compound was generously supplied by Dr S. G. Waley).

Two characteristics of cataractous lenses favour mixed-disulphide formation. First, the protein thiol groups become more accessible and, secondly, there is relatively little glutathione present to reduce mixed disulphides. Huisman & Dozy (1962), working on haemoglobin, predicted that mixed-disulphide formation would occur when the concentration of glutathione was low.

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Diquat Cataract in the Rat

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Rats fed on a diet containing 0.05–0.075% of the herbicide diquat (1,1'-ethylene-2,2'-dipyridylum dibromide) slowly develop lens opacities while remaining healthy in other respects (Howe & Wright, 1965; A. Pirie & J. R. Rees, unpublished work). The lens opacity starts in the posterior cortex, spreads to the central core and finally becomes complete. Mitosis in the lens epithelium is initially depressed, but recovers and no cellular damage remains. Intraperitoneal injection of diquat labelled with ^{14}C in the ethylene bridge leads to appearance of radioactivity in the lens and other parts of the eye.

The herbicidal action of diquat is considered to be due to its reduction to a bright-green free radical in photosynthesizing cells (Homer, Mees & Tomlinson, 1960; Davenport, 1963). The reaction is reversed by O_2 with formation of H_2O_2 . Gage (1968) has described several enzyme systems in liver that can form the free radical, and Orr (1966) found that ascorbic acid can reduce diquat to the free radical in air while being oxidized itself. Present experiments have shown that the ascorbic acid of the lens and of intraocular fluids was less in diquat-

fed rats than in litter-mate controls. We confirmed the finding by D. G. Clark (personal communication) that the GSH concentration of the lens remained at the normal value during cataract development. This marks diquat cataract off from many other types in which the GSH concentration of the lens decreases.

We have investigated enzymic and non-enzymic reactions of diquat with constituents of lens, aqueous humour and vitreous humour. A freshly prepared lens extract will reduce diquat to the free radical anaerobically in the dark, probably largely through the action of glutathione reductase and NADPH. The free radical is also formed photochemically in sunlight and can be demonstrated anaerobically in the presence of electron donors such as EDTA or amino acids, or with aqueous humour. Sunlight will also catalyse aerobic oxidation of ascorbic acid by diquat in aqueous humour. H_2O_2 is formed. The maintenance of GSH in the cataractous lens may be connected with the ability of the diquat free radical to reduce GSSG in the presence of glutathione reductase and NADP.

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Spontaneous Reversal of Arsenate-Induced Swelling of Mitochondria

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Hunter & Ford (1955) and Packer (1961) have described mitochondrial swelling induced by arsenate and prevented by EDTA. Ter Welle & Slater (1967) found that arsenate produces a time-dependent appearance of oligomycin-insensitive respiration and that this also is prevented by EDTA.

Addition of arsenate (1.25 mM) to rat liver mitochondria oxidizing β -hydroxybutyrate in an Mg^{2+} -free medium results in the following events: a lag phase in which the rate of oxygen uptake is approximately doubled and during which little or no swelling occurs; a phase of marked swelling and acceleration of oxygen uptake; a phase of temporary reversal of swelling (by about 20% of the total) during which the high rate of oxygen uptake is maintained; a phase of slow steady swelling during which the rate of oxygen uptake declines; a small amplitude burst of swelling when the medium goes anaerobic (or if antimycin A or an uncoupling agent