

Created for the Optical Society of America

For the 50th Anniversary of the invention of the laser, the Optical Society of America commissioned a video for middle school students to explain how the laser illuminates modern life. Given the myriad applications for this technology, and to make the story more accessible to our audience, I focused the script on how the laser is transforming transportation, communication and the internet, medicine and logistics.

<u>VIDEO</u>	<u>AUDIO</u>
We see cars and trucks on suburban streets with oddly shaped antenna, laser sensors and other exotic gear. They are robotic vehicles competing in the DARPA Urban Challenge, 2007. We follow them as they're put through their paces.	<u>NARRATOR:</u> What you're looking at is a race....but unlike any race you've ever seen. Because these cars are robots... demonstrating their driving skills as they navigate a 60 mile course in the DARPA Urban Challenge.
Dr. Tony Tether (from the DARPA video) and images from the DARPA Urban Challenge	<u>DR. TONY TETHER:</u> The reason we're here, is this technology will save a lot of lives on the battlefield.
(from the DARPA video)	<u>NEWSCASTERS:</u> This is the DARPA Urban Challenge.
(from the DARPA video)	<u>JEFF BECK:</u> There are a lot of good teams here. This is going to be a lot of fun.
(from the DARPA video) and images from DARPA Urban Challenge	<u>ANNOUNCER:</u> The Urban Challenge features unmanned robotic ground vehicles equipped with the latest autonomous vehicle technologies...
More images from the DARPA Urban Challenge	<u>NARRATOR:</u> On their own, these robots have to follow all the traffic rules, avoid obstacles and cars, and do it all in six hours. They use GPS systems to navigate, on-board computers to do the driving, and lasers to see what's ahead. Laser vision keeps them safe and in control. And that same technology will keep us out of danger in the cars of the future.

<u>VIDEO</u>	<u>AUDIO</u>
ANIMATION Using JB09 #361 as a background, Main Title lights on the screen: "PULSE: The Story of Lasers"	
Montage of images of items containing lasers, including DVDs, supermarket scanners, Medical lasers used in surgery, patient ID, traffic control and the like	<u>NARRATOR:</u> Lasers are so common today they're almost invisible. They play our music, price our groceries, heal the sick, transport our goods, speed up the Internet, track our products, smooth our way through tollbooths, protect our teeth, and help keep our troops out of harm's way.
ANIMATION Using JB09 #347 as a background Title lights on the screen: "SUPERCHARGING THE INTERNET"	<u>NARRATOR:</u> Lasers drive innovation. They're the solution to many of our technological problems. Take, for example, the Internet.
DARPA Urban Challenge reprise (from the DARPA video)	<u>NARRATOR:</u> The Internet was created by DARPA, the research arm of the Pentagon... they also created the DARPA Urban Challenge we saw earlier.
DARPA images of the early internet (from the DARPA video) modern computer screens showing itunes, facebook, skype communication, etc. or shots of kids on their computers going to all those sites	<u>NARRATOR:</u> The Internet back then was really slow. Just words on a screen...that's it. Scientists would have to find some way to supercharge it to play music, send photos, make calls, show videos, play games ...and all the other stuff we do everyday now. But to do all that, we would need something pretty cool.
image of a laser	<u>NARRATION:</u> Sounds like a great job for a laser. :

<u>VIDEO</u>	<u>AUDIO</u>
Science Journalist (perhaps Ira Flatow)	<p><u>SCIENCE JOURNALIST:</u> (would say something like the following):</p> <p>The laser is the perfect messenger service for the computer.</p>
<p>Abstract background portraying computers in action from JB09 #354/355/374</p> <p>NYT Article: Sharing the Supercomputers</p>	<p><u>SCIENCE JOURNALIST:</u> (would say something like the following):</p> <p>After all, computers see everything as ones and zeros , and they can talk really, really fast. But to hook up with other computers...</p> <p>they need some way to send their messages over great destinations, at super speed. And what travels faster than the speed of light?</p>
<p>We see images of working lasers, fiber arrays and super computers</p> <p>NYT Article: New Bell Laser Device increases Data Capacity</p> <p>NYT Article: PATENTS: A Laser Device to Speed Long Distance Data</p> <p>NYT Article: Fiberoptics Speed Record: One Trillion Bits a Second</p>	<p><u>NARRATOR:</u></p> <p>You could say a laser is like a sophisticated light engine. It creates a super-intense ray of light, tightly controls it, and shoots it out in a narrow, powerful beam.</p> <p>And lasers can switch on and off incredibly fast -- more than a trillion times a second.</p> <p>Computers read those pulses just like ones and zeroes. So they can speak the same language. Like a computer version of Morse Code.</p> <p>:</p> <p>:</p> <p>:</p>

<u>VIDEO</u>	<u>AUDIO</u>
<p>Images of fiber optic cables emitting light Eyewire CTE008 showing fiber optic cables and footage from WNET program "Innovation: Light Speed"</p> <p>NYT Article: Fiber Optic Network is Urged at Conference</p>	<p><u>SCIENCE JOURNALIST:</u> (would say something like the following):</p> <p>But getting the laser pulses from computer to computer was the next challenge. And the answer to that would be found in fiber optics. Glass fibers no wider than a human hair, but able to carry laser light pulses over great distances. Bundle them together and you have something really powerful.</p> <p>Fiber optics would become the super fast highways that let us send laser pulses to their destination.</p>
<p>We see Verizon workmen installing fiber optic cable in various settings. NYT Article: How to Rewire America</p> <p>NYT Article: A Trans Atlantic Cable Network Deal NYT Article: Fiber Optic Cable Demand Outstrips Supply</p> <p>Abstract images portraying the Internet JB09 #357/364/381</p>	<p><u>NARRATOR:</u> But first, we had to lay fiber optic cable everywhere. All around the globe, companies and governments spent billions of dollars wiring neighborhoods, factories, and businesses with fiber optic cables. They ran cables from town to city and even under the ocean.</p> <p>And while that was happening, scientists found ways to send more and more laser light pulses over the fiber optic networks. That stream of ones and zeroes became a mighty river and then a vast ocean. And that was how lasers helped shape the modern Internet.</p> <p>:</p>

<u>VIDEO</u>	<u>AUDIO</u>
<p>ANIMATION Using JB09 #347 as a background Title lights on the screen: "EMPOWERING MODERN MEDICINE"</p>	<p><u>NARRATOR:</u> Lasers and fiber optics have another role to play, this time in modern medicine.</p>
<p>We see row upon row of paper file folders holding patient records.</p>	<p><u>NARRATOR:</u> The problem was the ever growing pile of hand written patient records. That's how hospitals track their patients, tests, medication and procedures. Much of it entered by hand. It was easy to make mistakes, misfile papers...and it took a lot of time. But all that is changing.</p>
<p>Nurse reads Barcode bracelet on a patients's wrist (from Siemens VNR)</p>	<p><u>CORRESPONDENT:</u> Bar code technology is already in use in about 2% of our nation's hospitals. But the FDA's latest proposal calls for 100% compliance, saying patients' safety is at stake.</p>
<p>hand held laser scanners used for patient records (from Siemens VNRs)</p>	<p><u>NARRATOR:</u> Now, hand held laser scanners and computers help hospitals track their patients , monitor their meds and make sure patients get what they need, when they need it. And they're also saving lives.</p>
<p>nurse and patient (from Siemens VNR)</p>	<p><u>CORRESPONDENT:</u> The Institute of Medicine reports that anywhere from 48,000 to 90,000 patients die each year due to medical errors. The FDA says bar coding can help reduce these numbers.</p> <p>:</p> <p>:</p>

<u>VIDEO</u>	<u>AUDIO</u>
Correspondent on camera (from Siemens VNR)	<p><u>CORRESPONDENT:</u> Bar Coding has already been implemented at all US Veterans hospitals, where officials have since reported a decrease in medication errors. The FDA is now encouraging all private health centers nation wide to follow suit.</p>
images of hospital surgery. early medical device: the Gastroscope and other visuals from the WNET production "Innovation: Light Speed"	<p><u>SCIENCE JOURNALIST:</u> (would say something like the following): My favorite is how lasers are being used in surgery. And that brings fiber optics back into the story. It began with a simple problem. How could doctors see what was going on inside a patient's stomach? Even as late as the 1950s, all they had was a rigid, painful device called a gastroscope -- basically a hollow tube with mirrors. But in 1956, a college freshman created a new kind of scope using thin, flexible glass fibers. It would be the first use of fiber optics in medicine -- and way before the Internet was even possible.</p>
We see images of hospital operating theater and surgical team	<p><u>NARRATOR:</u> Modern medicine has developed all kinds of sophisticated ways to scan the body. But until recently, surgeons still used a scalpel to get to the root of the problem. That often meant a big, expensive operation... long recovery... and costly hospital stay. And there were places in the body too difficult for the surgeons' knife.</p> <p>:</p>

<u>VIDEO</u>	<u>AUDIO</u>
We see minimally invasive surgical procedures	<p><u>SCIENCE JOURNALIST:</u> (would say something like the following):</p> <p>Now modern fiber-optic scopes can go everywhere in the body, even the brain. And they're designed not just for viewing, but for a new kind of surgery using lasers.</p>
<p>We see images of test lasers NYT Article: Lasers May Make the Kindest Cuts</p> <p>NYT Article: Lasers 'Weld' Damaged Arteries</p>	<p><u>NARRATOR:</u> Lasers have another powerful quality... their energy can be completely focused to drill, burn or cut. Making them the perfect surgical knife to go with fiber-optic scopes.</p> <p>Lasers can be extremely small and their energy carefully controlled... so they can vaporize their target and leave everything else untouched.</p>
Images of laser surgery	<p><u>NARRATOR:</u> And now surgeons use lasers to cut out cancer, heal a damaged blood vessel, even save eyesight threatened by glaucoma or diabetes.</p>
<p>MRI assisted brain surgery</p> <p>NYT Article: What's New in Medical Lasers: Gambling That Doctors Will Trade In their Scalpels</p> <p>NYT Article: WHAT'S NEXT: Lasers Set Cells Aglow for a Biopsy Without the Knife</p> <p>NYT Article: With Lasers and Daring, Doctors Race to Save a Young Man's Brain</p>	<p><u>SCIENCE JOURNALIST:</u> Lasers and fiber optics are at the heart of what we call "minimally invasive surgery."</p> <p>We're even able to go inside the brain using fiber optics and a laser scalpel to operate on just the small area that's creating the problem. Another way lasers are helping doctors save lives.</p>
<p>ANIMATION Using JB09 #347 as a background Title lights on the screen: "DRIVING INNOVATION"</p>	

<u>VIDEO</u>	<u>AUDIO</u>
we see images of AGVs (Automatic Guided Vehicles) in a fast-paced industrial ballet.	<p><u>NARRATOR:</u> Lasers are also part of the new industrial revolution. They're being used all over the world as eyes for a new kind of robot.</p>
Shots of loading and unloading containers at a port	<p><u>NARRATOR:</u> We live in a global economy... products we make and use are shipped all over the world. Huge international ports load and unload our goods. And then we move them by ship, plane, train and truck. And deliver them to the warehouse until we need them. All of it requiring a vast transportation network. And some way of keeping tracking of it all.</p> <p>:</p>
UPS. Inside a modern package handling facility, following a package's progress along a series of conveyor belts.	<p><u>NARRATOR:</u> Ever wonder where your package is? Just go on the Internet and find out. Shipping companies monitor millions of packages to speed everything to the right destination. That's where lasers come in. They track their progress by reading their bar code labels. And automatically route them through a twisting maze of conveyor belts, whisking them along to the right place. All of this used to be done by hand. Not anymore.</p> <p>:</p> <p>:</p> <p>:</p>

<u>VIDEO</u>	<u>AUDIO</u>
<p>Inside the SICK AG warehouse, we see intelligent sensor operations as pallets of goods ride along conveyor belts, all of it automated (from the SICK AG video)</p>	<p><u>NARRATOR:</u> Now the goal is: keep the lines humming.. everything in motion... all the time. Lasers guide the way... with sensors along the line ... fiber optics to send the messages... big computers to manage it all. Now our products can scoot along untouched by human hands... or stored until we need them in warehouses "run" by robots.</p>
<p>inside the SICK AG warehouse, we see intelligent sensor operations as pallets of goods ride along conveyor belts, all of it automated (from the SICK AG video)</p>	<p><u>SCIENCE JOURNALIST:</u> We use lasers to measure distance, too. Lasers are extremely accurate. So they help the robots load correctly and make sure they don't hit anything while they're doing it. And on the line, they keep watch that everything is working just the way it should.</p>
<p>DARPA Urban Challenge, cars pass the finish line.</p>	<p><u>NARRATOR:</u> Meanwhile, back at the race.. Five cars made the finish line in under six hours. Another big win for lasers. It's their versatility that makes lasers so useful. We've seen just a handful of all the things they can do. And who knows what we'll see in the years to come. With lasers lighting the way to a better quality of life for all of us, who knows, maybe you'll be part of that story.</p>
<p>laser montage</p>	<p><u>NARRATOR:</u> And the next time you get a package, go online, listen to music, watch a DVD, visit the grocery store, maybe you'll stop and think, there's are lasers out there, working for me.</p>