

# Regional

# Physics professor leads research into laser uses

Lasers have gone from being the subject of science fiction to an everyday necessity. And scientists tell us that there is much more to lasers than we know, and that the future will bring us many more benefits from lasers than what we can now imagine.

One of those scientists is Hernando García. Born in the town of Armenia in Colombia, South America, García has been fascinated with physics since he was a student in high school. He obtained his bachelor's degree in physics at the New Jersey Institute of Technology and his master's and doctoral degrees, also in physics, at Rutgers University. Today he is an associate professor of physics at Southern Illinois University Edwardsville.

His first research interest centered on the origin of the universe, but now he is working in the field of optics. What made him change his original interest?

"We observe the universe through light," García said in an interview. "Our eyes allow us to only see the 'visible light,' what we perceive as red light through violet. We also use light to communicate through fiber optics. We do not perceive the whole spectrum, but we use it."

For many people, lasers are half reality and half science fiction. Actually the term laser is an acronym for Light Amplification by Stimulated Emission of Radiation.

"That's a term invented by Albert Einstein," García said. "We know

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that light interacts with matter, like when light reflects on a surface, but is also absorbed. There is also spontaneous absorption, as well as you can use a photon (an elementary particle that is the unit of light) to stimulate the emission of light. That is how lasers work. Laser is an amplified radiation."

While some lasers are made only of visible light, there are also infrared, ultraviolet and even x-ray lasers.

Today blue lasers are used in some consumer products, such as the Blu-ray Disc, which has the capacity to store much greater memory — as well as produce sharper images — than DVDs.

Most people relate lasers to the so-called "light sabers" of the "Star Wars" movies. But in fact, García said, such a use of a laser is actually a physical impossibility.

"Lasers are very limited devices," he said. "The amount of energy you put in making a laser beam is about three or four times the energy of what you can produce, which makes it very inefficient."

While most people know something about Einstein, few realize that the German scientist was actually the one who laid the theoretical foundations of lasers.

Today we can find lasers being applied everywhere. In medicine, for example, lasers are used in surgery, dentistry, eye surgery and kidney stone treatments. In industry they are used to weld, cut, to mark parts and for measurements. Law enforcement officials use them for fingerprint detection. The military uses them as weapons for blinding enemy troops, to target objects and guide munitions and for missile defense.

But perhaps we are better acquainted with the use of laser applications on the products of everyday life, such as barcode scanners at supermarkets, optical discs (CDs, DVDs), laser printers and pointers, thermometers, holograms, and from their use by the entertainment industry in laser light shows. Lasers are also used in cosmetic skin treatments such as for hair removal or for the treatment of acne or cellulite.

García explains that lasers concentrate great amounts of energy onto very small points, which is why they can be dangerous if not used properly.

"I would say that the danger is in the precision with which you use the laser," he said. "Actually the Food and Drug Administration approved a few months ago the use of biological markers that attach to cancer cells to kill them."

García said he sees a lot of expansion in the application of lasers in medicine, such as in brain surgery where their precision can be effec-



Martha Garcia

Dr. Hernando García seen on a recent visit to South America.  
tive.

among his students in pursuing a career in lasers? "A lot. We have even some instruments that you cannot find in other universities of this region," García said.

And as for the number of jobs available for people who have an expertise in lasers? García repeated, "A lot."

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