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Fiber technology, though almost 50, still isn't available to all of America

While fiber optic technology was developed in the 1970s vast stretches of rural America are still aspiring to attain what is a household item in urban expanses of the U.S. That's the observation of Drew Wooley in the article "Through the Looking Glass" in a recent issue of Connected, the magazine of Farmers Telecommunications Cooperative in Rainsville, Alabama.

Millions of miles of fiber now crisscross the globe, connecting people continents apart with instantaneous communication, and supporting high-definition video and high speed internet.

In the 1980s, engineers assumed that optical cables would replace more expensive copper cables for telephone service, saving money in the process. When the use of the Internet exploded in the 1990s, suddenly there was a great demand for cables that could carry heavy loads of digital data. Optical fiber fit the bill perfectly, and many thousands of miles of new cable have been laid all around the world.

Fiber optics rendered all previous telephone network transmission media obsolete. By 2000, copper wire for the most part persisted only in local loops that ran between telephone exchanges and individual subscribers, and microwave systems had been largely decommissioned. The cost of transmitting a phone call to any place on Earth within reach of a fiber-optic cable rapidly approached zero, thus knitting the planet more closely into a single instant communications web, greatly facilitating global commerce. The widespread adoption of fiber optics made the global internet possible. Communication-in-a- flash technology still isn't available to all of America, though rural communications providers are doing their best to bring it to the rural landscape.

"We've grown used to the idea that information can travel in many ways. Landline telephones convert the sound of a voice into electric signals transmitted across lengths of wire. Cell phones use radio waves traveling through the air. Fiber transmits light through glass for telecommunications almost instantaneously," says Wooley.

Each fiber strand is made up of a glass core thinner than a human hair, with light signals transmitted through the glass. The core is surrounded by a cladding that reflects light back into the glass, bouncing the signal from side to side until it reaches its endpoint.

Fiber optics make it possible to transmit large amounts of information simultaneously. A single cable can bundle thousands of fiber strands.

Woolley explains that a single strand of fiber is three times stronger than steel and more durable than copper, yet is light and flexible.

The glass is extremely pure to prevent signals from degrading over long distances--so pure, Woolley says, that if the ocean were made of the same glass, an observer could stand on the surface and clearly see the ocean floor miles below.

Making fiber is characterized as "precision rocket science"that involves mixing oxygen with liquid forms of silicon and germanium inside a glass tube. As the chemicals mix the tube is heated to extreme temperatures. An ensuing chemical reaction leaves white soot inside the glass that the heat fuses into what becomes the glasss core of the fiber. The tube itself becomes the reflective cladding that surrounds the core.

Over several hours the tube eventually collapses on

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SPECIAL POINTS OF INTEREST

• Vast stretches of rural America are still striving to attain fiber optic service, though technology was developed almost five decades ago.

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• A single strand of fiber is three times stronger than steel and more durable than copper, yet is light and flexible.

• If the ocean were made of the same glass as fiber optic cable, an observer could stand on the surface and clearly see the ocean floor miles below.

• Fiber transmits light through glass for telecommunications almost instantaneously.

Landlines are still the gold standard in exact location over cellular phones when a home emergency occurs

Should an emergency occur at your home that requires you to use a phone to dial 911, what's the best sort of phone to reach for?

"Your decision to use a landline or a cellular phone could greatly impact the ability of emergency responders including firefighters, police, and medical personnel to find your location," says Brian Fortes, CEO of the National Emergency Number Association.

"A crucial question is can first responders find the person making that 911 call? It's easier to track someone down using a landline phone than a cellular. Landline is still the gold standard for 911 location," Fortes said.

According to Fortes, the big difference is what dispatchers see on the screen. If an emergency call comes from your home via a landline, dispatchers can pull up the exact address of where the call originated.

Should the call originate from a cellular phone, the dispatcher gets a network's best guess at the coordinates of the caller. Accuracy of the coordinates could be 300 yards or more away from the caller's location.

"It's always going to be a challenge for first responders if you don't know that address," says Fortes.

Which mode of emergency communication makes Fortes feel safer?

"While wireless providers and emergency officials are making strides to improve the location capabilities for the networks, I feel safer knowing that I have a landline home phone. I have a landline in my home for security reasons. In an emergency, if you have access to a wired phone, I would certainly use the wired phone," said Fortes.

300 METERS

Current specifications for some emergency cell phone calls only require the phone to be trackable within a 300 meter area. Once emergency personnel respond to a cellular 911 call, first responders may have an area the length of three football fields to search. How many other houses are 300 yards from your home? Realistically, there will be 911 calls that fall out of that 150 or 300 meter range. Landline phones give authorities a specific address to send first responders.

THE ELDERLY AND YOUNG

The two groups of people who have the hardest time explaining to dispatchers where they are located are young children who don't know their address and older adults who may be unable to talk or can't remember where they are. A landline home phone gives dispatchers an exact address that allows them to send first responders rapidly to the right place.

THE Z AXIS

When a wireless emergency call is placed, the signal can only be tracked to a geographic area. The current 911 system can't make any distinction for vertical location, also called the Z axis. For example, in a three story apartment complex or in a condo above a shop or restaurant, responders may be able to find the location, but will have no idea about the floor where the call originated.

FIVE YEARS

The Federal Communications Commission adopted new rules in 2015 requiring major improvements in cellular 911 calls. Wireless phone providers have five years to phase in these improvements. While work is underway to improve the cellular emergency call system, the gold standard is "exact location" and cellular 911 isn't capable of providing that yet.

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itself into a solid glass rod called a preform. To stretch it out, the preform is hung from a drawing tower, where one end is heated in an oven to 3,600 degrees Fahrenheit. As the tip of the rod softens a glob falls slowly toward the ground with gravity, forming a long, thin thread. The fiber becomes incredibly thin and stretches to great lenghts without breaking.

As it cools the fiber is threaded through pulleys and receives a series of protective coatings before being wound onto a spool, ready for testing and then use.

Fiber is particularly improving people's lives in rural areas, allowing the ability to do distance learning for those who wouldn't otherwise have access to a university environment—or through telemedicine that permits diagnosis over long distances. Families are also allowed to connect at high speed over great distances.

"All of this is what is truly changing the landscape of the global community," says Woolley.

On the medical front, fiber optics are even being used to provide tiny lights for improved nonintrusive surgery techniques and prostherics.

Development of prosthetic limbs that can produce the sensation of feeling for the user, Woolley relates. "Fast internet service and clear phone conversation with someone on the other side of the world are apparent benefits of fiber, but the possibilities are endless when high speed fiber service can be brought to rural America," he says.