violet light to nitric oxide and atomic oxygen. The latter combines with molecular oxygen to form ozone. In the Los Angeles basin of Southern California daily peaks of ozone concentration of 15 to 38 p.p.h.m. (parts per hundred million) are frequent in summer and autumn. Even the remote areas of North America often have background concentrations of about 2 p.p.h.m.

Although it is known that ozone is phytotoxic, the threshold concentrations at which toxicity becomes apparent are known for relatively few species. Symptoms of external injury include chlorotic and necrotic lesions, but long before these appear a variety of metabolic processes, including photosynthesis, mitochondrial activity and amino acid synthesis, are affected, as well as membrane permeability. The critical exposures which cause such damage have been examined for some crop and tree species, but little is known of the response of natural plant communities.

Treshow and Stewart (*Biol. Conserv.*, **5**, 209; 1973) now have data on the threshold levels of ozone resulting in injury symptoms for a variety of wild plant species. The plants were enclosed in portable fumigation chambers in the field within grassland and woodland habitats in Utah and were exposed to ozone concentrations of 15, 25, 30 or 40 p.p.h.m. for 2 h; they were examined immediately after the experiment and again 2 days later. The experiments were thus concerned with short term, acute ozone pollution rather than long term chronic effects.

Of the seventy species examined, several, including *Bromus tectorum* and *Populus tremuloides*, both important or even dominant species in some types of grassland and woodland in the area, showed visible symptoms of injury after just 2 h exposure at 15 p.p.h.m. ozone. Only five species showed no signs of injury after 2 h exposure to 40 p.p.h.m. ozone. This range and order of sensitivity to ozone agrees well with data already published on crop plants.

Ambient ozone concentrations were generally lower than 15 p.p.h.m. In clearings a level of 9 p.p.h.m. was occasionally reached, but beneath the tree canopy in woodland, values were often less than 1 p.p.h.m. This does not necessarily mean that vegetation was unaffected, since damage at a physiological level normally precedes morphological damage and occurs at lower levels than chlorosis and necrosis. It is also possible that reproduction and germination might be impaired by chronic, low level pollution, which would result in long term changes in the composition of the vegetation.

Treshow and Stewart consider it possible that in time sensitive species may be eliminated, leaving unoccupied niches and bare ground, which would result in a loss of stability in the vegetation. This is an unlikely event since there are several very resistant species in the communities, including some woody perennials (for example, *Acer grandidentatum*). Changes in vegetational composition could, however, have other repercussions such as the reduction of the productivity of an ecosystem.

BURROWING ANIMALS

Airing the Prairie Dog

from our Animal Behaviour Correspondent

PRAIRIE dogs (*Cynomys ludovicianus*) have a problem. These rodents live in long narrow burrows (about 12 cm wide and up to 30 m long) which must somehow be ventilated. Vogel, Ellington and Kilgore (*J. comp. Physiol.*, **85**, 1; 1973) have calculated that, at the very least, there must be complete exchange of the air in the burrow with the atmosphere every 10 h and probably more often. They found that neither diffusion of oxygen through the soil or at the burrow entrance nor the direct action of the wind adequately explains how gas is exchanged with the atmosphere to meet the respiratory needs of the animal. How then do the prairie dogs avoid suffocation?

Vogel *et al.* argue that two physical principles may underlie the ventilation. One is Bernouilli's principle in which flow is related to pressure differences generated by variations in velocity along a streamline. The other is 'viscous sucking', the attraction of stagnant fluid to adjacent rapidly moving fluid. Either mechanism demands that the two entrances to a burrow be dissimilar. Now it has been known for some time that prairie dogs do indeed build two sorts of entrance to their burrows: 'dome craters' (wide and rounded) and 'rim craters' (narrow, steep-walled, with a rim). But the functional significance of these two types was unknown.

Investigations showed that the typical burrow in a prairie dog town has a rim crater at one end and a dome crater at the other. By dropping smoke candles down some burrows, it could also be shown that when even a slight breeze blew, air entered the burrow through the lower mound and left it through the higher one and that the air in the burrow was completely changed in less than 10 min. They then made scale models of prairie dog burrows in which the height and shape of the mounds at each end could be altered, and found that adequate ventilation would result if the mounds at each end of the tunnel were different either in shape or in height. Real mounds are different in both height and shape, which enhances their effectiveness. The authors point out that this ventilation is efficient almost regardless of which direction the wind is coming from and works even when there is very little wind at all.

Positive Control of Enzyme Synthesis

THE appearance of three articles on the control of repression of the tryptophan operon (*Nature new Biol.*, **245**, 131, 133 and 137; 1973) leaves no doubt that negative control of enzyme synthesis exists. More recently (see *Nature*, **245**, 407; 1973), it was suggested that positive control for biosynthetic schemes must also exist, and indeed that is precisely what Levinthal, Williams, Levinthal and Umbarger put forward in *Nature New Biology* next Wednesday (November 21).

Levinthal *et al.* have isolated a mutant in *Escherichia coli* K12 that renders the cells sensitive to leucine. The system being examined is the biosynthesis of isoleucine, valine and leucine, so it is no surprise that the enzyme threonine deaminase (specified by the *ilvA* gene) is involved (see *Nature new Biol.*, **244**, 34; 1973). Moreover, the leu^s mutation has been located within the *ilvA* gene, and it has been found to affect the regulatory properties of threonine deaminase with no concomitant alteration in its catalytic activity.

This unique class of *ilvA* mutant (note that *ilvA* encodes the enzyme threonine deaminase, the first enzyme in isoleucine biosynthesis, and is feedback-inhibited by isoleucine) affords the putative regulatory role of threonine deaminase to be separated from its catalytic function in isoleucine and valine biosynthesis. The regulatory role not only involves the *ilvADE* operon and the genes *ilvB* and *ilvC* but also, predictably, is involved in the control of the amino acyl tRNA synthetases for isoleucine, valine and leucine.

Earlier Hatfield and Burns (*Proc. natn. Acad. Sci. U.S.A.*, **66**, 1027; 1970) had proffered a model to explain such regulatory properties inherent in threonine deaminase; they provided genetic and physiological evidence for the role of the enzyme in regulation of the pathway (at the level of synthesis). They suggested, however, that negative control may apply. Next Wednesday's paper by Levinthal *et al.* indeed confirms their idea that the *ilvA* gene product, strategically located, is a key regulatory target in the cell.

The leu^s mutant is found to be recessive to the wild type allele. This indicates the absence of function in the *ilvA* mutant and thus allows Levinthal *et al.* to aver that the wild type gene ($ilvaA^+$) produces a positive effector for the control of enzyme synthesis.