Our eyes enable us to view the world around us and to complete many everyday tasks. While people may take vision for granted, it is a complicated process that requires numerous components of the human eye and brain to work together.

This edition of SCIENCE SCREEN REPORT explores how the eyes work to create vision. It also discusses complications that can interfere with eyesight, and some medical breakthroughs that are helping people regain good vision.
Vision is a complicated process that requires numerous components of the human eye and brain to work together. Visual perception begins when light rays enter the cornea and lens. The cornea and lens then bend the rays of light and bring them into focus upon a thin transparent layer of nerve tissue called the retina. The retina captures the image as if it was film in a camera and sends it to the brain to be developed. The retina is connected to the brain by the optic nerve.

Perhaps the most common eye problem is that of poor vision. This occurs when the cornea or lens becomes misshapen, causing certain areas of the retina to receive less light. Contact lenses or glass-es help correct this condition by bending the light before it enters the eye. Lasik surgery is another option that has had success in correcting poor vision, using a special laser to reshape the cornea.

Many complications and diseases can affect our eyesight and cause blurred vision, tunnel vision, and blindness. Macular degeneration affects a part of the retina called the macula. This allows us to focus clearly and to see with sharp, straight-ahead vision. Instead of seeing straight ahead, people with macular degeneration have only the outermost peripheral vision, seeing out of the corner of their eye. They see a dark, distorted patch where the center vision is blacked out. Fortunately, a procedure called photodynamic therapy can help some patients. Others may require surgery.

Glaucoma is another eye disease caused by pressure within the eye and on the optic nerve that can lead to blindness. However, if it is detected early on through annual eye exams, special eye drops may alleviate the pressure. If not, surgery is needed.

However, there are some eye diseases that cannot be treated. One of these is retinitis pigmentosa. This blocks out all peripheral vision, allowing the person to see only in tunnel vision. Most people with this disease eventually go blind.

Fortunately, medical breakthroughs are unveiling ways for people who are legally blind to see again. Those who are blind due to corneal related complications may benefit from the Boston Scleral Lens. This looks like an extra large contact lens that fits over the sclera part of the eye and then arches over the cornea.

Other revolutionary research may offer future hope for blind people suffering from retinal diseases. A new microelectronic retinal implant, or retinal prosthesis, is currently being tested. It is designed to restore vision by taking over the job of the damaged retina cells. However, more research is needed before it becomes a commercial product.

Further hope to restore and improve vision can be expected in the future, as scientists continue to investigate new ways of restoring good vision for people with vision-related problems.

### ADVANCED ORGANIZERS

Prior to viewing this video, students should have some understanding of the following Benchmarks*:

**Benchmark 1: The Nature of Science**

1. When similar investigations give different results, the scientific challenge is to judge whether the differences are trivial or significant, and it often takes further studies to decide. Even with similar results, scientists may wait until an investigation has been repeated many times before accepting the results as correct. (Section A)
2. New ideas in science sometimes spring from unexpected findings, and they usually lead to new investigations (Section B).
3. When similar investigations give different results, the scientific challenge is to judge whether the differences are trivial or significant, and it often takes further studies to decide. Even with similar results, scientists may wait until an investigation has been repeated many times before accepting the results as correct. (Section A)

**Benchmark 3: The Nature of Technology**

Technological problems often create a demand for new scientific knowledge, and new technologies make it possible for scientists to extend their research in new ways or to undertake entirely new lines of research. The very availability of new technology often sparks scientific advances. (Section F)

**Benchmark 8: The Designed World**

Technology has made it possible to repair and sometimes replace some body parts. (Section F)

### VOCABULARY

- Air tonometry
- Cornea
- Computer tomography
- Druen
- Glaucoma
- Hyperopia
- Lasik
- Macular degeneration
- Myopia
- Optic nerve
- Optometrist
- Peripheral vision
- Photoreceptor cells
- Photodynamic therapy
- Retina
- Retinitis pigmentosa
- Retinal prosthesis
- Sclera

### CAREER POSSIBILITIES

- **BIOLOGIST**
- **ENGINEER**
- **NEUROLOGIST**
- **PHOTO_DYNAMIC THERAPIST**
- **OPTOMETRIST**
- **OPHTHALMOLOGIST**