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As an intern at Garmin AT, electrical and computer engineering student Shannon Mark tests a tray of circuit boards destined for remote-control devices for aircraft radios. (Photo courtesy of Garmin AT, Inc.)

Oregon's Engineering Engine

An industry-university cooperative powers the state's high-tech workforce

By Lee Sherman

If you looked in on Mike Sabo at Cascade Microtech's corporate headquarters in the Silicon Forest last summer, you couldn't have distinguished him from the firm's 20 full-fledged engineers. Just like them, he spent his days designing and testing precision equipment for many of the world's biggest microchip manufacturers. Only one small clue gave away his status as a student intern: the tower of textbooks teetering over his workstation.

"For this internship, I'm using stuff I've learned in almost every class I've taken at OSU — mechanics, materials, thermodynamics, mechanical design," says the mechanical engineering senior from Klamath Falls, Oregon.

Sabo is one of the 1,800 students who, over the past 30 years, have cut their engineering teeth on a unique, Pacific Northwest internship cooperative called the **Multiple Engineering Co-op Program (MECOP)**. Since Tektronix, Boeing and Freightliner (now Daimler Trucks) and several other firms launched the co-op with OSU in 1978, more than 100 companies and two engineering schools have joined up. Today, students at Portland State University and Oregon Institute of Technology compete, along with those from OSU, for well-paid, six-month stints at a wide array of member companies, mostly in Oregon and Washington. Giants such as Intel, Wah Chang, Hewlett-Packard and Siltronic are on the member roster, as are municipalities such as Portland, Salem and Bend. (A sister program for civil engineering, CECOP, was folded into the mix along the way.)

Each MECOP student completes two internships — one as a junior, one as a senior — during his or her undergraduate program. Pay is about 70 percent of market rate for new engineers.

MECOP by the Numbers

The co-op is a high-octane engine for growing and sustaining Oregon's engineering workforce, says one longtime member of the program's industry advisory board. His company is putting the finishing touches on a plant expansion that doubled its size in 2008.

"We've been able to grow in Oregon because there is a technology base here," says Steve VanArsdale, operations manager for Garmin AT, a division of the international GPS company that makes navigation tools for aviation. "A good part of that base is fed by the MECOP program. If we had to attract all of our engineers from out-of-state, it would be very difficult to fill our positions."

Of Garmin AT's 130 engineers, 17 are former MECOP students, he says. Statewide statistics tell the story: 90 percent of MECOP graduates work for companies in Oregon. Of those, 75 percent work at MECOP member firms.

More Than Mundane

Internships are nothing new, of course. But most are more perfunctory than truly professional.

"A lot of times, interns are brought in just for mundane, routine tasks to get them familiar with a company," says VanArsdale, a 1984 graduate of OSU who has twice chaired the MECOP board. "The work they do isn't really engineering-type of work."

Not so for the co-op.

"You're not one of those interns who gets the coffee or takes notes at meetings or cleans up stuff," says Sabo. "It's like an entry-level job. You actually get in there and get your hands dirty."

For Sabo, "getting your hands dirty" meant digging into authentic projects on the frontiers of avionics and electronics. The "glass cockpit" revolution and the microchip miniaturization quest were the high-tech hinterlands he explored during his MECOP internships at Garmin's Salem plant and Cascade Microtech's Beaverton office. In this world where a micron (one-millionth of a meter) is a big deal, Sabo worked on "process optimization" for building circuit boards (tweaking the manufacturing process to make it faster, better and easier). His design, a fixture to hold the boards securely during automated soldering, eliminated hand soldering and slashed production time. Similarly, Sabo's project at Cascade Microtech plunged him into precision problem-solving for testing wafers. He and his mentor redesigned and tested a vacuum chuck (clamp) to specifications of 20 microns (less than the width of a human hair) to prevent tilting during huge temperature fluxes.

"It gave me a whole different tilt on the design process," Sabo says. "In school, you get some exposure to the manufacturing side, but it's hard to really completely understand it unless you've worked on it. Companies can really cut costs if things are designed right the first time."

Wanted: Companies with Heart

Giving new engineers firsthand experience in moving an idea smoothly from concept to product pays off big for the industry, which is pushing "design for manufacturability," according to Sabo. And that's the point of MECOP: to challenge students with actual engineering problems that lead not only to better technical skills, but also to big-picture thinking that will transfer to future tasks in other workplaces. To make sure that happens, co-op companies commit to their interns before the students ever show up. Mentors receive a half-day training at aptly named member firm MentorGraphics. They listen to former mentors and interns, as well as to MECOP coordinator Gary Petersen, who has shepherded the program from his Corvallis campus office since it got off the ground three decades ago.

"We want the student to be treated as a professional from Day One," says Petersen, whose salary is paid by member companies, not by OSU. "This is a designed experience, not a cheap labor pool. When companies apply to become members, we tell them, 'If you don't have a heart for the students, we don't want you.'"

Another OSU student, computer engineering junior Aaron Breault, looks up from his monitor in the airy, windowed, four-person pod where he's interning at Garmin. He's part of a team engineering and troubleshooting test fixtures, as well as programming software, for the company's state-of-the-art digital display for aircraft. "We really work as a group," says Breault, who grew up in Michigan. "Here I'm treated like an engineer instead of like an intern to pass work off to."

As he describes a just-completed database project in which he streamlined the company's test software ("It's a lot more robust now"), Breault conveys a measure of enthusiasm you might expect to hear from a young person recounting, say, a great snowboard run or an outstanding spring break. He can barely contain his excitement about newfound understandings of schematics, capacitors, power supplies, thermal units, network interfacing and the like. "I've grown more during this internship than just about any experience in my life," he says. "This closes the

disconnect between book knowledge and practical knowledge. It's amazing how much I've learned about applying my coursework to real problems."

Shannon Mark, an electrical and computer engineering senior from Beaverton, Oregon, concurs. "Just being in a job setting is definitely different than being in class," she says of her MECOP internships at Garmin and Intel. "I've learned so many hardware and software skills that can't be taught in school."

Confidence, Savvy and Passion

MECOP students get a big boost not only to their technical prowess, but also to their interpersonal skills. Their three interviews, one to get into the program and two for internship placement, give them invaluable practice for the job-hunting jungle. Girded with well-honed communication savvy and the cool confidence of a proven commodity, MECOP students enter the job market with a big leg-up. VanArsdale witnessed the MECOP advantage in action when he was an engineer at UPS. "We had applicants from all over the country for three openings," he recalls. "All three positions went to former MECOP students."

Mike Sabo has zeroed in on his future niche, thanks in large part to his MECOP experience. He's heading to graduate school to work with OSU Professor **Deborah Pence** in her micro-channel research. "Through the internships, I learned that I want to be more on the technical, advanced-development side of stuff, not just working on widgets," Sabo says. "I want to get into a small, specialized field, something that challenges me."

As Sabo talks about his graduate program, about using computational fluid dynamics and image processing to develop "really small heat sinks" with potentially revolutionary applications in microelectronics, you can hear the intensity deepening in his voice. This student has found his path and his passion.

With a grin, Aaron Breault sums up the value of MECOP this way: "If there was a copy of myself that had passed up this internship, I'd probably slap him."