

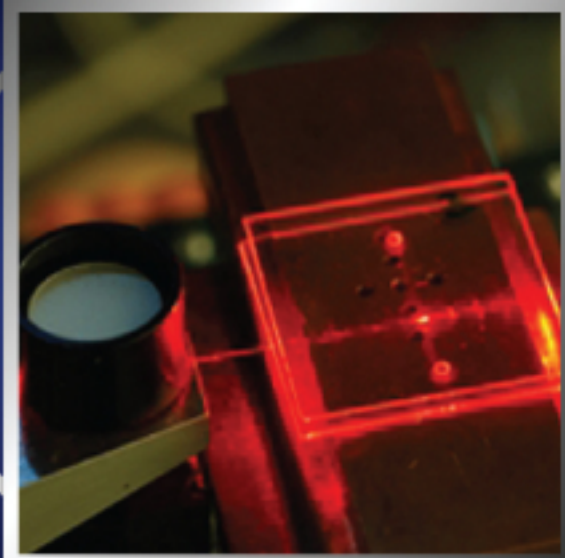
LASERS

Illuminating the Future

The roots of modern laser technology go back to a burst of innovation in the years following Theodore Maiman's demonstration of the ruby laser in 1960. Today lasers are ubiquitous; they can be found in DVD and CD players, checkout stands in supermarkets, and in the physician's office. The laser's many uses stem from its unique properties; for example, the ability to achieve high power while being focused to a pinpoint makes the laser ideal as a precision scalpel in medicine or as a means to slice through thick plates of steel. Lasers continue to transform the world with their seemingly limitless potential, with current R&D efforts contributing to more effective and efficient healthcare, energy, commerce and communication solutions.

Healthier bodies with lab-on-a-chip

Miniaturized diagnostic testing and sensing systems (laboratory-on-a-chip), which utilize organic lasers with other components, may enable inexpensive, disposable tests that can be analyzed at the patients' side or even embedded beneath the skin. A wide range of physiological parameters can be detected, making LOCs part of efforts to improve global health.



Clean, abundant energy

The U.S. National Ignition Facility (NIF), part of Department of Energy's Lawrence Livermore National Laboratory, is developing world's largest laser system, which will focus 192 laser beams onto a small fuel capsule. The goal is to create a small star the diameter of a human hair, opening the door to fusion and providing a sustainable, carbon-free energy source to meet worldwide energy needs.

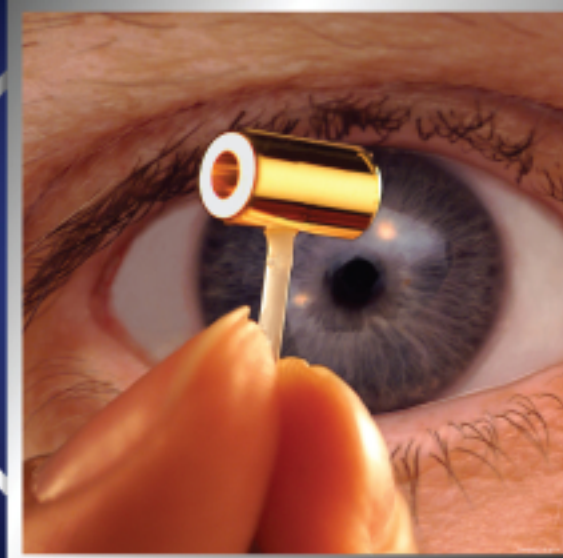


Photo Credit: Lawrence Livermore National Security, LLC, and Lawrence Livermore National Laboratory

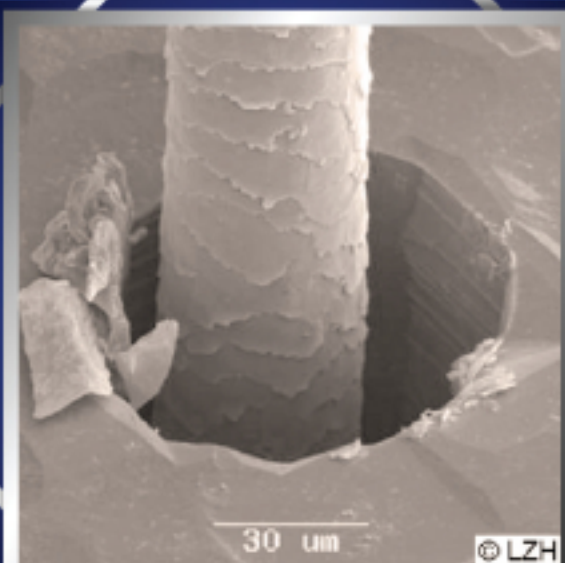
New world of communications

Unprecedented performance for data-communication links is on the horizon. Inside fiber-optic cables are bundles of long, thin, transparent fibers that are surrounded by a highly reflective material. Light enters one end, carrying vast amounts of data. Investigations into the uses of vertical-cavity surface-emitting lasers (VCSELs) that are high speed and low cost promise to improve the transmission rates dramatically. Examples include the ability to transmit the entire Library of Congress, 32 million books, in less than one hour.



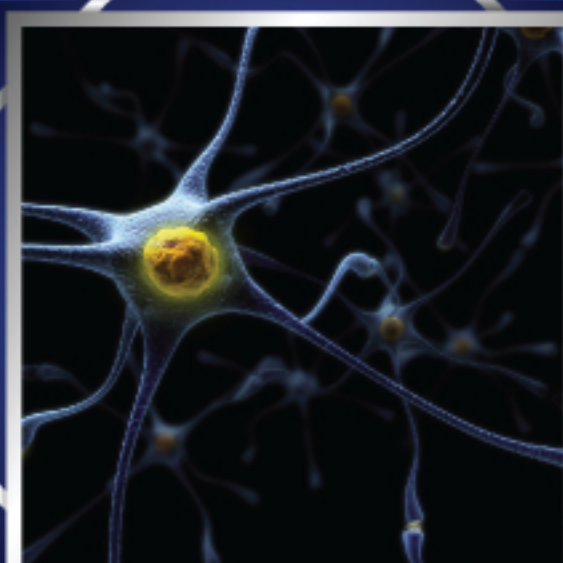
Fast and efficient manufacturing

With developments of fiber lasers in industrial applications, manufacturers are looking at significant efficiency gains with faster and more precise cutting. In the photovoltaic industry, these technologies will enable a competitive advantage with high-speed drilling, grooving, scribing, and other capabilities down to the micron level.



Early disease diagnosis and treatment

Researchers have found that a technique used to visualize amyloid fibers, the plaque that tangles neurons in Alzheimer sufferers, might have the potential to diagnose and destroy them in the clinic. Clinical trials utilizing a laser-based technique could lead to diagnostics that identify the disease decades before onset of symptoms, and zapping the fibers with lasers would inhibit their growth and degrade them.



Imagining the future

Viewing 3D holographic movies without special glasses, possibly even on your home television | Miniature devices that carry billions of bits of information, which project images and information into the air in the form of laser holograms | Treating mental disorders with low-power laser light | Not only reshaping the cornea for improved vision with the LASIK technique, but reshaping the entire eye for 20/20 vision | Attaining the dream of unlimited clean energy for the entire world | When the phone rings, seeing a realistic, projected image of the caller in the room | Diagnosing cancer and asthma by simply sampling breath with an exhale

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