Blindness

Contents: Practical work, reading and questions on the nature, causes and treatment of blindness.

Time: 2 periods.

Intended use: GCSE Biology, Physics and Integrated Science. Links with work on the eye and defects of vision.

Aims:

- To complement and revise prior work on the eye
- To develop awareness of some of the problems faced by blind people
- To develop awareness of some of the causes of and treatments for blindness, particularly in developing countries
- To show some of the medical applications of modern technology
- To provide opportunities to experience some of the problems of blindness, and to practise skills in reading and comprehension.

Requirements: Students' worksheets No. 406. Blindfolds.

This unit is best used after conventional work on the eye and defects of vision.

The exercise in 'What is it like to be blind?' need not take long, but is important in order to give students a feel for the problems encountered by blind people. In school trials it was found to be a very effective way of getting students involved in the topic.

Notes on some of the questions

Qs 1 to 4 An extended version of this exercise, with accompanying information, is to be found in 'What is it like to be blind?', a leaflet produced by the Royal National Institute for the Blind (see 'Further resources' below).

One of the less obvious problems of blindness is the difficulty of conversation without the benefit of eye contact and body language.

Q. 5 As well as the white stick helping sighted people to identify a person who is blind, the stick itself is important for the blind person as a means of locating objects, by touch and by echo detection.

Q. 9 Mention could be made of the greater incidence of blinding tropical disease in the developing world, and of the lower level of medical provision.

Qs 10 and 11 are intended to encourage students to do a little research of their own, perhaps for homework. The notes below may be of help to the teacher.

Trachoma

Trachoma is a disease in which the conjunctiva and cornea are affected by a virus, leading to blindness. The disease is very common in Africa and the East. Up to one-sixth of the world's population may be affected.

Glaucoma

This disease is derived from abnormal pressures building up in the eyeball. As a result blood fails to reach the eye and loss of vision results. If it is discovered early enough progression can be halted.

Keratomalacia

Keratomalacia is caused by a deficiency of vitamin A in the diet. This disease leads to softening and eventual perforation of the retina.

Xerophthalmia

Xerophthalmia is common among the poor of many developing countries and is due to a deficiency of vitamin A. Its most serious consequence is defective vision, starting with night blindness and ending with total blindness.

Onchocerciasis (River Blindness)

Onchocerciasis is caused by the filarial worm, *Onchocerca volvulus*, which is transmitted by the black fly, *Simulium*. The larvae of the filarial worm are introduced into the skin by the bite of the fly. The worms migrate through the tissues, causing inflammation of the skin, enlargement of the lymphatic glands and inflammation of the eye, leading to blindness.

Rubella (German Measles)

Pregnant women infected with rubella virus may transmit this virus to the unborn child in the uterus. The risk of infection is highest during the first few weeks of pregnancy, when 50 per cent of infants will be affected. The risk falls to 4 per cent by the fourth month. The affected babies show one or more of the features of the congenital rubella syndrome. The commonest features are cataracts, deafness and heart defects. Girls are now immunised against rubella in their early teens.

Further resources

The Royal Commonwealth Society for the Blind have useful resources, including films, concerning the problem of blindness in developing countries. Royal Commonwealth Society for the Blind, Commonwealth House, Heath Road, Haywards Heath, West Sussex RH16 3AZ.

The Royal National Institute for the Blind (RNIB) will supply information concerning blindness, including samples of braille sheets and a key to the braille alphabet. The Royal National Institute for the Blind, Education Department, 224-228 Great Portland Street, London W1N 6AA.

Acknowledgements Figure 1 supplied by RNIB; Figure 2 is reproduced by permission from *Science* by Graham Hill and John Holman (Nelson); Figure 3 reproduced by permission of Royal Commonwealth Society for the Blind.

BLINDNESS

For those of us who are able to see, it is difficult to imagine what it would be like to be blind. *But more than 27 million people in the world are blind.* That is at least one in every 175 people.

Activity: What is it like to be blind?

It is difficult to imagine the problems we would meet if we were to become blind. In this experiment you are going to find out a little about the difficulties.

While you are doing the experiment, think about questions 1 to 4.

What you do

With your partner, decide who will be 'blind' first. The 'blind' person should put on the blindfold. Fasten it so that you cannot see anything, but do not make it too tight.

Once you are blindfolded you must not remove the blindfold at all until your turn has finished. The other person will act as the guide. You will be going for a walk around the school. It is up to the guide to make sure that the 'blind' person does not come into any danger.

Ask your teacher how long you may go out for. At 'half-time' change places.

When you return write your answers to questions 1 to 4.

Figure 1 This visually handicapped girl uses her sense of touch to find out about the donkey.

Questions

1 *What thing do you find most difficult about being 'blind'?*

2 *How would you find your way around the school on your own if you were blind?*

3 *What advice would you give to someone acting as a guide to a blind person?*

4 *In what ways is* conversation *difficult when you cannot see?*

What causes blindness?

Blindness has many causes. Accidents, disease, poor diet and old age can all lead to partial or total blindness. The following sections tell you about the causes of blindness, and some of the ways it can be cured. After reading, answer questions 5 to 11.

You may need to refer to Figure 2, which shows the main parts of the eye.

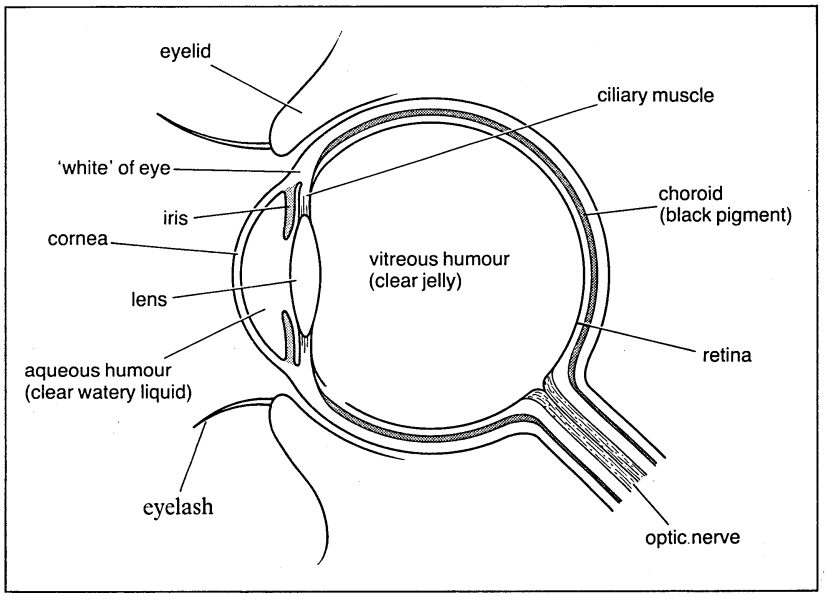

Figure 2 The main parts of the eye

Blindness in Britain

In Britain only a very small proportion of the population are blind, though this still amounts to 130 000 people. Blindness is most common among old people. The biggest cause of blindness is diabetes, which affects about 600 000 people.

Diabetes may cause the blood vessels in the eye to grow abnormally. The vessels may weaken and spill blood on the retina. This may disturb vision or even cause blindness. The vessels can be sealed by welding them with a fine laser beam.

Not all blind people are *totally* blind. In Britain people are **registered blind** if they are unable to read the top letter in an eyesight test from three metres or less. People with only a tiny bit of vision left can learn to use it very effectively.

Cataracts are another serious cause of blindness in Britain (see below).

Blindness in tropical countries

In the tropical countries of the world the problem of blindness is often far greater than in Britain. Blindness is usually caused by tropical diseases which are often not treated until too late.

For example, in parts of tropical Africa and Central America one of the major causes of blindness is a small black fly. The fly passes on a small parasite worm when it bites the skin of the victim. The worm travels through the body and causes inflammation of the eye. If it is not treated, the disease causes blindness. Because the fly breeds in rivers the disease is called **River Blindness**.

River Blindness is increasing as the number of dams and irrigation schemes in developing countries grow. These areas provide suitable habitats for the black fly. Up to 80 per cent infection occurs in some areas. In some villages all the adults are blind. People will often move away from land where there is running water to less fertile land to avoid infection.

The fly can be controlled by removing the vegetation from near the water or by using insecticides like DDT. River blindness was wiped out in Kenya by the use of DDT, but this has side effects on other animal life.

Cataracts

Sometimes the eye lens becomes clouded. This causes blurred vision, and eventually blindness. This disease is called **cataract**. The problem usually occurs in old age and is particularly common in developing countries.

The blindness can be cured by removing the lens. 3000 years ago surgeons would push the lens down into the eye 'out of the way'. The operation was sometimes successful.

In India 5.5 million people are unable to see because they have cataracts. The cure is simple — remove the clouded lens and fit the patient with glasses. However, there are few eye hospitals in India and most patients cannot afford treatment. The solution to this problem is 'Eye Camps'.

Eye Camps

Before the arrival of the Eye Camp, advance notices are posted on trees or taken round by a man on a bicycle. Nurses and equipment arrive, and the clinic is set up. Sometimes it is in a local building, but often tents are used.

A temporary operating theatre is set up and patients are examined and treated. Surgeons may operate on up to 200 patients in a day, removing a diseased lens in five minutes. Ten days later the bandages are removed and the patient is fitted with glasses — their sight restored.

The first Eye Camps were organized in India. They were so successful that the idea has spread to Pakistan, Bangladesh and Sri Lanka.

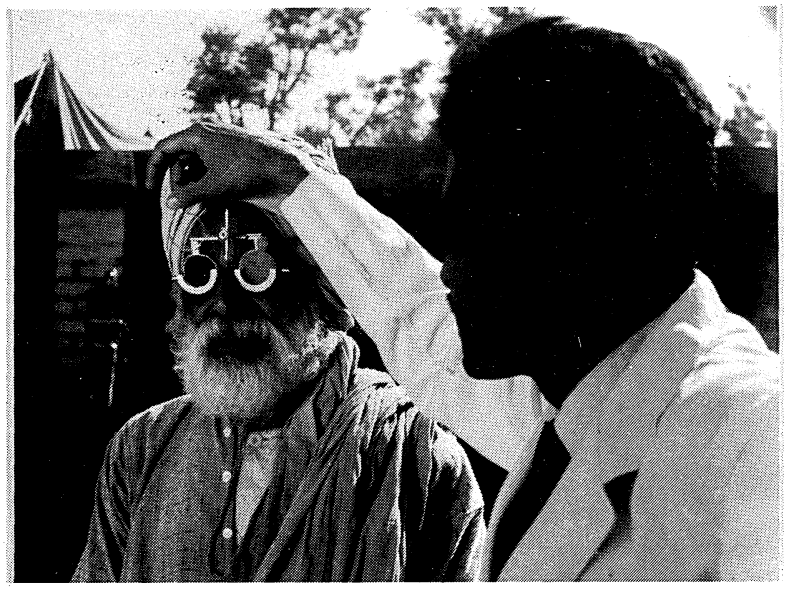

Figure 3 A patient having his eyes tested after a successful operation in an Indian Eye Camp.

A more sophisticated cataract operation uses ultrasonic vibrations. The tip of an ultrasonic vibrator is inserted through a small cut in the cornea. Very high frequency vibrations cause the lens to break up. The inside of the eye is then flushed with water and the pieces of lens are washed away. The patient is then given glasses or a contact lens.

Questions to answer and discuss

5 *Why do blind people carry white sticks?*

6 *Education is difficult for blind children. In Britain, blind children often go to special boarding schools. But more and more blind children are being educated in normal schools.*
What problems are there with each type of education? Which do you think you would prefer if you were blind?

7 *What is your attitude to blind people? How do you feel when you meet or see a blind person?*

8 *In what ways has modern technology helped improve the treatment of blindness?*

9 *Why are there relatively fewer blind people in Britain than in the developing world?*

10 *Occasionally babies are born blind. How would this affect the way they develop in the first few months of life? Try to find out what causes babies to be blind.*

11 *Glaucoma and trachoma are diseases which frequently cause blindness. Find out more about these and other blinding diseases.*