drugs remain largely unknown, certainly at the molecular level, in spite of much speculation. A suggestion by Folkers (*Proc. natn. Acad. Sci. U.S.A.* **73**, 4653; 1976) that inhibition of mitochondrial coenzyme enzymes might be an important factor, has been taken up by Lown (*Biochem. biophys. Res. Commun.* **76**, 705; 1977), who suggests modifications to the anthraquinone chromophore of the drugs as a means of surmounting the cardiotoxicity. However, it does seem that such alterations would result in the undesirable effect of markedly decreasing DNA binding ability since the basic requirement for intercalation, a planar chromophore, would no longer be so well obeyed. This illustrates one of the pitfalls of this approach to molecular drug design—how optimisation of one characteristic often results in deleterious effects to others. □

Binding the *lac* repressor

from Alan D. B. Malcolm

THE *lac* repressor protein binding to *lac* operator DNA is the classic example of specific protein–DNA binding, and as such is the best characterised in terms of molecular structure. But it is still not clear why the repressor binds that particular DNA sequence so tightly and how interaction of the repressor protein with inducers such as isopropyl thiogalactoside (IPTG) completely abolishes its capacity to bind operator.

The repressor consists of four identical subunits whose primary sequence is known and studies of repressor mutants have shown that it is the N terminus which is involved in operator binding. Recently (*J. biol. Chem.* **251**, 3386; 1976) Files and Weber showed that trypsin treatment of the repressor removes the N terminal 59 amino acids from each chain leaving a tetrameric core which still binds inducer but does not bind DNA. Geisler and Weber (*Biochemistry* **16**, 938; 1977) have now found conditions for the tryptic digestion so that the intact 1–59 peptide may be isolated (albeit in a mixture with the 1–51 peptide as well). The 1–59 peptide has considerable secondary structure and can bind DNA. However it does so only weakly—with about the same dissociation constant with which the intact repressor binds non-operator DNA. This binding is still thought to be biologically significant however, because kinetic studies suggest that the repressor first binds to any (non-operator) sequence and then moves along the double helix until it locates the operator where it then binds 10^8 times more tightly.

The original operator region sequenced by Gilbert and Maxam consisted of the 27 nucleotides protected by the repressor from enzyme digestion. When the sequence was subsequently extended to 35 base pairs it was clear that there were four regions related by

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Elephants in Uganda

from Robert M. May

FOR the elephants of Uganda, life has got worse under General Amin. This is supported by the trends recently reported for the number of elephants in Kabalega Falls (formerly Murchison Falls) and in Rwenzori (formerly Queen Elizabeth) National Parks (Eltringham & Malpas *Oryx* **13**, 334; 1976; Eltringham *E. Afr. Wildl. J.* **15**' 19; 1977 and personal communication). The figures in the table are average numbers of elephants for wet seasons only, and are based on aerial sample counts (Eltringham *E. Afr. Wildl. J.* **10**, 299; 1972). The asterisks on the numbers for 1976 denote that they are uncorrected total counts, and therefore overestimates.

These and other African Parks were created at a time when the amount of habitat available to large animals was severely decreasing due to increases in the human population. Until the late 1920s, elephants ranged over 70% of the land area of Uganda; by 1960 the figure was 17%. As a result, large animals have tended to crowd into game reserves and National Parks, often at densities above the carrying capacity of the environment. The problem is particularly acute for elephants, whose feeding habits of uprooting and debarking trees can be very destructive. By the mid-1960s, conditions in the Murchison Falls National Park had so deteriorated that it was feared the Park would erode into a near desert, and 2,000 elephants were shot in an attempt to alleviate matters (Laws, Parker & Johnstone *E. Afr. Wildl. J.* **8**, 163; 1970). The problem of environmental degradation wrought by elephants has arisen in other East African National Parks, most notably Tsavo, and opinion is divided both about the ultimate cause and about the cure (Caughley & Goddard *E. Afr. Wildl. J.* **13**, 39; 1975; Laws *Oikos* **21**, 1; 1970). Neither the optimal density nor the optimal age structure are well understood.

Into this vexed situation, the numbers tabulated above introduce a grim note. The precipitous decline that in 3 years has reduced the elephant population in Rwenzori by a factor of four, and in Kabalega Falls by a factor of ten, is clearly due to poaching for ivory. No attempts have been made to use the carcasses for food, nor to remove the valuable skin from the ears (an elephant hide attache case sells for $600 to those crass enough to carry one). The elephant populations have not even enjoyed the benefits of a thinning, but rather the distribution has changed, with the animals now concentrated into relatively few pockets, where, presumably, they are safest. Eltringham and Malpas observe, moreover, that "the indiscriminate slaughter has caused a breakdown in the normally well ordered family structure: indications of a collapse in the social order are to be seen in the clumping of family units into large amorphous herds. Normally, the family is led by the matriarch which, being the oldest in the group, has large tusks and is, therefore, the poacher's prime target. With the loss of the matriarchs, the leaderless elephants have tended to congregate together, so that locally their density remains high and damage to the vegetation continues."

The experience of the past 20 years has shown that, even with the best will in the world, there are formidable ecological problems in the management of wildlife preserves. For the East African National Parks, the income generated by tourism has provided a practical motive for grappling with these management problems; with the decay of Uganda's tourist industry, it seems that mere anarchy is loosed upon the elephants.

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Time	Kabalega Falls (Southern sector)	Rwenzori
Average of earlier counts	8,042	2,633
September, 1973	10,187	2,864
September, 1974	4,072	1,868
September, 1975	1,061	931
September, 1976	1,346*	704*