred Hansen, manager of integrated-circuit operations, said the company is pleased with the university and with transporation facilities, and enthusiastic about the workforce and community.

Their products include the recently introduced H-P personal computer, the HP87, and the earlier professional personal computers the HP83A and HP85A.

(Also in Corvallis: Tiny Janel Laboratories, a TV antenna-coupler maker owned by engineer Robert Larkin. He quit Bell Laboratories to avoid a transfer from New Jersey to Chicago, and the family toured the country to choose a new hometown. Janel has nine employees.)

In Grants Pass, Litton Industries

Oregon

Guidance and Control Systems is Josephine County's largest employer, with 425 people. They build military inertial-navigation subassemblies. Human Resources Manager Robert F. Morrison says the company, low-profile by policy, adopted an active civic role because the community expected it. "We find it enjoyable," says Morrison, who is on the community college and Cancer Society boards. Worker turnover is below three percent a month, and when upper-level jobs are posted in other parts of the Litton organization it creates "mass pandemonium—everybody wants to come to Oregon."

Preceding Litton Industries in Grants Pass was the Oregon Technical Products Division of the Bell Aerospace Division of Tektron Inc. They make military subassemblies with 240 employees, almost all locally hired. The community college helps with training, and "there's a better work ethic," says manager William L. Renton.

(Also in Grants Pass: Met One Inc., 25 employees, making particle counters and meterological instruments. Owner Louis Petralli, feeling crowded in Sunnyvale, Calif., made the decision after driving through the town once. "This is it," he recalls thinking.)

Medford, an orchard and sawmill town south of Grants Pass, has two new high-tech operations recently opened by Silicon Valley veterans who came out of retirement for the assignments.

James A. Little, president of Simco/Ramic Inc., makes sawmill-control computer systems using harsh-environment technology developed for satellites and missiles by the parent corporation, Quantic Industries of San Carlos, Calif. The Littles live on their dude ranch near Northern California's Trinity Alps. He commutes 100 miles each way, and says he has the best of two worlds.

DeWayne L. Spickler, general manager of the Oregon Division of International Memories Inc., Cupertino, Calif., had retired to the hamlet of Rogue River and built a 3,800-square-foot house. Then he persuaded IMI to set up a Winchester disk-drive plant at the site of a former Veterans Administration hospital, to make use of the under-employed, high-quality labor pool. He has 89 workers and is building toward 250. "These people come in, sit down and get to work without being harrassed; they thoroughly understand you have to do a job right to be productively employed," he said.

WINDSHIELD-WIPER KIDNEY

Medical technology hasn't gone much beyond the entrepreneurial stage in Oregon yet, despite significant products developed in local hospitals.

One exception is B-D Drake Willock, a subsidiary of Becton-Dickinson, in the Portland suburb of Milwaukie.

With 350 employees, they ship about 400 kidney dialysis machines to the world market monthly. Besides the basic hemodialysis process, the firm makes a peritoneal dialysis unit for children and frail patients which uses the patient's own abdominal lining as a filter.

The company grew around a machine invented by Oregon City engineer Charles Willock to help a neighbor, Dr. Richard Drake, who had a patient dying for lack of an artificial kidney machine. Willock's invention was the first automated dialysis machine and was later converted into an home unit whose price was reduced by using commonly available parts, including a truck windshield-wiper motor for the pump.

Cardiovascular devices are built in Portland by Instromedix and a spinoff company, Powers Medical System, among others. Instromedix products include external pacemaker monitors, and remote electrocardiogram and blood-pressure monitors. They use microprocessors to hold the data, then replay it through a telephone adapter. The firm has about a dozen specialists in its research department.

AN ENVIRONMENT FOR TECHNOLOGY

What does it all portend?

Many observers see fulfillment of Computer-Age Prophecy in the Oregon trend.

If high-technology people can perform their work anywhere within limits of communication and transportation, numbers of them will wish to do it in Oregon, they believe.

Numbers are, already. The landscape is changing in suburban Oregon.

One morning in February on the edge of Beaverton, two mallard ducks cupped their wings and dropped into a steep landing glide, slaloming toward a lowland where mallard guidance systems predict sheltering creeks and marshes.

The landing was aborted when they saw a landscaped parking lot covering the lowland; an asphalt sea broken by atolls of new "spec" warehouses.

And 80 percent of the warehouses carried the logos of computer, electronic or biomedical companies.

The economists of the Bonneville Power Administration, the federal regional power-system operator and planner, expect high-tech manufacturing to be Oregon's biggest industry before the year 2000.

Marple's Newsletter, a respected regional business report from Seattle, noting the pressure for computerized productivity that is expected to maintain high technology as a high-growth industry, seconded the Bonneville Power Administration view.

"The region has only begun to scratch the surface," concluded Marple's.

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