Institute grantees are investigating optics and refractive disorders. The use of high speed computers and ultrasound to measure different parts of the eye may lead to greater understanding of these areas. Other investigators are studying the muscles which move the eye.

Much of the work of Institute grantees has been directed to mapping the visual impulse through the retina and various nerve pathways in the brain. The knowledge that has been gained from these studies has contributed greatly to understanding of the nervous system as well as the visual function. It has been shown, for instance, that there is an independent nerve pathway for the eye to pick up and follow roving objects.

Color Vision

Investigations have added to the information on the chemistry and other properties of the pigments in the human eye on which color vision depends. The spectra of these pigments have been determined by direct microspectrophotometry and their composition determined in part by direct regeneration experiments. Also a simple psychophysical procedure has been designed that isolates the action spectra of these pigments in living subjects. This makes it possible to measure the color vision pigments and their properties in the eyes of normal, color-blind, and color deviating subjects. The information so obtained has implications for the genetics of inherited types of color defective vision.

Microspectrophotometric measurements upon the outer segments of the cones of primates and of fish which appear to be able to distinguish colors in the same manner as humans have explained color vision at the receptor level; these animals possess three classes of cones, each of which absorbs light maximally in a different part of the spectrum.

However, electrophysiological studies in both fish and primates have shown that the different classes of receptors are not connected by separate pathways to the brain. Instead, opponent pairs of receptor types exert the antagonistic effects of excitation and inhibition upon the retinal ganglion cells.

It has been incontestably demonstrated that topical administration of certain adrenocorticosteroids produces in some individuals an increase in intraocular pressure. Were it possible to find a drug with antiinflammatory activity, yet free from intraocular pressure-increasing effect, the result would be both a beneficial therapeutic agent and a valuable investigative tool. Some success with such a medication, a synthetic steroid called medrysone, has been reported. Administration of this drug was not associated with rise in intraocular pressure in either glaucoma patients or normal volunteers.

A new synthetic steroid called medrysone was successfully used with glaucoma patients and normal controls. This drug has antiinflammatory activity yet is free from the intraocular pressure-increasing affects which characterize certain other drugs used to control glaucoma. It should be a valuable investigative tool as well as a beneficial therapeutic agent.

Because a number of drugs being used in the treatment of systemic disease may have dangerous side effects on the eye, it is important that these side effects be recognized at the earliest moment in order that blindness may be prevented. For example, chloroquine, used to treat arthritis and lupus erythematosus, produces eye damage if given in large doses over prolonged periods of time. The most serious, and irreparable damage is that which occurs to the sensitive neural film—the retina of the eye. A simple test has now been devised to recognize this dangerous reaction in its earliest stages.

To be treated are a continual stream of individuals from all walks of life who have been exposed to an unbelievable array of toxic agents, the actions of which are only partially understood and for which we have few antidotes.

Expanded research dedicated toward the development of new and effective pharmaceuticals for the treatment of many eye disorders is of at least equal importance. It is to the national interest to develop more active programs dealing with these critical problems.

Instruments and Techniques

Increasingly, psychology and engineering are joining forces with medicine and surgery to find the answers to problems of vision. While scientists keep their sights on prevention and treatment of eye disorders, they also look forward to the day when an artificial eye may be developed, perhaps with the characteristics of a miniature TV camera, which can replace a faulty human eye. So positive are scientists that this may become a reality that definite planning is under way to lay the groundwork for this accomplishment. Meanwhile, many new instruments and