

CORRESPONDENCE

Limits of Growth

SIR,—As a member of the Club of Rome, I have been able to read a pre-publication copy of Dr Dennis L. Meadows's study *The Limits to Growth* which you castigated in an editorial (*Nature*, 236, 47; 1972) a month or more before it will become available to most of your readers. May I assure them that there is a good deal more to be said for it than your thunderings implied?

In the first place, Dr Meadows emphasizes several times that these studies should not be interpreted as predictions. What he is trying to do is to examine and illustrate the modes of behaviour of a complex system involving both positive and negative feed-backs when it is subjected to sudden alterations in inputs. Broadly speaking, he is investigating the transients which may occur on the way towards a new equilibrated pathway (or chreod, in my terminology). And when such transients could take the form of doublings or halvings of the world population in periods of a few decades, they are of more human concern than the word "transients" may at first suggest.

There are, of course, many real and important questions to be asked about this preliminary study. How robust are the demonstrated modes of behaviour against variations in the coefficients assigned to measure the strength of the various interactions involved? One would have wished Meadows to have provided more definite evidence on this point, but personally, having spent much of my life studying the highly "canalized" processes of biological development, I find fairly plausible his assurance that such variations (within reasonable limits) rarely alter the modes of behaviour and usually only produce minor alterations in the timing of them.

Probably a more serious question is

one alluded to, in somewhat superior tones, by the editor of *Nature*, namely that this is a very "aggregated" study. It lumps together, not only nations and regions of very different characters into global totals of population, food production and so on, but also aggregates together various sorts of production, for example, housing and the infrastructures of urbanization with more ephemeral and less necessary consumer goods. Further distinctions within some of the broad categories employed by Meadows will certainly be very necessary. Indeed, I think he would be first to admit so; and further work, sponsored by the Club of Rome, is already attempting refinements of this sort. The results of these developments will be awaited with interest by all those, who I think will be many, who feel that Dr Meadows has taken an interesting first step in one of the few directions which seem to offer hope of a rational understanding of the complex world system.

Yours faithfully,

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Breast Cancer

SIR,—With great interest we read the editorial on the possible viral aetiology of human breast cancer (*Nature*, 235, 7; 1972). You mentioned a statement in which Spiegelman would advise women from breast cancer families not to nurse in case they had virus in their milk. As an objection to this thought you pointed out other possible routes of vertical transmission, referring to the work of the "Dutch school of RNA tumour virologists" on the murine counterpart of the human breast cancer virus.

In our studies we emphasized the role

of the gametes in the transmission of various murine mammary tumour virus strains. However, we observed that if mice are prenatally infected with such a virus, additional milk borne infection has an accelerating effect on mammary tumour development. In addition, female mice which are heterozygous for spontaneous release of a gamete borne virus can infect their offspring either genetically or with their milk; that is, if a daughter does not carry the gene for virus release, she still may develop a mammary tumour because she was infected the other way.

These two observations may support those who want to abolish breast feeding by virus-carrying mothers. But one must also take into consideration that we only found transfer of the virus if large numbers of virus particles are present in the milk. As far as we know in most human milks the amount of virus is low. Often a hundred times more would be necessary to have effect in the murine situation. In our opinion the advice of Spiegelman could be moderated in that it might be given to those women who have a great deal of virus in their milk.

However, a further problem is that prolonged lactation has a protective effect on the mammary gland with regard to carcinogenesis. By not nursing, a mother may either save her child from getting breast cancer or at least delay it, but at the same time she promotes the chance that she will get the disease herself. Therefore, discussion of breast feeding seems rather academic, particularly in view of the many other aspects of breast feeding which are not related to the cancer problem.

Yours faithfully,

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Obituary

Professor G. Ya. Bei-Bienko

THE prominent Soviet biologist, Professor G. Ya. Bei-Bienko, died on November 2, 1971, after a short illness. He was President of the Entomological Society of the USSR Corresponding Member of the Academy of Sciences of the USSR and holder of several state awards. He was also President of the

last International Congress of Entomology, held in Moscow in 1968.

Professor Bei-Bienko was born on February 7, 1903, in the small Ukrainian town of Belopolie. His family, who were shoemakers, moved soon afterwards to Omsk in Siberia, and it was here that he went to school and later to the Omsk Agricultural Institute. After graduating he joined the staff of the Institute and later

became Lecturer in Applied Entomology there.

During his childhood Bei-Bienko accompanied his father on many of his business trips in Siberia and it was during these travels that he developed the love for nature—and particularly the interest in insects—that was to last for the rest of his life. While still a student he became interested in the orthoptera and, after making a list of