Eyes to the Future

Welcome, all wonders in one sight!
Eternity shut in a span.

—Richard Crashaw

At Rochester General Hospital, medical technician Anthony Guida works at restoring sight for the blind. A new process, in use since only a year before last March, makes it possible to store parts of the eye at 190 degrees below zero.

Only a small part of the eye tissue, called the cornea, needs to be preserved to restore sight to many blind persons, according to Dr. Max Presberg, who brought the present program to Rochester.

The cornea serves as a clear window in front of the pupil, while it keeps fluid inside the eye and protects the iris. Many forms of blindness result from scars on the cornea, and a transplant makes possible new vision. Now cryogenics, the science of extremely low temperatures, makes it possible to preserve corneas for extended periods of time.

Preparation of the cornea and its freezing, which are shown in these photographs, involves the separation of the delicate membrane from the rest of the eye, a gradual cooling in ice, and then the final insertion into liquid nitrogen.

Once technician Guida has severed the cornea from the donor eyeball, he lifts it on a thin thread to place it inside a small vial. The vial contains a solution of sugar, albumin and an exotic substance known as dimethyl sulfoxide. The latter removes moisture from the cornea tissues, and prevents ice crystals from damaging the cells when the final freezing takes place.

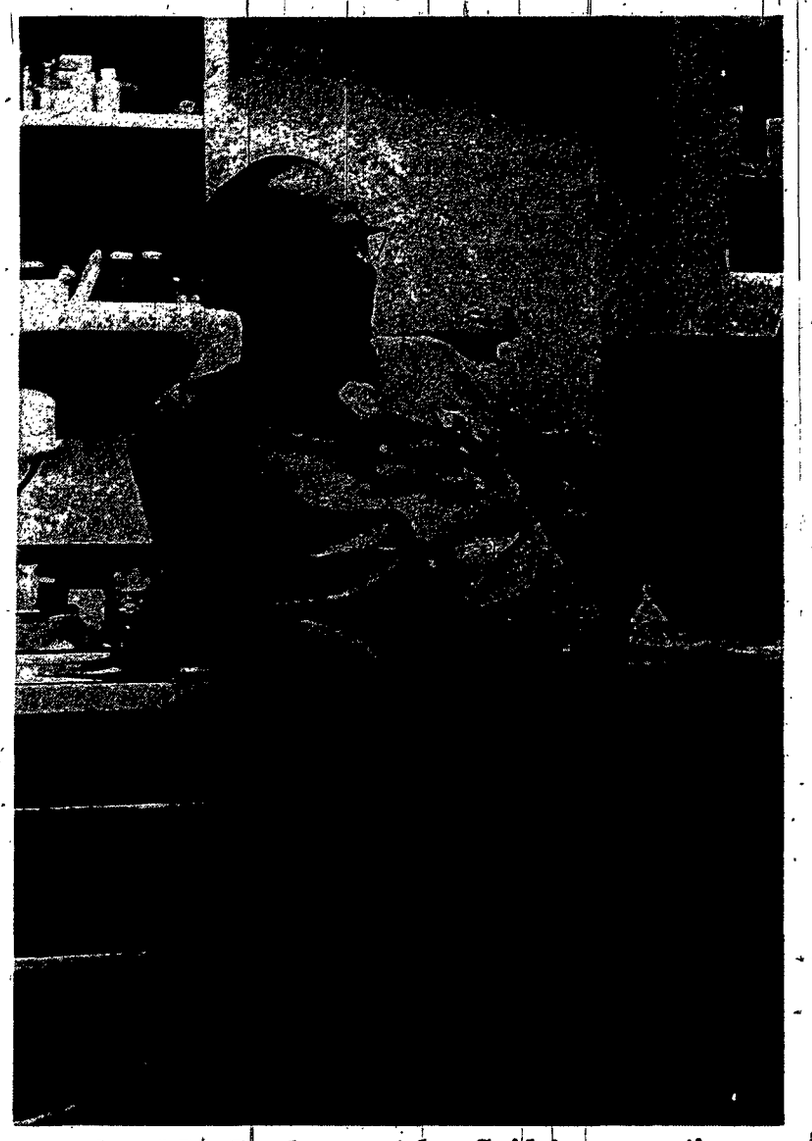
Finally, liquid nitrogen is poured into a heavily insulated freezer and the corneas, now encased in gas-proof containers, are nestled into a rack above the liquid. When Guida turns on the blower inside the freezer, the corneas gradually cool, at a controlled rate, to their final temperature of 190 degrees below zero.

The cryogenic process now in use at Rochester General was first developed in Gainesville, Fla., and then started in this city by Dr. Presberg when he was director of ophthalmology at the hospital. Although many surgeons prefer fresh tissue, ophthalmologists from around the world show interest in the Rochester program. Most recently, Dr. Wolfgang Leydhecker of Wurzburg, Germany came to gather information for the establishment of a similar eye-bank program in his home city.

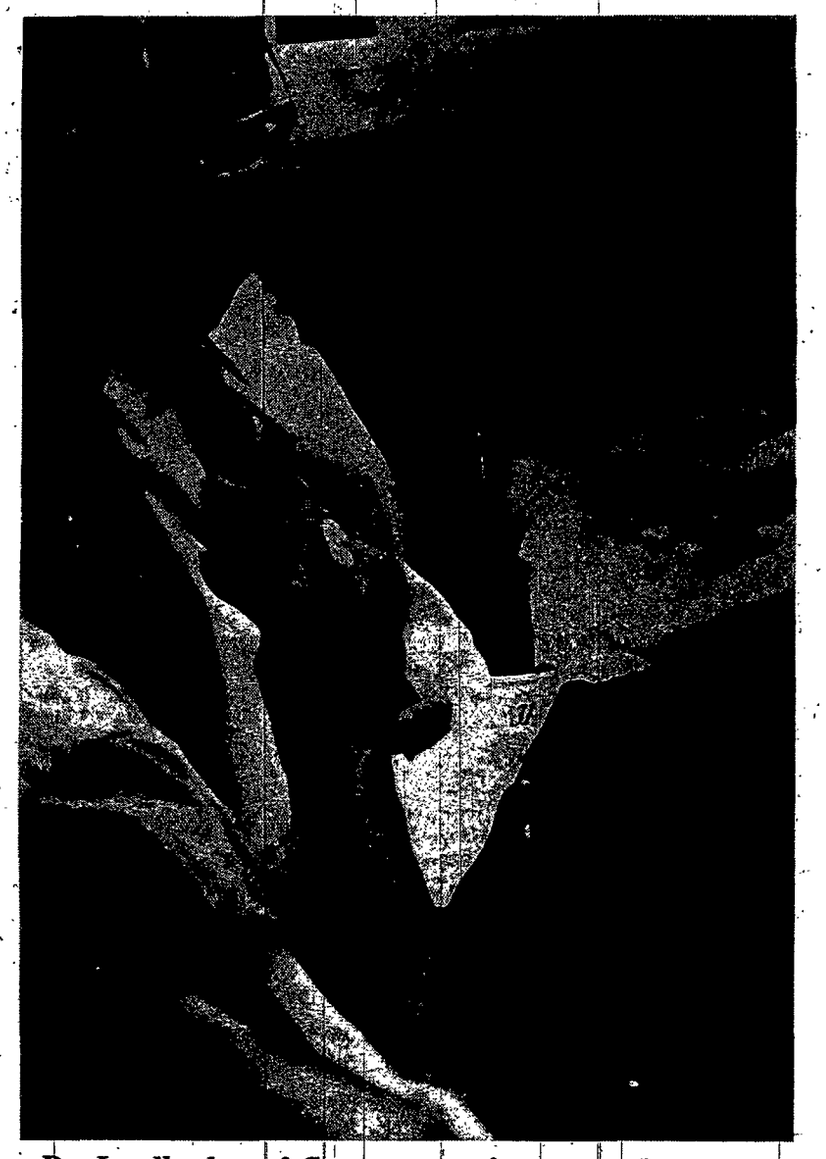
Dr. Presberg believes that the new cryogenic method, while it will not replace the conventional method of preserving corneas, has two important advantages. In cases when a cornea transplant needs to be made immediately, a more perfect match can be accomplished by drawing on the reserve of cornea types already frozen. This eliminates waiting for the right type of donor. Cryogenics also promises relief for areas like North Africa, where corneal blindness abounds. Trachoma, a viral disease which scars the cornea, occurs often among populations with poor hygiene, and over 400 million people suffer blindness because of it.

The eyes used in this program come from pledges made to the Rochester Eye and Human Parts Bank, according to its executive director, Edward Boyce. To donate his eyes, anybody may sign a pledge which allows them to be used after his death, to give sight to one who has lost it.

Text and photos by Laurence E. Keefe



A relaxed Dr. Presberg watches Guida's preparations.



Dr. Leydhecker of Germany receives an explanation.

Encased in its vial, the cornea goes into