matters arising

Solar activity on August 12, 1975

ATTENTION has been called to the unusual number and proportion of Type III-RS (reverse slope) solar radio bursts observed on August 12, 1975 (ref. 1). We believe a simple explanation of these observations is suggested by comparison with Hα filtergram movies obtained at Big Bear Solar Observatory on that date. We observed a number of the radio bursts to coincide in time with a homologous set of flares at the preceding edge of Mount Wilson spot group 19598. This group was at ~ 45°W, thus our line of sight to the flares lay through the corona above the spot group. We suggest that the bursts were emitted as U bursts by an electron stream travelling from the flare site along a closed field line to the following part of the group. The emission at the plasma frequency on the preceding side of the field line could not propagate through the coronal density enhancement over the spot group to Earth. Only on the following side, where there was no intervening region of higher density, could the emitted radiation be observed. Therefore the bursts were seen only where the electrons were moving downward in the corona, producing reverse slope bursts. A detailed study of these events is in preparation.

BARRY J. LABONTE

Big Bear Solar Observatory,
Hale Observatories,
Pasadena, California 91101

1 Tarnstrom, G. L., and Zehntner, C., *Nature*, 258 693–694 (1975).

Oscillations in tropical ecosystems

BIGGER[1] has provided examples to show that population oscillations do in fact occur in the tropics. My purpose here is to show that his observations actually provide evidence in favour of the suggestion[2] that the linear connectivity of complex ecosystems is low, even though they contradict a deduction that was drawn from this.

There are essentially three types of oscillations which we might expect to observe in an ecosystem. Two of these are produced by interactions within the system; these are Lotka–Volterra oscillations around a stable steady state and limit cycle oscillations around an unstable steady state. The third possibility, which was not taken into account by Saunders and Bazin, is forced oscillations, in which a system which would otherwise be in a stable steady state oscillates either in response to a cyclic environmental perturbation or else on account of some autonomous oscillation of one species.

When oscillations are caused by interactions, the periods are chiefly determined by the parameters of the system. In such a case we would not expect the periods to be almost all very nearly one or two years; this is much more likely to indicate that the oscillations arise from seasonal variation in the environment. Bigger's observations are thus not in conflict with the suggestion that the structure of tropical ecosystems is not such as to produce oscillations. Moreover, that the response of the system to a periodic perturbation is a stable oscillation with the same period is evidence that the system is overdamped; were this not the case we would expect there to be oscillations with different periods (determined by the parameters of the system and not, in general, equal to one generation length) superimposed on the annual cycle.

The evidence, then, still supports the contention that the linear connectivity of complex ecosystems is low and that it is this that accounts for their stability. It follows that it is not likely to be profitable to think of complex ecosystems as generalised Lotka–Volterra systems which can be adequately analysed in terms of the linear parts of their interactions. Indeed, if it is true that even the lynx cycle in Canada is a forced oscillation[3], then the Lotka–Volterra equations themselves may be directly applicable almost nowhere in ecology, though they may remain useful for conceptual purposes.

P. T. SAUNDERS

Department of Mathematics,
Queen Elizabeth College,
London W8 7AH, UK

1 Bigger, M., *Nature*, 259, 207–209 (1976).
2 Saunders, P. T., and Bazin, M. J., *Nature*, 256, 120–121 (1975).
3 Bulmer, M. G., *J. Anim. Ecol.*, 43, 701–718 (1974).

Evidence for polygenes

THOMPSON[1] has suggested that the generally held belief among quantitative geneticists that quantitative variation is determined by a large number of loci is an assumption which "unfortunately, some have come to think of . . . as an established fact". Fisher[2] considered in detail the hypothesis that some traits were determined by a large number of Mendelian factors. The assumptions made in that paper are the consequence of this hypothesis. He showed, as he says[3], "that the heredity behaviour to be observed does not become more complex" as the number of factors is increased. The evidence available, so far, favours this hypothesis.

Thompson[1], however, argues that "there is no compelling reason to think that the total number of loci affecting a quantitative character is exceptionally large". He believes that a "relatively small" number of genes could account for the genetic variance of a quantitative character; however, there are a number of published cases where a large number of loci is indicated.

Consider 3 loci, each with two equally frequent alleles, no dominance and equal effects. With environmental effects the distribution of the trait determined by these loci will be approximately normal. If 10% of the population are selected as parents, then after two generations the parental population and their progeny will be genetically homogeneous. The larger the number of segregating loci the larger will be the number of generations required to obtain a genetically homogeneous population. This will be true in the presence of polymorphism, as well.

Falconer[5], discussing the results of four selection experiments, says "the response continues for about 20 to 30 generations and the total range is between 15 and 30 times the square root of the additive variance . . .". Such a response cannot be explained by a small number of segregating loci. It has also been found that there is no appreciable change in the variance in the first few generations of selection. This favours the hypothesis of a large number of loci rather than that of a small number of loci.

There is, however, other evidence