

# The art of hand-polishing precision optics

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Growing up in a household of artists and engineers, Peter Thelin was destined for a career in which artistry mattered. Only for him, art has come in the form of manipulating the shapes, sizes and qualities of optics. And now, as one of the few remaining practitioners of hand-polishing optics, Thelin is passing his artistry along to the next generation of optics specialists.

"Art is anything you put your mind to," says Thelin, who has been perfecting his hand-polishing skills for more than 30 years. His career began in 1978, hand-polishing optics at Zygo Corporation in Middlefield, Connecticut, while pursuing a passion for cartooning and painting. He soon realized that polishing optics, too, was a form of art, and he looked to Lawrence Livermore Laboratory as the epicenter of cutting-edge technologies. His dream of working at the Laboratory came true in December 1988, and Thelin has been a master optician at the Lab ever since.

Early on, Thelin collaborated on several key projects, including the NOVA laser, predecessor of the National Ignition Facility, working closely over a span of 15 years with Steve Payne and his group—including Kathleen Schaffers, Chris Ebbers and Zhi Liao—on a large number of advanced laser material development efforts. They included the high-repetition-rate Mercury Laser project and recently, with Payne and Nerine Cherepy's Scintillator Group, working exotic material for radiation detection. He has won several R&D100 awards, known as the "Oscars of Invention," as a result of his many critical contributions to Lab optics over the years.

These projects required testing of new material samples, which often involves such challenges as the tiny size of the sample (some as small as 20 microns), their sensitivity to water and common polishing compounds, and their extremely delicate nature, which makes them prone to stress fractures. Thelin's expertise and valuable feedback were crucial to the success of many projects involving exotic materials. His delicate touch enabled him to develop processes that allow him to work with fragile crystals.

Thelin notes that few people today still do what he does, and that hand polishing optics is a curiosity and a topic of discussion at trade shows and among his peers, who always are eager to learn what materials he's working with.

"For many one-of-a-kind jobs, your hands are the fixtures holding the part," Thelin says as he explains the evolution of computer-controlled polishing machines in the industry. While manufacturing processes have changed over the years and automation has largely replaced the traditional craftsman-style optician, "it's time-consuming to write programs for a machine to do work for research," Thelin says.

The work at the Lab is unique and specialized, and requires the hands-on experience Thelin enjoys. He hadn't previously encountered many of the unusual materials the Lab's Optic Shop allows him to work with—materials used only here. His shop offers challenges every day with a variety of unique and intriguing projects. He says the Lab's constant demand keeps him engaged.

Thelin's days are filled with working on multiple jobs and projects while mentoring an accomplished optician, Eric Strang, who one day will fill his shoes. After 20 years of experience, Strang has continued to follow his passion of polishing, grinding and hand-working optics. But that didn't come easily, as he was always reminded of the growing

automation of the optics profession. After making key connections during his early career, he solidified his purpose and things fell into place when a dinner with Thelin offered him the opportunity to work together at the Lab.

"I'm very satisfied with what I'm doing now," Strang says. "I no longer feel as though I'm a cog in a machine." He explains that Thelin wears many hats in his role, including customer relations, making all of his tooling, supervising himself and engineering. This aspect of his job excites him as he understands the bigger picture of the work he is doing. "It makes a big difference in morale," he says.

Strang realized early on that that LLNL was not a production environment. "There are breakthroughs happening here," he says, and that's what keeps him happy and motivated.

Asked about his legacy, Thelin said, "I hope the [optical](#) shop keeps going another 50 years and the art behind the optics continues." His advice to young and upcoming opticians? "Try to determine if your job can become automated. The closer you get to the creative process, the less chance of that happening."

When not in his shop, Thelin enjoys painting, working on cars, sailing and testing his strong ping-pong skills.

Provided by Lawrence Livermore National Laboratory

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