Aldridge and Street (*Biochem. J.*, **107**, 315; 1968) measured respiration and phosphorylation using pyruvate as the substrate. In both investigations unsupplemented mitochondria showed very low P : O ratios (unmeasurable with succinate, 0·89 using α-ketoglutarate as substrate and less than 0·3 using pyruvate as substrate). These values are those given by the production of ATP during the carbohydrate breakdown reactions known as substrate level phosphorylation, and imply that no phosphorylation is accompanying electron transport. When large amounts of serum albumin, which had been treated to remove all fats, were added to the incubation medium, the P : O ratios increased considerably and approached those normally found in other tissues; using succinate as substrate, ratios of 1·24 and 1·66 were recorded; with pyruvate as substrate the ratios became 0·78 to 1·44, while the ratio with α-ketoglutarate as substrate rose to 2·69.

Aldridge and Street think that the isolated mitochondria must be damaged in some way, and the addition of serum albumin restores the mitochondrial structure so that phosphorylation again accompanies electron transport. Guillory and Racker, on the other hand, think that the low P : O ratios are caused by the presence of free fatty acids which can act as uncoupling agents (Pressman and Lardy, *Biochim. Biophys. Acta*, **21**, 458; 1956) and serum albumin removes the fatty acids. During intense heat production, as much as 50 per cent of the total lipid is lost from brown fat, and the lipid hydrolysis is stimulated by norepinephrine (Joel, Treble and Bell, *Fed. Proc.*, **23**, 271; 1964). Prusiner, Williamson, Chance and Paddle (*Arch. Biochem. Biophys.*, **123**, 368; 1968) have recently shown that norepinephrine increases the temperature, reduces the oxygen tension and stimulates the oxidation of reduced nicotinamide coenzymes in brown fat *in vivo*. They calculate that only 25 per cent of the possible heat production is lost if the mitochondria are also producing ATP. They believe that the increased respiration can account for the increase in temperature without any uncoupling of oxidative phosphorylation, though they cannot completely account for the way in which the phosphate acceptor is regenerated. The amount of uncoupling in these mitochondria and the precise way in which heat production is controlled remains, therefore, a controversial question.

An All-cone Retina

from our Neurophysiology Correspondent

THE retina of the ground squirrel (*Citellus maxicanus*) has cones but no rods. The cones are evenly distributed, with no fovea or area centralis; the ganglion cells and their dendritic arborizations do not change in size with retinal location; and only a single pigment, with a peak in its absorption spectrum at 525 nm, has been detected by microspectrophotometry. These anatomical features have now been complemented with the results of micro-electrode recordings from the optic nerve (C. R. Michael, *J. Neurophysiol.*, **31**, 249; 1968). Michael mapped receptive fields of retinal ganglion cells in animals under light nembutal anaesthesia and describes three classes. The first has what is the now classical centre-surround organization; illumination of the centre produces a response antagonized by illumination of the surround. ON (excited by light) and OFF (inhibited by light and excited by cessation of a light stimulus) centres are equally common. Threshold for the surround is higher than for the centre. This is a contrast sensitive organization, and accounts for the receptive fields of about half the ganglion cells studied. Whether responses are excitatory or inhibitory is independent of wavelength of the stimulus. Although movement of a light spot through such a receptive field produces a brisk response whenever the centre-surround border is crossed, the size of this response is independent of the direction of movement.

Receptive fields of the second class do show directional selectivity. Their centres are ON–OFF, but with a moving stimulus a brisk discharge is evoked only by movement in a preferred direction, within an angular range of 40° or 50°. The preferred direction is the same for a white spot on a black background as for a black spot on a white background, and while the directionally sensitive part of the receptive field corresponds with the ON–OFF centre, it is impossible to distinguish separate excitatory and inhibitory regions within this area: the response is not, therefore, the result of a stimulus crossing a boundary between inhibitory and excitatory regions. Michael suggests a hypothesis for movement detection similar to that proposed by Barlow and Levick for retinal ganglion cells in the rabbit (*J. Physiol.*, **178**, 477; 1965). Michael proposes that the spread of inhibition is mediated by horizontal cell processes with inhibitory synapses on bipolar cells, near the cone bipolar synapses. A ganglion cell connected to an array of bipolar cells can become a sequence detecting device, responding to successive excitation in only one direction. Although there is no specific anatomical evidence for this arrangement, there are synapses which might well be involved in such a system.

The third class of optic nerve fibres shows opponent colour responses, having receptive fields which are either green-ON, blue-OFF, or the reverse. Each unit apparently has two sets of cones, one blue-sensitive (spectral sensitivity peak at 460 nm) and one green-sensitive (peak at 525 nm). Each component can be suppressed by light adaptation at the appropriate wavelength. These receptive fields have three kinds of spatial structure: in the first, the blue and green cones have the same spatial distribution, so these units are probably only functioning as frequency discriminators; in the second, green cones are connected only to the field centres, while blue cones are connected to both centre and surround, allowing a degree of both spatial and spectral discrimination; thirdly, there are units sensitive to both contrast and colour. These have normal centre-surround organization in white light, but the field centres receive inputs only from green cones, while the peripheries are connected only to blue cones. These receptive field properties are similar to some of those found in lateral geniculate cells of the rhesus monkey (Wiesel and Hubel, *J. Neurophysiol*, **29**, 1115; 1966) and in goldfish ganglion cells (Wagner, MacNichol and Wolbarsht, *J. Gen. Physiol.*, **43**, 45; 1960).

Drug Dependence

from a Correspondent

CAN experiments with bacteria or strips of gut help to explain the behaviour of the drug addict? Are drugs