

# ecologist



Vol. 2 No. 9

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**The sailing ship in a fuel crisis**

by Basil Greenhill

***Blueprint in Parliament • Survival in the  
desert • Development and disease***



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# ecologist

Vol. 2 No. 9 September 1972

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Of course the area of the forest would be greater if the tree were horizontal

# Editorial

## Stepping on Epping

Compared to the forests of Amazonas, Epping Forest does not amount to much. Yet there are so few areas of deciduous woodland left in England that its threatened destruction should be of national concern. Last year (*Ecologist*, April 1971), we expressed alarm at the damage wrought by the enlargement of the A11-North Circular junction. At the time, the authorities, including the Corporation of the City of London who are Conservators of the Forest, justified the development on the grounds that traffic congestion had to be relieved and anyway land taken from the Forest for roadworks would be replaced elsewhere. Congestion is now as bad as before, and the replaced land is a reservoir.

Because the 6,000 acre forest is a long strip rather than a block it is extremely vulnerable, and the A11 which traverses most of its length makes it still more so. The effect of the A11 has been mitigated to some extent by the continued presence of free-ranging cows, which slow down some of the traffic, but there is a strong anti-cattle lobby and their right to remain is frequently challenged.

The wild mammals for which Epping Forest is famous can no longer survive there. The black fallow deer have fled to quieter land nearby and have probably been reduced in numbers, and the badgers have abandoned their sets. Sadly, recent attempts at reintroduction have been a total failure.

This month, work is scheduled to begin on the Redbridge to Loughton section of the M11 motorway. Many people concerned with the future of Epping hope that the M11, which runs to the east of the Forest, will reduce much of the pressure on it by drawing off traffic on the A11. The Davidge Report, a pilot study on future local traffic conditions, has stated that the anticipated changes in traffic flow on the road network will be dramatic and on the whole will be beneficial to the district. Mr. Rufus Ide, an Epping Forest Conservator, has expressed the

belief that even the deer might come back to the Forest. This ignores the general experience that motorways have a suction effect on either side of them. Formerly quiet roads become subjected to much heavier freight traffic en route to access points.

The main purpose of the M11 seems to be to carry traffic to and from Stanstead, which has become London's third airport by stealth. However, it is Foulness (the so-called third London airport, laughingly known in the Department of the Environment as the World's First Environmental Airport and hopefully the last), that presents the greatest threat to Epping. Two motorways and a railway are scheduled to service Foulness. The precise routes are as yet unknown, but the likelihood of their going through the Forest is strong, since it consists only of trees, things from which the DoE believes it has long descended.

The first motorway has to be built before 1980. Already, the M16 has been proposed as the key component in the Foulness motorway complex, designed to link the M11, M12 and the Foulness motorways, with access to the north through what must surely become the "spaghetti junction" of London. This motorway to the north, true to motorway psychology, follows the line of least resistance, the shortest distance being through Epping Forest.

There is a real possibility that the Conservators of the Forest acting as custodians of this national heritage will give in to the Department of the Environment's demand that the motorway go through Epping Forest. They are to be given the choice of access either through the Wake Arms (the widest part of the Forest) or Bell Common. The expected compromise in the case of the Wake Arms route, now considered the most likely, is to slightly reduce the damage by providing a cut and cover operation.

Public consultation has been neither sought nor as far as we know considered, and the whole plan is cloaked in secrecy. This is a pity, since the pub-

lic might like to remind DoE and the Conservators that both routes through the Forest are unnecessary. The A11 and M11 meet near Hastingwood, north of Epping at the Harlow interchange, where an intersection is already planned. It would seem logical that if a link to the north is required then it should proceed from there.

A further danger is from the Foulness Route 8, proposed by Roskill, which would cross Epping Forest theoretically through a tunnel, though probably in practice much of the route would be in deep cuttings.

There is little protest to be heard from those who are intimately concerned with the future of Epping Forest. There appears to be no champion of this single and largest amenity that is taken so much for granted by Londoners. The pride of the Corporation of the City of London, namely the Conservation Centre sited in Epping Forest, was provided as a gesture to European Conservation Year with great fanfare, but now is ominously silent. Its function as a field studies centre is invaluable, but surely it does not object to the conservation of the forest in which it stands.

It is also sad to see the Corporation of the City of London, while acting as the authority set up in the reign of Queen Victoria to protect the land for use of the public, buying adjacent land cheaply and not annexing it to Epping Forest whose interests the conservators are meant to be championing. A poor state of management is evident when the natural aspect of Epping Forest in the form of some of its most delightful animals have no rights in the Forest and rely for survival on the refuge of a rapidly decreasing number of private estates.

The mandate given to the Conservators by the nation to keep the Forest in its natural state for the enjoyment of the people has been admirably kept in the past. This trust should be seen to be justified and especially now when the real challenge to the Forest is at hand.

# Natural Resources and the Environment

## Parliamentary debate

28 April 1972

On 28th April the House of Commons debated the environmental crisis, with particular reference to the depletion of resources and the problems attendant on economic growth. The debate centred on the analysis of the crisis and solutions to it that formed *A Blueprint for Survival*.

Reproduced from *Hansard*, by permission.

4.4 p.m.

**Mr Bruce Douglas-Mann** (Kensington North): I wish to bring to the attention of the House the subject of the impact of our present policies on our natural resources and the environment. This is a large question to raise on a Friday afternoon because it amounts to little less than the question whether mankind can survive, a proposition on which doubt must be cast.

It is said to be fashionable to discuss this subject and to talk about ecology and the environment. The fact that it is fashionable should not deter us from assessing the real merits of the matter, bearing in mind that fashionable questions can be very relevant. I believe that it was fashionable to discuss the dangers of war breaking out in 1939. The fact that it was a fashionable and, therefore, derided issue did not make it any the less relevant.

There has been a great deal of discussion in the Press over the last 18 months or two years about the impact of population growth, economic growth and pollution on the prospects of the survival of the human race. More and more people are becoming aware that some of the courses we are pursuing, or are allowing to be pursued, are creating a very dangerous situation for mankind. As yet, however, there has not, as far as I know, been any discussion of the subject in Parliament, although there were a couple of speeches in the debate on the principle of our entry into Europe.

Although to raise the subject on a Friday in an empty House—

**Mr Andrew Faulds** (Smethwick): It

is not empty.

**Mr Douglas-Mann**: I apologise to my hon. Friend and any other hon. Members. To raise the subject in a partially empty House on a Friday afternoon may seem to treat it without adequate respect, but I hope that today we shall at least start the discussion, and that further discussion will follow.

It was said in an article in *The Times* a few weeks ago that ecology seems to be discussed, when it is discussed at all, between the extreme pessimists who think that we have only 25 years left to live and the extreme optimists who think that we may have as many as 50 years left to go. When we look at how the experts approach the subject, we find very few real optimists who can see a prospect of our continuing our present policies and ways of life for more than half way through the next century.

The trouble is that the vast majority of people are not prepared to look at where we are going, and at the impact of what we do on our prospects of survival. For a very long time now we have seen living standards rising because of economic growth and the economic policies we are pursuing. The effects have been obviously visibly good, but good only for a minority—for the developed countries and for the present generation. We have to think of our children's generation and their children's generation. It is not only the present effect of what we do now. The question is whether what we do now will provide the possibility of survival.

It is obvious that one cannot pursue a policy of indefinite growth in a world whose resources are finite, without ultimately running out of resources. Many discussions have taken place recently. The optimists have poured scorn on some of the figures put forward by those who take a more gloomy view. We have had *Blueprint for Survival*, and the arguments of that publication

scoffed at in *Nature*. We have had Professor Meadows' book, *The Limits to Growth*, and his arguments, if not exactly scoffed at, seriously disputed by Dr Jeremy Bray, a member of my own party and former hon. Member for Middlesbrough, West.

But even looking at the arguments advanced by the optimists, taking into account all their scorn about attempting to provide precise mathematical models of what will happen, taking into account the fact that all the estimates made of world population growth have varied from year to year—and as those estimates are projections from the 1960s to the year 2000 and later there must be variations—all the figures that anyone who knows about the subject has prepared predict a very substantial increase in world population.

Dr Jeremy Bray, who is counted an extreme optimist in this context, estimates the world population of the developing countries will have risen from its present figure of 2,500 million to 5,000 million by the year 2000, and that the population of the developed countries will have risen from its present figure of 1,000 million to 2,000 million, making by the turn of the century a world population of 7,000 million, nearly double what it is today. Dr Jeremy Bray, taking the United Nations figures and projecting them, estimates that allowing for the changes for which we can hope—these are on the most optimistic estimates—there is a probability that by the turn of the next century the population of the developing countries will have doubled yet again resulting in a world population of about 12,000 million.

Looking only 25 to 30 years ahead, we must expect that the world's population will be twice what it is now. As a consequence of this change, there will be a very acute shortage of land. This is something about which we can do practically nothing, because the main

increase in the population between now and the end of the century will arise because the age of death will have been put back, and no one would wish to change that. We do, however, need to adopt policies which we hope will drastically reduce the birth rate in the years to come just to ensure that the population does not increase even faster than Dr Bray estimated.

One of the major questions is whether the world can possibly produce sufficient food to avoid an absolute disaster, whether we shall have the fertilisers and the phosphates to enable us to feed the very rapidly increasing world population. *The Observer* discussion on "Spaceship Earth" consisted of an argument between an optimist and pessimist. The optimist—Dr Borlaug—said that one of the greatest needs at the moment is fertiliser. Professor Borgstrom, the pessimist, maintained that the situation for fertilisers and the prospect of their being sufficient fertiliser to provide for the world's needs was limited at the outside to about 30 years. Unless we can find an alternative for the phosphates which we are rapidly washing to the bottom of the oceans, we shall not have enough materials to enable the world to provide what it otherwise could do of the resources of the world.

Minerals are disappearing rapidly. One can have arguments as to the size of the need and the rate at which minerals are disappearing—for instance, whether our resources of petroleum oils are 30 years, 40 years, 50 years, or 20 years, whether our resources of natural gas are, as Professor Meadows estimates, 20 years or less, whether it is not true that tin and tungsten will disappear within the lifetime of nearly all of us present at this time. But, whatever the argument, no one disputes that resources are finite and will ultimately be exhausted if we waste them.

As yet, we are doing very little to counteract all these developments. On the contrary we are expounding the advantages of economic growth. It is sometimes argued that for any one of us who enjoys a high living standard to say that we should reverse the trends, that we should seek to ensure that we do not have yet more rapid growth of the economy and that we do not have yet more rapid growth of the consumption of resources is, in effect, to say that we are pulling up the ladder behind us.

I do not believe that this is so. Although it is obviously *prima facie* the case that if we were to reverse the trends of economic growth now it would be the developing countries which would suffer, if we are to survive, and if indeed our children's generation or possibly our own generation is to survive, we shall have to move rapidly towards a completely different approach to the conduct of the world's economy.

The only circumstances in which we can expect to get the rest of the world, or indeed our own country, to accept that we should not expand our use of resources even further and that we should not go even further with economic growth is if we were in a situation of much greater equality than we are today. If we were able to say that everybody was sharing alike in prosperity and that everybody was getting a fair share of our resources, we could legitimately say that we were not going to expand the use of those resources even further.

I believe that the argument for equality both within Britain and between Britain and the world has become much stronger as a result of our awareness of the resources situation which is now increasingly being impressed upon us. We cannot say to the developing countries "You must have no more growth, but we will." That would be atrociously unfair. Such growth as there is must be concentrated upon those countries which are deprived at the present time.

Here I am embarking on even more controversial ground than I did in the early part of my speech, but I hope that we can agree that what is urgently needed is far greater concentration on the conservation of resources by fiscal changes which will ensure that the polluter pays—and here I pay tribute to the Government for having done quite a lot in this direction. But pollution is only the first and most obvious, and possibly the least important, aspect of what I am discussing. Pollution destroys the environment and the capacity of the world to produce the food to sustain the ecological systems. That is something that we must check, and we must make sure that resources are provided to ensure that it is checked.

That, however, is only the first step. We must also take the fiscal measures to ensure that we do not waste natural resources, and do not allow those re-

sources that we have to be used up or washed away at the bottom of the sea and become exhausted in the various ways which modern industry makes so easy and profitable. We must also ensure that jobs are found in order to keep the rapidly increasing population of the world in employment, in a situation in which it can economically survive without continuing the increasing use of natural resources.

It is already immensely difficult to maintain full employment in Britain. One of the measures that we can take to maintain full employment and to counteract the steady tendency towards an increase in the use of natural resources is a deliberate shift of emphasis in Government policy towards service industries rather than production industries. We need by fiscal and Government measures to encourage people to re-cycle bottles, to build more houses rather than more cars, to build durable things rather than non-durable ones, to provide hospital, educational and other services rather than provide more consumable goods which are not seriously affecting our ultimate living standards but are rapidly destroying the means of survival.

**Mr Faulds:** Would my hon. Friend not agree that an answer that I had from the Ministry the other day was extremely depressing in this context? When I asked about the re-use of industrial damaged chemicals and solvents, the answer I got was that market forces would provide the answer. Does not my hon. Friend find this answer evasive of the responsibilities of any Government?

**Mr Douglas-Mann:** Indeed, this is an argument that has been presented by many people—that as tin runs out, for example, it will become more expensive and we shall switch to a substitute. I think the Government must accept that it would be better if we started looking towards avoiding waste of resources now. Even if that argument were valid, which I do not accept—there cannot be an infinite number of substitutes for tin—we should ensure now that we do not use it all up. We should take measures now to ensure that we have car hire systems rather than car selling systems so that people may have a car to use for holidays and weekends rather than that everybody should own a car and that our entire economy should be based on the necessity for everybody to have a car.

We should be looking now for measures to enable us to switch to conservation—this would require Government intervention—and we should be looking for measures to enable us to preserve resources rather than destroy them. We should be looking for the development of service industries and labour-intensive industries rather than labour-saving industries. I realise that, *prima facie*, that may appear to be the argument of a twentieth-century Luddite, but, at the end of the cycle begun by the Industrial Revolution, I feel that we have reached a point where our natural resources are being damaged or diminished to an extent which requires us to think in terms of greater use of labour rather than greater and greater use of natural resources.

I have raised some very large questions. I have been able only to touch upon them, but I hope that the Minister will be able to say that Government policy is at least alive to these matters and that we shall see changes in policy—there must be policy changes by both parties here; it is not a party issue in that sense—to ensure that we have a better chance not only of surviving but of providing the real essentials of good living standards for future generations rather than the increased production of goods which do not always improve living standards in a situation in which people have no room or opportunity to enjoy them.

4.21 p.m.

**The Under-Secretary of State for the Environment (Mr. Eldon Griffiths):** If he has not tried to put all eternity into an hour-glass, the hon. Member for Kensington, North (Mr Douglas-Mann) has sought to put the whole of ecology and the environment into a 16-minute speech. He must forgive me at the outset if, in the 12 or 13 minutes left to me to reply, I do not attempt to deal with all the questions of conservation, population, pollution, re-cycling and the rest which he raised. But I agree with the hon. Gentleman that there is need for a serious and balanced debate at the highest political and intellectual levels about some of the highly emotive concepts of the world environment which now engage public attention.

Some of the questions which we should examine in the House are these. Is it right to hold the view that diseases, starvation and conflict will inevitably follow, fairly soon, on the pursuit of economic growth, or is it on

the other hand right to hope that our various social, economic and political structures are strong and flexible enough to adapt themselves to the changes which will undoubtedly develop? Is there any compelling necessity for controls on world population, and, if so, how and by whom are those controls to be exercised?

These are matters which my right hon. Friend and I hope to be discussing with other Government representatives at the Stockholm conference, but they have been brought into prominence in this country by the publication recently of a quite remarkable document *Blueprint for Survival*. This argues that continued exponential growth in human demand for natural resources cannot possibly be sustained and that, unless stabilisation occurs before resources become too depleted or competition for them becomes too acute, there is grave risk of a world-wide social breakdown. To avoid this consequence, the authors suggest that there is need, first, to minimise the disruption of ecological processes; second, to conserve materials and energy; third, to stabilise human populations; and fourth, to maintain within that context a social system with freedom of choice and enjoyment for the individual.

I need not emphasise that there is some dilemma between freedom of choice for the individual and the need for State direction if the other aims of minimising disruption and conserving materials are to be secured. But this dilemma is the problem of all Governments and all free Parliaments—it is, indeed, what we are for.

Basic to the studies in the *Blueprint* is the belief that five main elements—population, food production, industrialisation, pollution and the depletion of non-renewable resources—are all increasing exponentially. By putting together the five elements into one computer model, assuming certain relationships between them, and taking into account their exponential growth, those carrying out the studies have produced quite frightening predictions of the global problems with which mankind will be confronted over the next half century.

I also readily agree that the continued advance of science and technology must increase the ability of man to damage his habitat. That damage may vary from extermination of various world species to catastrophes like

world-wide damage to plankton through contamination of the oceans, with the resultant destruction of fisheries and reduction in the conversion of carbon dioxide to carbon and oxygen. But with each scientific advance man is better able to see the results of his actions and if he is wise to combat them before they get out of hand. Our capacity to produce new substances is of course liable to run ahead of capacity to foresee their effects—this happened with DDT—but, on the other hand, the developed countries where those substances originated are now aware of the point and are devising protective mechanisms to operate in advance of serious damage.

The authors of the *Blueprint* have suggested a number of steps that they think necessary for this country. They propose a society with a stabilised population, perhaps of 30 million in Great Britain, which would be organised in neighbourhoods of 500, representing communities of 5,000, in regions of 500,000. It is argued that such a stable society would be to a large extent self-supporting and would make few demands for mobility because it would be socially self-contained. The individual would find satisfaction, and the mental and physical health of the community would be assured. I would be the last to argue with the authors in their attempt to postulate a stable society but the philosophy behind the proposals seems to be of G. K. Chesterton on the one hand and birth control on the other.

This thesis takes it for granted that we could somehow return to this bucolic state if only we had the will. In fact the sort of life envisaged in such a society was only ever possible for a tiny minority, and even that minority depended on the existence of a much larger population, living on the brink of starvation.

The hard reality is—and surely it is nothing for us to be ashamed of—that it is only modern industry and modern technology and modern fertilisers—the very economic growth which so many affect to despise—which has made it possible for the mass of ordinary people to have anything like a decent standard of life in this island. The real alternative to modern pesticides and complex industrial processes and all their consequences is not happy country-dwellers living in pleasant cottages as Brueghel painted them. The

only alternative is the sort of mass misery we associate with the Bengal famines.

In attempting, and it cannot be more than an attempt, to comment on some of the points the hon. Member has made I would like only to offer to the House one or two broad perspectives as the Government see them. The first is that, contrary to rumour, we are not in this country losing the battle to protect our environment. I would not say we are winning it, but we are more than holding our own.

Some pronouncements necessitate that it is already too late, that we are blindly heading into an environmental apocalypse, that the insects will die, that the ice caps will melt and that we shall all either drown in sewage or choke to death on sulphur dioxide. I do not dismiss these projections; I want to find out more about them. I am not complacent because there are dangers and anxieties, and none of us has any excuse to sit back. The facts are that our air is generally cleaner, our rivers on the whole a good deal less polluted and our industrial effluent and toxic wastes, though very much greater in volume and vastly more complex in character, on the whole less dangerous and less offensive than any of these things were 100 years, 50 years or even 10 years ago.

The second perspective I offer to the hon. Gentleman concerns the vexed question of growth on the one hand and a proper, indeed urgent, concern for the environment and the human condition on the other hand. If our population and pollution problem has

become more acute though not necessarily more unmanageable in recent years, it is precisely because our rate of economic growth has been not too high but too low. For inadequate economic growth robs us of choice; it forces us to concentrate our limited resources so as to meet the demand for more, whether more houses, more schools or more help for spastic children. By doing so it deprives us of the means and opportunity to invest in something that is better. Far from saving the environment, economic stagnation can leave us insufficiently well breched to protect it.

From my own experience in the Department when it comes to cleaning up rivers, reducing the number of slums or improving the condition of life, what we require are not fewer resources but more. Let no one imagine that the environment gains from a low rate of growth. The environment suffers along with all the rest. What we need is a new definition of the purpose of growth and the reasons for creating wealth.

That purpose will have more and more to do with the use of our increasing resources to build quietness into engines, to pour less and less toxic effluent into our rivers and seas and to pay the price—it will be a high one—of avoiding or clearing up industrial pollution as we go along.

My final point of perspective is directed more to those outside the House rather than those inside it who are passionately concerned about pollution but who sometimes do not stop to think of what is really involved. We know from our experience that fine

words and grand generalisations cure no pollution. Nor for that matter does sweeping legislation. The job of doing what is needed to protect the environment instead of just talking about it nearly always comes down to the unglamorous details, to the public health inspector poking about in the cesspits and the incinerators, to the alkali inspector measuring the number of grains of dust emitted from a factory chimney and to pressing ahead with the work of the committee dealing with back-siphonage in sewers.

When I first came to the Department I was surprised to find myself responsible for such bodies as the working party on the design of sewer pumps. I have learned that when we are talking about pollution these are the places where the action is. It is here, not in the headlines, that we win the battle to protect the environment. I say to those who on occasions press the panic button that if we use scare tactics too often we divert too large a proportion of our limited and technical manpower away from the job of tackling the hard work.

I am grateful to the hon. Gentleman for having raised this wide subject and I shall study his remarks with interest. He will realise that in dealing with a subject so global—

*The Question having been proposed after Four o'clock, and the debate having continued for half an hour, Mr DEPUTY SPEAKER adjourned the House without Question put, pursuant to the Standing Order.*

*Adjourned at twenty-six minutes to Five o'clock.*

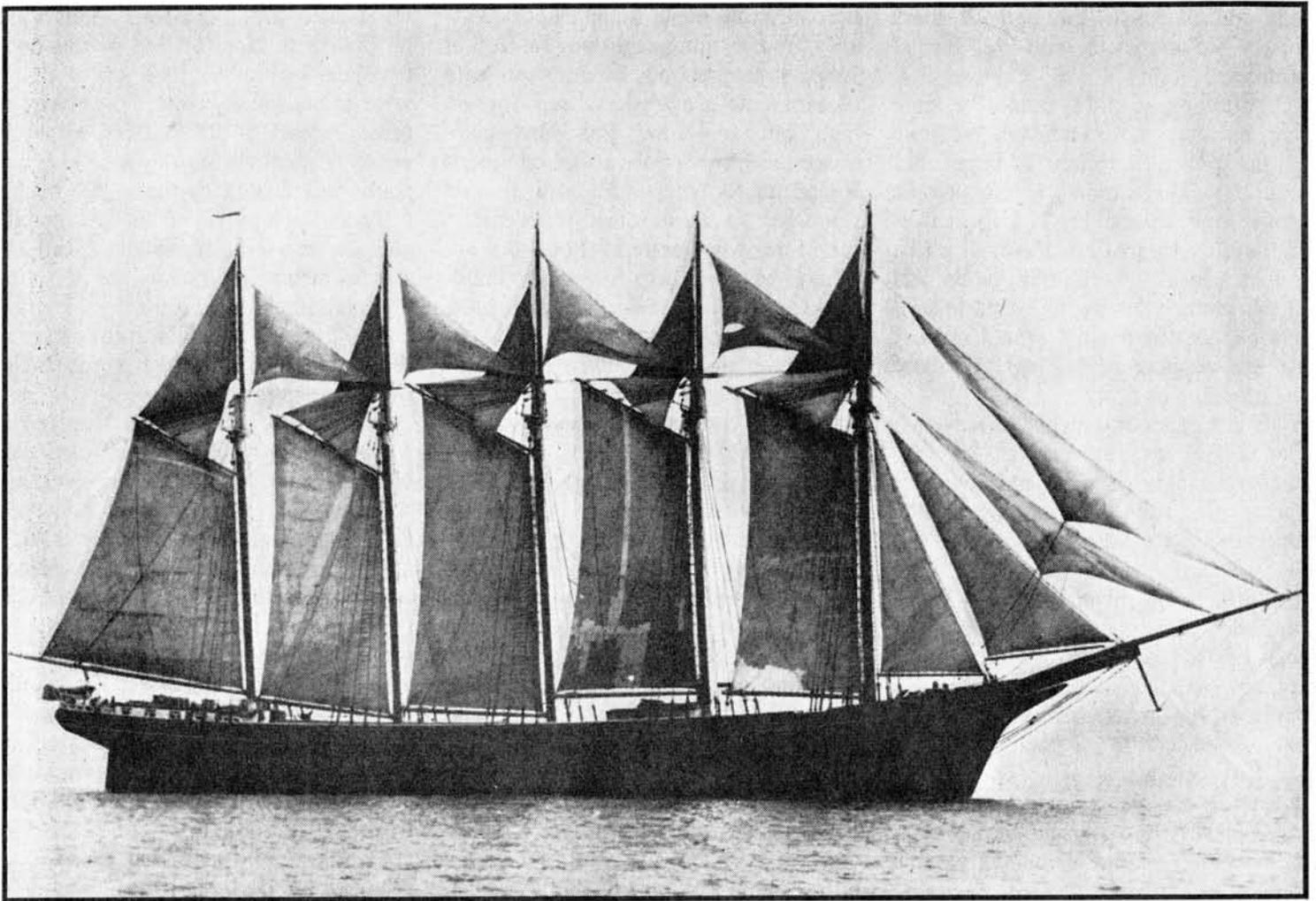
## ORGANIC FARMING COURSE

Following on the successful one-week course entitled 'A BIOLOGICAL APPROACH TO SOIL HUSBANDRY' held at Ewell Technical College in July this year, THE SOIL ASSOCIATION in conjunction with Ewell Technical College intends to hold a further two one-week courses in 1973. The first will be held from APRIL 9th-13th 1973, and the second during the middle of July 1973.

It is hoped to cover the PRINCIPLES, VARIETIES OF PRACTICE CONSISTENT WITH PRINCIPLES; AND ECONOMIC FACTORS of this method of husbandry. The course will take the form of lectures, discussions, and a visit to an organic farm and/or market garden.

Further information will be sent to those who have expressed interest by writing to:

**HEAD OF DEPARTMENT, DEPARTMENT OF BIOLOGICAL SCIENCES,  
Ewell County Technical College, Reigate Road, Ewell, Surrey.  
Telephone: 01-394 1730/9**



An American five masted schooner, Governor Ames. (Photo: National Maritime Museum)

# The Sailing Ship in a Fuel Crisis

by Basil Greenhill

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Sailing ships, making use of advances in aerodynamics and other branches of technology, could transport cargoes across the world cheaply, efficiently, quietly and cleanly—and help save the world's diminishing stocks of fuel. The author is the director of the National Maritime Museum.

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The large deep water sailing ship died out as an effective commercial proposition in Britain about 70 years ago. After the turn of the century almost no new big sailing ships were built in this country. In the United States and Canada it took another ten years or so before the last big wooden schooners, other than those built during the First World War boom conditions,

were launched. There were, of course, spectacular survivals. The Second World War finally ended the big sailing ship. Until then a fleet of old steel square rigged vessels, owned in the Gulf of Bothnia, used to carry cargoes of grain annually from Australia to England. Another fleet of elderly wooden four and five masted schooners under the United States and Canadian flags used to carry cargoes up and down the east coast of North America, and a number of them made trans-Atlantic voyages with cargoes even in the late 1930s. But these were anachronisms operating on marginal profits in conditions accidentally more or less favourable to them.

The small merchant sailing ship lasted rather longer. The hard-working master/owner of a Danish or Nova Scotian wooden three masted schooner could still make a sufficiently good living carrying dried and salted cod

fish across the North Atlantic from Newfoundland to Europe to bring new capital into the business for the construction of new vessels as late as the middle 1920s. Astonishing as it may seem, in 1939 over 100 auxiliary motor schooners and ketches were still making a living carrying cargo around the coasts of the British Isles. But again their survival was largely the result of economic and social accident and the life had gone out of the industry in this country when the last merchant sailing ship was launched in Britain in 1913.

As the sailing ship, except in exceptional circumstances, ceased to be a serious proposition for forward looking investors before the First World War it may seem strange to consider its possible revival now. But with a world faced with massive pollution problems from floating oil slicks, and ultimately with a crisis in the supply of the fossil fuels on which it is vitally dependent,

the necessity of that revival may not be so very remote.

The complex skills developed by mankind to move thousands of tons of cargo across the world in conditions of reasonable safety by the use of the wind alone took many centuries to acquire. At the end of the sailing ship's working life those had become very highly developed indeed. Their use was limited only by the technical development of the sailing ship herself.

This technical development is worth examining. In the early years of this century big sailing ships were of two kinds. Generally speaking the British and European vessels were built of steel with steel masts and spars and rigging made largely of iron wire. They were square rigged, that is, the sails were set from spars slung across the masts which would be swung round them to trim the sails to a contrary wind. Such vessels were expensive to build and to maintain and unlike the modern sailing dinghy or racing yacht they were very poor performers to windward. They were the result, not of scientific experiment and design, but of a process of practical evolution characterised by a lack of experimental enterprise and by technical conservatism. They made the minimum use of available labour saving devices and even though a series of special winches and other equipment had been devised by an enterprising British master mariner hardly any British sailing ship owner used them.

### Old gaffers

The big American vessels and virtually all the small sailing vessels from both sides of the Atlantic were rigged on the whole more efficiently than the big European sailing ships with gaff and boom sails, gigantic versions of the sails of the old fashioned yachts nowadays dubbed "old gaffers." These sails were more efficient to windward than the square sails, and much cheaper to install and maintain. Vessels equipped with them did not need such big crews as did the square rigged ships. But the vessels which carried them, large and small, were nearly all built of wood, which made them a bad insurance risk and unsuitable for some classes of cargo. They were the products of fragmented local industry using local materials—of what has been called "the carpenter and blacksmith technology." Consequently their

design was also traditional and unscientific and they were constructed of materials which by modern standards were crude in the extreme.

Despite the limitations of the existing wind propelled ships, by the early years of this century sailing techniques had been built up which enabled merchant sailing vessels at their best to maintain really astonishing levels of performance. Particularly in Germany, knowledge had been built up of the world's wind systems as they affected the principal trade routes with which German sailing vessels were concerned which was systematic, comprehensive and very practical. Big square rigged ships could make their way reasonably predictably on average over a series of voyages by taking sea routes which were very far from the shortest, in terms of miles sailed, but by using which, varying from season to season, they could be reasonably sure of keeping the wind where it did them most good, that is on one or the other quarter so that it filled all the sails and drove them on. The huge wooden American schooners could also be sailed efficiently by the use of these same techniques and could tolerate the wind forward of the beam. The considerable commercial success of these big schooners was made possible by a more imaginative investment in labour saving machinery than was customary in British vessels, and indeed in the early years of this century the American schooner had reached a stage of development in which she could carry nearly 250 tons more cargo for every crew member than any vessels, power or sail, which had preceded them, or were to follow them until well into the second half of the twentieth century.

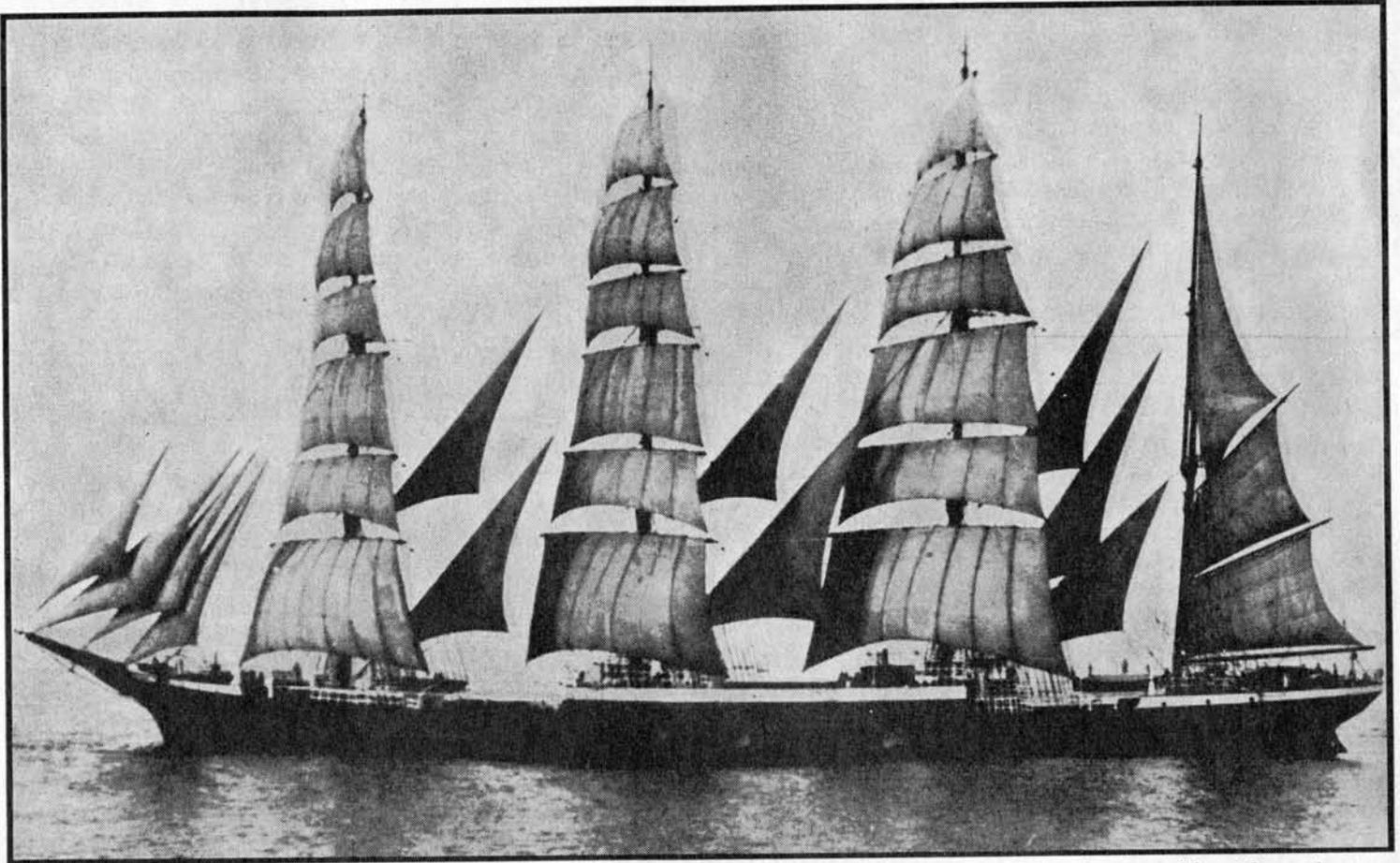
It is this use by the Americans of the man-power saving devices available to them at the time—most notably steam hauling machinery to set the sails—which gives the key to the possible future of the sailing ship in an era of increasing world fuel shortages. For sailing ships could be built today which would use the much greater knowledge of the world's wind and weather which now exists to far greater effect than could the vessels of 70 years ago. When the last large sailing vessels were built the Wright brothers' flight at Kitty Hawk was still a recent event. There was virtually no knowledge of aero-dynamics available. Today it

would be possible to launch a design and experimental programme leading towards the production of a vessel which would have a far higher performance, in terms of speed for a given state of wind and sea and ability to make progress in contrary winds, than the vessels of the past. She would have very little of the sticks-and-string rigging traditionally associated with sailing vessels about her, and what there was would require very little maintenance. The use of low power electric motors to trim her probably semi-rigid fore and aft and square sails, used in combination to exploit all winds to the maximum, would require relatively very little precious fuel. Her crew could be the minimum number required by a modern powered vessel of the same size, or even less. She would sail along quietly, without noise, pollution of air or sea, carrying perhaps 6,000 or 7,000 tons of cargo from Europe to Australia for a fuel consumption less than that used by a similar sized motor ship crossing the North Sea, and taking only twice as long on the average on the voyage as a modern powered vessel.

### Continuous motion aerofoils

Such a sailing ship would not, of course, look like the clippers of the 1860s, and steel four masted barques of the 1890s, or the big American schooners of the early 1900s. She would be built of steel, and since speed, given a reasonable hull form, is now known to be conditioned chiefly by horse power in relation to displacement the designers would be likely to concentrate on a sail system which generated the highest driving power, rather than on a clipper-like hull. There would be a great deal of light alloy in her superstructure and fittings and her sails might come out of the experimental stage as a series of aerofoils rather like vertical airliner wings with a flap system designed to extend and contract their area—setting, reefing and taking in sail—continuously adjusting itself as she sailed along. The trim of the sails to the wind would be automatically adjusted also, so that the whole system would be in continuous motion, like the trimming flaps of a jumbo jet in flight.

Such a modern merchant sailing ship would not have even a low powered auxiliary propulsion engine, for it would probably not add to earnings



*A 20th century square rigged merchant sailing ship, the German four masted barque Magdalen Vinnen. (Photo: National Maritime Museum).*

enough to cover investment, maintenance and manning costs. She would be dependent upon tugs for operation in restricted waters and for entering and leaving port. She would require the use of sophisticated materials in her construction, and therefore she would be the product of an industrial situation in which fuel was available for manufacturing purposes, at a price. In an era of fuel shortage, and therefore very high fuel costs, she might well not only be economic in the sense of paying a reasonable return on capital, but indeed vital to the economy as a whole, since with such vessels transport by sea might become an industrial process not requiring the continuous large scale use of precious fuel stocks.

There would be many adjustments in present shipping practices to be made to accommodate such vessels in general use. Insurers of ships and cargoes would require new standards of classification and a whole new system of rules governing structure and equipment would no doubt rapidly evolve, as new rules have already evolved to cover other new classes of vessel. New manning rules would be needed and possibly new combinations of skills requiring changes in both Union practice and government legislation. Fuel shortage would have to be sufficiently acute to drive costs and freights up to high

levels before the extra interest on the longer investment in cargoes twice as long in transit as is now customary was compensated for by the cheaper rates of the sailing vessel. But given a situation of acute fuel shortage, combined, perhaps, with conservation laws which imposed high costs on shipowners, the ordinary workings of the market would, in due course, make wind driven vessels a serious proposition once more.

A vessel such as I have described would be a ship of an intermediate stage—a fuel shortage but not a situation in which fuel was becoming unobtainable. As such she might have a very important role in trade where freights were not high enough to support the employment of atomic powered vessels, assuming that atomic vessels can ever be developed for general and widespread use.

But a situation in which fuel was virtually unobtainable would, of course, require a much more drastic solution if sea transport was to be maintained. Such a situation would mean virtually a return to a man and animal powered, wood fired, industry. There would not be the resources ashore to build a sophisticated vessel of the type I have described. In these circumstances ships would inevitably become small again—that is, limited to the size dictated by wooden construction and manually

operated gear. Given present and later knowledge of aero-dynamics and weather this does not necessarily mean that maritime commerce would revert to the sort of small wooden square rigged merchant sailing ship in which Captain Cook explored the Pacific Ocean or even to the world of the three-masted schooner of 1890. Even if we were once again reduced to the “carpenter and blacksmith” technology at sea we should be able to make great improvement on our ancestors’ efforts in the rigging of vessels and the shaping of their sails, in the design of fittings and the comfort of those on board. Knowledge of the wind and weather would allow improved average voyage times and a higher degree of safety than in 18th and 19th century seafaring.

But there would be many old skills to be relearned and many new habits to develop and this process might easily take a whole generation to complete. Basically a major world fuel shortage would not stop transport by sea. Just as before fossil fuels came into widespread use, sailing ships could sail the seas again, and much more safely and efficiently than in the days of the clippers. Perhaps design and experimental work on the development of modern merchant sailing vessels should be begun soon, before the crisis is actually upon us.

# Development and Disease in Africa

by Charles C. Hughes  
and  
John M. Hunter

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For most countries of the world, this is an "age of development", of planned endeavours to intervene in the *status quo ante* with the purpose of initiating change, both economic and social. But developmental activities often produce unexpected and sometimes vitiating consequences. The very nature of change itself (being an intervention in the physical and human environment) pre-disposes to disease, although it does not necessarily cause it, because it disrupts established ecological patterns at many levels of interrelationship. This idea can be extensively corroborated in contemporary Africa.

This important paper has been condensed and divided into two parts, the first, which follows, deals with infectious diseases; the second, to be published in next month's *Ecologist*, deals with malnutrition.

In each case, the evidence is replete with examples of development interventions that inadvertently increase disease hazards.

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Development programmes, being an intervention into the affairs of nature, will have both intended and unintended consequences; that is to say, they enter the scene as elements in the ecological dialectic in which all life is enmeshed, and they must be examined as such.

Aside from major purposes abstractly stated (eg, "to raise agricultural productivity"), what other kinds of changes which have obvious relevance to the health status of the population often come about under the aegis of "development"?

(1) overall changes in man-habitat relationships (eg, working in new farmland or under other new geographical and geo-zoological conditions; relocation to different climatic and zoonotic areas).

(2) increased population movement,

mixing, and concentration (eg, building roads, railways, and other transportation networks; migration to town and sites of economic opportunity such as mines, factories, hydro-electric or irrigation projects; relocation of communities, etc).

(3) change of patterns of water flow and use (eg, building irrigation schemes, dams and ponds; use of polluted water resources in under-sanitised and overcrowded towns).

(4) change of vegetation cover (eg, cutting down forest or bush, altering ground cover; landscape clearing).

(5) changes in micro-environmental conditions (eg, changes in housing, neighbourhood and settlement patterns; in house style and construction materials; in location with respect to modes of transportation, sources of water, kinsmen, etc).

(6) changes in value systems and social sanction systems (e.g., conjunction of alternative ways of life in urban environments or socially heterogeneous populations, as in large-scale economic schemes; the erosion of traditional systems in conditions of economic deprivation, as in urban slums, etc.)

This listing of what might be called the "hidden costs" of development is clearly incomplete at this stage and unquestionably could be expanded with additional comprehensive data on change projects. But let us review the extent to which a change in disease patterns has ensued from such changes in ecological situations as those suggested above.

## The role of development in fostering disease *Sleeping Sickness*

Sleeping sickness is a protozoan disease caused by the genus *Trypanosoma*, which can infect not only domesticated and wild animals, but also man.

The Kissi tribal region of northern Liberia, bordering upon Sierra Leone and Guinea, is a prime focus of sleeping sickness in Liberia. Surveys in the early 1940's showed that the infection rate had been pushed down by treatment from 26 per cent to 2.5 per cent (Veatch, 1946)\*, but recent evidence shows that infection has increased, reaching 10 per cent in many places. In some areas, 79 per cent of the population are carrying *Trypanosome gambiense* in their blood, although advanced cases are rare (Vaucel et al., 1963).

There are two sets of reasons for this endemic focus. The first deals with

\* References will be given in full at the end of the second part of this article.

the traditional way of life. For one thing, the Kissi raise swamp rice in a tsetse habitat. Secondly, their migratory habits make adequate treatment difficult and many cases relapse. In addition, they live in small settlements whose surroundings are kept insufficiently cleared of vegetation, so that tsetse can breed in the immediate area. Finally, they keep pigs, which may be a reservoir of *T. gambiense* (Veatch, 1946).

Another set of reasons for the endemicity is based on "modernising" trends and sociopolitical developments. The Kissi tribe lives in adjoining sections of three countries: Liberia, Guinea and Sierra Leone, and much movement takes place across the international borders for purposes of trade and of visiting relatives. Political changes in Guinea following independence caused the control practices originated by the French to be dropped, and now Liberia is open to the ingress of new cases from that country (Foster, 1963). Of late, such movement has been greatly facilitated by improved road linkages. Reintroduction of trypanosomiasis into areas which were once clear of the disease has resulted. Such diffusion of the disease is illustrated, for example, in the case of the new road through Kissi country in northern Liberia, which was constructed in 1960. Because *Glossina palpalis* is found at every river crossing, a particular hazard arises wherever a road is intersected by a stream or river; vehicles often stop at such places for water and to refresh passengers, who thereby become highly susceptible to the bite of the tsetse fly. To compound the jeopardy, tsetse flies are attracted to moving vehicles and may therefore be carried by them for some miles, a fact instrumental in spreading the disease into former tsetse-free areas (Abedi and Miller, 1964; Bequaert, 1946).

Among the Ashanti in Ghana, there is a clear illustration of the role of migrant labour, another aspect of population movement, in the dissemination of the disease and the reinfesting of controlled areas. From the 1920's into the 1940's many labourers from the savanna areas of northern Ghana and from other northern countries such as the (now) Upper Volta Republic, Mali, and Niger moved into southern Ghana for work. As they migrated, they passed through the

tsetse belt immediately north of the forest, where they picked up the infection. Upon reaching their destination, Ashanti country in central Ghana, they became the source for spreading the disease. It spread to such an extent that Ashanti foci began to have higher rates than the north. At the same time, eradication campaigns in the northern areas were effective in reducing somewhat the incidence of infection there. With the periodic return of (infected) migrant labourers from the south, however, the process of reinfestation began. Such migratory movements continue today. One of the consequences is the recycling of trypanosomes in the northern savanna (Scott, 1975).

The case of the Moshie of the Upper Volta Republic provided some supporting statistics for this phenomenon (Scott, 1975). A sleeping sickness survey in Ashanti from 1952 to 1954 showed an incidence of 1.05 per cent among adult male Moshie. The rate for the general Ashanti population was 0.18 per cent, that is, one-sixth of the Moshie infection rate. A concomitant survey at the Yeji ferry on the north-south migration route in 1952 to 1954 clearly shows the degree of reinfestation northward. The rate among Moshie males of ages 16 to 44, on their initial entry of Ashanti, was 0.14 per cent; on leaving Ashanti, it was 1.44 per cent. To a certain extent an increased risk of morbidity accompanied employment in Ashanti. While the difference in infection rates is not great in absolute terms, its demographic implication could be of much more significance, especially when coupled with the rest of the disease load under which most Africans labour. Davey (1948), for example, has estimated that in a population with a 6 per cent trypanosomiasis infection rate, a stable population equilibrium is attained, while an infection rate as low as 3 per cent allows only some natural increase. Other surveys, conducted along the road network connecting Ashanti with the north, show clearly that the highest incidence of sleeping sickness occurs along the major highways because such lines of communication facilitate man-fly contact (Scott, 1957).

In Nigeria transmission has increased sharply in localised pockets along the main Jos-Wamba road, a road used by migrant labourers going to the tin workings in the plateau (Thomson, 1967). Another, almost textbook, illus-

tration of a man-made transmission site also comes from northern Nigeria, the area of Kanawa. In 1961, as a precautionary measure for labourers working on the Bornu railway extension, Kanawa was surveyed for prevalence of sleeping sickness. It was found to be free of the disease. Later, however, there was a sharp outbreak of sleeping sickness. Subsequent investigation indicated the source to be man-made; a small forest reserve was deliberately planted along the banks of a stream at the point where it was crossed by the main road—a place where people gathered to wash, drink and relax. In this case the trypanosome strain was one of high transmissibility but low virulence (Thomson, 1967).

Roads are thus linear-type transmission sites. Although systematic epidemiological data are not numerous, modern roads built for economic development seem to constitute a major health hazard in endemic regions, their very purpose being to encourage movement and mixture of peoples and goods but having, as implicated effects, the facilitation of man-vector contacts for several different kinds of insect-borne diseases. With the expanding road and physical communication networks in Africa, all of which facilitate population movement, the risks of rapid reinvansion of areas by tsetse (and consequent reinfestation) are great. One obvious suggestion from the public health point of view would be the imposition of strict vigilance and control measures (Thomson, 1967; Scott, 1957).

### Relocation hazards

Settlement relocation is often an etiological factor. In pre-colonial Africa, many traditional settlements were located in refuge areas, on mountaintops, on ridges, on high plateaus—inaccessible, easily defensible sites. These sites were elevated and therefore tended to be freer of fly-borne diseases than lowland sites. However, with the coming of the various European colonial regimes and the law and order they brought, settlements have tended to move down on the plains. Agricultural developments of this sort have often led to a significant increase in sleeping sickness.

The Rukuba tribe of the Bauchi Plateau of northern Nigeria illustrates the point. This virile tribe came to the verge of extinction because of an

epidemic of sleeping sickness. *Glossina palpalis* had inhabited the dense vegetation on the Rukuba escarpment long before the introduction of the trypanosomes themselves. After the Pax Britannica, homesteads were moved down on to the lowlands from the hill-top fortresses which had once repelled human invaders, thus bringing man and flies into ever increasing contact. During 1931 and 1932, farmers returning from Piti brought trypanosomes first into Ikala and then into Kakkek, thus providing the one biological necessity which had been lacking. Man, fly and parasite were thus brought together and a transmission cycle began, resulting in a devastating and cataclysmic epidemic. Ruins of once-prosperous compounds and farms became a feature of the Rukuba landscape (Duggan, 1962).

From the Dodos country in northern Uganda, another illustration shows how government action can trigger off an epidemic of sleeping sickness with repercussions in settlement, land use, economy and ecological balance. The government evacuated numbers of the Napore and Nyangeya tribes in 1924-25 in order to stop tribal warfare. As a result, a barrier to tsetse was removed because wild animals began to enter the territory formerly occupied (and extensively hunted in) by the Napore and Nyangeya. With the game the tsetse arrived. The advancing game and tsetse began to put pressure on the neighbouring Dodos peoples. Tsetse advanced 80 miles and infested 1,500 square miles of Dodos territory in the 1920's. In the face of this tsetse hazard, cattle-keeping Dodos people were forced to migrate towards the south and west into a much more limited territory. This caused overpopulation, overgrazing, and soil deterioration, and seriously affected the health and demography of the Dodos people. However, in 1946, a tsetse clearance programme was started and in three years two-thirds of the fly belt was cleared. The land which was reclaimed was in good condition after the long fallow (Deshler, 1960).

Another example of population transfer forced by economic development occurred in Rhodesia, the Bumi River area, in 1958. The changes brought about by the Kariba dam produced an outbreak of sleeping sickness as well as a decline in nutritional standard (Apted et al., 1963) and overall health status (Scudder, 1966). A section

of the Tonga tribe was displaced by the rising waters of Lake Kariba. They were moved to a dryer region in which their traditional crops would not ripen, but they were reluctant to use the new seed varieties given to them by the government. They therefore suffered from food shortage. When the group lived on the banks of the Zambesi River they had supplemented their diet with fish and rodents, which were not available in their new homeland. Severe malnutrition followed. A government grain store was established to help them, but because of its location, the store became a transmission site for sleeping sickness and a sharp outbreak occurred (Apted et al., 1963).

### *Bilharzia (Schistosomiasis)*

Schistosomiasis is caused by the worm *Schistosoma haematobium* or *S. mansoni*. The worm uses human beings as a primary host and snails as a secondary one. One of the chief ways of improving agricultural production in many parts of Africa is manipulation and control of water resources by dam construction and irrigation schemes. However, the reliability of water resources is not all that is ensured. In addition to creating dependable water resources, transmission networks are often produced for the diffusion of snails, which are the intermediate host of the schistosome. Indeed, the World Health Organisation commented: "The incidence of bilharzia has increased but it is of man's doing. As he constructs dams, irrigation ditches, etc., to alleviate the world's hunger, he sets up the ideal conditions... for the spread of the disease" (WHO, 1961, p. 431). Such schemes also tend to foster dense populations—both human and snail—and thereby increase rates of transmission. Because many new projects serve as foci for migration of labour forces, they result in population concentration, and often the introduction of the schistosome itself (by workers from endemic areas). And, in passing, it may be noted that of the two types of schistosomiasis—the urinary or vesical (due to *Schistosoma haematobium*), and the more severe form, intestinal bilharzia (due to *Schistosoma mansoni*), it is the latter which is mainly increased by the irrigation schemes (Alves, 1958). Thus irrigation, as an example of a technological improvement oriented to increasing agricultural yield, poses many health problems.

Closer attention to bilharzia implications of expanding irrigation schemes is necessary in Africa (Waddy, 1966).

Insofar, then, as the opening up of Africa means, in part, the tapping of considerable hydroelectric potential for the development of irrigation systems, it should be recognised that with every mile of water the bilharzia snail will very often appear.

Its debilitating effects will strike man down and make him an unproductive worker. And as the World Health Organisation noted with respect to the planning, and therefore preventive, phase, "The successful attack on the disease will be accomplished by a team: the engineer, the malacologist, the parasitologist, the sanitarian, the physician, and the chemist, widely divergent in training, speaking in the beginning different technical languages, but with a common purpose in mind" (WHO, 1953, quoted by Odei, 1961c). Such a plea for interdisciplinary co-ordination and planning is echoed by Lanoix (1958), who notes that irrigation systems have also been indicted by epidemiologists and other health authorities as the causal agents of several other diseases of man, such as enteric bacterial infections, diarrhoeas, cercarial dermatitis, guinea worm, polio and possibly histoplasmosis; such irrigation systems also provide suitable breeding places for dangerous insect vectors of malaria, dengue, encephalitis and filariasis. Thomas (1965), in dealing with the ecology of a small man-made lake in Ghana, has studied the great variety and number of potentially dangerous pathogenic parasites, of both man and domestic animals, which require an aquatic environment.

As far as general prevalence is concerned, it may be noted that bilharzia data on 14 selected African countries collected by McMullen (1963) show that out of a population of 100 million persons, there were some 34 million infected. More than 50 per cent of the population is infected in five of these countries: Egypt, 14 million out of 26 million; Ivory Coast, 1.75 million out of 3.1 million; Mozambique, 4.5 million out of 6.5 million; Rhodesia, 2.2 million out of 3.12 million; Tanzania, 5 million out of 9.5 million.

Other more specific rates and incidence patterns are those for French West Africa in 1952, which showed case mortality rates from vesical schistosomiasis of 0.3 per cent, i.e. 3

per 1,000, and that from intestinal schistosomiasis of 1.46 per cent, i.e. 14.6 per 1,000 (Odei, 1961c).

Egypt, with its vast irrigation network, is the most heavily infected country in the continent. A study in 1949 claimed that "since the erection of the (first) Aswan dam, bilharzia has spread out and health and mentality of the individual deteriorated". For example, in four selected areas in a three-year period bilharzia infection rates increased as follows: from 10 per cent to 44 per cent, from 7 per cent to 50 per cent, from 11 per cent to 64 per cent, from 2 per cent to 75 per cent (Lanoix, 1958).

In the Upper Volta Republic, about 50 per cent of the population, more than 1.5 million people, are infected at some time during their life with *S. haematobium*. Yet here, as an example of a general point of this paper, an analysis in public health terms indicates that programmes of bilharzia control are usually not of much practical value. One reason for this failure is that they are not combined with an integrated approach to general problems of environmental and urban sanitation. Ouagadougou, for example, has two public lavatories for a population of 70,000. Pollution by human waste along with refuse from houses and markets accumulate and offer harbour for flies and rats (McMullen and Francotte, 1962).

### Lack of ecological foresight

The Gezira area of the Republic of the Sudan provides a particularly good example of the danger of lack of ecological foresight. The welfare and prosperity of this area is significant to the country as a whole because the Gezira provides nearly one-third of the total revenue of the country. Before 1925, the people of the Gezira lived under primitive conditions, wholly dependent upon grain cultivation (mostly millet). Drinking water was scarce and drought was common. In 1918, work began on the dam at Sennar and it was completed after World War I. When the irrigation works were completed, cotton was planted and yielded abundantly. Prosperity came to the region.

Approximately three years after the establishment of irrigation, however, disease-transmitting snail vectors began to appear in the irrigation canals. The snail population increased from 1931

to 1953. The influx of migratory workers to the cotton fields, first from neighbouring areas, then from western Sudan, and finally from West Africa, also increased. By 1954, half a million people worked regularly in the Gezira area. The total number of temporary migrants fluctuated between 150,000 and 200,000 per annum.

In 1942, attention was drawn to the ever increasing incidence of bilharzia, which, it is believed, was introduced into the area by the migrant workers from West Africa. In 1947, field investigations in northern Gezira showed a mean incidence of 21 per cent among adults and 45 per cent among children. Another survey showed that infection rates among males were twice as high as infection rates among females. Much of the bilharzia in Gezira is the more virulent intestinal variety, *S. mansoni* (El-Nagar, 1958).

Irrigation schemes are being rapidly developed in Tanzania, and there is fear of increased bilharzial infection. Until recently, the only large-scale scheme was at Arusha Chini where sugar has been grown for several decades. But, between 1955 and 1961, nine new schemes were started, and, in addition, another 15 are now proposed. Since both forms of bilharzia, *S. mansoni* and *S. haematobium*, are endemic in many areas of Tanzania, it seems inevitable that the disease will spread and become severe as irrigation networks are developed and concentrations of human populations around them increase. And in many cases, migrant workers carry infection into the new irrigation scheme and establish a focus of transmission. For example, in one particular scheme, when the labour force was examined in an initial data setting survey, it was found that 1,425 (86 per cent) out of a total sample of 1,652 came from areas where *S. haematobium* is endemic, and 320 (19 per cent) came from areas where *S. mansoni* is endemic (Sturrock, 1965).

In the Mbarali irrigation scheme, Rufiji Basin, Tanzania, development began in 1950 and settlement started in 1961. Surveys of bilharzial infection were made in 1962, 1963, and 1965. In the four-year period from 1962 through 1965, the *S. haematobium* rate remained stable, ranging from 9.5 per cent in 1962 to 8.7 per cent in 1965. The *S. mansoni* infection rate, however, increased from 14.5 per cent in 1962 to

28.9 per cent in 1965. In the age group five to nine years, the infection increased from 16.3 per cent to 39.5 per cent; age group 20 to 39 years, 17.3 per cent to 26.4 per cent; age group 40 years and over, 24.0 per cent to 35.0 per cent. The *S. mansoni* rates were also differentiated according to occupation. Senior African Supervisors' infection increased from 2.5 per cent to 12.8 per cent, while Tenant Labourers' rose from 34.7 per cent to 63.7 per cent. Intestinal bilharzia is thus seriously increasing at both socioeconomic levels, and its prevalence is five times greater among tenant labourers, who work more in water on the irrigation scheme itself and whose villages are badly situated in relation to the irrigation scheme. The planned villages, in which the tenant labourers live, are all in the irrigated area and consist of mud huts which lack sanitation and depend for water on the secondary canal system of the irrigation scheme itself. This scheme provides numerous transmission sites. One of the obvious conclusions to be drawn is that all people moving into a new irrigation scheme should be examined for bilharzia, and infected persons treated (Sturrock, 1965).

In Tanzania, some five million people are infected. From northwest Tanzania, on the shores of Lake Victoria, figures from an unselected community sample indicate that *S. mansoni* infections are light but *S. haematobium* is rampant in the area, giving rise to hydronephrosis, ureteric lesions or non-functioning kidneys in more than 20 per cent of the children and in over 10 per cent of the adults (Forsyth and Bradley, 1966).

In 1954, the Department of Health in Rhodesia warned that large-scale irrigation projects might well wreck the health of the country and bring the most grandiose of schemes to an end. For example, one of the first irrigation schemes established in that country after World War II has been a complete failure and is now largely abandoned because the effects of malaria and bilharzia were not calculated (Lanoix, 1958).

In Rhodesia, a study of parasitic infection among 80 labourers on a tobacco farm showed that 45 had *S. haematobium*, 18 had *S. mansoni*, and 11 had hookworm. The investigator, however, did not feel that these parasite loads impaired the performance of these labourers to any great degree

(Young, 1955). But this observation was impressionistic rather than based on systematic data.

### European farms worse

In the Republic of South Africa, bilharzia is well known in Natal and is now also being reported in the Transvaal, particularly in the eastern low veld and in the north. It is likely that the extension of irrigation schemes in these areas will make the Transvaal a much more dangerous area than Natal. The *S. haematobium* incidence was only slightly higher among Africans on European farms in the north and east of Transvaal than in the African reservations (Anneche, 1955). However, the *S. mansoni* infection rate was 68.5 per cent on the European farms, as compared to 33.4 per cent on the reserves. The difference presumably resulted from the irrigation on the European farms.

Again in the Transvaal, on protected farms in the irrigated low veld the infection rates for Africans were 29.3 per cent and 49 per cent for *S. mansoni* and *S. haematobium* respectively. On farms without control, the *S. mansoni* rate was 68.5 per cent and the *S. haematobium* rate was 66.7 per cent. On the African reserves the *S. haematobium* rate was comparable to that of the unprotected farms, but the *S. mansoni* rate was lower (Anneche, 1955).

It appears that bilharzia is spreading into Southwest Africa: *S. haematobium* and *S. mansoni* have been found in the east Caprivi Strip next to Zambia. The disease has also been found in the Okovango swamp at Maum, where previous surveys had been negative. The swamp provides an ideal snail habitat, and therefore the disease dangers are very considerable in this area. No bilharzia is found at present in Ovamboland, but a major water diversion scheme is planned whereby the Kunene River water in Angola will be conveyed through canals into Ovamboland for water supplies and possible irrigation in this densely populated area. When it is completed, bilharzia, which is present in the southern Angola rivers, will probably spread into Ovamboland (Geldenhuys et al., 1967).

Other kinds of occupational activity or development schemes which involve manipulation of water resources may

also assist the spread of bilharzia. In the southern part of Cameroon, for example, it is noted that rice cultivation is eminently favourable for the spread of infection, since dangerous transmission sites include slow-moving streams, ponds and marshes (Odei, 1961a). Liberia serves as another example. There, bilharzia is an occupational disease among women who spend a great deal of their time washing clothes along riverbanks. In the marshes of the coastal areas in Portuguese Guinea women grow the main crop, rice. They consequently develop a high rate of vesical bilharzia (Odei, 1961c). At another development project in a low-lying area of eastern Kenya, a rice scheme was developed which was a focus for bilharzia; in this case, however, attempts are being made to control the snail habitat. In rural areas where bilharzia infection is endemic, such scattered foci present a very difficult problem for public health planners because any water-connected development activity, such as a rice scheme, or the construction of fishponds, compounds the problem immeasurably (Fendall and Grounds, 1956b).

Numerous other deleterious effects of the disease can also be noted. On the basis of a study in Dakar, it is believed that schistosomiasis may give rise to cirrhosis (Charmot, 1954). Furthermore, it is possible that bilharzial infection can adversely affect nutrition. Disorders in the conversion of the amino acid tryptophan to nicotinic acid (the vitamin niacin) have been encountered in bilharzial cases. This would be significant in the upset of protein metabolism and in the increased likelihood of pellagra, another extensive public health problem in Africa (Mousa et al., 1967). Regarding another complication, King (1965) reports that Bantu mine-workers in South Africa who have schistosomiasis develop irreversible urinary lesions with genitourinary complications.

In Africa, the distribution of the snail hosts of bilharzia is more widespread than the distribution of schistosomes. Therefore, the disease can easily spread over a much wider area than it covers at present. Since man is the primary carrier of the disease, its spread is greatly fostered by migration, by concentration around water holes, and by development of new ways of

farming which implicate surface water resources (Odei, 1961c).

### Malaria

There are three types of malaria in Africa, caused by three different but closely related parasites; *Plasmodium falciparum*, *Plasmodium malariae*, and *Plasmodium vivax*. *Plasmodium falciparum* is the most common. The vector of the disease is the anophelin mosquito; two varieties are widespread and relevant to the dissemination of the parasite in Africa: *Anopheles gambiae* and *Anopheles funestus*.

When malaria does not kill, it debilitates. Victims develop a variety of symptoms: anaemia, fever, high blood parasite level, and spleen enlargement. Populations in malarious regions are also characterised by high infant mortality and a greater susceptibility to many kinds of infection; in addition, pregnant women frequently suffer miscarriage as a result of the disease (Cannon, 1958). Thus, malaria contributes to the severity and exacerbation of a variety of morbid conditions in a population.

With malaria, as with bilharzia, the construction of irrigation schemes and expansion of agricultural programmes has facilitated the spread of the disease; indeed, the spread of malaria in Africa was probably facilitated from the beginning by man's own constructive activities. Livingstone, for example, notes that the clearing of tropical forest for agricultural purposes and the establishment of thatched-roofed permanent villages provided ideal habitats for *Anopheles gambiae* (1958). Similar processes, and similar effects, continue today. Wilson (1957) made a plea for co-ordinated environmental planning in this respect. The fears he expressed were realised in the Taveta area of Kenya and Tanzania when water from springs in the Kilimanjaro area was diverted for irrigation purposes and thereby provided ideal breeding sites for mosquitoes (Smith and Draper, 1959).

The fact that mosquitoes cannot transmit malaria directly to each other makes man's role in its diffusion a primary one; and widespread population movements in Africa, both those linked with traditional patterns such as pastoral nomadism and those linked with modern developments such as labour migration, are among the outstanding contributory features in this

respect. As such, migrations both facilitate the spread of malaria and create serious difficulties in its eradication. Since most of these population movements are essentially uncontrolled and many are inter-territorial and international, they often hamper effective eradication and control programmes through the re-infection possible in uncontrolled areas. In fact, the eradication and control of malaria in Africa today increasingly has more to do with understanding and control of the human relations aspect of the problem than with the biological aspects. The techniques of the malariologists and entomologists are well established, as are methods of eradication (the main purpose of which is to interrupt the transmission cycle); but what remains is the articulation of these techniques within widely differing physical and sociocultural environments. Population instability and movement is only one consideration; the ways in which a population is distributed, its settlement patterns, house types, farming practices, communication patterns, and water-use patterns, are also important aspects of a malaria eradication campaign. It is in the area of the complex interrelationships among the parasite, the vector, and man that further data and studies are needed (Prothero, 1961; Fonaroff, 1963).

Malaria and attempts to control or eradicate the disease prove that the quest for health is continuous and that there is only temporary respite. Malarial programmes are waging a continual fight to keep ahead of the proliferation of insecticide-resistant strains of the insect vectors which, through processes of natural selection, adaptive capabilities, and enormous reproductive capacity, are multiplying the disease threat. In a sense, the more control is attempted, the more the problem is exacerbated because of the need for new research to develop more effective and more specific insecticides. It might almost be said that unless the transmission cycle is broken at other points, insecticide spraying of the insect vector creates a new environment, an environment of "development", and is an attack on a problem which itself has been created by earlier spraying—a "disease of development".

This point has been documented in a number of studies. The study by Bruce-Chwatt (1956) with regard to DDT and dieldrin is a good example. After a

four-year spraying campaign in the region of Thies, Senegal, the parasite rate among children under age 14 was reduced from 22 per cent to only 14 per cent. However, the disease rebounded to 16 per cent within only a year. In the opinion of the researcher, this rebound occurred because of the adaptation of the mosquito vector to the new environmental conditions (Escudié and Abonnenc, 1958). In the Para area of Tanzania, there was another outbreak of malaria transmission based on similar factors. The spraying campaign ceased in 1959, and 13 months after the final round of dieldrin spraying, parasite rates had sharply increased, from a low figure of about 5 per cent only six months after the cessation of the spraying campaign, to an average rate of 30 per cent for children from two to nine years. The factor causing the rebound was the development of a new strain of *Anopheles gambiae*. Because the transmission cycle was not completely broken by the spray campaign, human susceptibility to the disease actually increased rather than diminished (Pringle, 1967).

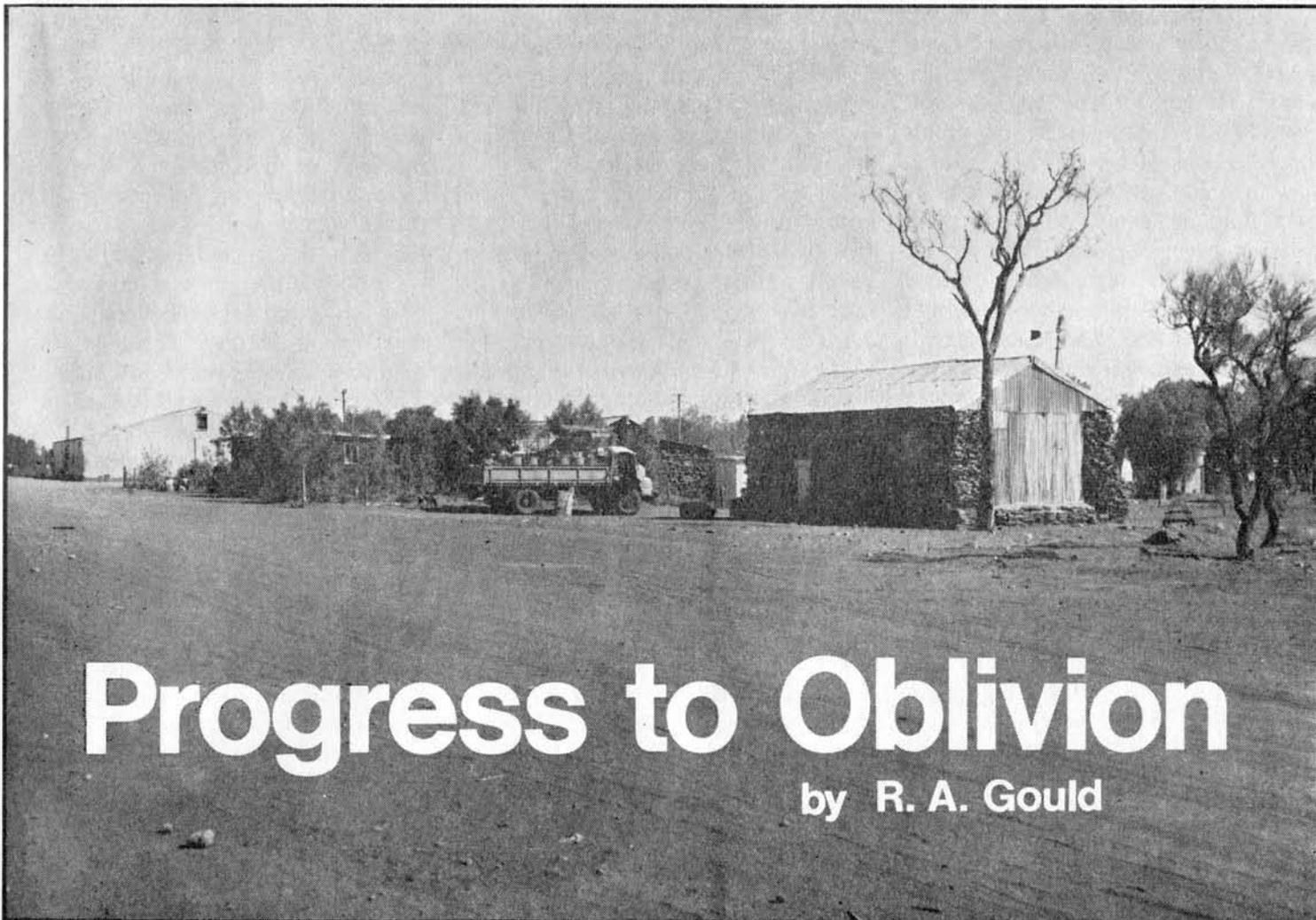
Resistance of mosquito vectors to insecticides has three forms: (1) simple behaviouristic, (2) excito-repellency, (3) physiological. Behaviouristic resistance occurs when an insect population changes its habits to avoid contact with the insecticide. For example, mosquitoes may try to rest on clothing or furniture or leave the house immediately after taking a blood meal, instead of resting on the walls of a room. Excito-repellency is a form of hypersensitivity to an insecticide. When a mosquito comes into contact with the poison, it may take off again before it has received a lethal dose. Physiological resistance arises when strains of mosquitoes emerge which are genetically tolerant to doses of toxicants which would be lethal for the majority of the mosquito population of the same species. It is this latter kind of resistance which poses such a severe problem and which has developed as a result of man's own activities in spraying campaigns. In 1967, the WHO Expert Committee on malaria reported that 24 vector species of *Anopheles* show resistance to dieldrin, DDT, or both. In 16 countries, 11 of these 24 vector species showed double resistance, which is much more difficult to counter than single resistance.

It is therefore clear that no single method will rid the world of malaria. Combination programmes incorporating techniques such as spraying, draining marshland, clearing of the bush, and mass chemotherapy and chemoprophylaxis have the best chance of success, although even with these measures it should be recognised that there may be a serious problem of drug resistance to the chemicals. Although such programmes might be expensive to mount and complicated to administer, there is no question of the overall gain in terms of worker well-being and productivity. In the Transvaal and Natal, for example, malaria control programmes decreased worker absenteeism by at least 30 per cent; and in Rhodesia an antimalaria campaign reduced absenteeism during the harvest season in the Mazoe Valley from 25 per cent to almost nothing (Wislow, 1951, pp. 24, 25; quoted in Taylor and Hall, 1967).

Even an effective antimalarial campaign brings other problems. First, the complete eradication of malaria from holoendemic areas will increase susceptibility so that any attacks that do occur after the campaign will tend to be more crippling to adults. Thus, in the long run, partial control may prove to be a social detriment. Secondly, the demographic effects of an antimalarial campaign will include a rise in the rates of population increase. In fact, the rate of increase may exceed that of food resources. Other problems, such as malnutrition, may arise because antimalarial campaigns lead to a sharp increase in birth rates and sharp decrease in death rates (Learmonth, 1954; Cannon, 1958). In the short run, too, it is foreseeable that a sharp reduction of infant mortality rates (as, for example, from a successful antimalarial programme) will lead to protein-calorie malnutrition because more surviving infants are competing for limited supplies of breast milk and other protein supplies. Thus, even an effective antimalaria campaign may at best substitute complex new problems for old ones.

This article, the second part of which will appear in next month's *The Ecologist*, is a slightly shortened version of a chapter in *The careless technology* (eds. John Milton and M. Taghi Farvar) to be published shortly by Tom Stacey Ltd.

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# Progress to Oblivion

by R. A. Gould

*The Warburton Ranges Mission, Western Australia (1970).*

By any yardstick, the Western Desert of Australia is one of the harshest and most impoverished natural habitats anywhere on earth. It occupies an area of about 250,000 square miles, although its boundaries are indistinct, and it can be regarded as a part of the larger province which is arid Australia. This region has been colonised by two distinct cultures, each with its own unique modes of adaptation: the Aborigines and the Europeans (including, of course, native-born Australians of European descent). How do these two adaptations to desert life compare? And which one is better suited to the rigours of this region? Finally, what is the likely outcome from the contact between these two ways of life?

## **The Western Desert environment and its resources**

For an area with an almost continuous covering of vegetation of one sort or another, the Western Desert possesses extremely small amounts of surface water. There is no co-ordinated system of drainage anywhere in this region. There are many creek-beds, but these rarely contain water except after torrential rains which are infrequent and unpredictable. The runoff from

these rains flows into depressions between the sandhills or into salt lakes. The region has no freshwater lakes, flowing rivers, or permanent springs. In other words, all water supplies for both native man and the native flora and fauna depend directly upon rainfall, which in this region everywhere averages less than 10 inches per year and which is distributed unevenly from time to time and place to place. Localised cachelments of rainwater are the

sole water sources, usually in the form of small shaded pools in rocky areas and localised subsurface water tables (the so-called "native wells") where Aborigines can dig down to the water.

Most of the Western Desert is covered with sandhills—low dunes of red sand running parallel to each other for many miles—separated by interdunal corridors ranging from a few hundred feet to many miles in width. There are also large areas covered by broad, undulating knolls of gravel, called rira by the Aborigines. Most of this country is open and either flat or undulating in character. However, to the east there are isolated but prominent mountain ranges. The two largest are the Warburton-Musgrave Ranges system and the Rawlinson-Petermann Ranges system, both of which run from east to west with summits ranging from 2,000 to 4,000 feet. These mountains are conspicuous landmarks in an area of otherwise monotonous relief, but they are neither high nor extensive enough to lead to any significant local increase in rainfall; hence they lack permanent streams.

The sandhill and rira countries are dominated by various species of spini-fex (*Triodia sp.*) a spiny, grasslike plant. Throughout the region, and especially in rocky areas, one finds concentrations of mulga scrub (*Acacia aneura*) and various eucalypts. The Aborigines distinguish 38 edible plant species, seven of which they depend upon heavily as staple foods. Animal life is also scarce. The Aborigines hunt and collect 47 named varieties of meat and fleshy food, but most of these are various kinds of small game like goanna lizards, mice, birds, grubs and, since their introduction by Europeans, rabbits and feral cats. The largest animal hunted is the red kangaroo, which rarely weighs over 100 lbs. It is not a herd animal and thus cannot be hunted economically in large numbers. Emus and wallabies are also hunted, but none of these species can be said to constitute any sort of big game. When compared with species lists from other deserts, the Western Desert stands out as a place which is exceedingly poor not only in numbers of edible plant and animal species but in numbers or amounts of those particular species as well. In terms of water supplies and plant and animal resources, this is a physical environment which by any standard is the most unreliable and impoverished in the world where people now live or are known to have lived directly off the land.

## The Aborigines

The fact that the Aborigines were able to live at all in this desert region indicates that their adaptation was an impressive human achievement. If you, the reader, were forced, let's say, to parachute into this area with only a few rudimentary tools like a knife and some matches you would certainly perish before long. Even if you had some understanding of the edible plants and animals of the region you would find that the knowledge which is needed for survival there tends to be localised, with survival resting on knowing precisely where to find water along with other resources in a given area. Knowledge of this kind is precisely what the Aborigines possess in abundance, and the mechanisms for transmitting this knowledge from one generation to the next form an important part of traditional Aborigine culture. More than their technology or their great physical endurance, it is this complex system

of knowledge—what anthropologists sometimes call a “cognitive map” of both the terrain and resources of their environment—that stands as the key to the adaptive success of the Aborigines in this harsh region.

How do the Aborigines make a living in this place? Table 1 shows the staple foods upon which the nomadic Western Desert Aborigines were depending for their livelihood during the two years when my wife and I were carrying out fieldwork and could observe their hunting and foraging patterns directly. The following general statements about their subsistence behaviour are made largely with reference to this table:

1. Women forage for the staples (here defined as any food which singly or in combination with other staples constitutes at least 50 per cent of the total diet by weight at the time it is collected) and thus provide the bulk of the diet. The diet is primarily vegetarian. Although longer-term observations are needed before precise figures can be given, it seems safe to say at this time that about 90 per cent of the time the women furnish at least 80 per cent of the food available to each group as a whole.

2. As can be seen in Table 1, there are times when the same staple may become available at widely different times of the year (note, for example, how wild figs were available in November-October in 1966 and in December-November and May-April of 1969-70). This is the result of localised conditions of rainfall or drought which can result in staples ripening at different times of the year in different localities. There is no regular seasonal pattern of food-collecting, since there are no predictable seasons in the desert when plants may be expected to ripen.

3. Although the number of edible plant species is reduced during drought years, the actual quantities of these drought-staples are generally greater than is the case for the same plants during wet years. In the case of the quandong this is the result of natural preservation of the dessicated fruits while the weather remains dry, but for the other drought-staples it seems to be a case of larger yields stimulated by the prolonged dry weather. Thus foraging in drought years is not as hard as one might at first suppose.

4. Men hunt constantly but with generally poor success. Both they and the women collect small game, which

provide the only protein available most of the time. Only on relatively rare occasions of sustained and heavy localised rainfall where game is abundant do the men's hunting efforts provide the bulk of the diet. In a sense, one can say that it is the dependable efforts of the women which free the men for the more chancy hunting activities.

5. The largest groups, usually between 100 and 150 individuals, come together on the rare occasions when hunting is good. These groupings are the result of natural rather than man-made food surpluses, even though the Aborigines do have the ability to prepare and store some vegetable foods. There is evidence to indicate that these food-storage practices may be oriented primarily towards emergency situations such as times of extreme drought or localised natural crop failures.

6. As drought conditions worsen and hunting becomes more difficult, groups tend to fragment and move to areas where they can base their activities close to one or more relatively permanent water-sources. While no water-sources are 100 per cent reliable or permanent, some are better than others; and it is these more dependable ones that one finds in use by minimal groups of from 10 to 30 individuals during drought periods.

7. The food-quest does not require more than a maximum of four to five hours of work for each woman each day, and generally it requires less. Even in times of drought, two or three hours' collecting by the women can provide sufficient food for the group for that day. In terms of man hours, much more time is expended by the men in their hunting, for much poorer returns. On most occasions there is plenty of leisure time for people to use in resting, gossiping, making tools and other objects (many of which are decorated and show a high standard of craftsmanship and even art). The idea voiced by some scholars like archaeologist, V. Gordon Childe, that hunter-gatherers were forced to search constantly for food and lacked the leisure time for other pursuits is not borne out in the case of the desert Aborigines. Indeed, this author has visited agricultural societies in other parts of the world where the amount of leisure time aside from activities directly tied to farming is considerably less than what the Aborigines have.

8. Mainly because of their direct

Table 1

Wet Year												VEGETABLE STAPLES (1966-67)
Dec	Nov	Oct	Sept	Aug	July	June	May	April	Mar	Feb	Jan	
												<b>YAWALYURU</b> —edible berries ( <i>Canthium latifolium</i> )
												<b>KALPARI</b> —edible seeds ( <i>Chenopodium rhadinostachyum</i> )
												<b>WANGUNU</b> —edible seeds ( <i>Eragrostis eriopoda</i> )
												<b>KAMPURARPA</b> (fresh)—edible fruit (native tomato— <i>Solanum sp.</i> )
												<b>WAYANU</b> —edible fruit ( <i>quandong-Santalum acuminatum</i> )
												<b>YILI</b> —edible fruit (wild fig— <i>Ficus sp.</i> )
												<b>NGARU</b> —edible fruit ( <i>Solanum eremophilum</i> )
												<b>KAMPURARPA</b> (dry)—edible fruit (native tomato— <i>Solanum sp.</i> )

Drought Year												VEGETABLE STAPLES (1969-70)
												<b>YILI</b> —edible fruit (wild fig— <i>Ficus sp.</i> )
												<b>WAYANU</b> —edible fruit ( <i>quandong-Santalum acuminatum</i> )

Inadequate Opportunity To Observe
Inadequate Opportunity To Observe

dependence on cachements of rain-water (correlated, of course, with the presence not too far away of staple food resources) in a region of fickle rainfall, the Aborigines must move frequently and travel long distances in order to maintain themselves. Journeys of as much as 250 to 350 miles are not unusual, particularly in times of drought. Groups observed in this study sometimes moved as many as nine times in a period of three months, living in a different camp each time and foraging over an area of roughly 1,000 square miles during that period. This is perhaps the greatest amount of nomadism reported for any known hunting-and-gathering society in the world, even when compared to groups like the Kalahari Bushman of Africa and the Great Basin Paiute of North America. Along with this, there is evidence of extremely low population

densities, on the order of one person per 35 to 40 square miles. Of course, actual concentrations of population were much greater than this figure would indicate.

Estimates for the total population of this area at the time of earliest European contact are, of course, somewhat conjectural, but the figure must lie somewhere between about 10-18,000 and 3,200. This latter figure is based on government census counts for 1967 and represents a kind of minimum figure after decline due to European-introduced diseases after contact. In many parts of Australia today, Aborigine populations are currently increasing at a rapid rate thanks to the introduction of public health schemes and better hospital care, and desert populations which now reside on government reserves are on the increase after a long period of decline. Today the few

nomadic groups remaining in the Western Desert are essentially remnants of much larger populations which have moved or been relocated on to missions and government stations like the Warburton Ranges Mission, Balgo Hills Mission, Jigalong, and Papunya. Nomadic foraging is no longer a demographically visible way of life in the Western Desert, even though there are still a few small groups that continue to live directly off the land.

### The Europeans

The early explorers of the Western Desert had only fleeting contacts with Aborigines and made little effort to learn their language or study their behaviour. These explorers included Philip Egerton-Warburton, Ernest Giles, William Goose, and John and Alexander Forrest, all of whom penetrated the area for the first time between



*Western Desert Aborigines camped at the Warburton Ranges Mission, Western Australia (1966). Note the lean-to's constructed of old sheets of metal and other scraps.*

1872 and 1876 in search of overland stock routes and grazing areas. Their efforts were repeatedly frustrated by the aridity and vastness of the terrain, and their reports gave little encouragement to those who followed. The next wave of explorers, though generally better equipped and forewarned of the hazards, fared little better. Men like Mills, Carnegie, Wells, Lindsay and Hann, who explored the region from 1883 to 1903, also experienced hardships and did not stay for long.

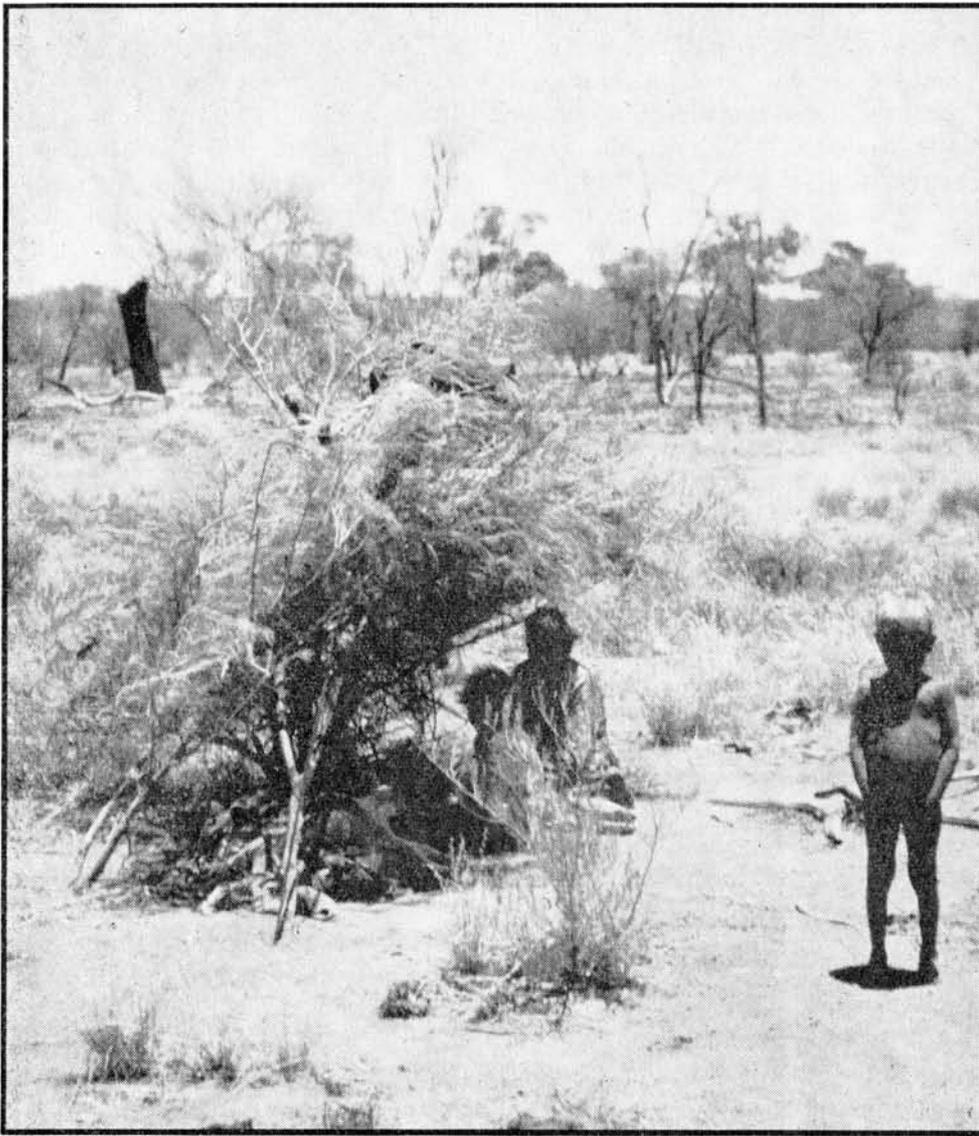
These explorers varied in their strategies towards the business of desert exploration. Some, like Giles and Carnegie, preferred to travel light and in small parties. Others, like the Forrests and Warburton, used large and well-equipped expeditions. All, however, experienced difficulties in finding water, and found it impossible to live off the land for very long. Whatever foraging and hunting they did along the way only served to supplement the

rations they had brought with them. Reading their journals today one is struck by the feeling shared by all of these explorers that the desert country was implacably hostile to both travel and settlement by Europeans.

It took an extraordinary development to promote settlement of any kind in or around this region, and that development occurred in 1892 and 1893 with the discovery of gold at Coolgardie and Kalgoorlie, respectively. This discovery precipitated a rush into the areas on the fringe of the desert, and by 1896 it is estimated that there were 65,000 people living on the Western Australian goldfields. Since no other substantial source of water was available, this population was sustained by a water pipeline built from Mundaring, near Perth, to Kalgoorlie, a total distance of 351 miles, at a cost of £2,700,000. By 1903 the Western Australian goldfields, now including mines at places along the desert fringe

like Wiluna, Laverton, and Leonora, produced half of Australia's total gold output, but by 1910 decline had set in as costs mounted for bigger and deeper mines. Many of the smaller diggings collapsed, turning many mining towns into true or near ghost towns.

In the early 1900's some sheep ranching was started on the desert fringe, but the Western Desert proper has never been amenable to sustained stock-raising. Agriculture without some form of irrigation was out of the question. Missionaries entered the desert, particularly in the 1930's, and small mission settlements like Warburton, Cundeelee, Balgo Hills and others continue to operate in the area. With one exception these missions are not self-sustaining and have required continuous transfusions of money and goods from their supporting societies ever since they were founded. The single exception is Cosmo Newberry Mission, at the southwest edge of the desert, where sheep



*Aborigine summer camp, about 15 miles north of the Warburton Ranges Mission, Western Australia (1967).*



*Aborigine women winnowing wanguu, an edible seed which serves as a staple food.*

ranching has sometimes managed to sustain the establishment.

Between 1958 and 1964 missile recovery roads were graded across the desert and a weather station was built at Giles, W.A. as the rocket-launching facilities at Woomera and the nuclear testing area at Maralinga, both in South Australia, were expanded. During this period government patrols regularly sought out Aborigines and resettled them at missions and on reserves. These patrols were continued until 1967, by which time the desert was almost totally depopulated of Aborigines aside from those already at settlements.

More recently, a quickening interest in the possibility of large mineral reserves of copper, nickel, iron, and other metals has led numerous mining companies to send exploration parties into the desert at various points. An earlier large-scale attempt in 1965 by the Hunt Oil Co. to find oil in the Western Desert

had failed, but the mineral prospects have been shown to be promising. The minerals are there, say the mining companies, but the costs of setting up the mines and their attendant facilities plus the high cost of transport involved in shipping out the ore has so far determined that their investments have been limited only to exploration. Close decisions were made at Warburton in 1968 and at Wingelinna in 1970 against setting up large mines, but it is possible that such mines and settlements may be developed there in the future.

As of 1967, when these mineral exploration projects were in full swing, there were still fewer than 500 Europeans living in or close to the Western Desert, suggesting an overall population density of fewer than one person per 500 square miles. Compared with the population figures given earlier for the Western Desert Aborigines (which are higher by a factor of at least 10) this is an extremely low density sug-

gesting a conspicuous lack of success in adapting to this environment. These figures are even more revealing when one realises the tremendous amounts of capital and supply needed to sustain these European settlements. The Europeans residing in the Western Desert do not live off the land but require regular shipments of supplies which must either be brought in by truck from the nearest railheads (at Leonora and Meekatharra) or flown in by air transport from Alice Springs or Kalgoorlie. There is something quite "cocoonlike" about European settlements in the Western Desert because of this lack of self-sustaining ability. So far the only self-sustaining quality of these settlements has been water, which has been obtained in every case from underground bores. However, these bores have only a limited capacity, and larger settlements than presently exist would probably require long-distance pipelines or other drastic

measures to get water in large amounts.

For most Europeans the Western Desert is not a desirable place to live. Nearly every European who resides there today, whether a missionary, weather-observer, prospector, or government official (and, I might also add here, an anthropologist!) does not live there permanently but on a rotation basis. Moreover in talking with the Europeans who live there one finds that the majority find it an interesting place for a while, but they dislike the hardships and isolation of living there and are usually glad when it is their turn to leave. In other words, the whole history of European exploration and settlement in the Western Desert has been one of temporary rather than permanent adjustments, with the general view that this place is still unfit for self-sustained human habitation. Here is one place where European-derived technology has not yet mastered the basic problems of living. Indeed, there is some question about whether it ever will master these problems in a satisfactory and permanent way.

### **Culture-contact and culture-loss**

Recent archaeological evidence indicates that the Aborigines have been living in the Western Desert of Australia for at least 10,000 years and that they have followed essentially the same way of life that they have today during that whole time. Europeans, on the other hand, have been there for only 100 years, and never in any large numbers. Yet it is the Aborigine way of life which is threatened, and that fact must surely stand as a monument to the cultural arrogance of European-derived civilisation. How did this happen?

Above all, of course, the Europeans possessed a superior technology which enabled them to penetrate the desert. However, it was not inevitable that this alone would disrupt traditional Aborigine life. Although some of the early explorers (especially Carnegie) grossly mistreated the Aborigines they met, Aborigine life was not much affected by these first contacts. Not until the gold rush were the desert Aborigines seriously threatened. Many Aborigines were attracted to the mining towns on the desert fringe. They were drawn by curiosity, the desire for material goods, food, and by the permanent water supply from the white man's wells. Camps grew up on the fringes of the towns.

Many of the Aborigines succumbed to introduced diseases, while others provided half the genes for an increasing mixed-blood population. A parallel situation occurred along the Transcontinental Railway line from 1919 to 1935. Here, too, large numbers of Western Desert Aborigines were drawn to the fringes of European settlement, leading to conditions of squalour which were seen and described by that extraordinary woman, Daisy Bates.

Later, with the establishment of missions and government reserves, further contacts between Europeans and Aborigines developed. These contacts intensified as more and more Aborigines were brought in from the desert and resettled at these places during the expansion of the Woomera Rocket Range programme. Today nearly all the Western Desert Aborigines reside in or around one of these settlements. They, too, suffered from European-introduced diseases like measles and respiratory ailments after they first arrived, and many died from them. But in most cases the basic attractions of permanent water, plus the desire for material goods to make life a little easier (blankets, axes, matches, and knives were sought after initially, but now rifles and cars are in demand as well) and food, and, last but not least, the social enjoyment of being able to come together in large groups for ceremonies and other activities, all have acted to encourage most of these people to stay at these settlements. The state governments have encouraged this tendency by providing schools and in some cases rations and other supplies for the Aborigines.

Visible signs of this change are apparent to any visitor to most Aboriginal reserves in the Western Desert. Lacking any stable form of employment, the Aborigines depend now for their food on a piecemeal variety of sources which include government rations, small-scale and erratic employment, old peoples' pensions, and whatever food can be gained by hunting and foraging in the areas around each settlement. But because they are living together in abnormally large and permanent concentrations when compared to their traditional nomadic condition (for example, during our periods of fieldwork the populations at Warburton Mission and the Laverton Reserve were around 400 and 300 individuals, respectively), the country for several

miles around one of these settlements tends to be picked clean of edible vegetation and timber for firewood. Although men are eager to go hunting in many cases, they find that there is no game left within walking distance of the settlement, and they try to obtain secondhand cars to use in hunting farther away. Many women are also willing and want to go foraging in the desert, but they, too, find that they must go too far from the settlement to find food. Thus one often sees large numbers of Aborigines just sitting around, day after day, near the settlement, awaiting rations or some new development like a ride with a passing vehicle to an area where there is better hunting or for a visit to relatives. From a state of complete economic independence based on the knowledge and ability to live off the land the desert Aborigines have adopted an economic status which is increasingly dependent upon European culture, even to the point of regularly accepting welfare. It should be pointed out that this is an irreversible trend. In time, as the dependence on European-derived food and goods increases, the traditional knowledge and skills connected with making a living in the desert will be lost. Indeed, this has already happened among Aborigines in many parts of Australia, and the Western Desert people represent a kind delayed example owing to their geographical isolation.

In keeping with the Australian state and national governments' policy of assimilation, many people argue that the Aborigines will ultimately be much better off when they can find employment and a place in the mainstream of Australian society. It is not the purpose of this discussion to argue the pros and cons of such a policy. But the case of the Western Desert Aborigines reveals a situation which is characterised by cultural loss as well as cultural change. If developments continue as they have for the last 100 years, a successful and self-sustaining, 10,000 year-old adaptation to the rigorous Western Desert environment will soon be replaced by two relatively unsuccessful and unstable adaptations; that of European-derived culture and that of the Europeanised culture of the Aborigines. While one may say that such a process is inevitable and will be good for the Aborigines, future generations of Aborigines, may wonder if this change was worth the cost.

# A BLUEPRINT FOR SURVIVAL

## Comments

From Professor D. Bryce-Smith

### Survival of four-dimensional man

The *Blueprint for Survival* has provided a long-needed rational analysis of some of the ecological problems which now face society, and has outlined various ways in which these problems might be tackled. But I am not sure it has gone to the heart of the matter. As a physical scientist, I have a strong commitment to the traditional scientific methodology of experiment, observation, measurement, calculation, and organisation, yet I feel aware of certain inadequacies when this is applied to problems of which man himself is a major component. This short essay is an attempt to place our ecological problems in the context of man and his nature, and to draw attention to certain relevant factors which fall outside the conventional bounds of physical science and sociology.

I feel that the present ecological situation stems from narcissistic elements in the nature of man, mainly his greed and selfishness. The seeds of these were sown in man's distant evolutionary past, but so were the seeds of his present material and moral achievements. It is on these achievements that we must build; but the *Blueprint* tends to concentrate on material issues, leaving the moral ones implicit. There is, to be true, in Appendix B an analysis of factors which influence the stability of social systems, but it tends to read in places almost like an essay in thermodynamics, and the word "moral" does not appear.

Man appears to owe his previous great success as an animal to four kinds of attribute, namely his great physical energy and dexterity, his instinctive curiosity, adaptability, and greed, his highly developed intellect, and his spiritual awareness. In this sense, man is the four-dimensional

being mentioned in the title of this essay. All four dimensions appear to interpenetrate in some manner which we do not yet well understand.

These attributes, each in varying degrees, have enabled him to react successfully to changed situations in the past, but they cannot necessarily be relied upon to do so in the future. But I do see it as essentially healthy that society (especially the young) appears already to have sensed instinctively that rapidly developing situation which the authors of the *Blueprint* have described so explicitly, and we may indeed see around us various forms, some rather bizarre, of the resulting social reaction. Some people of course deny that there is any ecological crisis; but the truly unhealthy organism is that which fails to react to changes in its environment. Unfortunately, much of the present reaction is chaotic. The great value of the *Blueprint* is that it attempts an intelligent organisation of this reaction in the classical manner: it describes the problem and then outlines some rational ways of tackling it. By calling on man's skill, adaptability, and intelligence, it relies on aspects of three of the four well-tried attributes mentioned above. And it implicitly touches the fourth too, for it suggests grounds for hope, and hope is a nourishment without which the spirit of man cannot readily create and accomplish in the face of physical difficulties. I see this spiritual fourth dimension as a key factor in the overall problem, and in any solution to it which we may be able to devise.

At this point, I feel I should define what I mean by the term "spiritual". I do not use it merely in the sense of "immaterial", for the "material-immaterial" dichotomy has long disappeared from fundamental physics: physical theory is now concerned with *form*, ie waves, fields, structure, and symmetry, and our conventional ex-

perience of the everyday physical world provides little guidance to the deeper strata of structured reality. I use the term rather to describe those parts of ourselves which we can subjectively recognise, or sense, to be at least partly independent of our bodily functioning as physico-chemical machines.

This usage of the term "spiritual" is akin to that in some religious teaching. It should not imply anything unscientific, for all our knowledge of reality is based on our perceptions which in turn are subject to our structural limitations.

To solve our present ecological problems we have to consider ways to promote changes in some of the basic patterns of man's behaviour and thought in order to deflect society from disintegration through disease, warfare, or sheer exhaustion under the weight of natural reactions to its pressures. As the *Blueprint* emphasises, these changes will include general realisation that true progress is not to be equated with simple material growth. We must come to accept that real progress is not crudely synonymous with growth *but should be seen as a movement towards stability*—not stability in a dull static sense, but rather in a sense of dynamic equilibrium. This is a situation where man's inquisitive instincts will still be necessary, but where his acquisitive instincts will need to be moderated and deflected more into the intellectual and spiritual domains.

### Spiritual imbalance

One may begin to perceive a developing pattern in all this. Man's knowledge and material acquisitions accumulate because they are readily passed on to successive generations, but each generation appears to learn wisdom afresh from personal experience, gaining comparatively little from the past. (I am referring to wisdom as essentially a spiritual quality, substantially distinct from intelligence.) It is true that one may point to signs of the evolution of a social conscience manifest in various forms of socialism and humanism, and to the fitful development of spiritual awareness in Judaism, Christianity, and various oriental religions; but the pure waters of the original inspirations are often muddied by contamination as they become distant from the source. This spiritual and material imbalance in man has of course been identified by many previ-

ous writers, but it seems worth restating because I feel it stands in close relationship to the ecological imbalance described in the *Blueprint*. The relationship may well be partly or even largely one of cause and effect. The ecological problem may provide the ladder by which man can take an evolutionary upward step if he is fit, or a downward step if he is unfit—in short, the crunch. I see it as natural, in the same sense that an Ice Age, say, is natural. But this evolutionary challenge appears to me to require more than technological and sociological re-organisation. Man may need to be activated more by a positive desire for a truly better life than just a blind fear of not surviving. Thus it may at last have become an evolutionary necessity for man to become more moral.

If this view is correct, our approach to man's ecological problems will be lopsided if it fails to refer to man in all his parts as they relate to his fellows and to his environment. But the *Blueprint* appears to be permeated by this assumption: science and technology have got us into a mess, so science and technology, with some help from sociology, can get us out.

I feel that we must start from a more basic assumption than this: man has got himself into a mess. The problems originate in the nature of man himself, and science and technology are but tools which he may use or abuse. Arthur Koestler writing in *The Ghost in the Machine* has expressed one viewpoint of this type with great cogency. He draws attention to the great rapidity, on the evolutionary time scale, with which the human brain has developed to its present size and complexity as an organ of the body, and considers that man is seriously, perhaps fatally, handicapped by those more primitive parts of his brain which he has inherited from his evolutionary ancestors. But the solution, perhaps surgery or some drug treatment, is unlikely to gain popular appeal.

I certainly go part of the way with Koestler, but I do not consider that man is necessarily innately defective in his physical make-up even though most individual men may well be so. There is abundant evidence from history that individual men have succeeded, often with great effort to be sure, in subordinating those coarser and instinctive aspects of emotion and behaviour (selfishness, lust, greed, hatred,

etc) by calling upon something higher within and/or external to themselves. Christianity and other world religions have long taught that this is possible, and have provided some of the better known individual examples from the ranks of their adherents. Secular doctrines such as Marxism, Maoism, and humanism seem to imply belief in a similar possibility for man, although these in their different ways appear to be handicapped by an excessive emphasis on human sense activity. Of course, it may seem reasonable to tackle those special problems first which one can perceive most clearly, but there is a danger in an oversimplified approach that one may develop an unduly dogmatic and restricted view of the nature of reality. These doctrines rest on the (sometimes tacit) assumption that reality should be defined in terms of man's present cognitive abilities—which seems arrogant, and unscientific.

It is true that Marx in his early *Theses on Feuerbach* recognised a limitation in the materialistic approach of his time, but the implications of this seem to have been overlooked during the implementation of his other teachings with their emphasis on *praxis*, and the supposed need to protect people from the distractions of religious belief. Likewise, the selflessness advocated by Mao Tse-Tung encourages a man to look beyond himself, and recalls aspects of the Christian ethic.

### Facts of life unrecognised

Yet I know of no theological or political doctrine which has recognised the economic and sociological facts of life spelt out in the *Blueprint*. No conceivable redistribution of wealth, material resources, or political power could indefinitely provide three square meals a day and the basics of present western material "civilisation" for the present world population, let alone that doubled population which we may reasonably expect by the end of the 20th century. Even re-organisation along the lines suggested in the *Blueprint* will of necessity involve some significant reduction in the more gadgety standards of life which we now associate with western civilisation, but I would expect the sensed quality of life to be improved. I see no prospect of accomplishing this substantial deflection from narrow materialism and self-interest through application

of any of the current political doctrines. Nor would I follow Dr Herman Kahn, and aim to utilise the power of human selfishness, properly harnessed, to cure our ills. Such a cure could in the long run prove worse than the disease.

A renaissance of religious belief might well offer a better prospect, but many of the present religious leaders and their followers appear to have lost credibility through attempts to maintain traditional doctrines in the face of growing economic and social pressures to which some of these doctrines, in their old forms, appear increasingly irrelevant, and in the face of the widespread (and I believe erroneous) view that science has "debunked" religion. The real conflict is not between science and religion, but between the scientific attitude with its emphasis on observation and the religious attitude with its emphasis on faith.

Of course, the correct scientific attitude is to preserve an open mind on all matters until good evidence is available. Yet paradoxically, the deeper aspects of reality may lie beyond the cognitive limitations of the human brain coupled to its present sensory organs, and recognisable "scientific" evidence on these may be inaccessible to us: as the Binomial Theorem is basically inaccessible to an ant. So despite what I have said above concerning the correct scientific attitude, it may be prudent for man not to allow his perceptions or his imagination (which can act as a type of sensory organ) to be unduly inhibited concerning questions of spiritual reality which do not as yet appear susceptible to treatment by conventional scientific methodology. It was Jung, I believe, who commented on the fact that religious belief is a necessary psychological prop to most men, whatever its absolute truth may be.\* Those well-meaning humanists and others who have sought to kick away this prop in the interests of what they suppose to be scientific truth or social progress may have unwittingly caused subtle damage to the fabric of society, and much individual confusion and unhappiness.

Thus the purpose of ecology should be to advance civilisation in the truest sense of the word, namely the *quality* of man's interaction with his fellow

\* Jung was once asked by a television interviewer "Do you believe that God exists?" "I do not believe," replied Jung, "I know."

men, and with his environment. This advance will certainly require intelligent and humane controls, perhaps of the type discussed in the *Blueprint*, but the necessary fundamental and lasting changes in our attitudes to our environment and to each other will not, I suspect, be brought about merely by fear of catastrophe, still less by government decree. A profound spiritual transformation will be required. Those of us trained in the disciplines of science can teach by personal example and in all other possible ways what we know about scientific reality, and equally about those aspects of reality on which present-day science provides little or no knowledge: about beauty, good and evil, and most of all, about love. The world may indeed be short of petroleum, platinum and the like, but when love is in short supply, no surplus of minerals will make life good.

### No lack of love

The problem of excess population cannot be readily attributed to a lack of love, as normally understood. Indeed, the statistical expectation of life, especially for the young, has risen in most parts of the world through seemingly humane developments in modern medicine, pest control, social services, and agricultural technology. This part of our problem seems more to stem from our limited intellectual ability to foresee the long-term consequences of our actions. For example we failed to realise that the increased control of disease by antibiotics and other modern drugs would also increase the population. Medicine may need in future to be directed more towards improving the quality of life for the individual than increasing the individual life span. Unfortunately, those who choose to define reality in terms of man may still opt for the latter.

It may be argued that man cannot be expected to pull himself up by his spiritual bootlaces, and that it is more natural for most men to be selfish than to be good; but this seems unduly pessimistic. While we must live with the frailties that exist within each of us to varying degrees, I do not believe that man has so little spiritual vigour that he cannot make the effort to surmount these, once he understands the point of the exercise. Further, many of the disadvantages under which we now try to function as reasonable and

humane creatures appear to stem from basically avoidable sociological and environmental hazards. Thus my personal concern with heavy metal pollutants such as lead stems from the realisation that these can give rise to serious emotional and behavioural abnormalities, quite apart from clinically recognisable disorders of health. The problem of coming to terms with our limitations is hard enough without the additional burden of self-inflicted physical damage to the brain.

It would be totally unrealistic to expect that man could develop a heightened spiritual awareness "at a stroke", as it were; but from a practical viewpoint I certainly feel that such awareness will be a necessary attribute in those political leaders who will have the task of piloting society through the rough waters ahead. Unfortunately, it is not easy to perceive many men of outstanding moral or spiritual stature among present world leaders, but, politics aside, I would venture to suggest Mao Tse-Tung and Willy Brandt as representing in some aspects the type of person I have in mind.

To summarise, I suggest that the nature of man is rapidly bringing him towards a crisis in his relationship with the world. Our attempts to avoid this crisis should call upon man's great reserves of spiritual strength, and should not just aim for better book-keeping in man's utilisation of material resources and control of his numbers—although these aspects are important too.

So as we plan to survive let us plan to deserve to survive.

### From O. Barraclough

No one I think can refrain from admiring the courage and imagination embodied in the *Blueprint for Survival*. It represents the first attempt to frame a new conception of the direction and purpose of human life. But like all pioneer efforts it has its imperfections and it is with the object of trying to help to eliminate some of these weaknesses that I offer the following comments.

In picking on decentralisation as, so to speak, the central issue, the document has not gone deep enough. The excessive centralisation from which we suffer is not a malady but a symptom. The real trouble is that we live in a society which regards the acquisition of goods as the principle objective of

human existence, and expresses this belief in a market economy. Given this belief and this economy centralisation is inevitable. In these conditions decentralisation could only be achieved and maintained by immensely strong central controls—a ridiculous paradox. What is needed is to alter the whole basis of our thinking and to establish a society in which men find their satisfaction in other things than piling up their possessions. In such a society over-centralisation will cease to be a problem and the organisation of society, both physical and administrative, will fall, of its own accord, into newer and better patterns.

This means a new approach to the purpose of work. At present, with most people, the purpose of work is to provide them and their families with as good a material standard of living as possible. The idea of providing a service to the community, or of satisfying their own creative instincts, figures to some extent in people's thoughts about their jobs—more in some cases than in others—but the provision of a high material standard of living is always paramount. What is needed is to reverse this order of precedence; to create a climate of opinion in which people work primarily to serve the community, secondly for the satisfaction of exercising their mental and physical powers, and only thirdly to get a living. In a society governed by these principles an adequate standard of living would be guaranteed to everyone, but income differentials would be small because they would no longer be needed. When a job provides its own satisfaction no further incentives are needed. This would mean a society largely egalitarian in material things, and in such a society there would be little scope for material status symbols or the accumulation of possessions. Moreover, where the primary aim of work is the welfare of the community, the stimulation of hitherto unfelt desires will be regarded as a rather unworthy occupation.

It is my belief that this proposition is not so Utopian as it may seem. I believe that there is a widespread feeling of dissatisfaction with the goals and methods of modern society, and therefore a real hope of our being able to make the necessary transformation in an orderly way before events overwhelm us.

Yours,

O. Barraclough, (Hon. Treasurer,  
Conservation Society).

# Reports

## Japan's GNP: Growing . . . Growing . . . Gone

Distant rumours and noises off. From the land that the cover story of last December's *Ecologist* described as being at once both an economic dream and ecological nightmare are coming definite signs of an awakening.

In that article<sup>1</sup> Peter Smith wrote that Japan's 102 millions "are in the mood for self-appraisal, and the unquestioning faith in the ever-increasing Gross National Product is increasingly turning to doubts over whether or not it is worth the physical difficulties and the environmental damage that has been created." The strength of these doubts, and the inspired action to which they are now forcing the country's economic policy-makers are only very gradually becoming apparent in the West. Yet it seems likely that their most meaningful economic contribution to the world community may be just about to surface: are the Japanese, of all people, planning to call the bluff of economic growth as a civilisation's rationale?

Tokyo's *Nihon Keizai Shinbun*<sup>2</sup> broke the news early in the new year with a front page item headed "Towards a doubling of national welfare". Our own *New Scientist*<sup>3</sup> followed this up and wrote a brief piece in February titled "Japan seeks a happiness measure." In so far as anything connected with national accounting can stir man's blood, the developments reported are sensational; yet, quite possibly the *New Scientist's* is the sole Western mention of the matter.

Source for the two reports was last summer's review of 21 member-nation's economies by the Organisation for Economic Co-operation and Development. As a supplement to their memorandum on Japan the OECD reprinted, for restricted circulation, an eight-page document<sup>4</sup> which they received from the Japanese delegation. Rendered, sometimes amusingly, by the delegation's own translators, this is a profoundly serious document, tying economics and ecology at a thoroughly practical level. As such it echoes much that has been written in these pages

over the past two years.

From the first page: "Accompanying the rapid development of the economy there have been many problems such as environmental problems like pollution, which have become more serious, or increasing hazards to the people's living like traffic accidents . . . the people's needs have become more diversified, and they want things of higher level, which are not easily fulfilled by mere increase in production and income, such as housing, improved environment for living, better way of spending their leisure . . . In order to meet these new wishes of the people, it is necessary to set up new targets in future economic plans, and efforts must be made to grasp them as concretely and quantitatively as possible. From this point of view the traditional concepts based on GNP are not quite adequate."

Chaired by Dr Miyoei Shinohara, a special committee to study Net National Welfare (NNW) was set up by the Economic Council, at the Prime Minister's request. Its task was to criticise and propose changes in Japan's national accounts, and to work on the construction of a new index to measure the success of the nation's economic activity in reaching qualitative goals set for the people's welfare.

"It is considered necessary to tackle with the development of new indices from various angles . . .", and the document goes on to identify four main approaches as a result of the committee's hearings.

### (1) *Reclassification of GNP according to social goals*

"The present GNP consists of in such a way that it represents 'who' (government, enterprise, households, etc.) bought how much of 'what' (consumers' goods, capital goods, etc.). Adding 'for what', the social targets (people's needs) to them, the GNP is going to be reclassified, so that it would give us a clue for finding new targets in economic planning . . . not only to see for what social goals (for instance health, education, etc.) the present GNP is spent, but also . . . to see for what social targets the resources available in the future GNP should be allocated.

### (2) *Strengthening GNP as a welfare index*

"The GNP concepts . . . looked at from the point of view of people's welfare its function is not sufficient. The reason why it is not can be ascribed to the problem of the so called 'disproduct' and to factors of welfare which are not reflected in GNP.

—what has to be expended for prevention of pollution, recovery from damages suffered by pollutions, prolongation of commuting distance due to urbanisation, traffic accidents, etc., are included as components of GNP. They are not necessarily contributing to improvement of welfare.

—pollution of natural environment (air, water, natural views, etc.) . . . are either not taken into consideration by the present system of national accounts at all, or some part of it has even been included as positive factors in the calculation of GNP. . . From the viewpoint of welfare, such pollutions and depletion of assets should be deducted . . .

—such negative factors in the present calculation of GNP as shortening of working hours (increase of free time) can be positive factors for the improvement of welfare.

### (3) *Change from flow economics to stock economics*

"This is an approach from social stocks, which people's welfare depends heavily on . . . the social stock used here does not only mean the 'stock of goods', in the narrow sense, as opposed to the 'flow' concept in the traditional economics, but contains also . . . stocks which relate to more sophisticated men's wants. . . They were divided into the following six items:

—natural stock (e.g. air and water pollutions, decrease of natural views)

—social overhead capital stock (e.g. houses, roads, parks in urban areas)

—private stock (e.g. consumers' durable goods, clothes, personal effects)

—personnel stock (e.g. teachers, medical doctors)

—cultural stock (e.g. cultural goods, communications media)

—social institutional stock (e.g. social security systems)

### (4) *Non-monetary approach to a welfare index*

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"Among the items which consists of people's living and welfare, some items are difficult to express in monetary terms . . . for instance nutrition, health, education, leisure, safety . . . which may not be expressed in monetary terms, may be expressed quantitatively in some form or other."

In their offering to the OECD the Japanese do not underestimate the conceptual and practical problems of combining these four approaches, with their various indices, into a single overall indicator of Net National Welfare. However, while it would be intellectually tidy to have a taut theoretical framework, it is ecologically imperative that the country's "kogai", public poison, be abated. First things first!

From the land of the rising yen and earnings has come a timely synthesis: a rising yearning for some of those fundamentals, those human verities, those "free goods" outside the market economy. With the help of Dr Shinohara's team the present Social and Economic Plan 1967-75, with its income-doubling targets, is being scrapped, and in its place the 1973-80 Plan, to be revealed this autumn, proposes the doubling of NNW over eight years. (Figures for GNP will still be recorded but solely as a measure of effective demand, signifying nothing more than the total spending power in the system.)

Meanwhile our own "standard of living" remains defined as the GNP per head of population; an index of the resources we have destroyed during the year, it lumps together all the goods we have made, with the bads, the trivial and the poisonous. Napalm or national park, pensions, prisons or plastic gnomes—they all contribute to the raising of our "standard of living", and each is worth exactly what it costs! They are all the same in the eyes of British economists, whose descent from off-white ivory-style tower blocks to sully themselves in reality is now eagerly awaited.

*Philip Brachi*

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2. *Nihon Keizai Shinbun*, 4 January 1972.
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## Organic Farming in America

Organic farmers and those who advocate organic systems of husbandry are concerned with sustainable techniques of food production that make the most efficient use of energy and nutrients and that enhance rather than degrade the environment. It is inevitable that they find themselves close to the centre of the environmental movement and that they should attract the support of the young people who are most keenly aware of the critical stage that has been reached in man's relationship with his environment.

This support is less evident in Britain than in America, where the environmentalists have received more attention and where the move towards organic husbandry is more advanced. Nearly half of the audience at a conference on municipal composting and organic farming, sponsored by Rodale Press and held from the 11th to 13th May in San Francisco, was under 30 years of age.

If organic farming is to be applied on a large scale we must learn to return to the land the organic matter we take from it. The first part of the conference attacked this problem, by dealing with the composting and recycling of municipal wastes. Much of the talk was technical, as manufacturers described machinery and equipment, scientists described processes and representatives of municipal authorities and private handlers of refuse described the techniques they employ. The problems are similar to those in Europe, although the refuse is not. Much of the plant designed in Europe cannot break down the large volumes of paper and the higher proportion of large objects that characterise American wastes. Composting and sewage treatment are less common than in Britain but some of the large cities are making progress. Frank Kudrna, of the Metropolitan Sanitary District of Chicago, boasted that Chicago contributes nothing to the pollution of Lake Michigan, for it treats all its sewage before discharge. The claim is certainly true, for he also told the conference that the effluent is released into the Ohio River, which flows away from the Lake. The sludge is used to reclaim land devastated by strip mining and he showed pictures of parks and nature reserves that had been created from desert. Los Angeles County cannot claim to cause no pollution, but it, too, is beginning to

compost its sewage sludge in windrows. The mature compost is supplied to a contractor who sells it to farmers and growers.

Municipal composting may be less advanced in America than in Britain, but organic farming is more so and American organic farmers are approaching solutions to problems of which their British counterparts are barely aware. Marketing and distribution is organised and the farmers were addressed by representatives of three wholesalers specialising in organically grown food, one of whom, Paul Hawken of the Erehwon Trading Company of Boston and Los Angeles, plans to open a branch in London.

The British-based Soil Association is compiling a definition and code of practice for organic farmers that will provide much needed consumer protection. The Americans have a certification programme which is being applied. It is an essential step, for one of the distributors said that his list of 200 organic suppliers had dwindled to 20 on closer examination of the cultural methods they used.

The preparation of such a scheme is more difficult than it may seem, for the difference between an organic farmer and one who uses artificial fertilisers and synthetic pesticides is largely one of attitude, of philosophy. It does not lend itself easily to objective analysis. The American farmers take account of this by requiring those who apply for certification to describe their system of husbandry in detail. From this description it is possible to evaluate the applicant's understanding of the principles of organic husbandry and the declaration is supported by examinations of soils for their humus content, which should increase over a period of time, and of soils, plants and produce for pesticide residues. A visual examination of farms determines the diversity of species of insects and wild plants. This diversity is reduced rapidly by the use of pesticides.

The Californian organic farmers took the first steps in forming an organisation to represent their interests and it is significant that they were offered office accommodation and secretarial assistance by an environmental group at the University of California, Berkeley. This was one of a number of universities from several states that were represented at the conference, the largest delegation being from Santa

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Cruz, which has a farm run organically by students who are learning as much as they can as fast as they can and applying their knowledge to create a complete life-style. Perhaps theirs is the most important contribution to the movement, for not only do they understand its principles and the broader environmental issues raised by organic farming, but they are seeking to modify their own lives in ways that others may follow.

The organic movement in America was started by the late J. I. Rodale, a writer and publisher, and it is his company, Rodale Press, today managed by his son, which makes the pace through its publications, which include the popular *Organic Gardening and Farming*, the erudite *Compost Science* (available in Britain through *The Ecologist*) and a wide range of books and smaller periodicals. It was Rodale Press which recognised the need for, created and applied a certification programme and it is Rodale Press which brought together the Californian farmers.

The conference was held in the unecological, but convenient, Hilton Hotel, in the heart of San Francisco. In a way it is an appropriate place for environmentalists to meet. San Francisco is a city of breath-taking beauty, spotlessly clean, alive and exciting. Yet about its steel and concrete towers and heavy civic masonry there is a strange air of impermanence. Nearly all the buildings are new, for in 1906 the old ones fell as the San Andreas Fault, on which the city of Saint Francis is built, shifted. Small tremors are common and soon the Fault will shift again. No one can know how large the earthquake will be, but there is at least a chance that the city will collapse. At night it blazes with lights more brilliant than those of any European city, as though its inhabitants were burning the resources of the earth for the pleasure of seeing how quickly they can be made to burn. It is the end of the road, the ultimate achievement of the consumer society, and it is eating, drinking, laughing, singing, dancing, playing and

burning its way, beautifully and innocently to destruction. The delegates to the Rodale conference loved it, as one must love it, but it is an object lesson for them and as the conference ended the young people from Santa Cruz were the first to hurry away. They, too, had enjoyed themselves, but they wanted to go home, back to reality.

Michael Allaby

## Pigging it

When arguments about "factory farming" drift from the high-ethical or food-global planes they tend to founder on profitability. Whatever you may think about the intensive, indoor rearing of livestock, at the present time it does make money and it will take a good deal of persuasion to win a hard-headed farmer away from the temptation to stay in business. Now, at last, the opponents of the system have a weapon, at least with regard to pigs. Not only is the intensive, indoor rearing of pigs cruel, immoral, wasteful of resources and a negative contribution to the world food balance, under certain conditions, as compared with outdoor rearing (whisper it first to get used to the sound) it is not even profitable. Wye College, bastion of the Agricultural Orthodox Church, says so.

The secret lies in a saying attributed to Chairman Mao Tse-Tung: "A pig is a little fertiliser factory on four legs", although the ungrateful scientists do not acknowledge this source of their inspiration, referring instead to the probably mythical Enterprises Studies Committee of the Ministry of Agriculture, which in 1967 suggested that they undertake a study of the effect of pigs as a break crop in continuous arable farming systems.

It was recognised that the rises in yields during the 1950s and early 1960s had ceased and that problems were intensifying. There was a need to re-establish some kind of rotation and in moving in this direction a number of farmers, especially on the chalk downlands of southern England, were using pigs as a break. The team contacted farmers who were using pigs in this way and kept detailed records of their progress through two summers and the intervening winter. The number of farmers varied between 43 and 46 as some dropped out and others took their places. The work of conducting the survey was shared between Wye

College (University of London) and Reading University. The report, *Outdoor Pig Production*, by Michael A. B. Boddington, is published by Wye College (Ashford, Kent), price 75p.

The first task was to examine the economic viability of the pig enterprises themselves. They found that "the outdoor herd exchanges high productivity for low capital cost, low labour charges and a system which permits greater ease of management". The contrast between indoor and outdoor systems is less sharp than it may seem, for there are a number of intermediary regimes under which the animals spend part of their lives indoors. These, too, were examined and the conclusion was that "the more truly outdoors the herd the more profitable it is. . . . Herds with some degree of environmental control, either during the winter or at farrowing time, achieve a higher degree of productivity but that the expense involved in achieving it more than offsets the gains thereby obtained. The litters per sow per annum tend to be higher and the numbers weaned per sow are likewise well up. The percentage mortality is also lower for herds housed in the winter. However, feed conversion rate, contrary to expectations, is lower in winter-indoor housed herds than in those which are housed for farrowing only, which, in turn, show a poorer efficiency in conversion than herds which are totally out of doors. This is reflected in the figures for feed cost per £100 gross output. Labour costs per £100 gross output are considerably increased as soon as steps are taken to bring pigs inside to any degree, and the same is true of veterinary and medicine charges" (see Table 1).

A word of caution is necessary before too much is read into these results. Most of the farms examined were on light soils. Some were on clays, but here management is more difficult. The land may be damaged by animals in winter, when it is wet, and the animals themselves may suffer. It is not unknown for a heavy sow to fracture a pelvis trying to move about in thick clayey mud. Nor will the true "factory farmers" be much impressed, for costings of a pig enterprise within an arable system are different from those of a specialised pig farm, where investment and overheads are so high that production must be maximised. Also, the indoor farmer probably has

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insufficient land to run his animals outdoors anyway.

Nevertheless, qualified though they may be, the facts and figures stand. It seems, too, that they do not vary much with breed, for the farmers consulted used a wide variety of different breeds with equal success. There were some losses of little pigs to foxes, which ate one farmer clean out of business! On balance, the advantages of outdoor systems outweighed their disadvantages. Dare we hope that more farmers will take a new, critical look at their costings? The parameter is crude, but it may bear a true relationship to the total, or energetic, efficiency, suggesting that it is more efficient to keep animals outdoors where they can fit into the natural energy budget than to expend additional energy controlling their environment, from which the farmer receives only part of the benefit from the utilisation by the animal of a part of the additional energy.

The profitability of the pig enterprises formed only one part of the investigation. Pigs had been introduced as a break in continuous arable cropping systems and the survey

attempted to discover their effect on subsequent cropping. This was more difficult. There is an almost infinite number of variables in farming and it is dangerous to attribute phenomena to any single cause, the more so when the phenomena themselves are subtle and complex. Of 22 farmers approached, only six would make any estimate of the effect pigs had on subsequent yields and these varied from an increase of 10 cwt per acre to a drop of 5 cwt in the first year. Ten of the farmers said they used less fertiliser following pigs and one horticulturist said the pigs considerably improved soil structure and fertility. Even attempts to relate fertiliser consumption to previous pig rearing are difficult and likely to be misleading, for the amount of fertiliser a farmer uses will vary with crop, soil type and weather. However, it was established that pigs make some contribution to soil structure and fertility, they may help control diseases in cereals and to eradicate certain weeds. When these advantages are added to the fact that they are more profitable by far than any other break crop and that the labour requirement is no greater, they must appear very attractive indeed.

The report of the survey is written cautiously. We must not expect the good men of Wye to move too fast. They make no reference to the wider

implications of their work, so it is impossible to know whether they are aware of them. They are fairly obvious. Continuous arable farming is not sustainable. It depletes soil structure and permits the build-up of weeds, pests and disease. In Britain the point of diminishing returns has been reached: inputs must increase while output remains constant. The solution is to abandon the system in favour of mixed farming. Since farmers have always known that pigs give more manure than other animals, the short-term expedient is to send for the pigs to save the situation. The logical next step is to complement the pigs with cattle, sheep and poultry.

This step may be too large for many of our agricultural scientists, but for the time being, as we return to Chairman Mao, they have the satisfaction of knowing that the Chinese, who have used pigs in this way for some years now, are right after all. Chairman Mao may believe pigs are profitable: Wye College has proved it. I bet he is relieved!

*Michael Allaby*

## Bird sanctuary destroyed

In spite of all the efforts by private individuals, by ADENA and the Wild Life Preservation Society, work has just started on the draining of the lake at Laguna del Duero, in the Province of Valladolid, Spain. This 150-acre lake was a famous wild bird sanctuary which attracted naturalists, not merely from Spain, but from all over Europe, because of the enormous variety of aquatic birds which nested there, or called in on their way south.

The lake was sold by the town council of Laguna del Duero to a building firm for 52 million pesetas. The idea is to build houses for 45 thousand people, mainly factory workers, on the site.

It has been pointed out to the council that this operation will not merely deprive the village of one of its principal attractions, but also bring about a very serious change in the ecology of the whole region. However, the money was too attractive to prevent the operation from going through. Offers were made by private individuals to collect the wild birds and provide them with another site where they could nest and live in peace, but these were simply ignored, and the birds will have to fend for themselves.

Table 1. Comparison between pigs kept outdoors all year with those kept outdoors for only part of the year

	Herds outdoors				All herds
	Part year	All year		Total all year	
		Farrowing inside	Farrowing outside		
Number of farms	4	4	33	37	41
Average herd size	131	33	185	174	170
Per £100 gross output (£):					
Feed	68.27	62.27	61.86	61.88	62.49
Labour	17.05	14.59	8.40	8.70	9.40
Vet. & medicines	3.66	1.26	1.20	1.21	1.44
Sundries	6.02	3.12	3.41	3.39	3.58
Housing	3.46	1.63	1.05	1.08	1.31
Equipment	1.17	0.35	0.81	0.79	0.83
Grazing	2.27	3.19	2.29	2.34	2.33
Other overheads	0.70	0.13	0.29	0.28	0.24
Total costs	102.60	86.54	79.31	79.67	81.71
Surplus	-2.60	13.46	20.69	20.33	18.29
Litters per sow per year	1.85	1.74	1.78	1.77	1.78
Pigs reared per sow p.a.	16.27	14.68	14.66	14.66	14.78
Percentage mortality	10.61	13.65	12.97	13.01	12.92
Feed conversion rate	4.96	4.84	4.78	4.79	4.81

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The local inhabitants and the municipal authorities turned out in numbers to witness and celebrate with joy the beginning of this operation! The Council defends its action by saying that the lake was an eye-sore and a breeding spot for mosquitoes. Yet I have spent many hours by that lake, collecting specimens, and have observed that the small fish which provided food for the wild birds were quite capable of keeping the mosquitoes under control.

The pity of it is that there was no real need to take over that piece of territory in order to build houses for the factory workers, because there is plenty of land available near at hand, which would have cost less than this operation—the estimated cost of the drainage is 30 million pesetas, quite apart from the cost of the land.

Who can say what the final effects will be on the ecology of the whole region? One thing is certain, namely that some species of wild aquatic birds which could only be observed on this lake will now disappear—and some of them are rare enough already.

*David L. Greenstock*

## Wasting Time

It would seem reasonable to expect a Government which decided to bring together housing, local government, transport, construction, etc. under the impressive umbrella of a Department of the Environment, to take great pains to ensure that environmental problems would be tackled in a more vigorous manner than in previous administrations.

Sadly, the waste disposal affair reveals a government which is not prepared to take necessary action until the problem leaps at their throats in the form of a massive Press campaign.

It is, however, reasonable to say that without these newspaper attacks this country would have had to wait until 1974 for the Deposit of Poisonous Wastes Act.

At the March conference marking the second report from the Royal Commission on Environmental Pollution, Sir Eric Ashby was reported

as saying that the Commission had warned the Environment Secretary, Mr Peter Walker, of the urgent need for immediate action on four separate occasions last year—in July, September, October and November.

The Commission was said to have told Peter Walker on November 30th “the risk to the public is such that we must pursue the matter immediately.”

Mr Walker's thoughts at the time were to let legislation on toxic wastes wait until 1974 and the completion of local government reform. However, the Commission insisted on immediate legislation.

When questioned on these points, a DoE spokesman told me that Sir Eric “had been misquoted, there were not warnings but joint consultations. It was mooted to include the Bill in local government reform but this was dropped when the country became aware of the true situation”. The total lack of restrictions and controls for the dumping of wastes of this nature until the spring of this year is amazing.

The true state of affairs was unveiled before Sir Eric's disclosures, at an emergency Press conference (well attended) called by the National Federation of Waste Disposal Contractors. Chairman of the Federation is Mr Tony Morgan, also Chairman of Purle Brothers Holdings Ltd.

This was convened to reply to the allegations and to draw attention to the new Code of Practice for the industry which was finally launched on April 17th.

During the meeting Mr Morgan acknowledged the weakness of the Code without the teeth of legislation.

The reason for this weakness was straightforward: although the Federation can claim the leading members of the industry as members, it boasts only 25 per cent of the total number of Britain's waste disposal contractors.

Unfortunately, the small firm was potentially the most dangerous. In the past there has been nothing to stop a manufacturer disposing of toxic waste in the cheapest manner possible—with the aid of a small, and perhaps inexperienced, operator.

Anyone who felt like it could set himself up as a waste disposal contractor. At the time, Mr Morgan likened the situation to giving a six-year-old child a stick of dynamite to play with.

Doubtless, the authorities are now busy attempting to assess the damage done in the past, but what of the new legislation?

An “environmental hazard” is defined as “waste deposited so as to subject persons or animals to material risks of death, injury or impairment of health or so as to threaten the pollution of the water supply.”

Penalties for offences under the Act carry fines of up to £400 or six months imprisonment, or both, on summary conviction, and unlimited fines and of up to five years imprisonment, or both, on indictment.

Under the new legislation, no one is able to remove waste unless notice has been served to the local authority and river authority concerned—three clear days before removal.

This notice is required to specify the nature, chemical composition and quantity of the waste involved, together with the site for deposit and the name of the transporter and original premises.

Commercial tip operators have to give notice of receipt of waste, also within three days, and giving the same specifications.

Responsibility for enforcement lies with the local authorities. They have the power to enter land, and are required to keep a record of details of the wastes deposited and sites of deposit.

Even these measures do not satisfy Sir Eric Ashby. At the Commission's conference he said: “The fact that you are punished heavily if you are found dumping waste in the wrong place must also have another side to the penny, so that a person knows where he can dump it.

“I think this would be far more effective than the punitive measures proposed.”

The Commission also wanted all waste disposal contractors to be registered. A spokesman for the DoE told me that “it was not thought necessary to require the registration of contractors.” It is interesting to note that, at their Press conference, the Federation said that it was impossible to arrive at the number of two or three vehicle firms at present operating in the UK.

There is also the possibility of the accelerated development of professional criminal activity in the field of waste disposal. Reports have already outlined cases involving regular operators being

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"warned off" a job—in a world of false names and number plates and men whose last thoughts concern possible dangers to water supplies.

*Anthony Redding*

## Cowley Wood nature reserve

On a still autumn day you hear the sound of falling leaves in Cowley Wood. At summer's high noon the drone of insects is like a distant organ note. Almost any night is punctuated by the conversation of owls.

From the burbling stream at the bottom—it is a tributary of the River Heddon and no one appears yet to have given it a name—the wood rises, a dense tapestry, to a height of around 900 ft. In shape rather like a whale, it faces north-east, so the south-westerly gales roar over it. Approximately 12 of its 71 acres were larch plantations some 50 years ago but after these were

cleared the area reverted to bracken and scrub, thus forming a distinctive habitat for various forms of wild life. Apart from the making of charcoal, which is no longer carried on, the whole wood has had very little interference from man and has grown by natural regeneration.

Cowley Wood is therefore a limberlost, an ecologist's paradise. In a clearing down by the brook is an old white-washed farmstead approached by a devious lane from the village of Parracombe in the heart of Exmoor. When John Butter heard that the farmstead and the wood were for sale he could not get there quickly enough from his home in Hertfordshire, which county he had long served as horticultural adviser in the Agricultural Development and Advisory Service. He took advantage of the recent shake-up in that Service to opt out, being disillusioned with the Government's agricultural policy and with much of current farming practice, and resolved that henceforth his must be an ecological way of life, showing in real terms what ecology means.

News that the estate was in the

market was telephoned to him by his friend Ed Sones while holidaying in Exmoor. Sones, who had been working in a rocket engineering establishment in Stevenage, is decidedly of a like way of thinking with John Butter. So also is Michael Reed, who gained a certificate in Field Biology at the University of London and was assistant curator at Stevenage Museum. Both decided to throw in their lot with John and the three combined to buy the property. John and Ed are married and have their wives with them and the Butters have two sons. Mike Reed is single.

The management of Cowley Wood as a Nature Reserve is now their joint dedicated purpose, and it will have to provide the wherewithal to live for all of them. At 16, Paul, the eldest son of Mr and Mrs Butter, is taking botany, zoology and chemistry at North Devon Technical College, and so will be well qualified for the ecological way of life.

The estate was taken over in the middle of August last. First steps towards subsistence were the acquisition of a flock of hens, some geese and guinea fowl. Rescued from a battery house at 25p each, the hens speedily

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adapted themselves to free range conditions.

One arable plot has been set aside for potatoes and another for brassicas, and soft fruit will be grown. Some apple trees are already there. In a patch of rough pasture Mike Reed will be carrying out sheep grazing trials and studying their effect on vegetation and soil conditioning.

The old lawn by the homestead will be cut only twice a year because two varieties of orchid grow in it, and also because more frequent cutting would destroy the caterpillars of several species of butterfly. With ample material available, composting was started early and a new garden will be created, not so much for ornament but to demonstrate ecological principles: wherefore pesticides, herbicides and fungicides will be foresworn. This enterprise, it is hoped, will prompt other people to go in for ecological gardens: this could well become a valuable means of preserving the many species of wild flower whose numbers are fast diminishing in our countryside, some of which are threatened with extinction.

A plastic greenhouse measuring 54 ft by 16 ft has been erected, and John Butter remarked that whereas most growers would first have sprayed this area with herbicides, he and his colleagues will clear it of weeds by hand. Soil-warmed electrically, the house will be used for rearing plants useful to butterflies, shrubs useful to birds, and for production of tomatoes for home consumption and sale. By the farmstead an old water butt serves as a fish hatchery, the intention being to use the brook to form ponds in which to breed trout.

Since moving in the time has been one of hard work, of discovery, recording and planning. Careful exploration has been made of all parts of the wood, which is predominantly of sessile oak, with some patches of ash, willow and sallow, plus an abundance of ferns and bracken.

There is no lack of congenial botanical homework for young Paul Butter, for he shares the task of identifying and cataloguing all the trees, shrubs,

plants, ferns, mosses and fungi. As for the mammalian count, this by mid-October included red deer, badger (there is one sett only 200 yards from the house), fox, hare, mole, water shrew, pipistrelle bat, whiskered bat, grey squirrel, short and long tailed field vole and hedgehog. There are frogs of course, and two reptiles, the common lizard and slow worm.

The bird list numbered 33 species. One pair of buzzards nested in this limberlost last summer, while of the 40 pairs of ravens reputed to have their home on Exmoor nine were seen here at one time. There is a populous roost for rooks, there are plenty of crows and jackdaws, and at least one owl has learned to respond to John Butter's imitative cry by flying down to him: a good omen, he says.

The butterfly list numbered 16 species and no fewer than 50 moth species had been identified. Eighteen different fungi had been counted, and in the brook two species of caddis larvae as well as three species of case builders were present, while nymphs of the mayfly *Ecdyonurus* were abundant.

A moth trap is installed on the lawn near the homestead, but only for identification purposes.

There is no intention of turning Cowley Wood into a zoo. "Zoos and wildlife centres are places where people have animals thrust before them," says Ed Sones. "Here they will have to look for what they want to see.

"Yes," adds John Butter. "All our creatures will be living in natural conditions, though of course we shut up the domestic livestock at night. And we shall be careful not to do anything likely to create trouble for farmers in this region. Our aims in short are to promote all aspects of conservation and to pursue business activities and a way of life with full regard to the environment and its wildlife."

Nature trails are planned, there will be hides for bird and animal watchers, and a Bronze Age track which traverses the wood will provide archaeological interest. Day visits will be by permit only, there being space for only 10 cars at a time, and it is hoped to provide accommodation for those who want to make a longer stay. Many well known naturalists and conservationists have expressed their interest in the project.

L. B. Powell

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## Coming events

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**25-27 September**—Sixth International Filtration and Separation Exhibition and the Third Dust Control & Air Cleaning Exhibition to be held in conjunction with FILTECH/73 to be organised by the Filtration Society at Olympia, London. The conference will highlight "what's new" in liquid/solid separation and dust control and air cleaning.

**20-21 October**—Brain, Consciousness and Human Survival. Symposium chaired by Arthur Koestler to be held at St. Pancras Assembly Rooms, Euston Road, London, N.W.1. Tickets can be obtained from The Teilhard Centre for the Future of Man, 3 Cromwell Place, London SW7 2JE. Tel. 01-584 7734.



# Gulliver in Automobilia

## Concerning Scientists

There is in Automobilia a numerous Class of Persons whose sole Employment is the Study of Natural Philosophy. They are termed *Scientists*, which is as much as to say "Those that know": and the Knowledge they have accumulated, of the World and all that is in it, is certainly very great.

These Scientists are esteemed above all other Professions: many Thousands are maintained in all parts of the Kingdom at the publick Expense, and their Judgement is held in so high Esteem, that no Enterprize is undertaken, nor no new Idea given Credence, but if it have the Approbation of some two or three of this Fraternity. In short, they resemble a Priesthood whose Wishes the secular Rulers must in all Matters consult: and since these Priests worship no God but their Science, and obey no moral Precepts but those vouchsafed by their own Conscience, it is small Wonder that the beneficial Nature of their Activities hath been at Times less than self-evident.

It is often the case, that a People's Character may be seen writ large in its Priesthood: so here, the Scientists have a greater Share than the Laity of the peculiar Vices of the Nation. They speak much of *Progress*; by which they mean, so far as I understand them, that all the Conditions of human Life are continually changing, that such Change is both inevitable and desirable, and that it therefore behoves every one to welcome and promote it. This Belief is the principle Article of their Faith: but they hold also, that all Knowledge is of itself good, however evil be the Means by which it is obtained, or the Uses to which it is put. I was dispos'd to view the Scientists at their Work; and therefore obtained Leave to visit one of their Academies and enter the Laboratories wherein they plan their

curious Trade.

In the first Room I entered, several Men were employed in devising a Food which should please the Eye, and be agreeable to the Palate, but pass through the Body without providing it with any Sustenance whatsoever. By this Invention, I was inform'd, the Glutton could indulge his Vice while escaping its corporeal Consequences. Another Scientist was engaged upon a mechanical Instrument, whereby the Texture of Biskets and such Victuals, whether brittle, crumbly or the like, could be measured with a Preciseness far greater than any of which the human Mouth is capable. I saw another at Work to dye Vegetables, and thus restore their proper Colour, which previously he had boiled out of them. There was a most ingenious Chemyst, who was endeavouring to render Water from all the Rivers of Automobilia alike, to the End that a Man might travel from one End of the Kingdom to the other, and drink the same Beer in every Town he passed through.

In another Apartment I found a Man whose constant Study was the Animal Kingdom: who deafened Song-birds, to see if they would still sing, and shackled Kittens from Birth, to find whether they would play when they were at last releas'd. He likewise showed me a Treatise he had written, describing how Apes, if depriv'd of their Mothers from Infancy, grew up morose and of an ill Temper; with many other curious Facts of a like instructive Nature. In a nearby Chamber was One that opened the Skulls of living Dogs to test what Effect he could induce by cutting out Portions of their Brains: he told me that, did the Law but suffer him, he would fain make the same Trial upon Men. Another Scientist had discovered the Means of achieving Conception in Rabbets without the Body, and afterwards im-

planting the Foetus in the Womb by Surgery: he was confident that the Like would shortly be attempted in Women also. His Companion had by the same Art contrived unnatural Unions, as of Man with Ape or Mouse or Hen. He hath as yet produced hereby nought but shapeless Mooncalves and mere Lumps of Flesh; but should his Skill grow to match his Ambition, I know not what monstrous Progeny, what Minotaurs or Gorgons, he may yet unleash upon the World.

Into one Chamber I was not permitted to enter: therein, I was informed, the Germes or Essences of many baneful Diseases were propagated in Bottles: for the Government of Automobilia keeps many Scientists in this Employment, purposing in Time of War to spread Plague and Pestilence among the Foe; or perhaps (for on this Point my Guide could give no plain Answer) to anticipate the Outbreak of War by an Attack, the Blame for which they can plausibly lay to God's Charge, and so conceal their own Guilt.

I visited many other Apartments, but shall not trouble my Readers with all the Curiosities I observed, being studious of Brevity. In Sum, I concluded that these Scientists with all their knowledge have not attained Wisdom. They are like Mercenary Soldiers, that will strive for any cause just or unjust if only the Pay be good: and all their Acuteness of Observation serves only to narrow their Vision. To seek to understand the World, as far as is within his Capacity, is the Privilege and perhaps the Duty of Man: but he who wishes to appreciate a great and noble Aedifice, had best study it as a Whole with Diligence and Admiration; not waste his Life in the Scrutiny of a single Brick, nor demolish the Structure Stone by Stone to discover how it was built.

Nicholas Gould

## Down to Earth



by Lawrence D. Hills

### Breath of life

Garlic is not so much a bulb of the onion family as a way of life. It is part of the health food shop and nature cure repertoire, makes a highly efficient collar worn to ward off vampires, and in Spain is reputed to keep vipers out of houses—one good breath and the smoothest serpent about turns and slithers away.

In 1944 Callito and Bailey (*Journal American Chemical Society* 66, 1950) isolated the active principle which they name "Allicin" and demonstrated its value against certain human bacterial infections. In 1951, Stoll and Seebeck (*Advances in Entomology*, Vol. XI, 1951, II, 377) claimed to have shown that it slowed the growth of certain malignant tumours. Now in 1972, Monsignor David Greenstock and Querubin Larrea have summed up eight years work on garlic as a pesticide, in a small but important report.\*

David Greenstock began working on garlic when he tested the Spanish peasant belief that this would repel Onion Fly (*Delia antiqua*). He found that though planting the bulbs round the plot was completely ineffective, alternate rows of garlic and onions saved 98 per cent of the crop. This was not due to any repellent effect of the smell, but a direct kill of larvae from what could only have been the root secretions of the garlic acting as a pesticide. In Britain we need onions more than we do garlic, and the modern system of raising almost entirely from sets which are immune to Onion Fly makes this unimportant, but in Spain and other countries where garlic has a bulk market and the crop is raised from seed, the remedy is valuable.

The next stage was boiling chopped garlic bulbs in water and spraying at varied dilutions against a range of pests, but without much success. He then tried the crude oil of garlic and through the

years discovered a number of solvents and emulsifiers which are described fully in the report, with their persistence on the leaves of plants, including one that endures for 23-30 days without harm to the crop, even after rain. Some are also effective in enabling weak solutions watered on the land to soak down and destroy soil pests.

These include Wireworm (*Agriotes spp.*) 87 per cent destroyed, Cockchafer larvae (*Melolontha vulgaris*) 83 per cent, Mole Crickets (*Gryllotalpa gryllotalpa*) a Southern European pest related to a sugar cane root-eating species in the West Indies, 91 per cent, and of course the Onion Fly with a 95 per cent kill on a field scale. The penetrating effect of the garlic would also justify trials against the Carrot Fly (*Delia rosea*) and the Cabbage Root Fly (*Delia brassicae*). Snails of several species suffered 73 per cent mortality, and *Agrioclimax agrestis* 82 per cent. The Keeled Slug (*Milax sowerbii*) is not found in Spain, but this underground species that attacks potatoes is a likely victim.

The best kills were of caterpillars with 98 per cent slaughter against the Ermine Moth (*Yponomeuta malinellus*), and *Pieris brassicae*, the Cabbage White, selected as typical hairy and non-hairy species. Though the Pea Weevil, *Bruchus pisorum*, lost 87 per cent of the population in a laboratory trial, the Colorado Beetle and its larvae escaped completely. The work of David Greenstock on biological pest controls for this now DDT-proof pest is covered in another report.†

This selectivity in missing beetles appears to be near that of nicotine which spares ladybirds, their larvae and hoverfly larvae, but the new garlic pesticide has not yet been tested against the pest-eating predators of the world. The complete slaughter from the use of organo-chlorine and organo-phosphorus compounds has often produced more pest damage after spraying than before.

David Greenstock discovered that the pesticide is a complex mixture of substances, mainly Allyl sulphides, and that garlics vary in their pesticidal properties, according to the soil they grow in. The evidence is that Allicin is an Allyl ester of Allyl thiosulphenic acid, produced by enzyme activity which cannot take place without suffi-

cient assimilable sulphur in the bulbs. This is produced in the soil by a number of micro-organisms, especially certain fungi, and they can neither develop nor increase in sufficient numbers without adequate humus. So it is likely that some of the valuable properties of garlic which are known to peasants depend on the bulb being grown by peasants or others who use compost and manure rather than chemical fertilisers.

The garlic emulsions were tested over a long period on chickens, rabbits, and white mice to establish their non-toxicity to wild life, stock or human beings. The results showed that rabbits with the pesticide in their diet put on more weight and showed stronger resistance to myxomatosis and immunity to ticks and fleas compared with the controls on the same diet but without garlic. The ten treated hens showed more resistance to bronchial infections than the ten untreated, and the mice injected with the pesticide showed no ill-effects. Experiments to test the bactericidal properties produced inhibition of growth in *Escherichia coli* and *Streptococcus pyogenes* and research continues, especially because garlic appears to be a bactericide for the Gram negative strains against which Penicillin has little or no effect.

The medicinal research, which now includes work on malignant tumours, is only a "spin-off" from the discovery of a safe and simple substitute for DDT, non-toxic to warm-blooded animals, cheaper, more powerful and of longer duration on sprayed leaves than derris and pyrethrum, and above all *non-persistent*. It can be used in unlimited quantities on the pest-prone "Green Revolution" grains without multiplying the million tons of DDT that now permanently pollute our environment.

Further research has the crippling disadvantage that the pesticide firms who make grants to Universities depend on their sales to underdeveloped countries now that the apprehensive West is banning persistent pesticides. David Greenstock's methods of oil extraction are suitable for cottage industries; garlic grows in every underdeveloped country, and the process is too simple to patent. Just as it is not possible to "unlearn" how to make nuclear weapons, this small report cannot be unwritten, so this safe and easy do-it-yourself "D.D.T." for every peasant and coolie which the world needs is coming faster than the Concorde.

\* *Garlic as an Insecticide* Henry Doubleday Research Association, Bocking, Braintree, Essex. 12p. post free.

† *Controlling the Colorado Beetle*, Biological Pest Control Report No. 4, Henry Doubleday Research Association, 12p.



## Friends of the Earth Newsletter

Friends of the Earth takes pleasure in devoting this newsletter to reports from groups throughout the country who have contributed to our activities.

*FOE Edinburgh:* 19 Dundas St.

Due to a very favourable response to the establishment of a FOE group in Edinburgh, Ann Cohen, group organiser, has found it necessary to delegate responsibility for various campaigns to study groups within the organisation. Issues under investigation include Sewage, Transport, Recycling and Population. They are being managed by a membership of 60 people. Publicity for FOE is high on the priority list and liaison with media and other groups is an important function of the group.

*FOE East Anglia:* 1 Thatch Cottage, Gt. Finborough, Suffolk.

Once again publicity, education and liaison work take pride of place for this group who have also been able, through a good response, to establish sub-groups in six towns in East Anglia. Packaging has been the mainstay and has provided a hub around which the group has revolved. Since March 25th FOE East Anglia has continued the campaign of picketing in various districts and will continue to do so until the Dept. of the Environment gives its assurance that the issues at stake are fully realised and that action will be taken. On the local front, Ray Mumford has been busy lecturing at schools and meeting other amenity bodies, and has been instrumental in launching a series of surveys of river pollution. Possible future campaigns include investigation of a cement works and an animal by-products firm.

*FOE Hemel Hempstead:* 28 Catlin St. This is a very young group whose first action was a clean-up campaign on a stretch of common land. Subsequent press coverage shows great potential

for future campaigns under the direction of Arthur Puffett, the area co-ordinator. Investigation into the viability of recycling campaigns is their current concern.

*FOE Barnes:* 9 Bracken Gdns., SW13.

Local publicity is again playing a major role in the establishment of this group who are producing a monthly newsheet detailing local eyesores and listing shops which accept used containers.

*FOE Bristol:* c/o University of Bristol Union, Queen's Road.

Fund-raising has taken the shape of organising a disco and hopefully, next year the group will run a regular publicity stall. Surveys are being carried out locally into peoples' attitudes to population and birth control and forums on environmental topics have proved to be a great success. A membership drive is planned for next year.

*FOE Nottingham:* Dept. of Zoology & Botany, University of Nottingham.

The diversity of this group's actions reflects the enthusiasm of Brian Grout's team. Population surveys are being conducted on a cost analysis basis in conjunction with Population Stabilisation, and many companies are coming under the scrutiny of the group. Local opinions are being gauged on transport problems and the City Corporation can't escape their attention. The Corporation's new incinerator doesn't impress FOE Nottingham and a campaign to illustrate the folly of burning vast quantities of waste is soon to be launched. Lectures and display stalls have proved financially beneficial and have provided an ideal platform from which to launch FOE.

*FOE Birmingham:* 64 Grassmoor Rd., King's Norton, Birmingham 30.

Free public transport has concerned this group since its inception a few months ago. Examination commitments have hampered their work (or vice versa) but they have managed to produce the first draft of a paper which outlines the campaign to date and argues sensibly for the introduction of free public transport. Needless to say, funds are virtually non-existent.

*FOE Metropolitan Essex:* 237 Eastern Ave. Redbridge, Ilford.

A steady rise in members for this area has led John Matthiessen to be hopeful of establishing working groups in three or four centres in the near future. Already many FOE members are working with the Birth Control campaign and one group in Wanstead has six

separate study groups investigating various aspects of environmental abuse. *FOE St Albans:* 56 Pondfield Cres., Marshalswick.

Indirect involvement in Parish Council meetings has enabled this group to be instrumental in the decisions taken at this level. Topics pertaining to the local environment are discussed at such meetings and they provide a vehicle for the proposal of constructive suggestions made by the group. Local press again have risen to the occasion and have given excellent coverage to methods of operation. FOE have been asked to suggest areas which are in need of trees and have managed to persuade the council to designate £1,000 for tree planting.

*FOE Liverpool:* 23 Sydenham Ave., Liverpool 17.

Street-theatre combined with fund-raising activities and media contact has enabled the Liverpool group to grow into an effective body in the NW of England which is quickly taking shape. They now have their own office (3 Devonshire Road, Liverpool 8) and an internal structure which facilitates greater scope for research. Currently issues under investigation include atmospheric lead content, sewage disposal on Merseyside and environmental education at adult level.

*FOE Mid Essex:* 134 Temple Grove, Bakers Lane, West Hanningford, Chelmsford.

This group has had a very successful first few months and has dedicated a lot of time to the preparation of publicity material and fund raising. Some excellent material has been produced, notably a striking poster which advertises FOE and lapel-badges which, although professionally produced, sell at only 5p each. Checklists and action sheets spread the word throughout Essex which as a county is probably the best organised in the country as far as FOE activity goes. Campaigns are at present limited to recycling and campaigning against "Vapona" fly-killer which, we are assured, has an effect on human beings as well as flies. In this campaign they have met with public health inspectors and have obtained an assurance from the Ministry of Agriculture that "Vapona" will in future carry a stronger warning on the package about the dangers to health. Furthermore, a leading retailer has agreed to withdraw stocks pending further tests of "Vapona".



## The nearly-compleat ecologist

POPULATION / RESOURCES / ENVIRONMENT (Second Edition) by Paul R. Ehrlich and Anne H. Ehrlich. W. H. Freeman & Co. Ltd., £4.30 or £2.60 paperback.

When the Ehrlichs' encyclopaedic view of the global environment first appeared, Francis Arnold (in *The Ecologist*, March, 1971) described it as "so authoritative that (it) makes(s) the reviewer's task almost impossible". Now, just over a year later, it has been issued as a second edition, revised and up-dated, the references and bibliography expanded and with several new sections. More authoritative than ever, it is intended as a reference work for all serious students of environment. As such it is an unqualified success, for not only does it sketch in the different aspects of man's predicament, linking them to give a broad, general picture, but the bibliography which follows each section will help the reader to pursue topics of especial interest to a greater depth. Thus, while most of the eco-literature informs, this book also instructs.

Yet in the year since the first edition was published the constant accumulation of data has changed the emphasis in the ecological debate. To many people this now hinges less on population growth and more on the availability of resources, particularly the non-renewable mineral resources on which the economic survival of the rich countries depends. The change is subtle and should not be overstated. The population problem has not disappeared and I, for one, accept the Ehrlich thesis that population growth, industrial growth (defined as affluence) and technology are linked in a multiplicative relationship in their impact on the environment. Yet for this very reason they

must be treated equally, for they are equal and the control of one will be inadequate without the simultaneous control of the others. *Population/Resources/Environment* concerns itself very largely with population growth. Of its 12 main sections, five deal exclusively with demography and population control and of the sections that remain, one deals with international relations, one with legislation, especially as it applies to the US, one with ecosystems in jeopardy, one with environmental threats to man, one with food and one with the limits to resources, of which only five pages are given to a discussion of non-renewable minerals. (With what must have been more an heroic feat of self-discipline, the swipe at Barry Commoner is contained within one paragraph.)

What has changed the picture, of course, is the series of exponential reserve indices for non-renewable resources compiled at MIT from the world models that were described in *The Limits to Growth*. The implication is that the rapid exhaustion of certain key materials may aggravate our other problems or, perhaps, by triggering the collapse of industrial societies, help solve them. Either way this factor should not be left out of account and it is disappointing that the Ehrlichs, who may have had access to this data in advance of its publication, did not discuss it more fully. It is a deficiency I hope they will remedy in their book's third edition. By asking for a more balanced book I fear I am asking for a much longer one, for I would be loathe to forfeit their descriptions of the population crisis or their demographic statistics and I believe we will continue to need their lucid dismissal of the theory of "demographic transition" for some time yet.

*Population/Resources/Environment* is available as a paperback, which may bring it within the reach of at least the

more affluent of the students for whom it is primarily intended. They should read it. It is still the clearest, most complete and best-documented statement we have of the present score and projected outcome of man's contest with his planet.

Michael Allaby

## People or environment?

POPULATION VERSUS LIBERTY by Jack Parsons. 417 pp. Pemberton Books, London 1971. £3.25.

BATTLE FOR THE ENVIRONMENT by Tony Aldous. Foreword, Kenneth Mellanby. 288 pp Paperback. Fontana/Collins, London 1972. 45p.

There is a danger in knowing too much. It sometimes makes one forget how little other people know. For readers of *The Ecologist*, the danger is that they may take it for granted that everyone shares their knowledge and apprehension about population growth. Many of them, no doubt, assume it is self-evident that there are too many people being born and unless we can control the birth-rate of human beings in the very near future, nature will do it for us in an exceedingly unpleasant and effective manner.

For these people the richness of Jack Parsons' book will be in his discussions of liberty and how in its forms compatible with human dignity and fulfilment it is eroded by the so-called fundamental freedom to have as many children as one wishes. The point is made and made insistently and with skill. To read it is to deepen one's own understanding of the true dimensions of human liberty and the danger in which it stands.

But there are the others, who insist there is no problem. Take *The Economist*. It published an astonishingly ill-informed article on 27th May which it

called "Bye-bye Baby Boom". In this it claims Britain will reach "zero-population growth" this year. It then goes on to discuss the need to deal with the problem of a falling population with more urgency than that of growing population because "as long as great tracts of the world and even of the British Isles stand empty there is always somewhere for the surplus to find room." It even suggests we may have to revise our immigration policy.

Even for *The Economist* this is stirring stuff. It is a magazine which is consistently wrong on a huge variety of topics. Perhaps this is because it sees itself as a kind of businessman's *Reveille* with bulging growth and consumption curves and promises of pneumatic profit margins substituted for the working man's pictures of bosoms and bottoms. But at the same time it is widely read and widely believed and this kind of nonsense about population, given wide currency, could create a totally false impression about our situation. The truth is that births currently exceed deaths by about 250,000 a year in the UK and the birth rate would have to fall a full twenty-five per cent further to bring about zero population growth in the present year.

Nor, of course, does the Catholic Church concede at an official level that there is anything to worry about. The defection of many of its laity is by no means matched by its hierarchy who still exercise considerable pressure in blocking official initiatives on population control. The preoccupations of a celibate clergy with the fate of spermatozoa, rather than of children born into a world unfit to receive them have undoubtedly retarded international and national action on many occasions.

Jack Parsons, however, does not indulge in vulgar polemics. His book is hugely readable, eminently sane and quite compelling. The readers of *The Economist*, the clergy and the gentleman who wrote in one of the Sunday supplements wondering which of his five children the population controllers would eliminate would find themselves charmed into assenting with his arguments, rather than bludgeoned into uneasy submission.

Liberty is an elusive concept. Jack Parsons examines its philosophy, its sociology and the legal notions surrounding it. His working definition is that liberty is the sum of a series of small freedoms, micro-freedoms he

calls them. A state of liberty means in practice being able to move, work, live, enjoy oneself, create a social life, educate oneself and one's children all without undue interference from others. It implies that one accepts the obligation not to destroy the micro-freedoms of others. The freedom to have one's cake is incompatible with the freedom to eat it; or, more appositely, the freedom to eat one's neighbour's cake is incompatible with his freedom to possess it in peace. An indefinitely rising population is incompatible with virtually all the micro-freedoms and hence with the whole notion of liberty. The micro-freedom of having children intrudes on all the other micro-freedoms. In the end population destroys liberty.

This is an urbane, witty and stimulating book. It is full of facts and ideas. Reading it illuminates the complex problems of preserving and enhancing liberty and leaves one in no doubt about the pressing reality of the problem of population growth.

*Battle for the Environment* is a different kind of book. Tony Aldous is the architectural and environmental correspondent of *The Times*. This book spells out in a more leisurely way than his journalism his developing ideas on the environmental crisis in Britain.

The word crisis comes easily to mind as one reads. The problems facing Britain are immense and though Tony Aldous finds grounds for cautious optimism there remain serious doubts about our will and ability to take the actions which will be required. In his strange little introduction Dr Mellanby seems bent on convincing us that things are under control and there is no need for worry. The recitation of what is happening all over Britain and the difficulty of influencing those who are destroying so much of our environment makes one wonder where he can find justification for his confidence.

The particular merit of *Battle for the Environment* is its immediacy. Perhaps it is over ambitious in trying to tackle every aspect of environmental action, it is weak once it gets away from roads and urban planning. But it is engaged with current events; it gives names and places; it discusses the politics and personalities of the Department of the Environment. For anyone engaged in fighting a battle over a road, motorway or urban redevelopment project it will make useful reading indeed.

Gerald Foley

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## Out of focus

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MURDEROUS PROVIDENCE, A Study of Pollution in Industrial Societies, by Harry Rothman. Hart-Davis, £2.95.

Five or six years ago the environmental crisis was seen as one of pollution. It became evident, however, that it could not be solved simply by the substitution of less disruptive technologies. It ran deeper than that, so that now we are concerned with its philosophical and theological implications. We need a major reform of our civilisation.

We have learned a good deal about pollution, as a symptom of the malaise, and the time is over for books that deal with this alone, unless they are truly exceptional. *Murderous Providence* is exceptional. Harry Rothman has given us descriptions so detailed and scientifically so perceptive and accurate as to amount to a significant contribution to the overall debate. Some of his arguments, too, as when he deals with the secrecy that surrounds many forms of pollution, may help to bring about small but important piecemeal reforms.

He makes a further contribution by showing that it is the poorer sections of the community which suffer first and most seriously from environmental deterioration and that it is they who are likely to have to pay for environmental improvements. He disposes of the charge of "elitism" that has been levelled against environmentalists.

Had he confined himself to a description of pollution and measures that have been and could be taken to deal with it, all would have been well. Unfortunately, he enters the solutions field with a suggestion that man's survival may require the establishment of Marxist governments following global revolution. He makes the mistake of taking pollution for the whole of the problem, arguing that it is caused not by economic growth and even less by population growth, but by the economic forces operating within a capitalist system. It can be cured, he says, by replacing capitalism by socialism, while avoiding the bureaucracy that has given the USSR an environment no better than that of any capitalist state of comparable industrial capacity.

It is a simplistic view but one that is likely to appeal to many people. It ignores the mathematical relationship between population growth and environmental deterioration and overlooks the problem of resource depletion. Even if the crisis is not caused by economic growth, it cannot be cured by it.

Having spent most of the book convincing us of the validity of the data on which the scientific evaluation of the problem is based, he dismisses the solutions suggested by scientists on the ground that they assume there is no need for social and political change. This is unjust, for *A Blueprint for Survival*, the most comprehensive attempt at a solution to receive wide scientific support, calls for changes of the most radical nature. Even were it true, he falls into his own trap of calling on men to be nicer to one another and to their planet. He exhorts us to support a system of environmental planning based on the existing UN institutional structure and to create a socialist society.

Perhaps the crisis is too large, its implications too fearsome? It is very tempting to treat one or two of the more tractable symptoms, the more so if at the same time we can establish a social framework that pleases us. Pollution can be controlled without revolution, but this is not the problem. The problem cannot be cured by the substitution of a new society with identical aims. The problem is that the planet is not large enough. What are we going to do about that?

Michael Allaby

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## Monkeys and men

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CHALLENGE TO SURVIVAL by Leonard Williams. Andre Deutsch £3.50.

ANIMAL TRAPS AND TRAPPING by James Bateman. David & Charles £3.50.

Leonard Williams is one of the great eccentrics of our time—a professional guitarist, the founder (one is tempted to say “founder-member”) of a free-living colony of woolly monkeys, an obstinately individualistic Marxist and an advocate of group marriage who

actually practises what he preaches. Such a man could not produce a *dull* book: and in *Challenge to Survival* the reader's chief danger is that of mental indigestion induced by the sheer range and number of ideas offered for his consumption. It is not a very easy book: rather, it is one to read, and pass on to one's friends, and discuss, and read again. It is worth the effort.

Williams' starting-point is a familiar one. In recent years ethology has become a fashionable science: and the public imagination has been captured particularly by the notion that the study of animal behaviour may cast light on human moral, social and political problems. Attention has focused, naturally, on our closest relatives, the primates. The behaviour of captive monkeys and apes has been a major stock-in-trade of animal psychologists for decades: but the new trend has been to increase the emphasis on the sociology of wild primate groups. Leonard Williams' is closer to the latter approach. His monkeys are only nominally captive: they could “escape” by simply climbing down a tree and walking away, but none of them has ever chosen to abandon the territory and the tribe for the insecurity of complete freedom. The word *tribe* is important: these monkeys are not a random assemblage of individuals like the average zoo collection, but a complex balanced society with its own laws and culture.

Williams rejects the notion that animals can be studied completely objectively. His method is to become, as far as possible, a monkey himself, and to study their habits, as a good anthropologist does a human culture, from the inside. This intimate acquaintance with another primate species has led him to speculate about the origins of man and morality. The lesson he draws is a revolutionary one. His loathing for technological civilisation is evident throughout: and he sees our very adaptability as one of our greatest dangers—“the possibility that man will succeed in adapting to an automated existence, to an amoralised and electronic environment... to an anti-culture that exiles all the spiritual, aesthetic and biological impulses that constitute the very drive and fabric of human nature.”

The typical primate society is hierarchical; but the leader is normally benevolent, not a tyrant. Of non-

human primates, the gibbon alone is monogamous—and it is also the least social and most aggressive. Williams sees monogamy as a product of male dominance and the institution of private property; as a cultural pattern, not an instinctive one. But the *family*, he maintains, is fundamental to primate society, human and non-human. His own preference, therefore, is for some kind of group-family: most people may find this distasteful, but his good-humoured and reasonable handling of the topic must command respect even from those who remain unconverted. I myself remain doubtful how far hypotheses about “natural” human behaviour are relevant to our predicament: it is obvious that stable and contented human societies have existed with widely differing patterns of authority, sexual custom, child-rearing procedure and so forth. We *are* a very adaptable species—a fact which has got us into our present mess, but also offers the only hope that we may get out of it. If monkey social organisation has anything to teach us (and Williams makes out a good case for it), we can learn. There is really no need to base every sensible improvement in our way of life on a supposed Palaeolithic precedent.

James Bateman deals with an unpleasant aspect of human behaviour, primitive and civilised alike. It is hard, when reading his book, to know whether to be more disgusted with man's insatiable predatoriness or amazed at his unfailing invention. Certainly some of the examples described and illustrated in this book are fascinating and impressive, considered simply as specimens of primitive technology. The survey is a very full one, and contains all that most people would want to know about traps. On the ethics of trapping, the author's position is ambivalent: he is, after all, writing history rather than propaganda. “Professional fur-trappers”, he assures us, “are, with a few exceptions, human people.” On the same page he warns us that a stoat, caught in a steel trap, will sometimes sham dead, “only to become extremely *vicious* when handled.” (My italics.) Cet animal est très méchant; quand on l'attaque, il se défend... Misanthropists will find plenty here to confirm them in their views: but at least they will enjoy the short section on man-traps!

Nicholas Gould

# Feedback

## **Rising Crime Good for Business**

During the 1960s serious crime soared 176 per cent in the US. Violent crime was up 10 per cent and robbery jumped 12 per cent during the first 9 months of 1971. This has brought more and more companies into the business of providing security services.

The main growth in the business of security firms has been in protecting commercial and industrial customers from hijackers, burglars, shoplifters and dishonest employees. But their revenue from residential users is gaining. Conservative estimates of the revenues of private firms combating crime total about \$2,000 millions (£748 millions) annually. Shoplifting and "shrinkage" from all causes now stands at \$3,500 millions (£1,373 millions) a year. The National Retail Merchants Association say that shortages are increasing at the rate of no less than 20 per cent annually.

Source: *The Guardian*, 2.8.72.

## **Less Energy, same standard of living**

Two researchers at the University of California at Berkeley report that studies they have done show it is possible to reduce per capita energy consumption in the United States to 62 per cent of current levels and maintain the same standard of living.

A. B. Makhijani and A. J. Lichtenberg of the UC College of Engineering recommend a five-point programme for reducing energy waste and for utilising now unused available forms of energy:

1. Use of solar energy for household heating and other purposes, a potential which could be realised "if the necessary funding for the R & D were to become available."

2. Implementation of a "total energy" concept, the use of now-wasted heat from nuclear and fossil-fuelled power plants for operating turbines, for

preheating, drying, space heating or desalination.

3. Materials reuse and recycling (for instance, instead of using energy-intensive aluminium for throw-away beverage containers, the beverage industry would go back to the use of returnable bottles.

4. Improving transportation efficiency, through rapid transit, through smaller automobiles, through the use of recycled materials in automobile manufacture and through partial replacement of truck hauling with rail hauling.

5. Improving the thermal efficiency of power plants, through such devices as magnetohydrodynamics (MHD) topping cycles or an increase in maximum operating temperatures of power plants.

Source: *Science News*. Vol 101, No. 11.

## **Enzyme, not milk fat, causes artery disease, cardiologist theorizes**

An interesting, if highly speculative theory of the genesis of atherosclerosis has been put forward by a Connecticut cardiologist. Implicated as the prime villain in his view of the disease is homogenised milk.

Dr Kurt A. Oster, chief of cardiology at Park City Hospital in Bridgeport, bases this extraordinary conclusion on several lines of evidence.

One is the association between national death rates from atherosclerotic disease and the national rate of consumption of homogenised milk. The US, which has the second highest death rate, consumes virtually all its milk homogenised. Only a third of the milk is homogenised in Finland, but the Finns drink more than twice as much milk as the Americans and have a higher death rate. At the other end of the scale, very little milk of any kind is consumed in France and even less in Japan; both countries also

have extremely low death rates from arterial disease.

Dr Oster sees a physiological basis for his theory, too. Cow's milk, he notes, is rich in the enzyme xanthine oxidase. In natural milk, it is found in large globules of fat, but when milk is homogenised, these particles are reduced to less than one-third their natural size and are absorbed through the intestinal wall to a much greater extent than natural fat globules, the doctor claims. Once in the system, they can be deposited on artery walls, or perhaps act by oxidising a group of chemicals called plasmalogens, which are key components of the arterial wall.

Dr Oster says that because the milk usually used in cheese is not homogenised, the fat globules are still too large to be readily absorbed. He points out that in Italy, Switzerland and France, where huge amounts of cheese are eaten, there is a very low death rate from atherosclerotic disease. This also indicates, he says, that it isn't saturated fatty acids as such that cause cholesterol to be deposited, as many doctors believe, but the homogenisation of fat.

The cardiologist also claims that he has found initial success using folic acid (a B vitamin) as an inhibitor of xanthine oxidase in patients with angina pectoris, a common form of arterial disease.

Because it is impossible, at present, to observe the progress of atherosclerosis in living people, it will not be easy to demonstrate the correctness of this—or any other—theory of arterial plaque deposition. However, since raw, whole milk from a certified herd of cows or goats is superior in taste and nutrition to the homogenised commercial kind, switching over would not be without benefits.

Source: *Rodales Health Bulletin*, Vol. 10, No. 6, 18 March, 1972.

# BOOKS BY POST

The following is a selection from our Booklist on Ecology. Copies of the list may be had on receipt of an s.a.e. For the following, send money plus 10% to cover post and packing.

Approaching the Benign Environment. Buckminster Fuller	45p	Science and Survival. Barry Commoner	40p
The Limits to Growth. Club of Rome Report	£1.00	The Doomsday Book. G. Rattray Taylor	45p
Must the Seas Die? Colin Moorcraft	£1.25	The Environmental Handbook. Ed. John Barr	40p
Environmental Solutions. Ed. Nicholas Pole	60p	Only One Earth. Barbara Ward and Rene Dubos	45p
Polluting Britain. Jeremy Bugler	35p	How to be a Survivor. Dr. Paul Ehrlich	40p
Battle for the Environment. Tony Aldous	45p	Wilderness and Plenty. Sir Frank Fraser Darling	30p
Ecology: Can We Survive Under Capitalism. Gus Hall	62½p	The Environmental Game. Nigel Calder	42½p
The Sea Around Us. Rachel Carson	30p	The Population Bomb	30p
The Biological Time Bomb. G. Rattray Taylor	50p	The Last Whole Earth Catalogue	£2.50
Planet in Peril. R. F. Dasmann	30p	The Tassajara Breadbook	£1.00
Since Silent Spring. Frank Graham Jr.	40p	Living on the Earth. A survival book from the USA	£2.20
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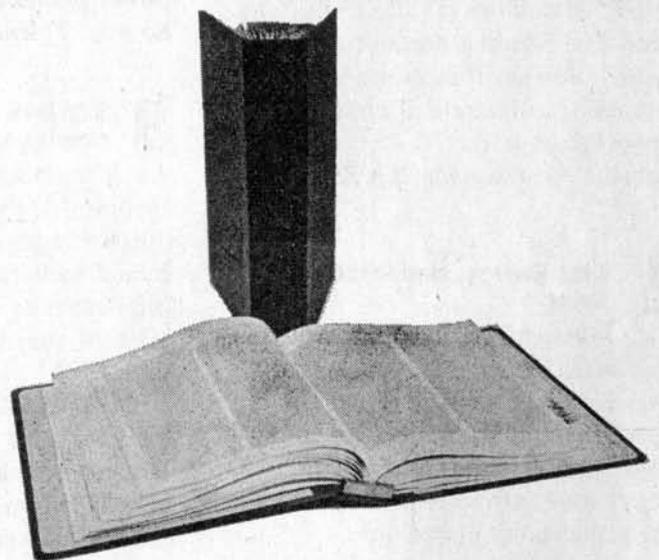
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# SNOWDONIAN SELL-OUT

Britain's National Parks are disintegrating before the pressures that they were set up to avoid. Mining, Hydro-electricity, Nuclear Power Stations, Property developers. All have established themselves in the National Parks since the 1949 Act.

The C.E.G.B. pumped storage scheme in Llanberis is the latest nibble at the biscuit. It will bring—A 130 ft. dam in the National Park at Marchlyn under the Pillar of Elidir, Snowdonia's only isolated rock peak—43 ft. dams at each end of Llyn Peris at the foot of the Llanberis Pass only 3 miles from Snowdon summit and blocking those enchanting views of the lakes from the Pyg Track and the Pass, and from below Dolbadarn Castle, the scene that was painted by David Cox and Richard Wilson.

Hidden results will be even more extensive—new reservoirs to replace the lost water supply of Marchlyn—in the Nant Ffrancon, at Ogwen, Cwm Llafar or Llyn Cwellyn.

Seven years of heavy construction work, noise and lorries in the National Park. And afterwards? Fewer tourists, a permanently ruined environment, increased unemployment and more local pressure for another such scheme in the area as a 'solution'—then the Dolwyddelan plan and another nuclear power station in the Lleyn.

The C.E.G.B. are submitting a Private Bill for the Llanberis scheme to the House in November. This will avoid the "inconvenience" of a public enquiry where objectors might have appeared.

Show your opposition then where it counts—in Parliament!!!

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The House of Commons,  
London, S.W.1.

As one of your constituents I ask you to do all you can to oppose the Parliamentary Bill to be promoted by the C.E.G.B. in the 1972/73 session for a pumped storage scheme in the Llanberis area, or elsewhere in the Snowdonia National Park.

Name: ..... Address: .....

Signed: .....

Date: .....

SCIENCEPUB LDN 23258

TO WHOM IT MAY CONCERN

*Urgent*

GORDON AND BREACH ARE PUBLISHING A TOPICAL NEWSLETTER  
ENVIRONMENTAL TIMES STOP THIS NEWSLETTER WILL PRESENT  
CONCISE AND UP-TO-DATE INFORMATION ON TOPICS OF ENVIRONMENTAL  
CONCERN - POLLUTION, NUTRITION, NOISE, DRUGS, PUBLIC HEALTH,  
URBAN PROBLEMS, GENETICS AND ECOLOGY STOP  
FACTS AND REMEDIES WILL BE INCLUDED STOP THE NEWSLETTER  
WILL ALSO CONTAIN REPORTS ON CONFERENCES AND LEGISLATION STOP  
FIRST ISSUE DUE AUTUMN 72 STOP  
FOR FURTHER INFORMATION WRITE OR TELEX GORDON AND BREACH  
41-42 WILLIAM IV STREET, LONDON WC2

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