

## Applied Research

Applied research is generally carried out to solve a problem. For example, when certain refrigerants escape into the upper atmosphere, they damage the ozone layer, which helps block harmful ultraviolet rays from reaching the surface of Earth. In response to concerns that this atmospheric damage could pose health problems, chemists have developed new refrigerants. In applied research, researchers are driven not by curiosity or a desire to know but by a desire to solve a specific problem.

## Technological Development

Technological development typically involves the production and use of products that improve our quality of life. Examples include computers, catalytic converters for cars, and biodegradable materials.

Technological applications often lag far behind the discoveries that are eventually used in technologies. For example, nonstick cookware, a technological application, was developed well after the accidental discovery of Teflon. When it was later discovered that the Teflon coating on cookware often peeled off, a new challenge arose. Using applied research, scientists were then able to improve the bond between the Teflon and the metal surface of the cookware so that it did not peel.

Basic research, applied research, and technological development often overlap. Discoveries made in basic research may lead to applications that can result in new technologies. For example, knowledge of crystals and light that was gained from basic research was used to develop lasers. It was then discovered that pulses of light from lasers can be sent through optical fibers. Today, telephone messages and cable television signals are carried quickly over long distances using fiber optics.



**FIGURE 2** The chemical structure of the material in an optical fiber gives it the property of total internal reflection. This property, which allows these fibers to carry light, was discovered through basic and applied research. The use of this property to build networks by sending data on light pulses is the technological development of fiber optics.

## SECTION REVIEW

1. Define *chemistry*.
2. Name six branches of study in chemistry.
3. Compare and contrast basic research, applied research, and technological development.

## Critical Thinking

4. **INFERRING RELATIONSHIPS** Scientific and technological advances are constantly changing how people live and work. Discuss a change that you have observed in your lifetime and that has made life easier or more enjoyable for you.