The color spectrum is introduced to students in grade school, which shows how color is interpreted based on its wavelengths; however, there are wavelengths shorter and longer that the color spectrum, this is referred to as the electromagnetic spectrum. ("The visible spectrum" - Britannica) This spectrum is broken up by the energy and lengths of the waves that the radiation has starting from lowest energy and longest wavelength. The EM spectrum covers gamma rays, X-rays, ultraviolet light, visible light (color), infrared radiation, microwaves, and radio waves. ("The Electromagnetic Spectrum" - NASA) A few more applications of the EM spectrum not covered in the introduction are GPS satellites, ovens, security systems, and remote controls. The article highlights segments of the spectrum that are used in three different applications: telecommunications networks use light waves for signal transmission using optical fibers, microwaves are used in mobile phones to communicate, and X-rays are widely used in medical imaging. The article continues on to explain how new methods of manipulating electromagnetic waves could potentially create new and exciting technology.

This article explores four technical advancements. Firstly, all-optical data handling aims at minimizing bottlenecks in communication networks. Currently, optical signals are converted to electrical signals for routing and processing, using strictly all-optical signals could result in faster networks for signal processing. The second area discusses photonics, using light to manipulate and examine molecular scale objects. This application could revolutionize industries such as drug production and microfabrication. The third area explains how new materials can be used to control physical properties of light and electromagnetic radiation that has never been controlled before. This could revolutionize mobile communications, imaging, and displays. The final section mentions advancements in non-intrusive imaging technology which could lead to advancements in areas such as security and medical diagnostics. Among these, all-optical data handling captivated me the most because I am interested in the applications of optical fiber. I am curious to learn about how communication networks can be improved. I believe this is very important to meet the growing needs of communication networks.

In the past 20 years, optical fiber technology has replaced copper cable as the primary medium for data transmission across telecommunications networks, with the exception of the final connection to homes. This is because optical fibers can handle large amounts of data using light, which is more efficient than electrical pulses carried by copper cables, however, it comes with its own set of challenges. Examples are in routing and ensuring data precisely reaches its intended destination. Light waves can not be easily manipulated when compared to electrical signals, current systems convert optical signals into electrical form for processing and routing, before converting them once again into optical signals. This conversion process creates significant bottlenecks, which are manageable under current demand. As the demand for bandwidth continues to grow, this could cause issues in the future.. The push towards fully optical networks aims to fix these challenges by removing the need for signal conversion; this would unlock the full potential of optical fiber technology for seamless, high-speed data

communication. To remove the need for signal conversion, hybrid systems that route and switch an optical signal electronically, without the need for conversion, are being developed. Scientists have made considerable progress in developing photonic bandgap structures and quantum technologies. While quantum cryptography has seen practical testing, the commercial availability of these advanced optical technologies appears promising but may still be emerging or limited to specific applications. I found the fact that this optical network advancement is crucial to the design and implementation of a quantum computer. This is an example of one new technology that could snowball into something very interesting and abstract, such as a quantum computer.

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