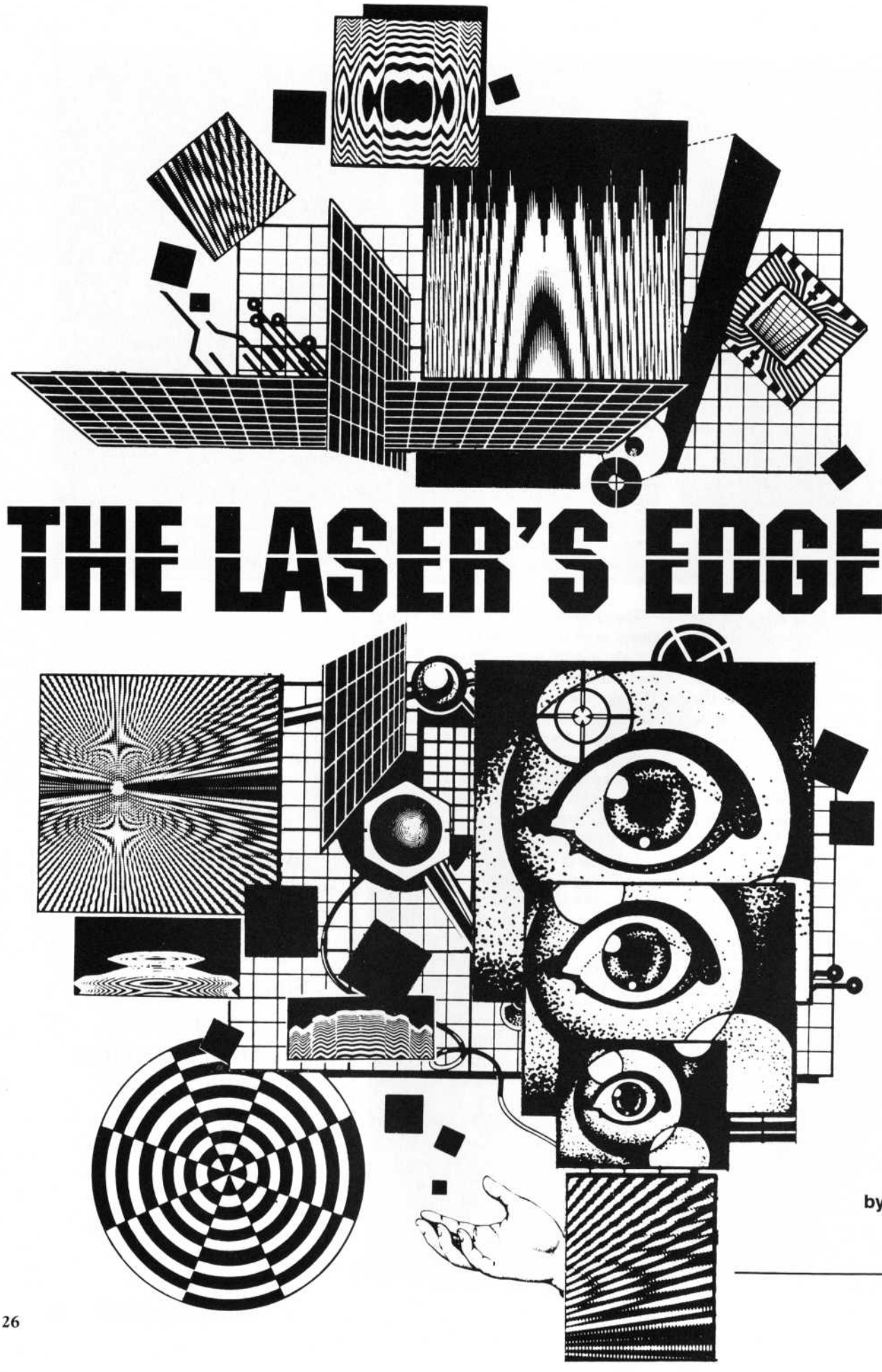
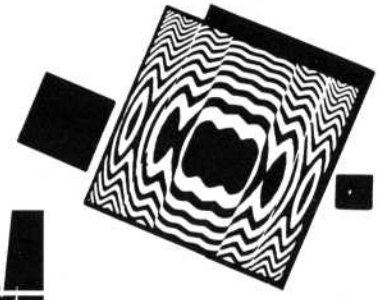


THE LASER'S EDGE

by BOB NIGH



OU ophthalmologist's work in laser surgery brings new hope to glaucoma sufferers.

Most medical researchers can only dream of someday being able to announce a "major breakthrough" in their field of expertise—one which will mean a better quality of life for millions of people. For Dr. Wayne F. March, however, the dream has come true.

March is professor and vice chairman of the department of ophthalmology at the OU Health Sciences Center, director of the glaucoma service at the Dean A. McGee Eye Institute and chief of ophthalmology at the Veteran's Affairs Medical Center, all in Oklahoma City. He was the focus of national attention in late September when he announced Federal Drug Administration approval of a new technique he has developed to treat glaucoma—laser sclerostomy.

Glaucoma, which affects two percent of the U.S. population, occurs when fluid builds up inside the eye. The resulting pressure reduces the victim's peripheral vision. The standard treatment for advanced cases of glaucoma is a surgical procedure that has changed very little since its development in France in the late 19th century.

"There has not been a major improvement in glaucoma surgery in the past 100 years," says March. "The standard treatment for glaucoma has been a surgical filtration procedure in which a permanent fistula (passage) is created to allow the trapped fluid to escape."

The disadvantages of such treatment include subjecting the patient to one hour of surgery in the operating room, using an injectable or general anesthesia, putting at least 10 sutures in the eye, having the patient stay overnight in the hospital and having the patient use an eye patch for a week following the surgery.

Laser sclerostomy has two distinct advantages. The procedure is much simpler for the ophthalmologist to perform and is much less invasive to the patient.

"Laser sclerostomy is performed on an outpatient basis by the surgeon inserting a 26-gauge probe (approximately the thickness of a human hair) beneath the conjunctiva of the eye after a local anesthetic has been applied," March explains. "A Holmium laser is then fired to create a fistula, and the pressure in the eye is reduced. The procedure is virtually painless, takes only five minutes to perform and does away with the sutures and hospital stay required through conventional glaucoma surgery. The patient is able to walk out of the doctor's office immediately, and vision usually is returned to normal within two weeks.

"Laser sclerostomy is a major breakthrough and should gain international interest," March continues. "It will revolutionize the treatment of glaucoma."

Evidence of the intense interest in the procedure already is available. Last May, March introduced laser sclerostomy to 350 eye surgeons from around the world during a workshop titled "Advanced Ophthalmic Laser Therapy" in Lucerne, Switzerland. On October 1, March trained 200 eye surgeons in the technique at an international workshop in Oklahoma City.

"We have been working for six years to develop a laser procedure to treat glaucoma that would reduce morbidity, pain and inflammation in the patient," March says. "We were successful last year and have since treated 200 experimental cases with an 80 percent rate."

Initially, laser sclerostomy will be used to treat patients whose glaucoma cannot be controlled by medication. However, the procedure also may be applied in the not-too-distant future to some patients who have difficulty tolerating medication.

For laser sclerostomy, and most projects at the Curnutt Research Laboratory at the Dean A. McGee Eye Institute, a new solid state laser — the Holmium laser—is used.

"I believe the Holmium laser will become the foremost laser for all medical laser applications in the future," March says, "not just in ophthalmology, but in all other areas of medicine."

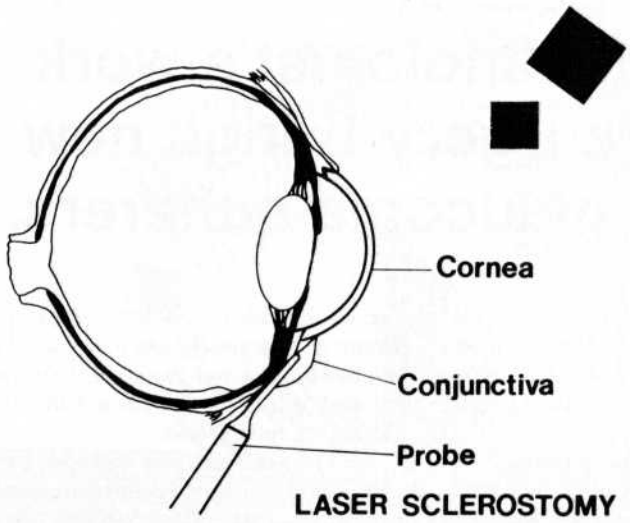
Solid state lasers, he explains, are lasers that use a solid crystal to create the laser beam. They are an improvement over the earlier models that used either a gas or liquid medium to emit the light.

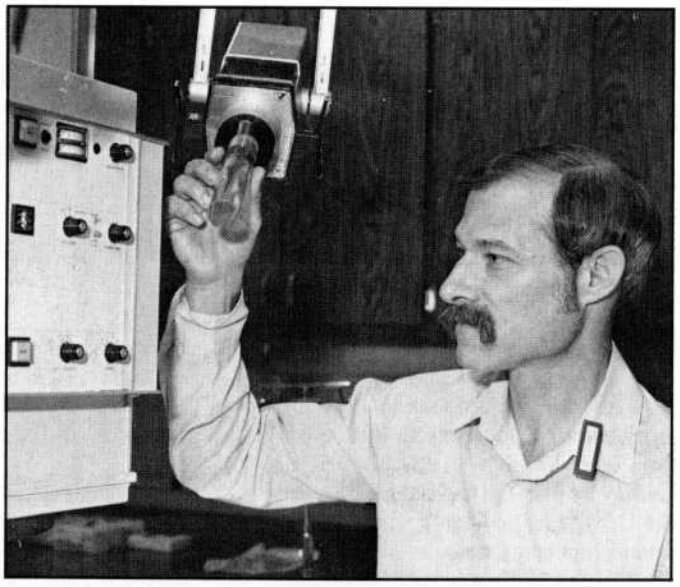
A laser, which is an acronym for "light amplification by simulated emission of radiation," emits light through a particular medium by the process of "lasing." Lasing involves substances that have the ability to "lase" or absorb energy and emit a new source of light energy that is more useful.

Nobel Prize winner Charles Hard Townes developed the laser in 1962. The most important property of laser light is its concentration or brightness, March says. Another valuable property is its ability to be concentrated for short intervals in "pulses."

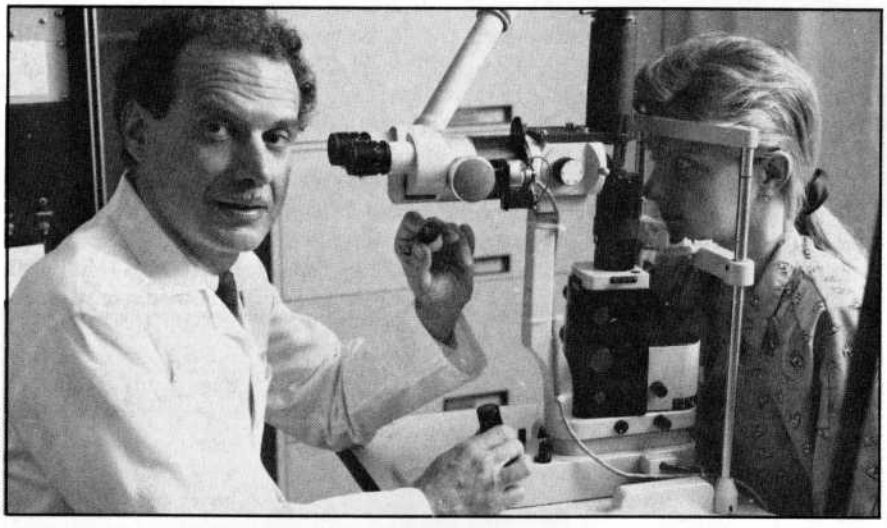
Differential absorption, a process in which a light beam only affects a tissue if it is absorbed by that tissue, is the key to lasers.

"In ophthalmology, laser beams generally are used in two ways," March says. "A short pulse (a few billionths of a second long) is used for cutting, while a longer pulse is used for cauterizing, or welding. The beauty of using lasers in eye surgery is that you





Dr. Timothy Tytle hopes to remove gallstones with a pulsed dye laser without removing the gallbladder.



Jim Thomas

The pacesetting work of Dr. Wayne F. March, left, in laser sclerostomy is bringing national attention to OU's ophthalmology department, but laser research is also having an impact in many other medical specialties at the Health Sciences Center and has industrial applications that could benefit the state's economy.

don't have to worry about sterility because only light enters the eye. Infection is minimized because no bacteria get in."

March says the new solid state lasers soon will make older models obsolete because they are much smaller physically, more efficient and cheaper to maintain. He also expects the Curnutt Research Laboratory to be at the forefront of laser research and application for the next several years.

The laboratory is the clincial base for the Center for Laser Development and Applications, located principally in the Noble Research Building at Oklahoma State University in Stillwater. Last year, the Oklahoma Center for the Advancement of Science and Technology (OCAST) awarded $5.5 million to create the Center for Laser Development and Applications, of which the OU Health Sciences Center is a collaborating partner. March is the center's associate (medical) director.

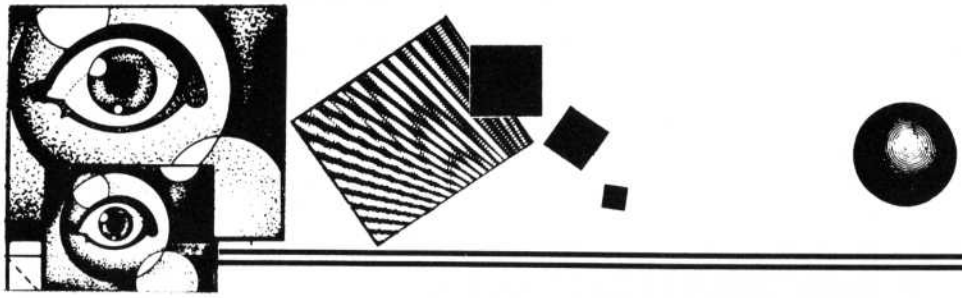
"Our section sponsors and coordinates medical laser research on the OU Health Sciences Center campus," March says. "We currently are sponsoring research with the departments of surgery, otolaryngology, radiology, medicine and urology, and expect to be involved with at least five more departments within the next year."

The Curnutt Research Laboratory employs two full-time Ph.D.s and two laboratory technicians, in addition to March. One of the projects under way at the lab is a method to disrupt cavities in teeth in a painless manner. Dr. Art Vernino, professor of periodontics and director of the graduate periodontics program, is involved in that project, along with Dr. Raleigh Holt, associate professor of removable prosthodontics.

In addition, Dr. Timothy Tytle, OU associate professor of radiological sciences, is conducting animal experiments on the removal of gallstones with a pulsed dye laser without requiring the removal of the gallbladder. He is sponsored by the Center for Laser Development and Applications.

"We are working on developing a better optical fiber delivery system in order to make the gallbladder more accessible to facilitate treatment of gallstones," March explains.

Also in progress is the development of a technique using a Yttrium-Aluminum-Garnet (YAG) laser, which



uses infrared light to destroy, in a minimally invasive fashion, cancer cells in the human liver. The principal investigator on that project is Dr. Mark Mellow, adjunct professor of gastroenterology.

"Another goal of the OCAST Center for Laser Development and Applications is to improve laser technology within the state to attract industry," March says.

Some examples are notable:

- Eagle-Picher Labs, of Miami, Oklahoma, another participant in the OCAST center, has developed a new laser chip, which the company presently is marketing.
- The 3M Company's plant in Weatherford has developed a new process for cutting tape, using an ultrafast, high-powered laser. The process has increased production dramatically at the plant, which makes several types of tape, including plastic, audio and video tape.
- Phillips Petroleum Company, of Bartlesville, has been working with center researchers to show new properties of a chemical for which the company's patent soon will expire.

March earned his B.S. and M.D. degrees from Northwestern University in Chicago. After interning at the U.S. Public Health Service Hospital in San Francisco in 1971-72, he was a clinical resident in ophthalmology at Northwestern University Medical School from 1972-75.

He served as a NIH Postdoctoral Research Fellow at the University of Wisconsin in Madison from 1975-76 and was a fellow and associate faculty member in the department of ophthalmology at the University of Iowa in Iowa City before coming to OU. March is certified by both the American Board of Ophthalmology and the American Board of Laser Surgery.

"I like ophthalmology because it's scientific and exact," he says. "I became interested in lasers because I have a background in biophysics, and I realized that lasers have great potential. As a result, I took special training in electro-optics at the University of Wisconsin."

"I can foresee that, within the next decade, large-incision surgery will disappear, and lasers will be used in conjunction with virtually every form of surgery in every specialty . . . lasers will make it possible to do small-incision surgery through optical fiber endoscopes."

After participating in one of the first national studies of lasers, March began to subspecialize in the field. He has since written five major textbooks on the subject: *Advances in Ophthalmic Laser Therapy, Practical Ophthalmic Problems, Ophthalmic Lasers: Current Clinical Uses, Ophthalmic Lasers: A Second Generation* and *Practical Laser Surgery.*

He also holds U.S. Patent No. 4,014,321 and British Patent No. 1,521,133 for a non-invasive glucose sensor system. The device uses a laser to measure glucose in the eyes of diabetics.

Since 1979, March has been principal investigator or co-principal investigator in research projects totaling more than $6.5 million in funding from such sources as OCAST, Research to Prevent Blindness Inc., the Presbyterian Health Foundation and the National Institutes of Health.

March sees the laser as a rapidly developing tool for physicians, no matter what their specialty. To that end, the OU Board of Regents has created a division of bio-optics and visual science within the OU department of ophthalmology with an aim of transferring the laser expertise developed in ophthalmology to other specialties of medicine. March is director of this new division.

"The purpose of this division is to form close interdepartmental associations in the development of laser research," he says. "We've already started bridging the gap between departments, and we will be expanding that effort in the future.

"I can foresee that, within the next decade, large-incision surgery will disappear, and lasers will be used in conjunction with virtually every form of surgery in every specialty," March says. "The scalpel and other instruments still will be used in conjunction with lasers, but the lasers will make it possible to do small-incision surgery through optical fiber endoscopes. It will be possible to do all abdominal surgery, urologic surgery and prostatic surgery through a laparoscope, which requires only a small incision.

"OU will be in the forefront of that research," March adds. "We will become the world center for the application of the Holmium laser into many medical specialties."