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WADEBRIDGE ECOLOGICAL CENTRE

Weekend conferences

The Wadebridge Ecological Centre has been set up to study long term global trends and to work out the details of an integrated programme of change originally sketched out in *A Blueprint for Survival* and designed to ensure a transition to a sustainable society that satisfied physical, biological, social and ecological exigencies.

To finance this work, weekend conferences are being organised. At each conference, at least three out of five of the resident members of the Centre (Michael Allaby, Robert Allen, Peter Bunyard, Edward Goldsmith and Andrew MacKillop) will be available for discussions. At least one non-resident member will also attend.

No more than twenty paying participants will be invited, at a cost to them of £50 including meals and accommodation.

Those interested should write for further details and programmes of meetings, stating the subject area* in which they are particularly interested, to The Secretary, Wadebridge Ecological Centre, 73 Molesworth Street, Wadebridge, Cornwall PL27 7DS.

*Subject areas include:

Methodology Ecology and Economics International Institutions Social Control Education Ecology and Religion Population Nutrition Health Water Management Agriculture Energy and Resources Transport Low Impact Technology The Problem as a Whole



Comment You've never had it so good . . .

Mr. Heath has announced his intention to commit this country to further economic growth. Let us consider the implications of such a policy. We have all been taught since our most tender childhood that science, technology and industry are enabling us to create a materialist paradise from which the basic human problems of poverty, unemployment, disease, ignorance, war and famine will have been eliminated once and for all.

It is increasingly evident, however, that this is not happening. In fact, in spite of massive economic growth throughout the world, these problems are everywhere on the increase.

Nowhere are science, technology and industry more developed than in the United States. If they provided a means of solving human problems, then there, at least, one would expect them to be solved. Yet America is on the verge of collapse. Twenty-one million people are officially classified as poor. Unemployment levels are rising. Twenty-five million people are suffering from malnutrition, many of whom have coloured television sets in their rooms. The nation's health is deteriorating fast. The educational system is breaking down. Crime is reaching epidemic proportions, and the prospect of new wars loom more menacingly than ever before. What has America gained by economic growth? The answer is nothing. What are we to gain if we move further in that direction? The answer is also nothing.

The truth is that we have totally misinterpreted the real nature of the problems for which economic growth is supposed to provide a remedy. We have defined them in such a way that they appear amenable to technological solutions-the only ones our society has to offer. In reality, they are of a much more subtle kind. Consider poverty. We simply regard it as material deprivation. If this were so, then indeed economic growth would be necessary to manufacture the material goods of which people are deprived. Poverty, however, is much more than this, otherwise there would be no poverty in America. It involves, above all, biological and social deprivation-deprivation of man's basic needs, for which material goods are but a poor substitute.

Yet it is precisely this substitution which economic growth ensures—the substitution of the superfluous for the indispensable.

By unemployment we really mean deprivation of a particular type of employment—capital-intensive employment. Economic growth increases the capital-intensiveness of industrial activity and thereby provides such jobs, but only at the cost of reducing the number of jobs of all other types.

Since this means that more investment is continually required to provide the same number of jobs, the economy must expand proportionately. Already, however, the third world cannot find the capital required to ensure minimum levels of employment. Massive unemployment is in fact inevitable there, as soon it will be in this country. In the long run, one must face it, economic growth must reduce rather than increase employment.

Ignorance, we intend to regard as deprivation of that sort of knowledge obtainable in capital-intensive educational establishments; totally disregarding the cultural wisdom which, in a traditional society, is transmitted from one generation to the next without the aid of institutions of any kind, and which far better achieves the real goal of education—that of teaching children to fulfil their functions as members of their families and communities—a goal we have completely lost sight of, and one to which our institutions contribute precious little.

Health, we regard as something that is automatically improved by increasing expenditure on doctors. dentists. hospitals and drugs. These have little to contribute to the health of a population. They can but provide a repairservice for the biological damage resulting very largely from increasing biological maladjustment to an environment for which our evolution has simply not designed us, and which, with economic growth, must divert ever further from the optimum. (It is no mere coincidence that the incidence of cancer, ischaemic heart disease and diabetes, very low in pre-industrial societies, increases almost in direct Continued on page 402

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C Ecologist, November 1973

You've never had it so good continued from page 401 proportion to per capita GNP.)

If economic growth is not solving human problems, its cost in terms of the resulting biological, social and ecological damage is very much higher than anyone ever thought. Mr. Heath has been warned repeatedly that the biosphere cannot sustain the massive quantities of five hundred thousand or so different pollutants with which it is continually bombarded at an ever greater rate. He has been warned that the world's finite resources are not sufficient to sustain further growth for very long. He has been warned that social systems throughout the world can no longer stand the increasing strains imposed on them by the population explosion, massive urbanisation and ever increasing mobility. As could be predicted he has chosen to ignore these warnings and heed instead the comforting voice of largely second-rate Government "experts" who, mainly for reasons of diplomacy, reassure him that such warnings are unfounded.

Yet, every day it becomes clearer that these warnings, if anything, were based on a very conservative estimate of present day realities. The situation is far more serious than we thought when we wrote the *Blueprint for Survival*.

In the meantime the Confederation of British Industries is clamouring for more growth, as is the Trades Union Congress. It is politically expedient to satisfy the short-term demands of the large and powerful sectors of the electorate that they represent. It is also politically expedient to maintain that all is well, that the British people "have never had it so good" as it is to avoid embarking on that radical programme of change required for our society to adapt to biological, social and ecological realities.

Mr. Heath's behaviour is indeed quite predictable, but so are its consequences for which posterity will one day hold him largely responsible. Both were predicted over three years ago in the final chapter of *Can Britain Survive?* It is reprinted in the following pages, in the somewhat naif hope that, faced with the probable, in fact, largely inevitable consequences of his policy, he might reconsider it, and substitute in its stead one that places the future of his country before that of short-term political expediency.

Edward Goldsmith



What of Britain's future?

by Edward Goldsmith

In 1971 a selection of articles from the Ecologist, together with a number of original papers and articles from other periodicals was collected and edited by Edward Goldsmith and published under the title Can Britain Survive? It was this book, and the arguments that were being developed within the ecological movement in general and in the pages of the *Ecologist* in particular that led to the publication, some months later, of A Blueprint for Survival. The final chapter of Can Britain Survive? was called "What of the future?" It made a number of predictions and it is reprinted here in order that its accuracy may be assessed in the light of events that have occurred and trends that may have become more evident in the two years that have elapsed since its first publication.

We are now in a position to make a few tentative suggestions as to what the future holds in store for the inhabitants of these isles.

First of all, a serious world food shortage appears inevitable. The demand for food is increasing at 3.9 per cent per annum. Production up till now has only increased by 2.6 per cent, while in 1969 for the first time there was actually no increase at all. The FAO plan for feeding the world is based on the extensive use of highyield wheats and the intensification of agriculture throughout the third world. For many reasons it is extremely unlikely to prove successful, save perhaps in the very short-term.

With regard to food from the seas the situation is similar. We are currently taking 70 million tons of fish from the seas, four times more than we were 25 years ago, and expect to increase this to 140 millions by the turn of the century. This will clearly never be achieved. In fact, in 1969, for the first time, world catches actually fell.

It is certain that, well before the end of the century, there will be a very severe food crisis with widespread famine in the poorer and more densely populated areas of the world.

It would be extremely naive to suppose that we in Britain will not be affected by these developments.

At the moment we import half our food. By the end of the century, as a result of foreseen population growth alone demand for food will have increased by possibly 20 per cent. If economic growth occurs according to plan, it will have more than doubled. In any case, we shall have to import more food than we do now. But who is going to sell it to us? Is it likely that countries threatened with starvation will be willing to export essential foodstuffs in exchange for manufactured goods of dubious utility? If they were to sell them at all, surely it would be only against essential basic raw materials which by then will also be in short supply. Also it is by no means certain that we shall remain capable of producing the manufactured goods whose sale has so far permitted us to purchase the food and other resources that are so desperately required for the proper

It is certain that, well before the end of the century, there will be a very severe food crisis with widespread famine in the poorer and more densely populated areas of the world. functioning of our industrial society.

Whatever happens we will have to rely more and more on our own agriculture. We shall have to try to feed ourselves. But will this be possible? Agricultural yields have increased by 50 per cent in the last 20 years. Our experts tell us that they can be increased still further by further intensive agriculture. However, both on theoretical and empirical grounds this thesis cannot be accepted.

Firstly, we are likely to run out of many of the essential inputs such as arable land, minerals and power. In addition we must expect diminishing and eventually negative returns on the technological inputs required for intensive food production, pesticides, fertilisers, antibiotics for intensive stockbreeding as well as on the various devices such as sonar and radar equipment made use of in modern fishing. Once more we are forced to face facts. We cannot increase indefinitely the amount of food from a fixed area, and we are rapidly reaching the point where every possible expedient will have been tried.

It is difficult for those living in present-day affluent Britain to accept that they are soon to be faced with a serious food shortage, yet this is the only conclusion that is consistent with the available information.

The food shortage is likely to have a seriously demoralising effect. It will tend to reduce resistance to disease, capacity to work and faith in the values of our industrial society.

As food becomes scarce and expensive, more and more marginal land will be turned over to agriculture. This means that any nature reserves and national parks with agricultural potential will be brought under the plough. Conservation in the face of continued demographic and economic growth is a pretty hopeless task. On the other hand, the more marginal the land, the more the technological inputs such as irrigation and fertilisers that are required. Since these will be in shorter supply there must eventually be a trend in the opposite direction, and wildernesses may begin to appear once more.

Meanwhile industry will undoubtedly fully exploit the wide open market for synthetic foods of every type. But these cannot be made out of nothing and many of the materials required for this purpose will be becoming scarce or unobtainable: petroleum products, for instance. Also, if our food is to be manufactured in factories instead of grown on the land, our requirements of ever scarcer resources, such as water and fuel, will correspondingly increase and such methods of food production will cause pollution which our environment well be ever less capable of absorbing. There is likely to be an eventual reaction against synthetic foods, when the side effects on human health of the countless chemical additives become more apparent.

• In the long run, once it is generally accepted that technology cannot indefinitely increase the short-term food supply, there is likely to be a gradual return to traditional methods of husbandry, which means smaller farms, less reliance on the agro-chemical industry and replacement of machines by men—all very beneficial tendencies which would probably not only maximise food production in the long run but lead to the re-establishment of a stable and healthy community.

But to enjoy these benefits we must first of all survive the initial chaos and reduce our population in one way or another to that level that can be fed without resorting to the gimmickry of modern agricultural methods.

Depletion of raw materials

A further condition for the survival of our industrial society is the availability of the requisite raw materials. This, as we approach the turn of the century, is extremely unlikely.

The world's mineral resources are nearing exhaustion. By the end of the century there will be practically no tungsten, copper, lead, zinc, gold, silver or platinum. Other minerals essential to industry will also be in short supply.

Shortages are likely to occur and prices are likely to increase dramatically long before stocks are actually exhausted, as producing nations will be increasingly reluctant to sell precious non-renewable resources which can be used for their own development. Producing nations will tend to import technological know-how and manufacture their own goods.

Scientists and technologists will attempt to develop all sorts of substitutes for these apparently indispensable resources. Many will be found, but it is unlikely that they will satisfy all our requirements. Whatever these materials are made of is likely to run out some day. Plastics, for instance, are normally made from petroleum products which will become progressively scarcer.

In the meantime, everything will be done to recycle existing stocks. Recycling is likely to be the basis of a major industry but it cannot hope to satisfy our ever-growing requirements. There is always a loss during a recycling process from, if nothing else, friction and oxidation. In the case of metals, the loss is likely to remain high in spite of the very efficient techniques that are bound to be developed.

It is not difficult to predict the shortterm effects of a shortage in minerals. Our economy will be radically affected, business will have to close down and there will be rising unemployment.

Once more the long-term effects are likely to be beneficial. There will be a tendency towards engineering craftsmanship and away from the throwaway economy. Also it will become economic to recycle countless waste products at present causing serious pollution.

The world's supply of fossil fuels

We shall have to import more food than we do now. But who is going to sell it to us? Is it likely that countries threatened with starvation will be willing to export essential foodstuffs in exchange for manufactured goods of dubious utility? If they were to sell them at all, surely it would be only against essential basic raw materials which by then will also be in short supply.



is nearing exhaustion. There is only enough natural gas for another 25 years or so, and oil reserves are only likely to last another 70 years. Long before stocks run out, oil is likely to be both scarce and expensive. The producing nations will become more conscious of their hold over the West. Indeed, by withholding oil supplies as they threatened to do in Teheran, they can bring about the total collapse of our industrial society.

Nuclear power is unlikely to provide an alternative source, as there is no solution in sight for the safe disposal of radioactive waste. The world's only remaining important and viable source of power is coal, of which there appears to be enough for a few hundred years. There should be a considerable revival of the coal industry, though to persuade people to work in coalmines once the original mining communities have broken up might present a challenging problem.

The fuel shortage which appears inevitable will also favour a return to small labour-intensive units both in agriculture and industry. It will also favour political and economic decentralisation. However, it will take a long time before these beneficial effects are felt. In the short-term, the fuel shortage will seriously depress industry and cause widespread unemployment.

Rising cost of pollution control

A third condition for the survival of our industrial society is our continued ability to transform raw materials into finished products. This is likely to be seriously compromised by many factors, including the increasing cost of pollution and its control.

As our environment's capacity to absorb pollutants of different sorts is slowly being reached the economic cost of each increment of pollution rises. Further demographic and economic growth can only aggravate these problems.

It is becoming evident that their costs in terms of increased medical care, extermination of wildlife, stunted plant growth, cleaning bills, etc. are very much higher than is generally accepted.

Industry will have to bear an everincreasing proportion of these costs which will mean higher prices and reduced economic activity. The government will also have to spend exorbitant sums on pollution control. Relatively clean air and clean water in the United States might cost as much as \$200 billion, which vastly exceeds what the present or any future government is likely to spend. Mr Nixon has proposed an expenditure of \$10 billion for this purpose before 1975, and even this sum is unlikely to be granted him by Congress.

As a result pollution is likely to get worse until such times as a shortage of raw materials makes recycling economic, and finally, as economic Long before stocks run out, oil is likely to be both scarce and expensive. The producing nations will become more conscious of their hold over the West.

activity begins to fall off.

The public is also likely to become even more pollution-conscious and conservation pressure must build up more and more, especially as in the next 30 years we can expect a number of serious ecological disasters. It is possible, for instance, that the Baltic Sea, the Mediterranean and the Black Sea will, before the end of the century, have become biological deserts devoid of any fish life. In addition, much of the fish life in the Atlantic and the Pacific may well be so contaminated as to have become inedible. Outbreaks of new diseases caused by specific pollutants such as Minamata disease in Japan are likely to occur, perhaps on a large scale.

Such catastrophes must slowly affect public opinion. They must lead to increased pressure on the government to deal with pollution problems and increase the disenchantment with the industrial way of life, especially among the young.



Deterioration in health

The deteriorating health of urban man is also going to be costly. The degenerative diseases associated with a faulty diet and exposure to pollutants in our food, water and air will also remain on the increase.

The conditions for the reappearance of large-scale epidemics are rapidly becoming more and more favourable. Population density is increasing. The resistance of urban-dwellers to disease is being progressively reduced as the levels of the different pollutants build up in their bodies. Mobility is increasing, thereby effectively spreading disease to areas where the population has not developed natural controls; and germs are rapidly becoming resistant to antibiotics. The development of the appropriate vaccine may prevent a serious epidemic from spreading throughout the world but if it were to originate in a country with a high population density such as England, it might wipe out a considerable proportion of the population before eventually being brought under control.

Whether or not there are epidemics to add to our afflictions, a serious recrudescence of infectious disease can be expected. Contrary to popular belief, these have not been conquered. The so-called miracle drugs have only granted us temporary respite. Gonorrhoea, for instance, which a few years ago was considered totally under control is now, after the common cold, the second most widespread disease in the United Kingdom.

In general, there is bound to be increasing disenchantment with modern medicine whose short-term benefits will be found to compensate less and less for their biological and social sideeffects.

Our continued ability to transform raw materials into finished products is dependent on the maintenance of social order. This essential condition is increasingly unlikely to be satisfied.

The conditions that lead to social appear all to disintegration be intimately linked with demographic and economic growth: both lead to greater reduction in the quality of life. Both lead to urbanisation and overcrowding, which have the most serious social consequences, in particular increasing crime and aggression. These tendencies, if unchecked, lead to further social disintegration which in turn must increase the need for all types of

state intervention—bureaucratic control, police action, state welfare—all of which inevitably give rise to further disintegration.

The ills from which industrial societies are at present suffering delinquency, crime, drug addiction, alcoholism, mental disease, suicide, etc—are the closely inter-related symptoms of social disintegration. As our population continues to grow, so these tendencies will further assert themselves.

As ever less consumer products become available to an ever-increasing population, there will be ever rising inflation, which will cause further social tension and disintegration.

Rising unemployment

Growing unemployment will also have serious social consequences.

It is common knowledge that few things are more demoralising than prolonged unemployment. Apart from The British government will do everything possible to combat the inevitable unemployment. Among other things it will attempt to encourage economic growth regardless of its environmental consequences.

the material deprivation involved, a man is deprived of his status which in an industrial society is largely determined by the work he does. He also loses his goal structure and his selfesteem. Galloping inflation will make matters still worse.

A further problem is the presence in this country of a large and expanding immigrant population which, as in the United States, will tend to concentrate in the city centres. The West Indians are likely to adapt badly to industrial life, their society displaying more of the symptoms of "anomie" or "egotely", and will tend to become particularly dependent on welfare. They are also likely to develop an ever-increasing resentment of the mainstream of society, which is likely to manifest itself, as with the Negoes of the United States, by violence and rioting. When the unemployment level is really high, tension is likely to build up against these groups who are the obvious scapegoats for society's ills. Racial strife is certain to develop.

We have taken the ability and inclination of our trading partners to purchase our finished products, as one of the basic conditions permitting the survival of our industrial society. Our trading partners are mainly industrial nations, like ourselves, and are likely to suffer from the same problems. This means that they will have to spend much more on imported raw materials



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and food than at present. Pollutioncontrol will also take up an ever greater proportion of their national budgets, as will control of the various manifestations of social disorder. As a result, they must have correspondingly less money to spend on non-essential manufactured goods. The industries on which they depend for their livelihood will also tend to be menaced by competitors from countries that, not being so advanced along the road to industrialisation, may not be suffering quite so badly from its side-effects. The obvious reaction would be to introduce protectionist measures such as import duties, quotas, etc.

Mounting inflation is also likely to lead Britain's trading partners to adopt protectionist measures to safeguard their currency. The protectionist spirit is already beginning to gain ground in the United States, and businesses are already obtaining subsidies, price supports and credit guarantees. At the moment of writing the US government is trying to persuade the Japanese to apply voluntary limitations to the export of textiles to the United States. A Maritime Bill has been passed which is overtly protectionist and which, among other things, trebles the number of merchant ships eligible for government subsidies. The Mills Bill which was designed to protect 120 manufactured products from foreign competition actually passed the House of Representatives to be narrowly defeated in the Senate. One can expect considerably more legislation of this type in the next decades.

The British government will do everything possible to combat the unemployment. inevitable Among other things it will attempt to encourage economic growth regardless of its environmental consequences. At the moment of writing, President Nixon is doing just this. In spite of the essential correlation between economic growth and environmental disruption that his Council for Environmental Quality cannot have failed to point out to him, he has poured \$2.2 billion into the sagging economy. The reason for this is obvious. He simply cannot afford a slump with widespread unemployment. Its cost in terms of votes and social unrest would be prohibitive. In his position, a British government would feel compelled to do exactly the same thing.

As food becomes scarce and expensive, more and more marginal land will be turned over to agriculture. This means that any nature reserves and national parks with argicultural potential will be brought under the plough.

Conservation and the backlash

On the other hand, conservationist pressure is building up and will continue to do so. It is bound to act as an ever greater brake to economic growth, each increment of which causes more noticeable environmental deterioration. To increase the water supply of our industrial conurbations. we will have to flood valleys of ever greater value to naturalists or put up barrages across increasingly beautiful estuaries. To build the countless new towns and motorways that we will require in the next 30 years will mean destroying ever finer scenery and depriving the country of even more valuable agricultural land. The difficulty encountered by the government in siting the third airport is but an example of the sort of problems that will be encountered more and more as demographic and economic expansion threaten what remains of the British countryside.

On the other hand, it is likely that a powerful anti-conservationist movement—and ecology backlash, as it is already known in America—will spring up, mainly among the industrial working classes and particularly the unemployed. They will tend to regard conservation as a conspiracy to deprive them of the benefits of our industrial society already reaped by the middle classes who form the bulk of the conservationist movement.

Eventually there may well be a new political alignment with no-growth conservationists on the one hand and a growth orientated alliance between big business interests and the trade unions on the other.

The conditions for the reappearance of large-scale epidemics are rapidly becoming more and more favourable. The latter is likely to be the more influential, at least to begin with, and it is more than likely that it will be able to apply sufficient pressure on the government to keep the latter firmly committed to economic growth in spite of mounting difficulties.

Whatever happens, there is likely to be an increasingly marked polarisation between the political parties. This will clearly render parliamentary government correspondingly more difficult and will create a tendency towards authoritarianism in order to maintain some semblance of social order, however superficial. Unless the British government transforms itself into a ruthless dictatorship, one is forced to predict the eventual breakdown of political control.

In the ensuing chaos one can foresee various attempts at social reintegration in the form of religio-political messianic movements, many of which, influenced by ecological teachings, will preach a return to nature. Like all messianic movements, these are likely to be violent and must further contribute to the general disorder, further reducing, in this way, the viability of what remains of our economy. The social system most likely to emerge is best described as feudal. People will gather round whichever strong men can provide the basic necessities of life, and offer protection against marauding bands from the dying cities.

Need for a stable society

To what extent can all this be avoided? Industrial society can clearly not survive for long. Nevertheless it should be possible to ensure a gradual transition to a different type of society whose survival does not depend on the maintenance of such specific and highly vulnerable conditions.

How can such a society be established? The first and most urgent task is to control our population. Not only must any further growth be avoided, but its present level must be reduced probably at least by half.

It is only in this way that this country can hope to feed itself in the long term. All possible means, however irreconcilable they might be with our present set of values, should be made use of to ensure that this goal be eventually achieved.

Next we must reduce the impact of each man on the environment by cutting down, in particular, on his energy consumption. An energy tax would clearly be a useful expedient but the most effective method must be to decentralise our society, politically, administratively and economically. This would lead to that other prerequisite of stability—the development of small self-regulating communities.

The totally absurd notion that bigger things are better, must be abandoned and with it the false ideal of "maximising" productivity—the pretext normally given for making things larger and more centralised.

Indeed it should be a precept of government, as it is of the organisation of nature, that everywhere there should be the maximum decentralisation. Nothing should be done at village level which could be done by the family, nothing at county level which could be done by the village, and so on all the way up.

A nation consisting of 56 million people can constitute a society only if it is highly organised into families, small communities, provinces, etc. Their members must be responsible for running their own affairs. They must be self-regulating for only in this way can they be stable.

Among those activities which must be radically decentralised is welfare. At the moment the State, by usurping those responsibilities that should be fulfilled at the communal and family levels, is contributing to their disintegration by rendering them largely redundant.

Economic activity should also be decentralised. Small traders, artisans and businessmen are on the whole stable citizens who tend to take pride in the quality of their work and in the services that they render the community. This should more than compensate for their lack of short-term "productivity".

Agriculture must also be decentralised. Contrary to what is generally thought, its output is probably increased by reducing the size of units rather than by increasing them.

The flight to the towns must also end. The destruction of rural life and the elimination of the small farmer, who should normally constitute the backbone of a stable society, is a social disaster whose cost to the community cannot be over-emphasised.

The most serious challenge at present is the provision of alternative employment for the countless millions Meanwhile industry will undoubtedly fully exploit the wide open market for synthetic foods of every type. But these cannot be made out of nothing and many of the materials required for this purpose will be becoming scarce or unobtainable: petroleum products, for instance.

of people who depend on technology for their living.

Decentralisation would contribute towards this by furthering the development of divergent cultural patterns, and of new activities to replace those that are no longer possible.

Benefits of decentralisation

The construction of beautiful buildings, the manufacture of fine furniture, the development of local arts and crafts, the revival of local festivities and religious ceremonies; all these things will provide a worthwhile substitute for the haphazard accumulation of manufactured goods to which our society is at present geared. In economic activity could be this "ritualised" as is "aggression" among stable societies (both human and nonhuman). Ritualised aggression provides a satisfactory outlet for a society's aggressive requirements without its leading to the annihilation of its enemies. Similarly, ritualised economic activity could be regarded as providing an outlet for man's essential requirements for creative work in such a way as to minimise the resultant damage to the environment.

Decentralisation would also result in a reduction of mobility. If people are employed where they live, less transport will be required. By reducing our dependence on technology, decentralisation would fulfil yet another essential function: that of reducing our vulnerability. The complex and self-regulating systems of nature would be allowed slowly to replace the relatively simple and externally regulated systems of our technosphere, a substitution essential to the establishment of ecological stability.

Clearly the transition to such a society would not be easy. The prin-



cipal problem would be how to provide satisfactory employment for so many people. New occupations that do not require the use of power, would probably take some time to develop. The dole does not solve the serious psychological problems of unemployment. It is at best a palliative. The only alternative is to accept that a vast amount of work is required to clean up the mess resulting from 150 years of uncontrolled economic growth.

A sort of national service for conservation on the lines of the Conservation Corps could be instituted, and the more decentralised its organisation, the more effective it is likely to be, as people would surely be keener to help clean up their local environment than that of people living at the other end of the country.

Moreover, it must be accepted that people should be employed whether or not their employment is justified on "economic grounds". This is already the case in the Soviet Union. "Economically unproductive" work of this sort would undoubtedly lead to a situation in which there would be more money around than goods to buy, again as in the case in the Soviet Union. The dissatisfaction this might give rise to would be partly offset by the development of the new occupations already referred to, as economic activity becomes ever more "ritualised". Meanwhile there will certainly be inflation-but on nothing like the scale that would accompany the total breakdown of our society, which is possibly the only alternative.

Can we make the transition?

A more serious objection is that the transition of a stable society would probably have to be carefully orchestrated as a single programme. If any part of it is left out, because it is regarded as objectionable by some sections of society in terms of current ethical norms, then the whole programme may well be a failure.

It follows that this social transformation can only be ensured by a government having a mandate to plan and implement such a programme as painlessly as possible, i.e. over the maximum period consistent with avoiding the catastrophes with which our society is at present menaced.

Is it likely that the British government will undertake a programme of this sort? The answer is unfortunately Shortages are likely to occur and prices are likely to increase dramatically long before stocks are actually exhausted, as producing nations will be increasingly reluctant to sell precious non-renewable resources which can be used for their own development. Producing nations will tend to import technological knowhow and manufacture their own goods.

"no". It would require first of all a degree of long-term planning of which we are undoubtedly incapable. It would also require subjecting a host of short-term requirements on the part of practically the whole population to wider and longer-term considerations. This would be very difficult as our society is geared to specifically shortterm ends. A businessman simply must declare profits at the end of the year if he is to survive, and to make these profits he is often forced to adopt methods detrimental to the society he lives in and also to his own long-term prospects.

A doctor must above all else relieve pain or lose his patients. To do this he currently administers drugs and uses diagnostic techniques such as X-rays and radio-isotopes that must inevitably increase disease in the long-term.

The farmer, in order to survive, as we have been at pains to point out in this book, must make use of highly unsound agricultural methods that must eventually lead to a reduction in output.

The scientist must above all succeed in achieving whatever short-term goal

The social system most likely to emerge is best described as feudal. People will gather round whichever strong men can provide the basic necessities of life, and offer protection against marauding bands from the dying cities. he has been set by the business enterprise or the government department he works for. He is likely to have neither the means nor the inclination to judge for himself what are the long-term effects of the work he is doing on the society or the ecosystem of which he is part.

A politician must win votes if he is to remain in office and to do this he must satisfy the countless short-term requirements of a predominantly ignorant and egoistic electorate, even when these are in direct conflict with the long-term interest of the society he has been called upon to direct. Neither the businessman, the doctor, the farmer, the scientist, the politician, nor anyone else in a position of authority, appears capable of questioning the basic assumptions underlying our industrial culture.

The tendency will thus be to blame all ills on technicalities that can be dealt with without having to modify these assumptions—leaving the real causes untouched.

Overcrowding, we shall persuade ourselves, is the result of poor urban planning, delinquency of insufficient state care and drug addiction of faulty education.

Pollution, we shall insist, is the avoidable result of the niggardliness of industrialists, lung cancer of insufficient money spent on cancer research and the world food shortage we shall attribute to the backwardness of agricultural techniques, and so on with all the other ills that must afflict us.

In this way vast sums of money will be wasted on more urban planning, more state care, more education, more cancer research, more pollution control and more poisonous agro-chemicals in a vain attempt to suppress the symptoms of the disease which we are incapable of treating as we are culturally unadapted to the life style that must constitute its only remedy.

To treat the symptoms, however, is to render the disease correspondingly more tolerable and to contribute thereby to its perpetuation.

Thus growth is not likely to cease as a result of a conscious decision on the part of anyone in authority but simply because the specific conditions in which it can occur will slowly cease to obtain.

As that moment draws near so we are entering a radically new phase in our history: the post-industrial age.

Development in Africa: The Human Factor

The coming of independence to a new nation means, besides self-government and management of its resources, responsibility for the total welfare of the population as a whole, and minimum disruption to wildlife and the ecosystem. When options are available, what is the wisest way to development?

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The problem confronting African countries today is poverty. This poverty is characterised by unemployment, underemployment, illiteracy, malnutrition, disease, starvation and bad housing. How is this problem to be solved? The URBAN WAY or the RURAL WAY to development? The imitation of the patterns of development of the industrialised nations or the adoption of development patterns suited to indigenous traditional and cultural conditions?

These are some of the issues which the Conference will discuss. Among the distinguished people who have agreed to participate at the Conference are:

Raph C. Uwechue, Editor-in-Chief, AFRICA.

Chenhamo Chimutengwende. Director Europe-Third World Research Centre.

Godwin Matatu. Europe-Third World Research Centre.

Jimoh Omo-Fadaka. Director, Africa Cultural Research Project; Associate Editor, the ECOLOGIST. Dr Moses IIo. Neurologist and Consultant Psychiatrist.

Edward Goldsmith; Publisher and Joint Editor of the ECOLOGIST.

Michael Allaby, Agricultural Specialist and Managing Editor of the ECOLOGIST.

John Aspinall. A Trustee of the ECOLOGICAL FOUNDATION.

Dr E. F. Schumacher. Founder and President of the Intermediate Technology Development Group Limited.

Satish Kumar. Founder of the London School of Nonviolence sponsored by Christian Action.

Brian Johnson. Director of the Institute for the Study of International Organisation, University of Sussex; Associate Editor, the ECOLOGIST.

Professor Hodder. Professor of Geography, School of Oriental and African Studies, University of London.

Prof. Samuel Aluko, Head of the Department of Economics, University of Ise, Nigeria.

Dr Michael Crawford, Fellow of the Nuffield Institute of Comparative Medicine.

And many others.

The fee for the Conference is £2.50. Students £1.50. African lunch, coffee and tea will be provided at the CALABASH RESTAURANT at the centre on Saturday and lunch only on Sunday for £1.65 for both days inclusive.

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Unravel the grid!

by Andrew MacKillop

Centralised electricity production is a monument of inefficiency. In the energy business this means: pollution, wasted energy, dependence on imported fuels (for countries without enough of their *own* fuel to waste), and high prices for the customer. Britain has one of the world's most centralised electricity production systems, and is therefore a world leader in wasted fuel and energy-related damage to the environment.

Britain's overall efficiency of electricity generation is certainly no more than 27 per cent¹, and the merest change in oil prices (oil at present generates about 25 per cent of our electricity) is automatically transferred through to electricity costs. However, if electricity production efficiency was raised by 5 per cent, for example, a 10 per cent rise in oil prices would be more than compensated for. The more the overall efficiency can be raised, the greater in general will be the electricity production system's resistance to fuel cost rises. The benefits do not stop here: each unit of input energy in a power station that can be transformed into electricity and sent out is one less unit that becomes noise, smoke, vibration and thermal damage in the environment around the power station.

Shortage of oil and gas, and environmental considerations are therefore twin supports to the case for fuel efficiency. The methods for attaining this could be grouped into two main categories: technical and systematic, the first being concerned with ways to improve the characteristics of *present* producing and distributing methods; and the second with alternative production and distribution *concepts*.

The efficiency of a heat engine, any heat engine, is controlled by the difference between its internal temperature (the heat source) and the cooling system's temperature (the heat sink). From the Second Law of Thermodynamics the maximum possible conversion efficiency of heat to mechanical energy conversion is therefore:

where S is the heat sink temperature, and T is the source temperature. In normal generating sets, steam at the highest possible temperature (at present technological-economic limits about 500°C) is first used to give mechanical power for dynamos in a hightemperature turbine, after which it is subsequently passed through other turbines at lower temperatures. With the heat sink at 37°C (the temperature of condensate leaving the turbine) the maximum possible efficiency is:

$$-\frac{273+37}{273+500}$$

or 60 per cent.² Modern sets can achieve about 80 per cent of this, or an overall conversion of 48 per cent (80 per cent of 60 per cent), meaning that of each 100 units of input fuel energy about 50 per cent do *not* become electricity.² They become heat—which is the final degradation of all forms of energy.

This is the situation for a modern generating plant, in peak condition, and typical emissions from such plants operating on different fuels are shown in Diagram 1. As can be seen, the wasted heat from such plants is always greater than the electricity sent out, especially in the case of nuclear plant, where for various reasons the sets generate steam at lower temperature than fossil-fuelled sets.3 Much of Britain's older generating plant is incapable of reaching input steam temperatures of 500°C, and 250-300°C is more usual. This lowers the maximum theoretical efficiency to around 40 per cent, and actual efficiency to about 30 per cent. There is then the situation regarding "on demand" steam sets, generating plant that is only used for satisfying peak loads. This type of plant can show actual conversion efficiencies4 of as low as 5 per cent, which prompts the question whether the CEGB should send it up chimneys, and into water-bodies.

Within the CEGB there is terrific inertia to change, partly due to a hightechnology conviction that present equipment systems are the peak of engineering finesse, but also due to system capitalisation. To install plant that wastes a mere 50 per cent of input fuel energy costs money; to get that money electricity prices must rise. As a result of price "restraint" the Area Boards have not been able to raise prices for more than a year, and are now mounting publicity drives for a rise of at least 10 per cent.5 With Phase III the permissive society should again return, allowing this rise, but also bringing another interesting test of "consumer resistance" or demand elasticity. All through the 1960s CEGB forecasts of demand growth were over optimistic. Consumer resistance, and falling rates of revenue increase badly interfered with capital supply for new plant. Over estimation of demand gave rise to new plant that is under utilised, and inefficient; under estimation requires older plant to be retained. Both situations lead to the same result.

There is therefore a strong fault in the argument for newer plant of conventional type, which in any case can only marginally raise generation efficiency. Beyond this point we need to examine new system concepts.

In alternative approaches to electricity production electricity is *not* regarded as the only form of energy required. Since massive amounts of heat are wasted by conventional plant (however efficient) and because heat is



required for domestic and industrial purposes, district heating⁶ and total energy7 concepts set out to sell heat, as well as produce electricity, from input fuel. While district heating systems, in general, are operated by piping formerly wasted heat to users from relatively unchanged (but more expensive) generating sets, the total energy concept involves decentralising the conversion and use of energy to hierarchies that extend downwards from medium-size cities to neighbourhoods, offices, and below.8 At each level total energy plant involves the distribution of both heat and electricity, and they could be looked on as small-scale district heating systems, except that there are often more important differences in the operating principles.

District heating

District heating is by no means an innovation, and on a world scale there are several hundred operating schemes.9 One of the largest-scale systems is operated at Vasteras in Sweden, where up to 1400MW of the input fuel energy of 1650MW is usefully used, with 900MW of heat energy, and 500MW of electricity (at peak rates) being sold to domestic and industrial users.10 Of course such a system requires heavy capital expenditure for installing hundreds of miles of insulated heatdistributing pipework. Also, special lower-temperature turbines are required to make the steam and superheated water available. Despite capital costs being as much as twice that for conventional plant, it must be noted that materials and labour costs for installing individual heat producing plant in serviced buildings are completely removed. In addition to factoring these items into district heating evaluation (which the CEGB, of course, does not) there are very considerable environmental savings, notably in reduced air and water pollution. Vasteras is a model example, but in this case air pollution levels are 90 per cent below the target aimed for by the Swedish government, of about 60µg/litre of sulphur oxides.11 Britain, with its new, "cleaner", air can only manage about 200ug/litre in its major cities.12

Another variation of the district heating concept is to use the fuel value of rubbish, which is often 50-70 per cent that of coal¹³ to produce both electricity and heat. Nottingham City Council commissioned such a plant on September 20th, which uses 200,000 tons of rubbish, together with 20,000 tons of coal, to supply 1.5MW of electricity, and 33MW of heat, on a yearly basis to 7,000 homes. Metals and ash are salvaged from the process, but it is arguable that a more effective use of resources would be to recycle "fuel" items such as plastics and paper, which with better sorting could be recycled as usable paper and packaging, rather than being completely degraded to ash.¹⁴

The overall efficiency of district heating varies with capital cost of plant, utilisation of heat and electricity, and more minor factors such as pipework insulation etc. Typical values are 45-75 per cent, or some 1.5 to 2.5 times the fuel-useful energy conversion of average conventional plant. Network centralised systems (large generating sets and grids) could be quite easily converted to district heating in many locations, especially where the power stations are near industrial or domestic buildings that can use large quantities of heat. Large nuclear stations, because of their plainly dangerous nature, are sited in distances from cities that usually represent a compromise between demands that they be sited at an infinite distance, and government demands for city-centre location. In general, although they produce enormous quantities of waste heat, they are too remote from users for district heating. Here we can conclude that the larger the plant-running on whatever fuel-the more difficult it is to adapt to district heating operation. This is an argument for smaller plant per se, and again there are environmental benefits. not least that smaller and fewer cooling towers are required. This of course means fewer drab, oppressive lumps of concrete around cities, and power plant aficionados are naturally appalled by such implications.

Increase efficiency, reduce impact

Despite these disappointments for our power station builders the district heating concept offers a fairly easilyrealised method of improving fuel efficiency, and reducing the environmental cost of power generation. In view of the present and coming world shortage of fossil fuels, which will not be compensated for Britain by minor, and multiple-owned North Sea fuel reserves, district heating is a very desirable improvement to our grossly wasteful electricity production system.

The use of fuel can be improved by as much again as the step-up in efficiency from conventional electricity production to district heating and electricity systems. This is by use of total energy systems, with or without an added contribution from renewable energy resources and new technologies. A total energy system, ideally, is tailored to supply the required energy by estimating energy needs in advance. and then designing and supplying requisite plant, for buildings and groups buildings. In this concept centralised power plant, cooling towers, district heating pipework, and grids are removed, being replaced by small heat and electricity-generating units, with cabling and pipe runs as required.15 The size of total energy plants is usually between about 25-250kW of electrical capacity, with about 40-400kW of heating capacity.16 In a typical plant the motive power is supplied from a modified diesel or petrol engine, with additional coolant pathways and heat exchangers to maximise the supply of useful heat. On smaller plant, heat is supplied directly as hot air or water, but larger total energy systems-for example installations for neighbourhood groups of houses-can have steam generated for heat distribution, as with district heating.

Operating at peak efficiency the very best district heating system has a ratio of heat: electricity of about 4; a total energy system can reduce this to 3:1 (a 25 per cent improvement) meaning that the supply of heat can be more tightly keyed into the demand pattern. While a district heating plant is often producing heat that cannot be used, (or only a small fraction can) the total energy system, by reducing the ration of heat to electricity, cuts down this potential waste. At higher capital cost total energy systems can have even higher fuel efficiency by producing small amounts of electricity and heat (e.g. for offices or groups of homes in summer), and bringing in large-scale plant only at night and in winter. It is therefore possible to provide energy to domestic and industrial users at constant rates of 60 per cent conversion of input fuel energy to useful energy, and ratios of as high as 80 per cent are quite easily achieved, especially with small plant that has daytime partload facilities. Such plant is from 2 to 2.8 times more efficient than conventional modern power stations, and *up* to 20 times more efficient than the older plant used by the CEGB!

Improved energy-efficiency does not have to stop here, although more sophisticated systems do require considerable planning and higher costs are the rule. Because we are concerned with improving the use of heat-a low grade form of energy-and tightlycontrolling the production of electricity (a high grade form of energy), we come to a point where improving the use of energy requires us to separate the ways in which we approach different forms of energy. We live near the bottom of a thermodynamic well, that starts in the sun, at about 30,000,000°C, and plummets down to absolute zero at -273°C. Life systems on our planet are all in the range of about 0-50°C, and must gain some advantage from the continuous degradation of energy towards absolute zero.17 Because of this thermodynamic well it is fairly easy to "re-route" the downward path of energy to our advantage. This is done by using a heat pump, which cools large bodies (such as water or air) by a small amount, and channels this energy into buildings as useful heat.

Heat pump efficiency

A heat engine is always battling against the thermodynamic well, but a heat pump is working *with* it. Since energy is not being converted from one form to another the "efficiency" of a heat pump is measured instead by its performance in channelling heat.¹⁸ If we are extracting heat from a large waterbody at, say, 5°C in Britain's winter, and pumping this into a building at 30°C the maximum theoretical performance is:

$$273 + 5$$

$$(273+30) - (273+5)$$

or 12.5. In theory, in these conditions, a perfect heat pump could extract 12.5 units of heat energy for each one unit of energy used to operate the pump. While commercial heat pumps, usually of air-to-air type built from conventional air conditioning equipment, have typical performance coefficients of 2 to 3, a Stirling cycle unit using water-source heat can give 6 to 1, or nearly 50 per cent of the theoretical maximum. The attraction of using heat pumps in addition to small total energy units is that the warm source of bulk heat can be the flue gases from the

FIG. 2 ENERGY USE CHARACTERISTICS OF SOME DIFFERENT TOTAL ENERGY AND T.E./HEAT PUMP SYSTEMS



engine used to generate electricity; alternatively water can be heated by the engine and stored in a large capacity tank during times when little heat is required for distribution. When heat is required a heat pump can use this store, enabling a large amount of heat to be delivered from small amounts of electricity. Since the amount of electricity required from a total energy system governs its overall performance, this enables the amount of electricity generated to be dampened, by recoupment of heat produced during parts of the demand cycle when heat is not in demand.

The above case is one in which it is assumed that a part of the electricity required is for heating (e.g. operating bar fires), and that the consumer will accept non-electric heating. There is also the more difficult problem concerning large-capacity storage. However, water can be very useful here because it has a high enthalpy, or heat content per unit volume, for each increment in temperature. A wellinsulated tank containing 5 cubic metres of water at 50°C, for example, can when chilled to 1°C, provide as much as 200kWh of heat energy, after allowing for heat losses. This is sufficient for the daily heat needs of about four average-size UK homes at present insulation standards-which are the worst in Europe.¹⁹ Where buildings are near waterbodies, including larger swimming pools, these can be keyed into this energy use system without requiring great changes in building practice.

The performance of heat pumps falls off rapidly as the difference between the source and sink is raised (which is the direct opposite of heat engines). Thus a "solar" collector heat source²⁰ (which in Britain would require to operate in the winter night to be useful) would have to have very large surface areas to extract sufficient quantities of heat energy from the environment, and would tend to have a low performance. While commercial heat pumps operating at a cold body temperature of -50° C and jettisoning heat into rooms at say 20°C, have performance coefficients below one, this is not the case with Stirling cycle units.²¹ Work is being undertaken to determine exactly the effective maximum heat differential that such units can operate at while still giving useful performance. The Stirling cycle units being developed by A. Wilkins of Plymouth,²² in association with Low Impact Technology, may in fact give useful heating from night-time sky radiation, but will require collector arrays of as large as 50 square metres. However these collectors, using glycol or other refrigerants, would be most unlike solar water heaters through the fact that the heat transfer fluid (glycol) will be at a considerably lower temperature than the air. Glass covers would therefore not be needed, reducing capital and maintenance costs.

Wind power

Wind power, another form of contemporary solar energy, can also be linked with total energy/heat pump systems. Because wind energy increases with the cube of velocity,²³ and in Britain is a major source of building



heat loss,²⁴ a semi-cybernetic household heating system suggests itself. Direct conversion of windpower to heat can be achieved by rotating a Callendar-type drum in a water bath; such systems, which have yet to be made available, could use anti-skid brakes, for example the Dunlop "Maxaret" type. Driving the conversion system with multiblade, or rationalised sail-type mills²⁵ would provide both robust, and potentially low cost, attributes. The wind-heated water can then serve as the low-grade heat source to a heat pump system. Alternatively, wind machines could drive the heat pumps, offering a high-efficiency heating system operated by renewable resources, and involving no combustion whatever.

A diesel or petrol internal combustion engine driving a total energy unit provide electricity at typical efficiencies of 20-30 per cent,26 which is a normal figure for such engines. The heat supplied from such units can bring up the overall conversion efficiency to 65-85 per cent. But where a large ratio of heat-electrical energy is required (for example in a situation where mains supply provides the bulk of electricity, but no heat) a heat pump can be operated from the electrical output of the total energy unit. Assuming a performance coefficient of 3 to 1 for the heat pump raises the operating efficiency of the system more than 100 per cent. In the above example the electrical part of the system would exhibit its low typical efficiency, as before; however, when converted to heat by the heat pump, the ratio of output heat to input fuel would be 60-90 per cent. There would then be heat available from engine cooling pathways and heat exchangers as with normal total energy units. This would give overall input fuel to useful heat output values of 105-145 per cent, that is a supply of useful heat greater than that in the fuel used to drive the system (by extracting heat from the environment).

Finally, again at a considerable step-up in capital cost, a Stirling-cycle heat pump can be driven from mechanical energy produced by another Stirling engine, that is also used to drive a dynamo when electricity is required. This would of course apply to demand situations where a very high ratio of heat to electricity was required, for example where other sources contributed the great bulk of electricity. With this arrangement each unit of input fuel could provide, through the mechanical energy and heat pump systems, as much as 2.65 to 3.8 units of heat. This is a conversion "efficiency" (operating performance) of 265-380 per cent.

There is thus a wide range of electricity and heat supply systems that show much higher performance than that of a network centralised grid, supplying electricity at low or very low conversion efficiency. When we also consider heat, the inevitable (although small) further decrease in conversion efficiency through using this electricity to operate electric heaters shows that such systems, on fuel efficiency and environment grounds, are both grossly wasteful and undesirable. District heating is an effective first step in improving fuel efficiency and it can be instituted, in many cases, without major change of generating plant. Much greater improvements in fuel efficiency can be produced by using total energy systems. These are essentially decentralised plant for producing useful energy, and for best performance should be designed to fit tightly into the energy demand structure of the intended installation. By using heat

Table 1

Performance ratio of alternatives compared to	Modern CEGB steam- electric plant conversion to		Old CEGB plant conversion to	
conventional systems	Electricity	Useful heat	Electricity	Useful heat
District heating	0.75-0.9	1.3-2.5	4-6	6-10
Normal total energy system	0.75-0.9	2-3	4-6	10-20
electric-drive heat pump Double Stirling-cycle total	0.75-0.9	3.5-5	4-6	20-30
energy unit/heat pump Heat pump with drive from	0.75-0.9	4-8	4-6	50-75
renewable-source energy (wind; solar; water) (microbial)	n.a.	infinite	n.a.	infinite

pumps in conjunction with total energy systems, very high overall conversion of fuel energy to useful energy can be obtained. In many cases the performance of such arrangements is a delivery of more than twice as much useful energy as input fuel energy. Finally there is very interesting scope for using renewable energy sources, both to supply low grade heat to heat pumps, and in many cases also for providing mechanical energy to heat pumps. Compared to present networked centralised systems the energy-efficiency of such systems is infinite, because non-thermal conversion of energy is being carried out, and because the energy sources concerned are wholly renewable.

Windmills on the pylons?

Over and above these facets of alternative energy supplies, which carry large environmental benefits, there are additional benefits for the environment. First, large and even medium size power stations are not required. Attendant plant such as cooling towers and ponds would also disappearsymbolising that heat was no longer a commodity to be carelessly thrown away. Most noticeably of all, the ugly "madman's Meccano" of oppressive grid pylons and lines would also not be needed, although in certain places these (when painted green for example) could serve as useful windmill towers.²⁷ Damage to the environment from thermal pollution would be re-



duced, having a marked upward effect on populations of stenythermal fish species such as salmon and trout. And decentralised energy systems would play a useful role in demographic and political decentralisation, with additional environmental, social and cultural benefits.

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MUSICAL IMPERIALISM by Tran Van Khê



Almost all the countries of Asia, Africa, Oceania and Latin America are non-industrial societies. In all these countries, as in certain strata of society in Western countries, music, for the workers who constitute the great mass of the population, is not simply entertainment, a source of spiritual satisfaction, or an art cultivated for its own sake, but is closely interwoven with everyday work and life.

Professional musicians and music-lovers approach music more as an art form, clothing it in theory and relating it to a certain world outlook or philosophy. Yet both for this elite and for the ordinary people, music remains bound up with social and religious functions.

Music rocks babies to sleep, and children use music in their games. It helps the labourer to forget how hard his work is, it is "the food of love" and a balm for hurt bodies and minds. It sees the dead on their way and consoles the living. It provides an accompaniment to all the operations of the farming calendar, the ploughing, harrowing, sowing, planting, harvesting and threshing and the husking and grinding of the rice. In non-industrial societies, particularly among the mass of the people, music is not an art pursued for the sake of art, but is present at all the important events of life—birth and betrothals, weddings and funerals. Farmers and craftsmen each have their own repertoire and music is present at all rural and seasonal festivities, at ceremonies to ward off misfortune, to placate evil spirits or thank the tutelary gods and guardian spirits.

Such music is usually vocal, sometimes with the accompaniment of simple but ingenious folk instruments which provide the melody or the rhythm. It is anonymous and orally transmitted, and each performer has the right to imprint his own character upon it. Performers are for the most part workers or semi-professionals.

Being essentially functional, this music differs from that practised as an art by professional musicians and connoisseurs who use more elaborate instruments, more complex vocal and instrumental techniques and more varied scales, and who have richer repertoires.

Music of this kind, seen as an art form, may have its origins in the music of the people, but differs from it in its artistic level and its function. As it is more sophisticated, it is harder to learn, and those who spend years learning it must either be able to make a living from it or be rich enough to regard it as a pastime.

Colonial maestros

In the nineteenth century, after attempting to conquer the countries of Asia and Africa by the "peaceful" method of converting the population to Christianity, the Western powers tried to overrun them by force of arms.

Tran Van Khê is not only a specialist on Asian music but an accomplished performer himself. He comes from a Viet-Namese family that has produced several generations of musicians and has an extraordinary knowledge of Asian musical instruments. He at present directs the Centre for the Study of Oriental Music at the Sorbonne's Institute of Musicology in Paris. He also heads a research team at the Centre National de la Recherche Scientifique, also in Paris, and is a member of the Unescosponsored International Music Council. For his recordings and commentaries on Vietnamese music he was awarded the Grand Prix de l'Academie des Disques Francais in 1960 and 1970 and the Deutscher Schallplatten Preis (1969).

Several of these countries lost their independence, whilst others came under foreign economic control.

The vast majority of the population in the countries which thus fell under colonial rule consisted of country folk —landless peasant tenant-farmers, agricultural workers at the mercy of landowners and money-lenders—deeply attached to the traditions of their ancestors.

Craftsmen, tradesmen and petty officials belonged to the "middle class", forming a moneyed and partly westernised bourgeoisie. The introduction of capitalist production methods created a proletariat which worked in the mines, factories, mills and plantations.

All these political and social upheavals brought about profound changes in the musical life of the nonindustrial societies. Some kinds of music fell into disuse or disappeared altogether.

Science and technology have done away with certain back-breaking jobs, but at the same time many work songs have disappeared or are about to do so. With the advent of power-driven ploughs, machines to husk the rice and modern irrigation systems, the old songs that used to accompany these operations are no longer heard. As steamboats replace sampans, canoes or sailing craft, the songs of the boatmen will become a thing of the past.

The development of science and medicine has spelt the end of the old "superstitions" in many countries. People now prefer to go to the doctor rather than the witch-doctor when they are ill, and the incantations for healing the sick, driving out devils and communicating with spirits are beginning to disappear.

Transistor radios have now penetrated even into very remote areas, and the peasants and shepherds who can now listen to music at home are not in any hurry to go to the market-place to listen to strolling singers, just as citydwellers are no longer so easily drawn to concerts or plays when they have television at home. Listening to the "new" music put out by the broadcasting stations, country folk tend to imitate an urban style of singing, particularly that of well-known singers or musicians.

The worst thing about this situation is that young country folk are deterred by the "new" music composed by young people under western influences from composing new songs in the traditional styles.

In contact with city-dwellers and listening to "arranged", "harmonised" versions of folk-music, they adopt a new repertoire composed by young musicians who are often unaware of their own traditions and have merely picked up a few rudiments of westernstyle composition, modelling their style on that of popular songs. Creative talent and the artistic level of folkmusic are everywhere in decline.

Several musical genres have indeed disappeared. Chinese, Korean and Viet-Namese court music is dying out now the courts themselves have gone. It is performed only on very special occasions, e.g. for national holidays, for receiving ambassadors, for groups of tourists, etc.

Confucian temple music is no longer played in China and Viet-Nam and is only heard in Seoul and Taipeh, where societies for the preservation of musical traditions have attempted to save them. The old ceremonies are no longer performed in Confucian temples.

In Iran, the ta'ziya, a historical and religious spectacle comparable with the medieval passion-plays, showing the martyrdoms of the Imams (legitimate successors to Mohammed), is no longer performed in the big towns, with the exception of Shiraz where it was presented during the international festivals of 1967 and 1970. The custom lingers on in the countryside but the plays are no longer performed with the same spontaneity as of old.

In Mauritania today, the character of the griot has greatly changed. Michel Guignard, author of *Musique, Honneur et Plaisir au Sahara*, writes in this connection that they are bebecoming less and less the minstrels and familiars of the nobility. Anyone can now go and listen to them or hear them on the radio. They therefore reach a wider audience with tastes and needs different from those of the minority whom they formerly served.

Similarly, the expert Hugo Zemp writes that now that the traditional way of life of the chiefs of the Senufo of the Ivory Coast has gone into decline, or has completely vanished as a result of changing political conditions, the flute orchestra has lost its raison d'être.

In Morocco, the Near East, India and Cambodia, all observers emphasise that modern life and the intrusion of modern technology deprive folk-art of



The "Dohol" and the "Sorna", traditional Persian instruments, being played at a wedding feast.

new subject matter and dry up the wellsprings of musical inspiration.

The new music

A new music is appearing everywhere, often as a result of the "acculturation" of traditional music, a process which is no less prejudicial to tradition than the disappearance of the old musical genres. "Acculturation" is a modern term signifying the adoption by a given people of a culture other than its own, but the phenomenon is by no means new.

Japan adopted Chinese music of the T'ang dynasty, Korean music and cham music in the ninth century, and the result was the Togaku, Komagaku and Ringyagaku styles of Japanese court music (Gagaku). Viet-Nam not only assimilated the Chinese tradition but also the Indian, through the intermediary of the ancient Indianinfluenced civilisation of the Champa kingdom while north Indian music was influenced by the music of Islam.

In the last few centuries, it has been primarily the encounter between western music and the traditional music of the non-industrial societies which has caused the most profound upheaval in the latter.

The causes of acculturation are many. In the beginning, it may be a praiseworthy desire to learn something new, a desire for progress, which incites musicians to do something different from their masters or predecessors, to give their music a personal stamp. When they had to rely on their own resources, change was slow; when they came into contact with neighbouring countries, more significant changes occurred. Acculturation is the product of contact between peoples and civilisations, combined with the attraction of novelty.

Contact between countries with the same culture is very fruitful—consider the impact of Chinese music, particularly of the T'ang dynasty (eighth-ninth centuries) on Japanese music, of T'ang and Sung (tenth-eleventh centuries) music on Korean music, and of Ming dynasty (fourteenth-sixteenth centuries). Thai music owed a great deal to the Khmer tradition and the instruments of the p'iphat orchestra of Thailand are the same as those in the bas-reliefs of Angkor. Turkish, Arab and Persian musicians all paid allegiance to the same musical theorists.

Above all, the encounter with the West has engendered hybrid musical forms. Africa and the East have followed the western lead and some have ascribed this to the superiority of western music.

The colonial peoples tried to imitate those who dominated them by the

superiority of their technology, in the belief that their culture too must be equally superior, and ended up confusing progress and modernisation with westernisation.

Lastly, the development of such media as radio, television and records speeds the process of acculturation even more. Transistors and records have reached even the remotest villages. Under constant musical attack from all sides, young people today are drawn and fascinated by this easy-to-write, easy-to-play, easy-to-remember music, and no longer have the patience to spend years of their lives learning the traditional music.

They need only learn to play a few chords on the Spanish guitar and after six months they can accompany themselves singing the western-style songs written by their compatriots. Those who fall in with the fashion of the day may become radio, television or recording stars and get rich quick.

The development of communications has also made it easier for musicians to travel. Some Oriental virtuosi who have given concerts in the West have been impressed by symphony orchestras and returned home with the idea of writing concertos for a traditional instrument and symphony orchestra. The result is hybrid music.

Etymologically, the words hybrid or hybridisation are not pejorative. As biological terms, they refer to the crossing of different species or even different varieties of the same species. In everyday speech, a hybrid is something in which two elements of different nature are artificially combined. Applied to language, to art or music, the term implies a certain disdain.

At the Shirax seminar on Asian Music in 1968 and again at the Congress of the International Music Council in New York, I suggested that there were two distinct sorts of hybridisation.

Firstly, there is the sort which impoverishes, which sometimes destroys the national character of one of the two traditions involved, which is what happens in most cases when the music of the East or of Africa comes into contact with western music.

Oriental or African musicians accompany songs based on particular tonalities on a piano tuned to an equally tempered scale, or use clarinets, saxophones and even electric guitars to perform traditional music, playing common chords or arpeggios to punctuate the musical phrases of traditional music. Hybridisation in such cases is detrimental because it tries to apply the instruments and styles of one tradition to another tradition with which they are incompatible.

On the other hand, there have been cases of beneficial hybridisation where the borrowing of foreign elements has led to a new flowering of a particular tradition.

This was what happened when the music of northern India came into contact with the Islamic tradition, when Japanese court music was enriched by the influence of T'ang dynasty Chinese music, Korean and cham music, and when Viet-Namese music assimilated both the Chinese and Indian traditions.

The effect is beneficial because the elements borrowed are compatible with the original tradition.

Can we reverse the trend?

Acculturation has reached epidemic proportions and caused havoc among the musical traditions of the nonindustrial societies, because instead of borrowing from the West new and constructive elements such as would lend new vigour to their own musical traditions, Asians and Africans have borrowed elements which are incompatible with the basic principles of their traditional music.

Acculturation is a universal phenomenon. What we must try to do is to turn the potentially destructive forces involved into constructive forces. The problem appears to me to be one of incompatibility and compatibility. Whereas the combining of compatible elements produces a successful "graft" the incompatibility of the elements concerned causes "rejection".

A very thorough knowledge of one's own national culture and the culture from which the elements are to be borrowed is needed in order to avoid "rejection". Unfortunately, the leading exponents of the traditional music, aloof in their ivory towers and blinded by their own superiority complexes, refuse to allow change and in many cases are unfamiliar with any tradition other than their own, which they consider to be the only valid one.

Young people, on the other hand, are only interested in western music, the only form they consider valid, the music of their own country being regarded as mere "folklore". Thus



Nepalese folk musicians, North India

neither the traditional musicians nor the young are capable of distinguishing which elements are compatible and which are incompatible and thus avoiding a type of acculturation which is prejudicial to their traditions.

In many countries, the new music corresponds to a new need, the need to sing together at mass gatherings. It has thus made its own contribution to the awakening of national consciousness and to preparing the peoples of those countries for the national liberation struggle, and has hence fulfilled its historical mission. In most cases, however, such music leaves a great deal to be desired from the artistic point of view.

Several young musicians have studied composition in the conservatoires of Europe and America and have adopted the western musical idiom once and for all. The general public is not yet receptive to their music, but at the same time it has lost interest in traditional music, which now only has a minority audience. Private concerts are given less and less frequently, while radio, television and records plug the new, heavily westernised music.

I do not agree with the fatalistic argument that traditional music is dying and must soon disappear to make way for another type of music, which, though perhaps less authentic, is more in keeping with the needs of modern society. The traditional music of the nonindustrial societies is not "dying"; it may be sick, but the thing to do with a sick man is not to kill him off or to let him die without trying to cure his. sickness. The present trouble may turn out to be nothing more than growing pains—if proper steps are taken straight away.

The re-birth—not the survival—of musical traditions is, needless to say, a problem which requires primarily a national solution. The cultural and educational organisations, public and private, and the governments of Asia and Africa could improve the teaching of traditional music, raise the standard of living of traditional musicians and reorganise national musical life.

Western countries could, however, help us in our task of rescuing our musical heritage by showing an interest in our authentic traditional music. Performers of such music who have been invited to give concerts in western countries enjoy greater prestige among their compatriots.

The International Music Council and International Institute for Comparative Music Studies and Documentation have not only helped the western public to appreciate Asian music at its true worth but have also helped to restore the confidence of masters of the art of traditional music in Asia.

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THE DELANEY AMENDMEN

by Samuel S.Epstein

For the third time since its original passage in 1958, the Delaney Amendment to the Federal Food, Drug and Cosmetic Act is once again under concerted and systematic attack. In hearings on the hazards of colour additives in 1960, in the wake of the cyclamate ban in 1969, and now after the ban on the animal feed additive diethylstilbestrol (DES) in 1973, the Delaney "anti-cancer" clause has been subjected to vigorous propagandistic attacks by those who assert that its strict prohibition against the deliberate addition of food additives which are chemical carcinogens (cancer-causing compounds) to food is too rigid, arbitrary and unscientific. In each of these three instances, the food and chemical industry has sounded alarms that the clause, if it continues to be enforced, will substantially hamper production of food by modern technology and result in reduced food supplies and higher costs.

The philosophical and scientific basis for the Delaney Amendment largely derives from a meeting of the International Union Against Cancer in 1954, where sharp distinctions were made between reversible and irreversible adverse effects of chemicals. For chemicals inducing reversible toxic effects, it was agreed without question that threshold levels, below which human exposure would be safe, could be reasonably determined. However, for chemicals inducing irreversible and possibly cumulative effects, particularly carcinogens, such threshold levels could in no way be defined.

This fundamental distinction was further emphasised at a symposium of the International Union Against Cancer two years later, all participants of which unanimously recommended that:

"As a basis for active cancer prevention, the proper authorities of various countries promulgate and enact adequate rules and regulations prohibiting the addition to food of any substance having potential carcinogenicity."

The Delaney Amendment, enacted 6 September 1958, as Public Law 85–929, prohibits the use of any carcinogenic chemical as a food additive. Specifically, the law states:

"That no additive shall be deemed safe if it is found to induce cancer when ingested by man or animal, or if it is found, after tests which are appropriate for the evaluation of the safety of food additives, to induce cancer in man or animal...."

According to general legal interpretation, the Delaney Amendment applies only to intentional food additives, and unintentional food additives, such as pesticide residues, are excluded from its requirements.

The Amendment invoked immediate strong opposition exemplified in the statement of Dr William Darby (Darby, 1960), Chairman of the National Academy of Sciences Food Protection Committee, at Congressional hearings that:

"Adequate protection would be afforded by the law without the inclusion of the Delaney Clause."

At the same hearings, Health, Education and Welfare (HEW) Secretary Arthur Flemming vigorously defended the scientific basis of the

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Delaney Clause and effectively rebutted the criticisms levelled against it by industrial consultants and representatives (Flemming, 1960). Secretary Flemming stated that:

"Scientifically, there is no way to determine a safe level for a substance known to produce cancer in animals."

The Secretary also explained that, contrary to general misconception, the Delaney Amendment was not in fact invoked in the "cranberry episode", since the cranberry growers whose crops had been condemned had used aminotriazole illegally before it was adequately tested or registered, in spite of the fact that the FDA, in May of 1959, had rejected a requested registration on a "no residue basis" for aminotriazole from American Cyanamid, as this pesticide was carcinogenic in rats, and cats, at even the lowest dose fed, 10 parts per million (ppm), and that a "no-effect level" had not even been determined. In spite of this illegal usage, the cranberry growers were unjustifiably compensated for their losses at the taxpayers' expense. There are clear analogies between this situation and the Congressional consideration of compensation to certain industries for losses after the restriction of cyclamates in 1969.

The fundamental principles of the Delaney Clause have been explained recently in an excellent paperback designed for the informed layman by a Washington-based public interest group (Health Research Group, 1972).

Criticisms of the Delaney Amendment

A wide range of criticisms have been and still are levelled against the Delaney Amendment. All such criticisms have emerged from industrial groups, trade associations, and their consultants, and from groups that are clearly identified with protection of industrial interest, such as the 1969 Task Force of the Food Protection Committee of the National Academy of Sciences, National Research Council (NAS-NRC), the Society of Toxicology, and industrial trade associations and their consultants. Another factor characterising criticisms of the Delaney Amendment by such "captive" spokesmen is their lack of expertise and national recognition in the field of chemical carcinogenesis, quite apart from the related areas of mutagenesis and teratogenesis. It is striking that no

It is perhaps no coincidence that the attacks on the Delaney Amendment are mounting at a time when the food chemical industry is poised for a major expansion. The chemical industry predicts that sales of chemical additives are expected to grow from \$485 million in 1970 to \$750 million by 1980.

such criticisms have emerged from qualified independent experts, from the scientific staff of the National Cancer Institute (NCI), from the membership of the International Union Against Cancer, from the American Cancer Society, or from qualified scientific representatives of citizen, consumer and public interest groups.

Typical anti-Delaney criticisms are briefly listed and rebutted below (Epstein, 1972a):

Any chemical can be made carcinogenic by testing in various routes.

Such claims are based on results of skin painting or subcutaneous injection of chemicals in rodents. These data are totally irrelevant to the Delaney Amendment, which may be invoked only on the basis of "tests which are appropriate for the evaluation of the safety of food additives", namely feeding.

Most chemicals are carcinogenic when tested at high doses.

These claims, made with reference to testing by feeding, in addition to testing by other routes, reveal a total lack of comprehension of the gross insensitivity of toxicological procedures, which is dictated by elementary statistical considerations. The need to test for carcinogenicity, besides for mutagenicity (induction of genetic damage) and of teratogenicity (induction birth defects) at levels higher than anticipated human exposures was explained as follows in recent hearings before the US Senate Subcommittee on Executive Reorganisation and Government Research (Epstein, 1971):

"For carcinogenicity, teratogenicity, and mutagenicity, pollutants must be tested at higher levels than those of general human exposure (*Reports of* the Advisory Panels on Carcinogeni-

city, Mutagenicity, and Teratogenicity, HEW, 1969); irrespective of route of administration maximally tolerated doses are recommended for this purpose as the highest dose in doseresponse studies. Testing at high doses is essential to the attempt to reduce the gross insensitivity imposed on animal tests by the small size of samples routinely tested, such as 50 or so rats or mice per dose level per chemical, compared with the millions of humans at presumptive risk (Reports of the Advisory Panels on Carcinogenicity, Mutagenicity, and Terato-genicity, HEW, 1969). To illustrate, assume that man is as sensitive to a particular carcinogen or teratogen as the rat or mouse; assume further that this particular agent will produce cancer or teratogenic effects in 1/10,000 humans exposed. Then the chances of detecting this in groups of 50 rats or mice, tested at ambient human exposure levels would be very low. Indeed samples of 10,000 rats or mice would be required to yield one cancer or teratogenic event, over and above any spontaneous occurrences; for significance, perhaps 30,000 rodents would be needed (Epstein et al., 1969).

"It must also be emphasised that testing at high dosages does not produce false positive carcinogenic results. There is no basis whatsoever for the contention that all chemicals are carcinogenic or mutagenic at high doses. To illustrate, in the recent Bionetics study, sponsored by the National Cancer Institute, about 140 pesticides were tested orally in mice of both sexes and strains at maximally tolerated doses from the first week of life until sacrifice at 18 months; less than 10 per cent of these pesticides were found to be carcinogenic (Report of the Advisory Panel on Carcinogenicity, HEW, 1969; Innes et al., 1969)."

Animals are much more sensitive to carcinogens than humans.

This argument has been rebutted with reference to both carcinogens and teratogens (Epstein, 1971) as follows:

"Of course in any particular instance humans may be less or more sensitive than rodents to the chemical in question; there is consequently no valid basis for the prediction of the relative sensitivities of test animals and man. Thus, meclizine, an antihistamine drug used in treatment of morning sickness, is teratogenic in the rat, but

not apparently in the few women studied (King, 1965; Yerushalamy and Milkovich, 1965). Contrastingly, for thalidomide the lowest effective human teratogenic dose is 0.5mg/kg/day (mg/kg is a standard way of expressing dosage, and means one thousandth of a gram per 1,000 grams body weight); the corresponding values for the mouse, rat, dog and hamster are 30, 50, 100, and 350 mg/kg/day, respectively (Kalter, 1968). Thus, humans are 60 times more sensitive than mice, 100 times more sensitive than rats. 200 times more sensitive than dogs, and 700 times more than hamsters. Similar considerations obtain for certain aromatic amines, such as 2-naphthylamine, which are potent bladder carcinogens for man and dogs, but not for rats, mice, guinea pigs, and rabbits (Hueper, 1969)."

Safe levels of carcinogens can be predicted from animal experiments.

This argument is based on the customary 100-fold safety factor used in developing permissible levels of human exposure to chemicals tested for chronic toxicity. While in chronic toxicity tests it is reasonable to find an apparent "no effect" level of a chemical and use this as a basis for deriving levels at which humans may be safely exposed, this approach is clearly impossible for carcinogens (Epstein, 1972a and b). As recently explained (Epstein, 1971):

"Apart from the gross insensitivity of animal test systems, and the impossibility of gauging human sensitivity from animal tests, ample data on interactions between carcinogens further confirm that it is not possible to predict safe levels of carcinogens based on an arbitrary fraction of the lowest effective animal dose in a particular experimental situation. Thus, the production of hepatomas in trout by feeding as little as 0.4 parts per billion of aflatoxin B1 is sharply enhanced by addition of various non-carcinogenic oils to the diet (Sinhuber et al., 1968). Similarly, carcinogenesis for mouse skin of low concentration of benzo(a)pyrene and benz(a)anthracene is increased 1,000-fold by the use of the noncarcinogenic n-dodecane as a solvent (Bingham and Falk, 1969). Intratracheal instillation of benzo(a)pyrene and ferric oxide in adult hamsters elicited a high incidence of lower respiratory tract tumours only in



animals pretreated at birth with a single low dose of diethyinitrosamine (Montesano *et al.*, 1970). Such considerations underlie the 1958 Delaney Amendment to the Federal Food, Drug and Cosmetic Act, which imposes zero tolerances for carcinogenic food additives. Zero tolerances should also be imposed for occupational carcinogens, such as asbestos.

"Hence, to predict a safe level for thalidomide or for 2-naphthylamine, from rodent data or from derived mathematical models, would expose humans to grossly unwarranted hazards."

The Delaney Amendment precludes scientific judgments and discretion.

The contrary is just in fact the case. The Amendment stipulates that the tests must be appropriate and must result in cancer, if the additive is to be banned. The decision as to appropriateness must reflect a variety of scientific factors and judgments, including design of experiment, number of animals tested, appropriateness of the route of test, nature of the test data, nature of the control data, and the level of significance of observed differences between the incidence of tumours in tests in contrast to control groups.

What the Amendment properly precludes, however, is the ability of a regulatory official, in response to industrial lobbying, political pressure or

According to general legal interpretation, the Delaney Amendment applies only to intentional food additives, and unintentional food additives, such as pesticide residues, are excluded from its requirements. ignorance, from setting arbitrary tolerances for carcinogenic food additives. Indeed, in the absence of such protective legislation it is difficult to conceive that the FDA would have, albeit belatedly, restricted cyclamates or DES, both unequivocal carcinogens.

Advances in analytic technology have made the zero tolerance concept untenable.

It is true that advances in analytic technology have made it possible to measure some trace residues at levels ranging from the part per million to the part per billion. However, the lower the concentration detected the lower is the risk. Exact quantification, in terms of numbers of presumed human cancer deaths, cannot be developed to express this degree of risk. We do know, however, that for carcinogens such as aflatoxin, a "no-effect level" is not reached in the rat or trout even at the part per billion level.

Additionally, establishing "low level" residue tolerances for any one carcino-, gen in food would, by precedent, permit unlimited numbers of other carcinogens also to be added. Apart from synergism between known carcinogens, between a known carcinogen and noncarcinogen, a wide range of undefined interactive mechanisms exist, which completely justify the concept of absolute zero tolerances. Relaxation of such tolerances carries with it the implicit risk of finite, but unquantifiable cancer risks. Additionally, estimation or prediction of cumulative effects of numerous low level dietary carcinogens is impossible.

The position of qualified experts

On 24 October 1969, the Deputy Assistant Secretary for HEW appointed an Ad Hoc eight-man committee, composed of recognised authorities in chemical carcinogenesis from universities and from the NCI, to investigate problems relating to low levels of environmental carcinogens (Ad Hoc Committee Report, 1970).

The Report, which was submitted to the Surgeon General on 22 April 1970, unanimously and unequivocally endorsed the Delaney Amendment with statements such as the following:

"The scientific basis on which the Government's position was established in 1958 remains valid. The progress of knowledge in carcinogenesis in the last decade has only strengthened the points made in Secretary Flemming's testimony."

The Ad Hoc Committee in an appendix to its Report severely criticised the NAS 1969 guidelines as follows:

"Since the purpose of the Report (the NAS guidelines) is to recommend guidelines and practices for selecting chemicals for human use without direct experimental toxicological evaluation, the lack of consideration of irreversible long-term toxic effects (which would not be ruled out by the suggested criteria) makes the suggested approach practically inappropriate and potentially dangerous."

On 14 December 1970, Dr Handler, the President of the NAS, wrote to the Surgeon General, Steinfield, supporting the position taken by his Food Protection Committee Task Force, rejecting the criticisms of it by the Ad Hoc Committee, and rejecting the unqualified support of the Delaney Amendment by the Ad Hoc Committee.

At a subsequent meeting between the Task Force and the Ad Hoc Committee, the Task Force offered a partial retraction, by suggesting that the concept of toxicological insignificance, that it had previously propounded, did not preclude the need for testing, but merely accorded a low priority for testing of chemicals in this category.

The position of HEW and the FDA

The cyclamate debacle prompted attempts in HEW to seek relaxation of the supposedly restrictive requirements of the Delaney Amendment. A proposed amendment was drafted which extended the Amendment to include teratogens and mutagens, besides carcinogens, but weakened it by allowing the Secretary of HEW to develop tolerances for any of these three classes of hazardous effects.

This draft bill aroused considerable opposition in the FDA, which as succinctly expressed in an internal memorandum, dated 5 December 1969, by a senior FDA official, Mr Alan T. Spiher, who vigorously opposed the draft bill, strongly endorsed the Delaney Amendment, and recommended its extension to mutagens and teratogens.

Dr Edwards who is now Assistant Secretary at HEW, has publicly denounced the Delaney Amendment as being "unscientific".

Currently, data are being developed



by the FDA, at Pine Bluff and elsewhere at the taxpayer's expense, which will be used to challenge the law, the Delaney Amendment, designed to protect him. Such plans are improper, as the onus for testing of profitable food chemicals legally devolves on industry. Apart from the impropriety of this approach, scientifically the large scale "megamouse" animal studies planned will certainly not provide the data needed to challenge the concept of zero tolerances for dietary carcinogens.

Referring to the "megamouse" studies planned at Pine Bluff, Dr Saffiotti, Associate Director for Carcinogenesis at the NCI, stated in recent Congressional Hearings (Saffiotti, 1971):

"I personally believe that certain approaches to the problem of identifying a 'safe threshold' for carcinogens are scientifically and economically unsound. I have in mind some proposals to test graded doses of one carcinogen, down to extremely low levels, such as those to which a human population may be exposed through, say, residues in food. In order to detect possible low incidences of tumours, such a study would use large numbers of mice, of the order of magnitude of 100,000 mice per experiment. This approach seems to assume that such a study would reveal that there is a threshold dose below which the carcinogen is no longer effective, and therefore that a 'safe dose' can be identified in this manner. Now, there is presently no scientific basis

Testing at high dosages does not produce false positive carcinogenic results. There is no basis whatsoever for the contention that all chemicals are carcinogenic or mutagenic at high doses.

for assuming that such a threshold would appear. Chances are that such a 'megamouse experiment' would actually confirm that no threshold can be determined. But let us assume that the results showed a lack of measurable tumour response below a certain dose level in the selected set of experimental conditions and for the single carcinogen under test. In order to base any generalisation for safety extrapolations on such a hypothetical finding, one would have to confirm it and extend it to include other carcinogens and other experimental conditions such as variations in diet, in the vehicles used, in the age of the animals, their sex, etc. Each of these tests would then imply other 'megamouse experiments'. The task would be a formidable one: suffice it to say that an experiment on 100,000 mice would cost about 15 million dollars; if one did 20 such experiments, it would cost 300 million dollars. All this to try and estimate the possible shape of a dose response curve, which would still leave most of our problems in the evaluation of carcinogenesis hazards unsolved. This effort would also block the nation's resources for long-term bioassays for years to come and actually prevent the use of such resources for the detection of potent carcinogenic hazards from yet untested environmental chemicals. If two million mice are made available as a resource, they can be used effectively to test 4,000 new compounds, each on 500 mice, thereby detecting among them those that are highly carcinogenic in the test conditions."

Proposed extension of the Delaney Amendment to carcinogens in water

Pursuant to section 515 of the Federal Water Pollution Control Act, the Administrator of the EPA announced in the Federal Register of 18 June 1973, his intention to hold public hearings with respect to proposing effluent standards for a list of 12 toxic pollutants. This represents an attempt to limit or ban discharges of these pollutants into water from "point sources", such as manufacturing plants, and hence to limit the possible occurrence of these pollutants in drinking water. Included in these pollutants are well-known carcinogens such as DDT, aldrin and benzidine.

Active consideration is now being directed to the possibility that the

Delaney law can be invoked against the deliberate discharge of carcinogens into water from industrial sources on the grounds that water is not only a "food" but is also used as as ingredient in the preparation of most foods. Additionally, the FDA has jurisdiction over bottled water sold in interstate commerce.

Proposed extension of the Delaney concept to occupational carcinogens

On 4 January 1973 the Oil, Chemical and Atomic Workers Union and the Health Research Group, Washington, D.C. filed a petition requesting the Department of Labor to promulgate Emergency Temporary Standards for 10 carcinogens which included wellknown occupational carcinogens such as benzidine and bis(chloromethyl) ether. The Department of Labor responded promptly and promulgated such temporary standards for 14 carcinogens, as announced in the Federal Register of 3 May 1973. An advisory Committee was appointed in June 1973, and charged with the mandate of recommending permanent standards which must be promulgated by November 1973. The Committee is on record as endorsing the concept that any level of exposure to occupational carcinogens represents a hazard and that the ideal of "no-exposure" must be pursued.

This represents the first time when decisions on occupational safety, in general, and occupational carcinogens, in particular, are being considered in an open adversarial forum and also the first time when the concept of noexposure, as dictated by the Delaney law, is under consideration for occupational carcinogens.

Proposed extension of the Delaney concept to include mutagens and teratogens

Carcinogenicity, mutagenicity and teratogenicity are unique and irreversible manifestations of chronic toxicity. No valid data exist indicating the existence of threshold levels for mutagens or teratogens, as indeed for carcinogens. For this reason, it appears both logical and consistent to extend the Delaney concept to mutagens and teratogens.

Indeed, concern for mutagenic effects, which can deleteriously affect many generations as yet unborn, must be even greater than for carcinogens



which affect one generation only.

As pointed out in recent Senate hearings (Epstein, 1971):

"Mutations can produce a wide diversity of deleterious effects. Many mutations produce effects similar to those produced by other, non-genetic causes. The impact of environmental mutagens is thus statistical rather than unique. This problem is further complicated by the time distribution of mutational effects. Some mutant genes are dominant, in which case, the abnormality or disease will appear in the immediate generation following occurrence of the mutation. Dominant mutations express themselves as early foetal deaths, or in abnormalities, such as achondroplasia, polydactyly, retinoblastoma, and sterility. On the other hand, the mutation may be recessive, requiring the presence of abnormal genes in both homologous chromosomes-one derived from each parent -to produce the effect. Recessive mutations, such as albinism, Fanconi anaemia, amaurotic idiocy, and phenylketonuria, may then be unexpressed for many generations. The major effects of increased mutation rates would thus be less obvious and spread over many generations, and would include ill-defined abnormalities, such as premature aging, and enhanced susceptibility to various diseases, notably leukemia and cancer, and alterations in sex ratios (Crow, 1968; Report of the Advisory Panel on Mutagenicity, HEW 1969.)"

In spite of repeated recommendations of expert advisory groups (Genetic Study section of the NIH, Crow Report, 1968; *Report of the Advisory*

Scientifically, there is no way to determine a safe level for a substance known to produce cancer in animals. Panel on Mutagenicity, HEW, 1969; Report on the NIEHS Task Force, 1970; Friedman, et al, Report of the FDA Advisory Committee on protocols for safety evaluation, 1970) that mutagenicity testing with currently available and practical methods be made mandatory or otherwise introduced into the standard armamentarium or toxicity testing, protocols for mutagenicity testing of food additives have still not yet been promulgated in the Federal Register, nor even have guidelines for such testing yet been published by the FDA.

The argument that available mutagenicity tests be further validated before their introduction into regulatory practice is without merit. Never in the history of the development of toxicology, have such extensive collaborative tests been successfully undertaken between government, industry and university scientists, as indeed has been the case with mutagenicity tests (Legator, 1972); the reproducibility, sensitivity, and practicality of these tests has been overwhelmingly established.

In spite of this a senior FDA official (Wodicka, 1972), with reference to Food Additives, recently stated:

"We have several contracts under way to test a selected number of the materials for teratogenicity and mutagenicity, as much to test the methods as to test the substances. The novelty of these fields is such that the methods are not generally accepted or agreed to and we need to make sure that the methods are okay before we draw any conclusions from the results."

Strong endorsement of the critical need to introduce mandatory mutagenicity testing was made by EPA Administrator Ruckelshaus (now Assistant Attorney General) in his speech before the Society of Toxicology on 9 March 1971:

"The truth is that most of the pollutants of the environment which engage our concern today have never been evaluated in these terms. Yet, I am informed that recently developed techniques are available that offer practical procedures for routinely testing for the hazards of mutations, cancer induction, or foetal damage. The need for such routine testing is clear. Certainly we ought not to wait for tragedies like the thalidomide incident of the 60s before responding to the need. And surely it would be unconscionable—inconceivable, in fact—that we should wait for time to reveal harmful mutations before we try to search out and eliminate the chemical mutagens."

This statement has been reflected in current EPA regulatory practice, which requires mutagenicity testing for pesticides.

With relation to teratogens, it was recently stated at Congressional Hearings (Epstein, 1971) that:

"Although the teratogenicity of various chemicals has been experimentally recognised for several decades, only after the thalidomide disaster of 1962 were legislative requirements for threegenerations reproductive tests established: the appropriateness of these as tests for teratogenicity has been questioned (*Report of the Advisory Panel* on *Teratogenicity*, HEW, 1969)."

The fact that some form of teratogenicity tests are now required in support of petitions for food additives clearly narrows the problem of the applicability of the Delaney concept to teratogens to the question of whether true threshold doses, rather than apparent no-effect levels, can be or ever have been validly established for teratogens. Therefore, the Delaney concept is apparently also relevant to teratogens.

The suggestion that all chemicals are teratogenic, as opposed to foeto-toxic, at high levels, such as the maximally tolerated doses, is clearly incorrect, as evidenced by the relatively low incidence of teratogenic compounds among the 48 pesticides tested by Bionectics Laboratories (*Report of the Advisory Panel on Teratogenicity of Pesticides*, HEW, 1969). The Report also stated:

"Pesticides should be tested at various concentrations including levels substantially higher than those to which the human population are likely to be exposed."

The Report also emphasises the insensitivity of standard test systems imposed by the relatively insufficient numbers of litters conventionally tested. The Report further states:

"Thus, compounds showing no increase (in birth defects) cannot be considered non-teratogenic."

Public health concerns on teratogens have been greatly increased by the realisation that they may produce transplacental carcinogenic effects. Transplacental carcinogenicity is thus an additional manifestation of teratogenicity.

The carcinogenic effect of teratogens is still largely unexplored as pregnant



animals are generally sacrificed by caesarean section in teratogenicity experiments. However, recent information has developed with relation to Nnitroso compounds indicating that they may induce carcinogenic effects, particularly of the central nervous system, when administered to rodents after organogenesis is complete (Preussmann *et al.*, 1969): administration of such agents during organogenesis may produce foeto-toxicity and growth disturbances, particularly of the central nervous system.

These findings are of particular importance in view of the ease of synthesis of N-nitroso compounds from simple precursors, nitrites and amides or amines, which are widely distributed in the environment, and also in view of strong epidemiological data implicating the influence of prenatal events in childhood tumours of the central nervous system and elsewhere (Miller, 1966). Such evidence includes peaks in mortality from major childhood tumours under the age of five years, the occasional association between such tumours and growth disturbances, such as hamartomas and congenital hemihypertrophy and the increased tumour risk in sibs of children with brain and other tumours.

These considerations are all the more compelling in view of the fact that recent Swedish data (Schubert, 1972) have revealed the following alarming facts:

"... the incidence of cancer of the

To predict a safe level for thalidomide or for 2-naphthylamine, from rodent data or from derived mathematical models, would expose humans to grossly unwarranted hazards. nervous system (predominantly of the brain) in children in the 0–4 year age group, has approximately tripled in the year for which data are available. The increase is statistically significant. There was no comparable increase in the incidence of nervous system tumours in the age groups 5–9 and 10–14 years. This suggests that the levels of the responsible factors have increased mainly during the last decade."

However, no such increase in nervous system tumours has been noted in the USA (Schneiderman, 1973).

Transplacental carcinogenicity, as a manifestation of teratogenicity, can be delayed until adult life, as has been recently demonstrated in post-pubertal girls, whose mothers were treated with DES during pregnancy, and more than adenocarcinoma of the vagina (Herbst *et al.*, 1971). In this connection, the reluctance of the FDA to ban the use of DES as a contraceptive morning after pill has been considered by some to exemplify their apparent image of industry and their disproportionate lack of concern with consumer hazards.

The benefit risk concept

The need to use many synthetic chemicals makes it essential to recognise and estimate the human and environmental ability with regard to the matching benefits they confer. Such costing must be weighted by factors including the persistence and environmental mobility of the chemical, the size of the population exposed, and the reversibility of the adverse effect. The costs of one malformed child, based on remedial and custodial care alone and excluding the deprivation of earnings, have been recently estimated as about \$250,000 (Oberle, 1969); similar costings can be developed for cancer induced by carcinogenic environmental pollutants. However, such costing is clearly impossible for genetic hazards, the scope and extent of whose effects in future generations cannot be predicted. Externalised environmental costs have until recently been ignored or discounted.

Hazards from a particular synthetic chemical need not necessarily be accepted even when matching benefits appear high, as equally efficacious but nonhazardous alternatives are usually available. The mandatory criterion of efficacy, once extended from therapeutic drugs to other synthetic chemicals, such as food additives and pesticides, may well simplify such

equations, especially for hazards from synthetic chemicals with no demonstrable benefits for the general population (Epstein, 1972 a and b). The imposition of a requirement for broad social utility may even further simplify the benefit-hazard equation. Illustratively, methoxychlor can replace the persistent and carcinogenic DDT whose efficacy for cotton insect control -a major current usage in the United States-is now questionable due to the emergence of DDT resistance. Such concepts have been recently emphasised with regard to food additives by an industrial representative who recommended that additives be excluded from products unless they either significantly improve the quality or nutritive value of the food or lower its cost as well as being safe (Kendall, 1969). This is in interesting contrast to the FDA viewpoint.

At recent Congressional hearings before Senator Nelson on 20 September 1972, FDA Commissioner Edwards opposed the recommendations Senator Nelson's Bill S. 3163 that a requirement for necessity or broad societal efficacy be imposed on food additives. In view of the FDA's ambivalent attitude on the Delaney Amendment, this is tantamount to an expression of apparent willingness to inflict carcinogenic hazards on massive human populations without providing them with demonstrable matching benefits.

Inherent in toxicological and regulatory philosophy and practice is lip service to the concept of balancing benefit, and benefit to the public not to industry, against risk, and risk to public health or environmental integrity and not economic risk to industry. If the chemical in question does not serve a broad socially and economically useful purpose for the general population, why introduce it and force the publicat-large to accept potential hazards without general matching benefits? Such questions should be vigorously directed to carcinogenic, and otherwise hazardous, cosmetic food colouring agents, in particular, and to all food additives, in general.

Conclusions

It has now become axiomatic that there are major defects in decision making procedures in regulatory processes, in general, and in the regulatory activities of the FDA relating to food additives,



in particular.

It is clear that the system of checks and balances, essential to the democratic process, is largely absent from FDA regulatory practice (Epstein, 1972 a and b). Apart from limited post hoc recourse, the citizen and consumer, and those who represent his interests, scientifically and legally, are virtually excluded from anticipatory involvement in decisions vitally affecting them. The concept of matching benefits against risk has been applied by the FDA to maximise short-term benefits to industry, even though this may entail minimal benefits and maximal risks to the consumer. While such an approach is of course detrimental to the consumer; it is also detrimental to the long-term interests of industry, which may suffer economic dislocation major when hazardous products, to which it has improperly developed major commitments, are belatedly banned from commerce. Such problems are in large measure attributable to crippling constraints which have developed and which still dominate the decision making process within the FDA. Responsibility for these constraints must be shared with the FDA, by the legislature, by the scientific community, and by consumers and citizens, who have not yet developed adequate mechanisms

Active consideration is now being directed to the possibility that the Delaney law can be invoked against the deliberate discharge of carcinogens into water from industrial sources on the grounds that water is not only a "food" but is also used as an ingredient in the preparation of most foods. for protecting their own vital rights and interests.

It is perhaps no coincidence that the attacks on the Delaney Amendment are mounting at a time when the food chemical industry is poised for a major expansion. The chemical industry predicts that sales of chemical additives are expected to grow from \$485 million in 1970 to \$750 million by 1980. In providing a framework for evaluating potential hazards of these additives, the Delaney Clause simply ratifies the prevailing expert opinion in the NCI and in other professionally qualified groups that there is no practical method to determine safe dietary levels for a carcinogen. Changing the Delaney Clause to give FDA discretion to set tolerances for carcinogens is, therefore, not only scientifically inappropriate, but, administratively foolhardy.

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There is no direct British equivalent to the Delaney Amendment, but similar food additives are used and a similar relationship exists between these additives and the health of consumers. In a forthcoming Ecologist Sydney Alford, a British nutritionist, will describe the current situation with regard to food additives in this country and the protection afforded to the consumer.

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Reports

Schools eco-action

What makes good environmental education? Many organisations connected with the environment have tried to find an answer, and, almost without exception, they have ignored the contribution which can be made by the secondary school students themselves. Such attempts are only likely to show a limited measure of success, since in many conservative schools, environmental ideas will never be introduced unless school students take environmental education into their own hands.

This type of activity has a value far beyond that of plugging a gap which the education authorities are reluctant to fill. Only through voluntary involvement in an ecology group which takes ecological principles out of the classroom, and confronts the real world, can the school student appreciate that the environment is a cause, not a subject; a commitment, not a study.

School student action has other advantages. The activities themselves are of concrete value to the environment; the effects of national and local campaigns on parents are likely to be greatly increased if their children are personally involved; in school groups a new generation of activists is being nurtured, and through such a grassroots movement, the devotion and change of spirit demanded by the Blueprint can become a reality. It is on the school-group activists of today, whether they monitor pollution in-California, or recycle newspapers in Hampshire, that the stable society of tomorrow will be built.

The Schools Eco-Action Group was formed in January of this year. Since then, it has produced four action and education guides on newspaper recycling, population, toxic metals and survival gardening, and others are in the pipeline. Other services include the maintenance of stocks of literature on all aspects of the environment, and a mail-order book-service with full book-reviews, and advice and references available for all school groups.

Member groups are kept informed of the campaigns of other schools affiliated to SEAG, and also of a few of the highly successful American school groups. All of these have appeared in the 20-page monthly newsletters that SEAG produces. (Back issues of the action guides are available separately, though they originally appeared in the newsletters). For those starting up groups a 26-page duplicated Guide to Secondary School Environmental Action: An Introductory Campaign Guide (available from SEAG for 10p) has also been produced. Advice and information are available to school groups at all times.

In the future we hope to set up a mobile exhibition to tour schools, and help set up ecology groups. We hope to do this early in 1974, but this will obviously depend on SEAG's financial situation! We shall also be producing a guide to the various environmental organisations in this country (SEAG is affiliated to FOE and the Conservation Society), and making an effort to encourage school students to join one or more of them. In this way they are more likely to continue to be active in the ecology movement after leaving school.

Last May, SEAG sent a delegate to the International Conference on Youth and the Environment in Chicago. Sponsored by UNESCO, the conference drew together school-group delegates from 12 countries to discuss their approach to ecology, education and international co-operation in the field of school ecology action. In general, the outlook of the delegates is the same as that of SEAG. That is, basically in accordance with the ideas expressed in the *Blueprint*, though with appropriate modifications to include greater social equality, particularly between the over-developed and under-developed countries—a problem of particular concern to SEAG. The simultaneous appearance of school groups in many parts of the world gives ground for optimism.

What you can do

Please write to SEAG for details if you are either a student or teacher, and might be interested in forming a group at your school. This involves a considerable amount of effort in organisation, and in rousing and holding enthusiasm for the work of the group. The effort is well worth while, and some groups have been very successful. SEAG will send you the introductory campaign guide, and give you advice and information including the addresses of local organisations, and local branches of national organisations, and if necessary produce suitable literature for circulation. If you feel that you do not have enough time to form your own group, but would be prepared to disseminate SEAG propaganda, we should be very glad to hear

Sponsored by Outset 73 (Tallis House, Tallis Street, London EC4Y0JA) 600 young volunteers spent two days in July clearing part of the Thames foreshore to raise money for charity. Well over $\pounds 1,000$ was raised.



from you.

SEAG is short-staffed, and if you have just left school and would be prepared to work full-time or part-time for a period during the present school year, please contact us. Advice, suggestions and offers of help in other ways are also much appreciated.

If you would like to have details, the address is: 28 Wood Lane, Highgate, London N6 5UB.

At present, SEAG has 25 member schools, and we hope to expand this ultimately to every secondary school in the country. In order to increase our membership and our services, we shall need money. Member schools at present pay 50p per year for the newsletter, though this in no way covers our costs, and adults can become associate members for £2 per year. Through the fund-raising efforts of member schools, and through subscriptions, we ought to become self-sufficient, but the size of our membership, and the pressing need for expansion makes this quite impossible at the moment. Therefore any contributions, or advice about fund-raising methods, will be gratefully received.

Julian Cummins and Phil Brooke

Chrysler in Leicester: the buyer can move in

The Inquiry into Chrysler's application to buy 605 acres of land near the village of Bruntingthorpe, Leicestershire, for use as a vehicle testing centre has reached its decision. Chrysler can move in.

We predicted* the battle would be one in which the important issues were not raised. This foreboding was amply borne out by the events. Every question of real substance was excluded from the Inquiry either by its terms of reference or by the Inspector's refusal to give weight to broader considerations, aided by the determination of local objectors to concentrate on the relatively minor matter of noise nuisance.

This seems to have been a tactical error. The evidence is completely bogged down in technical considerations of noise measurements. To those who live in an urban environment, the concern of those who would preserve the pristine quiet of the countryside from the additional noise of a dozen or so vehicles verges on the cranky. Noise is the condition of modern existence. A few decibels here or there is of little moment.

What the Bruntingthorpe Inquiry ignored was the future of the motor industry. There was no discussion of that. It is probably the most fundamental point of all.

Nor was there any real discussion of agricultural land. The Inspector ruled that it was not "a material consideration". In other words, there is no way in which he could consider the relevance of taking 600 acres of farm land and devoting it to motor vehicle testing.

Finally, the Inquiry failed totally to clear up the ugly secrecy surrounding the sale. No details have been released of the price Chrysler paid or the conditions under which they acquired their exclusive option to tender for the land. It is believed they paid in the region of £150 per acre. A current value for the land would be between four and six times that amount.

Commercial security was a reason Chrysler gave for needing Bruntingthorpe. Despite the incredulous chal-

Coming events

25 November—A Strategy for Energy— One-day symposium organised jointly by The Conservation Society and The Science and Technology Society, to consider the political, social, economic and environmental consequences of the worsening energy crisis, and also to survey the opportunities for capital investment in renewable energy sources. Full details from Peter Dickson, 11 Hamilton Crescent, Bearsden, Glasgow.

26–29 November—Fuel and the Environment 1973. Conference organised by the Institute of Fuel. Further information from the Conference Secretary, 18 Devonshire Street, London W1N 2AU.

28-30 November—International symposium "RECYCLING and corporate goals: A new environmental technology or a new economic priority?" For further information contact Rudolf Brun, Gottlieb Duttweiler Institute, CH-8803 Ruschlikon, Switzerland.

13-17 November 1974—Anti-Pollution Exhibition, Milan. For further details contact Peter R. Smith, The Birmingham Engineering & Building Centre Limited, Broad Street, Birmingham B1 2DB.

4-7 December—Seminar on Heavy Metals in the Environment to be held at Vanderbilt University, Nashville, Tennessee. Further information from Professor Peter A. Krenkel, Box 1670, Station B, Vanderbilt University, Nashville, Tennessee 37235, USA.

17-21 December-Congress on Marine Waste Disposal to be held in San Remo, lenge to this made by some of the objectors, the Inspector seems to have accepted it. Since the erection of a chain-link fence offers no protection against even a moderately competent industrial spy or what Ian Breach called an "enterprising journalist", one must look to another meaning for the term "commercial security".

Whether or not Chrysler's cars are secure, their investment is, for out of the muddle the company has emerged as the owner of 600 acres of prime agricultural land whose value continues to rise.

Gerald Foley

* Ecologist, 1973. 3. 2, 41.

The extracts printed in our September issue under the title "Progress to Poverty" were taken from the book *Poverty and Progress* by Richard G. Wilkinson published by Methuen & Co. Ltd., in March 1973, in hardback £2.60 and paperback at £1.25., © 1973 Richard G. Wilkinson.

Italy. Details from Prof. E. F. Frangipane, Institute of Sanitary Engineering, Milan Polytechnic, Piazza Leonardo da Vinci 32, 20133, Milan, Italy.

Summer Term 1974—One term course for serving teachers of the 8 to 13 years group in Environmental Studies. The course will consider environmental problems and the contribution that education can make to their solution. The main emphasis will be on teaching method. Further details from John Burton, Alsager College of Education, Alsager, Cheshire.

9-13 September 1974—Water Pollution Research. Seventh International Conference. Paris. Completed papers on all aspects of water pollution research in the freshwater and marine environment are invited before 7th November 1973 for the above conference. Enquiries—contact Dr S. H. Jenkins, c/o Upper Tame Main Drainage Authority, 156/170 Newhall Street, Birmingham B3 1SE.

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Notebook

Who gains from development?

Development does not combat poverty, it benefits mainly the rich. This is illustrated by the experience of India. "During the First Development Decade (to be precise, between 1960-61 and 1967-68), while overall per capita consumption of the population increased by 2.4 per cent, the per capita consumption of the poorest 40 per cent of the population actually fell, that of the poorest 10 per cent of the population falling by over 15 per cent. For the rural population also, while overall per capita consumption increased by 3.8 per cent that increase was also less for the poorer people, and that of the poorest 5 per cent of the rural population actually fell. At the same time, the disparity between the urban sector and the rural sector increased to the disadvantage of the poorer rural sector."

"Poverty in India" by V. M. Dandekar and Nilahanthar Rath, Indian School of Political Economy, Bombay, 1971. Quoted by Hans Singer in *New Internationalist*.

Liars, damned liars and expert witnesses

Massive compensation is being sought on behalf of four men exposed to high levels of radiation while working at Windscale Atomic Energy Plant. The management of British Nuclear Fuels, which runs the plant, denies there is any evidence that the diseases they suffered from, and which in two cases have resulted in death, can be attributed to the radiation they received.

Experts can be found to say practically anything. It is a by-word in the legal profession that there are three types of liars; ordinary liars, damned liars and expert witnesses. An eminent professor who acted as an expert witness in a courtroom in Japan, not long ago, testified that there was no evidence that thalidomide was in any way associated with infant malformations.

However, Dr James Ferris, a Home Office pathologist, takes some beating. He told the inquest on Mr Henry King, one of the victims (who has recently died of a brain tumour), that there was no known association between plutonium radiation and the development of malignant tumours, though he admitted, somewhat magnanimously, that the remote possibility could not be excluded.

One of the solicitors complains that so little is known about plutonium that he finds it difficult to prepare his case. I suggest he gets in touch with the *Ecologist*. Radiation is the carcinogen about which we know the most, and plutonium is one of the most dangerous sources known. It is generally accepted that the smallest dose can cause biological damage that could cause cancer, the bigger the dose, the greater the danger. The literature on the subject is massive.

There is only one problem, and that is that people living in industrial society are subjected to a very large number of carcinogens and it is impossible, in theory as well as in practice, to prove which one is responsible for a particular tumour. However, if Mr King was subjected to an inordinately high dose of a particular carcinogen: radiation, then it is only reasonable to accept that this one, rather than any others to which he may have been exposed at current levels, is responsible for his death. To apply any other criterion would be a travesty of justice.

Slavery thriving

The somewhat arbitrary movement of labour by economic rather than physical pressure continues to do well. France now has 3.5 million immigrant workers-nearly twice as many as Britain, which is falling behind, and 175,000 newcomers enter the country each year. One labourer in five is now an immigrant. They come from Algeria (750,000), Portugal (685,000), Spain (650,000), Italy (590,000), Morocco (110,000),Tunisia (95,000), Black (60,000),Africa and Yugoslavia (55,000).

Jonathan Power, "The Third World in Paris". New Internationalist.

Another synergic effect

The Tyne Tunnel entrance at Wallsend appears to be polluted with a combination of antimony oxide and sulphur dioxide, which when mixed with rain water may constitute a dangerous health hazard.

According to a recent report, antimony oxide is not normally soluble in water, but the presence of sulphur dioxide (SO₂) in the air and consequently in the water, aids the solubility of the antimony and the resultant liquid has a mildly acid nature. This means that the antimony oxide has been converted, or "activated" by the SO₂ into a soluble poison which may make it capable of inflicting its maximum potential of injury.

Held responsible for the pollution, according to the *Sunday Times* (9 September 1973), is The Associated Lead Manufacturers Limited Antimony Works which each year produces 10,000 tons of antimony. Pollution from this factory is held responsible for the death of 15,000 trees on the approaches to the Tunnel, as well as ill health—mainly sickness and headaches, among workers.

Needless to say, the management maintains that emissions of antimony oxide and SO_2 from the factory are within safety limits. This may well be true: in which case it would tend to show once more how totally arbitrary are accepted safety limits. In fact, if one considers that there are probably synergic effects of this sort between most of the 500,000 or so pollutants in the environment, then it must be logistically impossible to establish anything but arbitary limits.

The vulnerability of industrial society

Itzhak Rabin, ex-Israeli Ambassador to the US, commented to Journalist Joseph Alsop about America's energy problems.

"You do not think enough about the oil problem. I have been looking into it for months. It is worse than you think —ten times worse. Your jugular, Western Europe's jugular, Japan's jugular all run through the Persian Gulf nowadays. Yet you have no means to defend your jugular... No nation can remain a great power that has a wholly undefended jugular waiting to be cut by anyone with a willing knife."

Friends of the Earth

Maplin

The completion of Maplin airport has been delayed for two years. It will now not be opened until 1982, says Environment Secretary, Mr Geoffrey Rippon.

But the ugly tentacles of urban sprawl and industrial development are still threatening the peaceful agricultural countryside of South East Essex. The Maplin project is not dead yet.

Most of the people in Essex only awoke this summer to the imminent threat, posed by Maplin, to their environment and way of life.

Until July, the Government had successfully propagated the illusion that Maplin airport was to be sited in the middle of the Thames Estuary, affecting nobody except the unfortunate Brent Geese.

But the hammer had to fall sooner or later. The Government finally admitted that a 600,000 population new city would have to be created, access routes to London would have to be built, and it would give no assurances that there would be no major industrial development.

The pieces of the jigsaw, which the Government had been hiding for so long, were put together. A major port would be built at Maplin; oil terminals for 500,000-ton tankers; oil refineries on nearby Canvey Island; a vast workforce imported into the area.

The Government clearly wanted to create a Europort—just like the Dutch had built at Rotterdam. It was a frightening prospect.

And so the airport is now seen as only the thin end of the wedge. It is why, despite overwhelming expert opinion against the need for a third London airport, the Government is still pushing the legislation through Parliament.

This is all the more reason for environmentalists throughout the country to oppose the Maplin scheme. For it embraces a whole philosophy—involving unthinking economic growth, destruction of wild life and prime quality agricultural land, and the end for scores of village communities.

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Consequently, Friends of the Earth has thrown its full weight behind the battle to stop Maplin. Nationally, the spearhead of the opposition is The Defenders of Essex. Help given by FOE includes underwriting the salary of a full-time official for the Defenders.

We have also promoted a widespread questionnaire to the people of Essex, canvassing their views, and towards the end of October we helped to mount a large-scale car invasion on London.

But although Central Office has been able to give this assistance, the ultimate success of the Campaign will depend largely on the presence of a strong national body of opinion against the project. The key actions will be fought in Parliament and so local FOE groups must keep up the pressure on their MPs. The politicians should be challenged. Write and ask why, for example, so much public money is being invested in the South East for a scheme so questioned by the industry itself.

When the Maplin Development Bill returns from the House of Lords to the Commons in October it will almost certainly become law. The Whips will fight hard to prevent a defeat now, particularly as the Bill has been amended by the Lords to the effect that Government must refer back to the House after further consultation. This will involve the Civil Aviation Authority (CAA) and the National Ports Council (NPC). The CAA have already strongly questioned the need for the airport; what the NPC will say to the idea of supertankers in the Channel and the place of such a port in the South East remains to be seen.

Problems also remain on the party political front, for a general election is in the offing, and opposers to Maplin should not forget all those seats to be gained or lost in West London over the noise issue (assuming that it is made the issue of importance that the current supporters of Maplin claim it to be).

People living around Heathrow and Gatwick are held out as wanting to see Maplin built. They believe, we are told, it will alleviate noise nuisance over their homes—even if they have to wait 10 years for relief.

If this is the case, these unfortunate people have been grossly misguided and are being used by the Government as pawns in a very sordid game. It has been calculated that improvements in aero-technology could be ten times as effective in reducing noise nuisance at Heathrow and Gatwick, if the Government would give the necessary financial backing.

The Roskill Commission investigated the third London airport question in 1970. Recently, its Deputy Research Tony Flowerdew, Director. Mr. had this to say: "It is my belief, after examining the evidence, that relatively simple and quick studies would be enough to provide clinching evidence that Maplin is a yast and environmentally damaging waste of public money, with the added risk that its construction will remove the necessarv impetus from the far more socially desirable programme of research and development into making the jet aircraft an acceptable neighbour".

However, taking all the "detailed" (sic) points on noise, the unfortunate geese, the villages, etc., etc., aside, one thing is made abundantly clear in all the fuss and argument. Nobody, it seems, in Government is capable of seeing the scheme in the round. We still have no national airport (nor transport) plan compatible with the concept of limited resources; we are still being asked to accept "super" developments involving environmental destruction and resource extravagance on an unprecedented scale in the name of progress and political prestige.

It is high time that Government came clean on the issue and called a public inquiry to examine the need and the cost of the proposed foulmess at Foulness.

Roger Anderson

(Joint FOE/Defenders of Essex Project Co-ordinator.)

Books

Mechanical toys

TECHNOLOGY, MAN AND THE ENVIRONMENT by David Hamilton. Faber. £4.75.

MAN, MACHINES AND TOMOR-ROW by M. W. Thring. Routledge and Kegan Paul. £2.25.

Both these books are feverishly keen to establish convential wisdom myths, and then to go on and create new ones! In breathless wonder David Hamilton recaps on the triumphs of hardware technology: nuclear power, the oil-chemicals industries, space exploration. Thring, after querulously pointing out some of the many real dangers of "technologism" goes into paroxysms of joy about the weird, generally useless and often hilarious creations that a "leisure" society might require.

Hamilton's book is undoubtedly the more "serious". Po-faced, we are taken through all the usual back-up. On every page exponential curves leap to horizons marked 2000-and the process is hailed as progress, at last, for mankind. The recource bases, cultural discontinuities, ecosystem stabilities, and other implications of continuous growth are very sketchily treated. After blandly stating that the car industry "is a pillar of modern technological society", Hamilton at least devotes a page or so to showing this pillar is rotting its own foundations. Here there is the effect of change's pace getting faster. When this book was writtenabout mid-1972-the car and motorway lobby was still in the ascendant, though in retrospect we see that it had reached its zenith. For now the Government itself (not generally admired for its bold radicalism) has at least called a tiny "no" to the car.

The nuclear power industry—providers of the only power systems that no insurance company would dream of insuring—is also fading a little now. Yet in Mr Hamilton's book we are back in the cuckoo land of early Teller. We are guilelessly presented the spectacle of Sorcerer's Apprentices who have just cracked the fission and fast reactor code. They can envisage an exponential process for producing plutonium—one of the deadliest materials on earth. This is of course just the stuff for military regimes, states at war, and unstable democracies.

Imagine that somehow we get the massive automation, electronic decentralisation of office work, and fantastic energy subsidy that an 18-hours-perweek leisure society would need. What then could be more necessary than a machine for walking upstairs? Or a table-clearing machine (that presumably hovers over the hapless leisurite as he consumes food-style aminoacid soup)? In Thring's book there is even a mechanical elephant; soon we can have metal replacements for all flora and fauna. After that we would really need a machine to take us to bed!

Both these books are chronicles in praise of false and unattainable gods. Whilst other civilisations have left wasteland tracts as mementoes, ours promises wastes that will need guarding for thousands of years. Perhaps we can find a Thring to design mechanical attendants for this, and a Hamilton to sing its delights.

Andrew MacKillop

Nothing new

SELF-SUFFICIENCY by John and Sally Seymour. Faber and Faber. £2.95.

POLITICAL WRITINGS OF WILLIAM MORRIS, edited by A. L. Morton. Lawrence and Wishart. £1.

For the last 18 years, John Seymour and his wife Sally have provided themselves, their children and the guests who visit them with every mouthful of food they consume. They are in the big time now, with 70 acres in Pembrokeshire, but for a number of years they fed themselves and their four children from five mediocre acres. They know what they are talking about.

Anyone planning to become a modern peasant cannot afford not to read this book. It is all there: what to grow and how to grow it, what livestock to keep and how to tend it, how to fish, how to preserve food. They slaughter and butcher their own sheep and pigs and they tell you how to do this as well, though it sounds messy to me! They even tell you how to poach salmon, which, we are assured, is quite legitimate morally if the fish is caught for food. The magistrate might disagree, but we are also told how to evade detection.

The life sounds splendid. All through the book there is an atmosphere of long evenings by a roaring wood fire munching smoked herring and drinking home brew—from Seymour malt, of course. It is cosy and if the book has a fault, perhaps this is it. The novice may find Arcadia muddier, colder, wetter and smellier than it seemed as he dreamt of it in his Kensington maisonette. He may find it more expensive, too, with land fetching up to £1,000 an acre and agricultural mortgages, if he can get one, at 12½ per cent.

Yet the authors admit that the book is written for the future. Today there are many people with the inclination to do as they have done, but rather fewer with the resources and determination to see it through. As the years go by their number will increase and *Self-Sufficiency* will inform and delight them and their children and their children's children, for its skills are the old skills and its wisdom the old wisdom of the countryside.

There is nothing new, of course, not even in the eco-literature. In 1887 William Morris wrote: "Shall I tell you what luxury has done for you in modern Europe? It has covered the merry green fields with the hovels of slaves, and blighted the flowers and trees with poisonous gases, and turned the rivers into sewers; till over many parts of Britain the common people have forgotten what a field or a flower is like, and their idea of beauty is a gas-poisoned gin-palace or a tawdry theatre. And civilisation thinks that is all right, and doesn't heed it..."

What follows is a description of the society Morris would like to see and were it not for the time-scale he might be accused of plagiarising *A Blueprint* for Survival. As it is, perhaps the less said about plagiarism the better!

Mr Morton has collected some of Morris's writings that are relevant to modern environmentalists and which, at the same time, give an impression of the passion and humanity of the man. Morris described himself as a communist and Mr Morton, himself a communist, refutes the claim made for Morris by the anarchists. In a way, both are right. Morris dissociated himself from the anarchists when the early socialist movement split, yet the society he describes, based on small, selfsustaining and self-governing communities, has more to do with anarchism than with centralist communism.

This small book may do much to place the environmental movement in its historical-political context.

Michael Allaby

Saving the whales

WHALES, SEALS AND DOLPHINS by Dr Gaskin. Heinemann Educational books. £5.

THE LIFE AND DEATH OF WHALES by Robert Burton. Survival Series. Andre Deutsch, £2.50.

A WHALE FOR THE KILLING by Farley Mowat. Heinemann. £2.75.

Although each of these three books is written from a different standpoint, the message that come through from them all is clear and urgent. If man has not yet succeeded in exterminating the great whales this is due only to the fact that as each species becomes rarer it is also increasingly uneconomical to hunt it. But this alone cannot save these superbly adapted creatures from ultimate destruction.

Dr Gaskin has produced a very full study of marine mammals with special reference to New Zealand waters. The documentation of information sources however is world wide and will be invaluable to the serious student. He writes as someone with comprehensive knowledge of the whaling industry, and as a member of the Special Scientific Committee of the International Whaling Commission. This gives his observations great authenticity and adds incontrovertible evidence to our knowledge of the failings of the IWC. The Scientific Committee was formed to collect biological information and, on the basis of this, to advise the Commission on the measures that must be taken for the conservation of the great whales. Such advice has been consistently forthcoming, and the Committee was warned of the decline in population of one species after another, but in every case the necessary measures recommended were ignored. The IWC is not bound by any law, has no teeth, cannot impose its rules on any but its own voluntary members, and is in any case dominated by the great whaling industries of Japan, Norway and Russia.

Robert Burton's book is a mine of information and includes the history of whaling from primitive coastal whaling to the modern factory ships. He too deplores the lack of effective control and underlines the uselessness of international research undertaken in the name of the IWC. His book deals with the great rorgual and sperm whales and he evidently feels shame as well as anger about man's part in the destruction of these mysterious. highly intelligent and as yet little understood giants of the sea. Although he quotes sad figures which illustrate the systematic decline of populations of each species, Dr Burton ends on a surprisingly optimistic note. Recent changes which apply a catch quota for each species, instead of calculating a total quote in BWU's (Blue Whale Units) will, he claims, result in quotas for sei and minke whales being set at a level to prevent over-exploitation. He also believes that the Blue Whale could in the course of a century regain its former numbers. In view of the demonstrable infringements of quotas and the official "blind" eye" turned on what we euphemistically call mistakes, one remains less sanguine than Dr Burton.

In Farley Mowat's book we have a highly emotional acount of two and a half weeks during which an eighty ton fin whale lived and finally died in a land locked inlet on the west coast of Newfoundland. Unhappily the local population thought it great sport to pepper the enormous captive with shot, and by the time the author had prevailed upon them to stop this senseless savagery, septicaemia had already set in and the whale was doomed. Farley Mowat's battle to save his whale, his hysterical anger, his frustration and his final grief totally engage the reader's sympathy. One hopes that his book will reach a wide public who may not already be aware of the threat to the great whales. The story is backed up by considerable knowledge and a plea for more pressure from all who are concerned, together with practical advice on how to help and who to contact. To those already concerned for their ultimate fate, these three books add valuable information and increase our sense of frustration and anger over the failure of IWC to ratify the whaling moratorium proposed and passed at the Stockholm Conference.

Ruth Lumley-Smith

OVERPOPULATION : EVERYBODY'S BABY?

By the year 2000 there will probably be an extra four or five million people living in Britain. To cope with this population increase the country needs to provide 600 infant school places a day, a new large comprehensive school every other day, 2,000 new homes a week and 20,000 new jobs every month.

The problem is world-wide. At the time of the birth of Christ the world's population was only 100 million; by the 17th century it had risen to 500 million and today it is more than 3,800 million. At present birth rates the figure will be up to 7,000 million within thirty years.

Few countries in the world are as densely populated as Britain. For us, therefore, the problem of control is both acute and highly controversial. Some argue the need for a free comprehensive birth control scheme. Others say this would cause greater promiscuity, and even question the need for any kind of control.

The author of this book, a medical practitioner, is Secretary of the Doctors and Overpopulation Group which exists to increase governmental and public awareness of the problem.

As Sir Julian Huxley writes in his Foreword "... unchecked procreation condemns many throughout the world to a life of poverty and misery as well as poor education ... Dr. Morris has marshalled an overwhelming case to show the extent of the problem."

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Letters

Flower Pickers

Sir,

With reference to Ruth Lumley-Smith's criticism (August) of my June article, I do not want really to stop young children making posies but I do want to stop them taking wild flowers in quantity. I know districts where primroses, once abundant, are now in only inaccessible places. If Ruth Lumley-Smith knows of places where "the annual orgy of primrose picking" will not reduce the numbers of plants, well then I am glad to hear it and good luck to her and the children. I know a bank in the Lake District where cowslips grow. At present that bank faces away from the road. Shortly a new road is to be built parallel to the old and with a picnic area nearby. I would not bet on the persistence of the cowslips once they come within the prospect of the pickers and their children.

I do not know what to say about weed-killers. They destroy an important niche in the ecosystem where farmers use them; on the other hand we cannot expect a farmer to grow anything but a clean crop. The practice



I fear most is the destruction of hedges. In the past, Governments have encouraged this with grants (and so produced some expensive food in the process) but it looks as if, with the profits food will yield in future, we may have to pay farmers not to destroy hedges.

Mr John Burton's Course in the Departmental Studies at Alsager College of Education, in which teachers will gain knowledge of the use of school estates as teaching resources, sounds marvellous and extremely interesting. It was a friend's success in this practice in his own school estate that partly prompted my article and its maxim: Take only what you have put there. I hope Mr Burton has plenty of applicants for his course next year. Yours faithfully,

John Blackwood, 27 East Barrmoss Avenue,

Port Glasgow PA 14 6HX Renfrewshire.

Sir,

While completely agreeing with John Blackwood's views as expressed in the June edition of *Ecologist*, I feel that some comment must be made concerning his distorted opinion of "environmental studies".

Environmental Studies, as it is now being taught in a number of schools is not just the "latest name" for botany or rural science. It is true that the subject, as an academic discipline, has been pioneered by teachers of biological subjects in particular. It may also be true that the content of courses is frequently dominated by biological and rural subject-matter. But it should be obvious that if our countryside is largely man-made, as Mr Blackwood so ably shows, then the field of Environmental Studies must extend beyond biology to the "human sciences". The proper study of the environment includes such diverse fields as agronomy, demography, land economics, urban planning, industrial location analysis, resource management, urban sociology, etc . . .

Was John Blackwood's article really about flowers, or about changes in the philosophy of science and in the teacher perception of the best method of study? Yours sincerely,

Martin J. Price, 30 Palmer Road, Poole, Dorset, BH15 3AR Sir,

In a recent advertisement (*Homes* and Gardens, May 1973) Alcan Foil explain how useful their foil dishes are for picnics. They then add: "If you're lucky enough to come across wild flowers on your picnic, your used foil dishes can come in very handy. A quick wipe then a couple of layers of moist tissue and you have a handy container for taking your flowers home without damage or deterioration."

Surely it is grossly irresponsible for a major organisation like Alcan to make suggestions of this kind; the picking of wild flowers does more than enough damage, as Mr John Blackwood has pointed out in your columns, without people being encouraged to grub up flowering plants, literally root and branch.

Yours faithfully, J. A. Thomson, 83 Riddlesdown Road, Purley, Surrey.

Proposed Sewage Works in Audley Park, Saffron Walden, Essex

Sir,

As residents of this Town who have formed a Community Group specifically to contest our Town Council's intention to allow development in Audley Park, may we appeal for support through your good offices from those who share with us the view that this Park, the setting for Audley End House, and laid out by "Capability" Brown, is not only a Local but National Amenity of priceless value.

The imminent proposal is to locate a new sewage works in the very centre of this landscaped park, with a site potential allowing for expansion to the Town from 10,000 to 26,000.

Further information on this Campaign is available from the "SAVE AUDLEY PARK" CAMPAIGN, 53 Gold Street, Saffron Walden, Essex. Yours faithfully, *Anthony Hawkey*, Secretary, "Save Audley Park" Campaign, 53 Gold Street, Saffron Walden, Essex.

Water metering

Sir,

I don't agree with Michael Allaby's comment on water metering under the title "Is Labour Drowning?" Obviously we have simply got to do something serious about water supplies and the only serious thing to do is to conserve them. Metering will not conserve, it will merely create a cost which will be put into the cost of the goods being manufactured.

If metering were attempted in domestic buildings, how long will it take our plumbers to complete the job? After it is done we simply go on using water but paying more for it and clamouring for higher wages.

We must use less water. We do not need to use two gallons every time we want to wash away half a gill of pee. It should be a first priority to install ballast in every lavatory flush and to make new ones with a smaller tank. Private swimming pools are being advertised widely. These should be banned and all existing ones filled in. Operations like car-washing should compulsorily use recycled water. All manufacturing businesses which involve the use of water must install recycling equipment under penalty, not pecuniary but of cutting-off of supplies.

Metering, no. Yours sincerely, *Peter Ecker*, 18 Mount Street, Breaston, Derby.

Sir,

I must protest against both the con-

tent and the tone of Michael Allaby's remarks about the attitude of the Labour Party to the proposed metering of domestic water supplies. The content because, first, he is apparently ignorant of the fact that virtually all industrial water supplies are metered already, and second, he ignores the fundamental argument against the metering of domestic supplies-that it would cost far more than it would save, not only financially but in terms of resources. He fails to take account of the energy needed to make, distribute and keep in order the millions of meters that would be required, or of the resources involved in reading the meters and calculating and sending out the bills.

Nor does he consider the other and far more effective ways of reducing water consumption, such as the provision of free tap washering services, the devotion of more time to finding and repairing leaks in the distribution system, and the imposition of charges for appliances known to use a lot of water.

As to tone, his remark that the Labour Party spokesman was "anxious to escape from his own image of Labour as the Party of the Great Unwashed" was unworthy of your journal and out of place in what purported to be a serious discussion of a serious subject.

Again, while I agree with him in regretting that the Labour Party does

not adopt a more egalitarian posture I fail to see why the Labour Party should be singled out for reproach in this matter. It is beyond doubt more egalitarian in its policies than either of the other parties.

Yours etc, O. Barraclough, Member of the Hereford Water Board, Old Court, Colwall, Malvern, WR 13 6QE.

Anti-motorway seminars

Sir.

At a meeting of The Transport Reform Group it was decided to examine the possibility of holding weekend seminars on running antimotorway campaigns, with particular reference to public enquiries. The Group is inundated with requests for help at enquiries and it is felt that such seminars would be a means to helping local groups to help themselves, thereby widening the front on which the national group fights.

Anybody interested in such seminars should write to: The Secretary, The Old Bakehouse, South Newington, Nr. Banbury, Oxon.

Yours sincerely, Robert Powell, The Liberal Party, 53, Spring Gardens, Manchester 1.

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CONFERENCES

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sponsored by the Environmental Economics Study Group and the Institution of Environmental Sciences. Five papers on energy resources, aspects of global modelling, fisheries and economic approaches to general resource depletion. To be held at the Royal Institution, London. Conference fee \pounds 7 to non-members of the EESG and IES. Application forms from D. W. Pearce, Conference Organiser, Department of Economics, University of Southampton, SO9 5NH.

THE ENERGY CRISIS GROWTH, STABILITY OR COLLAPSE

Public address by the President-Elect of the Conservation Society Lord Avebury. London School of Economics, Houghton Street, London WC2. Friday November 16th at 7.45 p.m. Tickets 30p plus s.a.e. from Conservation Society, 34 Bridge Street, Waltonon-Thames, or at the door.

AFRICAN CENTRE, 8th-9th December, 1973. "Development in Africa: The Human Factor". Further details from Tim Brooke, General Programme Organiser, Africa Centre, 38 King St., London WC2E 8JT. Tel: 01-836 1973.

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50 Gloucester Place, London W1H 3HJ

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The only environmentally committed political party in this country. Send for details to Lesley Whittaker, 69 Hertford Street, Coventry.

ALTERNATIVE SOCIETY is organising week end meetings on alternatives in health, education, criminal law, land ownership etc. Next meeting New Communities Exchange, Nov. 30th-Dec. 2nd. For further particulars: Stan Windass, 9 Morton Ave., Kidlington, Oxford. (Kidlington 3413).

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26 YEAR OLD North American intellectual seeks work that would enable further development of mature action-orientated analysis/ strategy relating to immediate future. Has senior government, corporate and academic research experience. Interested in political, technological, cultural, psychological, social, spiritual, environmental trends. Anything considered: challenging research preferred. London based. Resume on request. Box No. PD17.

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THE CYRENIANS need full-time volunteers to live and work in communities throughout the country for the homeless and rootless for a period of four to twelve months. Volunteers receive board and accommodation plus pocket money. Write for information to, The Cyrenians, 13 Wincheap, Canterbury CT1 3TB.

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