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## Concluding Discussion

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*Phil. Trans. R. Soc. Lond. B* 1979 **287**, 475-478  
doi: 10.1098/rstb.1979.0080

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## Concluding discussion

R. LE BERRE (*Onchocerciasis Control Programme, Ouagadougou, Upper Volta*)

The blackflies have now entered the club of the migrant pests through the widest possible door: here. All those concerned with tropical migrant pests, from blackflies to birds, face the same problems. Our common final objective is not the eradication of any of our enemies but their control, in order to prevent outbreaks in pest numbers or in disease transmission: and here I imply not only onchocerciasis but also diseases like sleeping sickness, which is not at all a *maladie du passé*, as we say, but certainly a *maladie de l'avenir*. Our strategies are all fundamentally based on the fact that the species we are fighting are mobile. Our tactics, based more and more on advanced technology, are very similar, with the uses of aircraft for prospecting and treatment, and of meteorology, radio and radar, for example; and in logistics we all have to seek improved mobility and flexibility. From discussions with other colleagues, it is clear that, without thinking about any common task force capable of dealing simultaneously with our different needs in different areas at the same time, we ought to be much better coordinated than we presently are. Our fundamental requirements for data like those of meteorology – wind systems, precipitation – should be better integrated, as should our communications systems; and exchanges of data, experience and ideas should be increased. A final common problem is that of sustaining the continuing effort which is still needed after the initial achievement of an encouraging measure of success. You locust people had this experience a long time ago; we in the onchocerciasis programme are now starting to feel it; and this is one more reason why I am very satisfied to have been able to participate in this meeting.

R. S. SCORER (*Department of Mathematics, Imperial College, London*)

I should like to follow up one of the ideas put out by M. Abdallahi yesterday, when he said that we should make a proper study of the ways in which our technological civilization could learn from and help nomadism. I think that Europeans have been extraordinarily arrogant in taking their ideas of what civilization should be like to other parts of the world, particularly those parts where existence was nomadic in the past. We come in a great hurry and create disasters for ourselves, and then begin to learn about the causes of them afterwards. I think it would be much better if we learned a bit more about the kind of human nomadism that M. Abdallahi is talking about, which organizes<sup>9</sup> that nature can repair itself, instead of our kind of mineral nomadism which leaves ruin behind.

O. M. S. ABDALLAHI (*Director-General, OCLALAV, Dakar, Senegal*)

I would like to draw a few conclusions from what has been said, though each of us in his own mind must have been doing so for himself. Looking back over the past 30 years or so, beginning with the problem of the Desert Locust, there has also been the Migratory Locust, then the blackflies, the armyworm and the grasshoppers. In attempting to make a start to deal with each of these pests, those responsible have had to try to reverse the order of the scientific and philosophical rule which says: 'Understand in order to foresee in order to manage.' They have tried to manage when the need has been urgent. That, I believe, is our crucial problem – and very different from the problems you have in the developed countries. Faced with a fire, we

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have to make use of every means available to put it out, without contemplation. Those who insist on complete understanding before attempting to manage, only distract attention. Now, in the findings of the groups of specialists who have made progress with the control of each of these pests, there have been certain elements in common. The meteorology is the same for all; the principles of aircraft operation are the same for all; the principles of pesticide application are the same for all. We are no longer obliged to consider only the autecology of each pest; we are now able to consider precisely the synecology of all these pests together; and in a new and quite literal sense we can begin to talk of their integrated control. But this integrated control is needed in famine-stricken countries, which have neither the time nor the money which is available for the long-term approach of the research workers fortunate enough to be born in the country of Descartes. I think that the findings of the past thirty years, and the conclusions of this meeting, on the locusts, the blackflies and the armyworm, provide sufficient priming for a real start on the agricultural development of these regions, which should no longer remain perpetually dependent on international aid in the form of the emergency operations of recent years, with gifts of grain which sometimes do not reach their destinations. To me, the most urgent need is for much better training, adapted to this synecological approach, no longer a separate training programme for each pest (Desert Locust, Migratory Locust and so on), but a common programme introducing each of these branches of applied science which has been found of general importance, including the most recent: radar. This common approach could also provide a basis for new research programmes, covering also other tropical pests, more effectively than the many programmes now being attempted separately.

In reply to Professor Scorer, social problems are indeed linked to these problems of the strategy and tactics of pest control, as I explained last year to Dr Rainey.† In particular, even the Sahara has potential resources which are more important than merely the reporting of locusts, or birds, or blackfly; throughout the arid tropics, our resources are not permanent, as in temperate climates, but the occasional rains represent temporary resources of a potential value meriting ecological and particularly meteorological research on a far greater scale than hitherto; and a gallery forest means to Dr Le Berre what a Saharan wadi means to me. Here again one returns to the need for the integrated approach, and for the integration of research and action. In Europe you are fortunate in having the possibility, the time, and the frame of mind to be able to separate research, training and action. We on the other hand face a harsh environment, in which man suffers famine, and becomes the subject and the object of development, which you, as a research worker, do not. To us it is very difficult to envisage the research worker as entirely separate from the man of action, and in our situation the two must be combined.

D. L. GUNN. The chairman (J. W. S. PRINGLE, F.R.S.) asked earlier if the intention was to reduce the overall population of a species or to behave so as to protect crops. For the Red Locust the latter is the object; the species is to be found in small numbers in a thousand and one places in the southern half of Africa – in every pan which grows a lot of grass in the wet season – and we do not concern ourselves at all with these. We concern ourselves with locusts which we have reason to believe may become menacing, and only with those. But that still leaves a question which has never been answered for many pests, especially these migrant ones: what are you paying to control them, in relation to what it would cost if you did not control them? This I suggest is the equation which requires to be solved for cost effectiveness. As a first step,

† *Phil. Trans. R. Soc. Lond. B* **278**, 451–453 (1977).

when I was in the Red Locust organization I invited its Council to consider allowing me to release just one substantial swarm from the Rukwa outbreak area, at a time when we had plenty of resources in hand, and we could have followed it and destroyed it at will, before it could have started doing harm by breeding in crops at the beginning of the next rains. However, the Council refused to permit any deliberate release, and we were no nearer to an answer to this question.

H. D. BROWN (*RLCS, Pretoria*). Locust control is a form of crop insurance, and it is therefore important to have some indication of the value of the crops susceptible to locust damage in a particular region so as to assess the likely financial loss and also the control premium that can be afforded. In southern Africa we have been looking more closely into this matter in case another Red Locust plague should develop and have come up with an approximate damage figure of 1½ billion Rand (say £700 000 000). Although the Red Locust is essentially a grass feeder, developing in floodplain grasslands, and therefore preferring cereal crops, sugarcane and bananas, it has also been recorded damaging numerous other crops and even trees. However, the situation is further complicated by the fact that the adult swarming period of the Red Locust, from about May to October, in southern Africa at least, is not synchronized with the main summer crop growing period, so that during this period wheat, tea and a few other crops on the upland areas and sugarcane and subtropical fruits and vegetables in the lowland areas would be the target crops. Then about 500 million Rand (say £200 000 000) may be a more realistic figure. In effect all the maize areas will be lying fallow and over the broad expanse of the subcontinental plateau there will be few crop targets for invading swarms until the rains have broken and planting commences. If invading swarms can be tracked down and attacked before this occurs little damage over the larger part of the maize area of Swaziland, Lesotho, South Africa, Rhodesia, Zambia, South West Africa (Namibia) and Malawi will result. This means that we should have sufficient time to mobilise control, provided we are prepared, before the locusts commence breeding from November to March and can then damage the new plantings.

Presently in southern Africa we are spending annually about 0.01 to 0.02 % of the above crop value on defensive control against Red Locust, a very small insurance premium indeed.

J. W. S. PRINGLE, F.R.S. (Chairman). I think it is true that the actual damage done by these pests, as a fraction of the gross national product of the various other African countries, has not been assessed. But, dealing in particular with the armyworm, I doubt if the damage it does, measured in those terms, is significant at all. Nevertheless it is a serious pest, because so many people live on subsistence agriculture; when an armyworm attack destroys their food completely they starve unless aid can be brought in, which is difficult in remote regions. So, although the overall economic effect may not be significant, it is nevertheless an important pest because of sociological considerations. But does anyone know what the economic damage done by the Desert Locust is, in any country?

D. L. GUNN. Only in isolated cases, rather than any comprehensive total.

R. C. RAINEY, F.R.S. May I suggest a way of evading your question, Sir, which is indeed a point which is repeatedly raised – but only when the pest populations are at a low level. In times of major invasion by Desert Locusts, in times of heavy armyworm infestation, these points do

not come up. What is vital on these occasions, whatever the colour of government – nationalist, colonialist, or what have you – is that what can be done must be done, and must be seen to be being done. So I think that to some extent this is a relatively academic point: unless and until governments appear which are prepared to disregard the apparent need for immediate action which is felt by those whose crops and livelihood are being attacked in this manner.

J. W. S. PRINGLE, F.R.S. I am sure that is – or has been – a factor, but I hope that none of us wish to spend money simply in order to give the appearance of doing something effective unless we are convinced that we are in fact doing something effective.

R. C. RAINEY, F.R.S. I think one takes that point entirely; but, again in times of really heavy infestation, almost the last thing you will want to do – or would be allowed to do – is to divert local scientific staff on to assessing the actual cost of damage, taking account also of the fact that the effects of insect damage on crop yield are extremely difficult to assess precisely.

As the chairman has already indicated, the essential point is undoubtedly the sociological one. Damage by all these pests is characteristically localized – affecting one man but often not his neighbour – and I suggest that communal help in such disasters may indeed be a major factor in maintaining the cohesion of the communities involved. As Chris Hemming has made clear (this symposium, p. 342), people feel the need to believe that the control operations in which they are participating are doing some good; but in practice people do not readily give up even if and when they may have misgivings on this point.