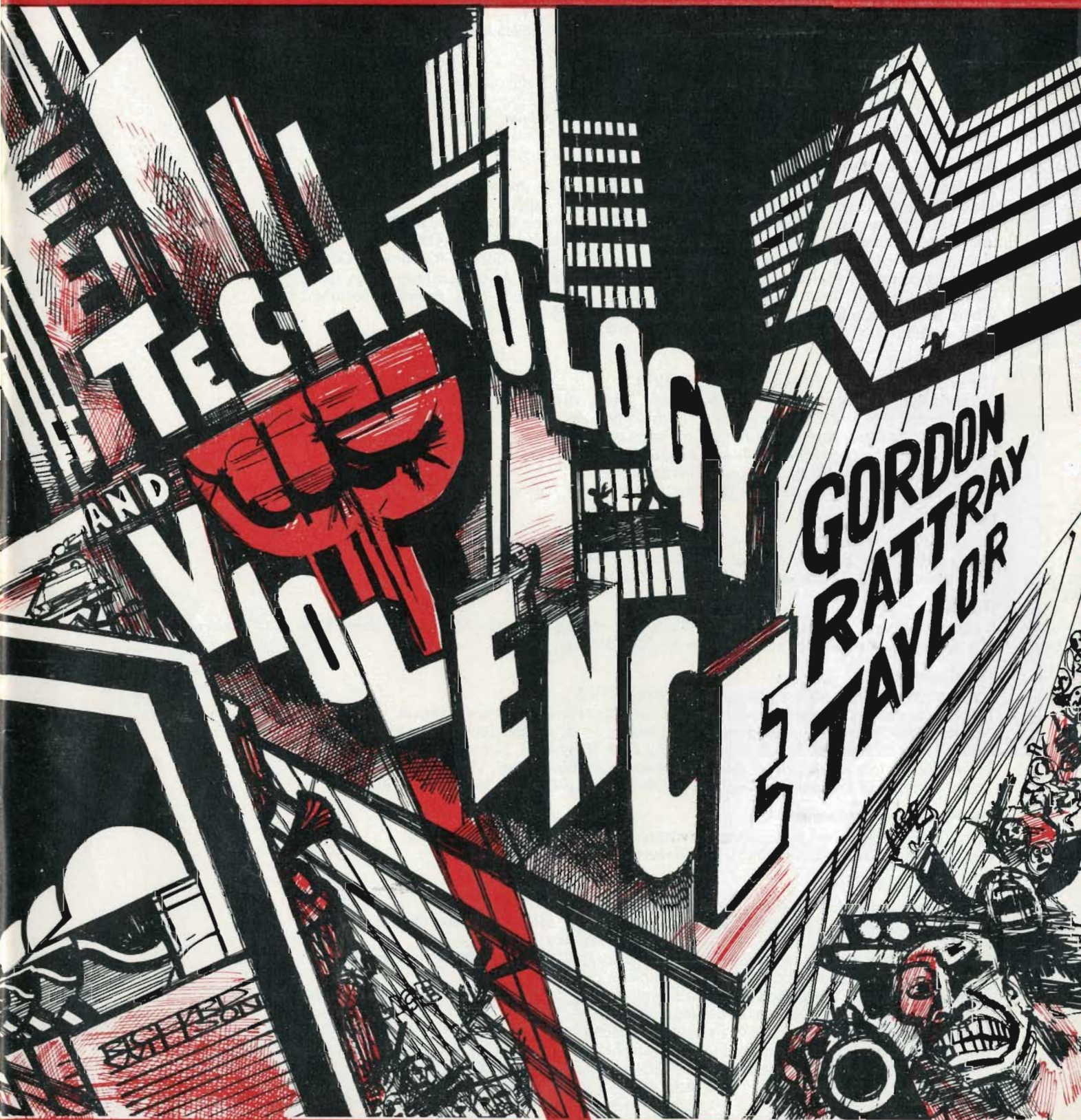


Ecologist

Vol.3 No.12 December 1973 25p



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In this issue

446 Energy—crisis or crunch?

by Peter Bunyard

Even without Arab-Israeli wars the chances are that we are in for massive fuel shortages in the years ahead.

452 Technology & violence

by Gordon Rattray Taylor

Violence and the means by which it is carried out is increasingly effective in our society.

456 The effect of wars, natural disasters and disease on population control

by F. M. Shattock

462 Does building houses increase homelessness?

by Edward Goldsmith

Disintegrating families and houses that don't last make a housing shortage inevitable

468 The unhappy fate of *Salmo Salar*

by Anthony Netboy

Pollution of estuaries combined with overfishing are bringing about the demise of the salmon

471 Notebook

472 In praise of potatoes Pollution and the Pit

473 Coming events

474 Friends of the earth

475 Books

477 Letters

480 Classified advertisements

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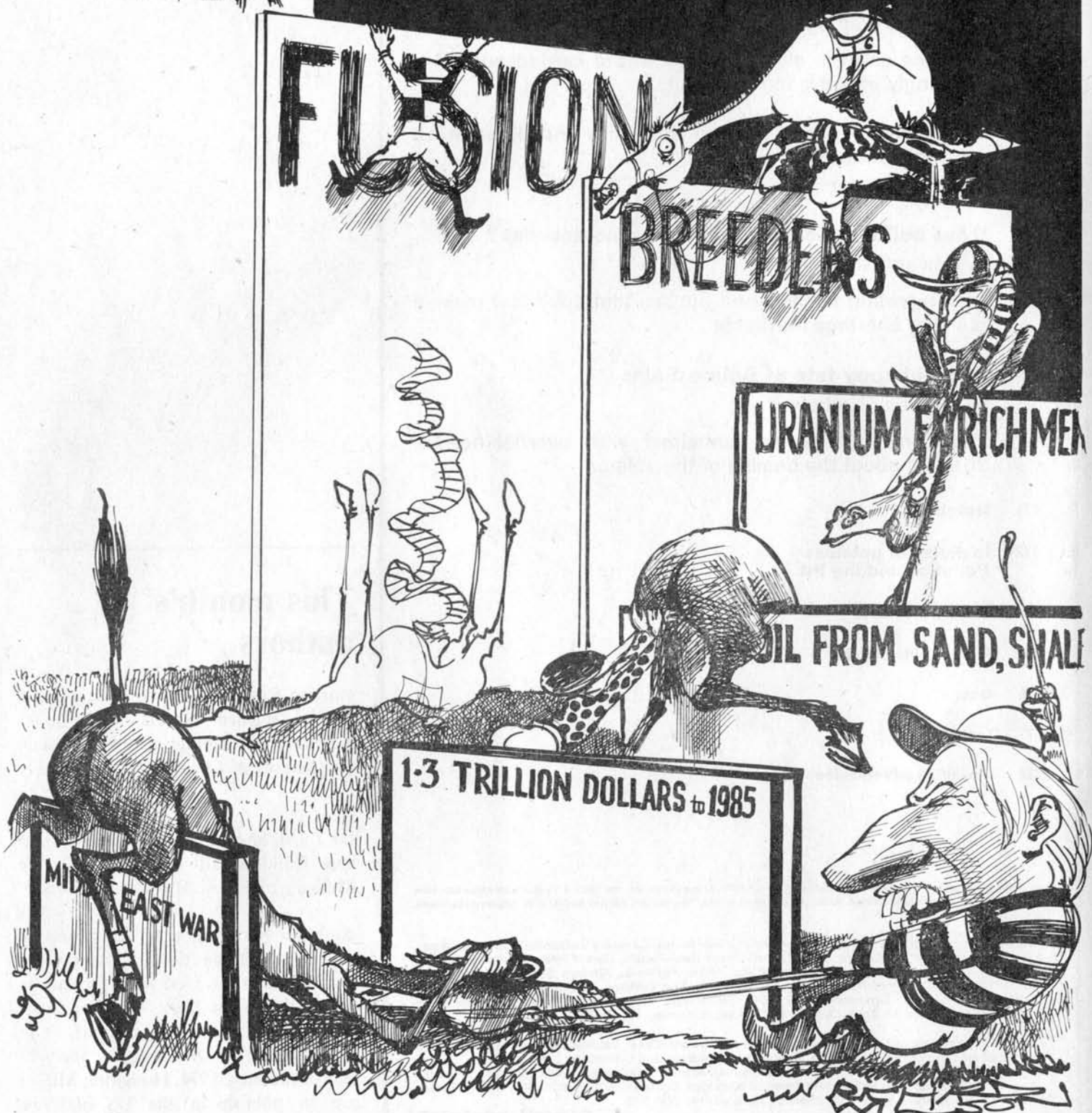
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URANIUM ENRICHMENT

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MIDDLE EAST WAR



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Comment

The energy steeplechase

Sir Eric Drake, chairman of BP, recently said with regard to North Sea Oil that "the Almighty had come to the rescue of Britain". God must have a thoroughly distorted sense of humour to have put the world's major resources of oil in a part of the world which has never known peace since the dawn of civilisation. Indeed, that oil has given the Arabs a trump card in their conflict with Israel, for as Holland has learnt to its cost no western nation can afford to jeopardise its oil-lifeline by appearing to take sides in the fray against what would appear to be Arab interest.

Of course the inevitable has happened. European governments—and a prize example is Ted Heath's government—are blaming the Arab-Israel war and the resulting oil embargoes for the oil shortages, just as they blamed poor harvests in the rest of the world for rising food prices earlier in the year. Indeed, the Conservative government here has been full of zeal to point out to the British public just how much it bent over backwards to appease the Arabs during the conflict. What these governments have not been prepared to do is to admit to the sheer idiocy of basing their country's economies on a commodity which is not only in limited supply, but which happens to be found for the most part in one of the world's politically hottest and least stable spots.

But the sad joke is that the war will not in the long run make a lot of difference to an impending oil shortage; for even if the Middle East co-operates fully with the West in trying to boost production to keep pace with intended demand there is absolutely no guarantee that the oil can be got out of the ground fast enough. As seen on page 447, the investment and infrastructure are reaching astronomical proportions just to meet the requirements of the next 12 years to 1985. After 1985 what then? Another frantic scramble for energy resources to meet another exponential leap in demand?

The technocrats are hoping that nuclear power will step smartly in. But nuclear power depends at present on enriched uranium and that means huge investments in extremely costly en-

richment plants together with their own energy supplies. To enrich one kilogram of uranium needs 2,500 kilowatt-hours of work, and by 1985 the world could be needing to enrich 60,000 tonnes of uranium each year.

At present the world's energy demands are rising so rapidly that a new energy hurdle has to be faced every few years, and most of that increased consumption is taking place in the West. It is a situation so full of folly that one wonders how sensible men could continue brazenly to advocate policies of growth and increased energy consumption.

There is only one answer and that is to embark immediately on policies to reduce demand for energy. We all know that life for us today, with twice the per capita consumption of energy in the early 1960s, is not even measurably better than it was then. Indeed it may be getting worse. Furthermore by hooking ourselves on an increased energy consumption we are enslaving ourselves ever more to those who control the energy circuits.

Peter Bunyard

Less food, less people?

It now appears that America is short of one million tons of nitrogen and phosphate fertilisers which could reduce food grain yields for next year by twenty million tons.

Senator Hubert Humphrey predicts that if nothing is done about it, there will be "an international food crisis, the likes of which the world has never seen".

Whether this leads to mass starvation or not, the mere fact of food shortages may well affect population levels.

Malthus, it will be remembered, considered that population grew to consume available food supplies.

This may not have been true of hunter gatherer bands, or even primitive agriculturalists, who undoubtedly developed cultural controls to prevent population from growing beyond that level which the environment could sustain. It does appear to be true, however, of urbanised societies.

This too is Rene Dubos' opinion, or

at least it was when he wrote his remarkable book *Man Adapting*. He points out that "All over the world and throughout historical times, the long-range population trends have always proved to be independent of epidemics, wars, famines, and other catastrophes. The widespread and fantastically destructive epidemics of plague that ravaged Western Europe during the Justinian era, and again during the Middle Ages, did of course sharply reduce population size for a while, but this effect was soon obliterated. The influence of the notorious London plague in 1665 was no longer perceptible 15 or 20 years later. In fact, the periods that followed the epidemics of plague from the fourteenth to the seventeenth centuries were among the most vigorous in Europe's history! The famines and epidemics that have historically laid waste in China, India and Egypt during historical times have not made these countries less densely populated. The four years of the First World War and the pandemic of influenza that followed it, caused at least 20 million deaths, but it took only a few months to make up this number again! Interestingly enough, concern with overpopulation became acute immediately after the end of the Second World War, before DDT and antimicrobial drugs could have exerted any significant impact on world health.

"The paradoxical truth is that the phenomenal increase in world population during the past 50 years has coincided with great epidemics, two world wars, several minor ones, and deep disruptions of social and economic life everywhere. Furthermore, as is well known, the most destitute and disease-ridden populations of the world are precisely the ones that are increasing the fastest. This is particularly the case for many rural areas in which the state of health is hardly affected by physicians, drugs, or sanitation. In fact, the shape of the curves depicting the growth of the world population makes it clear that the acceleration far antedates the introduction of vaccines, insecticides, and drugs. In many countries of tropical Africa, for example, the mean increase of the population was about 1.5 per cent per annum for the period 1950-60, even though malaria eradication had then barely begun in these areas."

On the other hand, population growth appears to have coincided with

increases in food supply, thus, "According to the Chinese census, the population of China, which was under 64 million in 1578, climbed to 108 million by 1661 and to 144 million by 1741. This extremely rapid growth seems to have resulted from the introduction into China of three kinds of crops easily grown and giving very large yields: corn around 1550, the sweet potato around 1590, and peanuts a little later.

"Interestingly enough, the most spectacular population spurt in Europe occurred at about the same time as in China, and seems to have been due in part to the introduction of the white potato from the Andes. Following this event, the population of Ireland increased from 3,200,000 in 1754 to 8,175,000 in 1846, not counting some 1,750,000 who emigrated during this period, and despite great poverty. A similar situation, on a smaller scale, was created by the introduction of the bean among the Pueblo Indians in the Rio Grande valley."

In Britain, the same principle applies. With the Industrial Revolution it became possible to increase food supplies by importing them from abroad and paying for them with money earned from the export of manufactured goods. Does population fall, however when food supplies are reduced? Dubos thinks it does, but only when the situation is acute. Thus hunger certainly reduces the desire or the ability to reproduce. Prisoners starved in concentration camps have reported that one of the earliest effects of under-nutrition was a loss of sexual desire. The acute famine that prevailed in the Netherlands during the late phase of the Second World War was followed one year later by a marked decline in the number of births. When the situation becomes chronic, however, habituation seems to set in and the breeding rate does not appear to fall.

Edward Goldsmith

Stop, you're killing me

In the winter of 1972, an outbreak of swine vesicular disease was diagnosed in Britain, after some earlier veterinarian confusion over the symptoms of this rare disease, which are similar to those of foot-and-mouth disease, which is common. Now it appears that this outbreak, which still continues, may be caused by a mutated form of the Coxsackie B5 virus, which, in its original

form, causes enteritis in humans.

Swine vesicular is not the only disease that can be transmitted between humans and other mammals, of course. Brucellosis, which British farmers are working to eradicate from the national herd, causes undulatory fever in the human flock. Research in Scotland showed some time ago that the same virus may be implicated in human and feline leukaemia. The implications of our close relationship to our four-footed friends and slaves are serious, perhaps more so than people imagine if we are to apply to humans the strictly logical approach we apply to animals.

It has been suggested that the incidence of human leukaemia might be reduced were pet cats to be killed. By the same token, the incidence of feline leukaemia might be reduced were humans to be killed. Who are we to say that one course is preferable to the other? The Italian authorities have even gone so far as to revenge themselves on defenceless molluscs for the recent cholera outbreak. No one proposed protecting the mussels from humans. It is our anthropocentric prejudice that leads us to suggest a particular course of action, not logic.

Like foot-and-mouth, swine vesicular disease is controlled by a slaughter policy. Any herd of animals one of whose members contracts the disease must be slaughtered. There is no thought of treatment. The police mount guard on the entrances to the farm and remain there until all exposed animals have been destroyed and their carcasses burnt.

The slaughter policy is supported by the farming community for economic reasons. The export of animals that can be guaranteed free from disease is lucrative, since even though the diseases

themselves may not be fatal, they do reduce productivity. Diseases can be excluded from the country in no other way and Britain can remain free only because it is an island with no land frontiers that can be crossed by wild animals.

If we are determined to keep swine vesicular disease from our shores, and if we are determined to eradicate brucellosis, the logic of the slaughter policy suggests that it should be extended to humans where it can be shown that the disease is transferable inter-specifically. Thus if Coxsackie B5 enteritis is diagnosed in a human, he, his immediate family, and all those with whom he has been in recent contact, should be destroyed.

There will be problems, of course. A farmer whose livestock is sacrificed to the slaughter policy is compensated by the Government at the current market value of his animals. If we are to be consistent, humans should be eligible for similar compensation. However, since humans have not been bought and sold in this country for several years, how is their commercial value to be assessed? Perhaps it would be possible to compute the value of their contribution to society for the remainder of their natural lives? Even were this difficulty to be overcome, to whom should the compensation be paid?

The cost might be high, but so is the cost of the livestock slaughter policy. It is not impossible that moral and social objections would be raised and that in support of them inconsistencies might be found in the argument for slaughter. If these arguments are valid for humans, may they not be equally valid for other livestock?

Michael Allaby



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?

This is the theme of a two-day Conference on Africa to be held at the AFRICA CENTRE on Saturday and Sunday 8 and 9 December 1973. The Conference is organised jointly by the ECOLOGIST and the AFRICA CENTRE.

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 Ilo. 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.

Those who wish to avail themselves of the facilities at the restaurant should send their remittance with the Conference registration fee.

Please register my name as a delegate to the Conference on "DEVELOPMENT IN AFRICA: THE HUMAN FACTOR" on Saturday 8 and 9 December 1973.

Enclosed is £..... Conference Registration fee. and £1.65 for lunch coffee and tea on Saturday and lunch only on Sunday

Name

Address

Telephone No.

For registration and fuller details write to:

Tim Brook,
General Programme Organiser,
AFRICA CENTRE,
38 King Street,
London W.C.2E 8JT.
Telephone 01-836 1973

ENERGY- CRISIS or crunch?

by Peter Bunyard

The *Financial Times* together with BOAC sponsored a three-day conference in London on "World Energy Supplies" to which they managed to bring key men from the various energy industries, from the big banks and from government. It was to be expected that the possibility of a crisis would be played down. Yet by reading between

the lines it became obvious that only a major, unprecedented co-operation between governments, the money lenders and the energy men together with a compliant Middle East could prevent a spectacular collapse of the industrial world as we now know it. Peter Bunyard reports from the conference.

The last time petrol was rationed in Britain was during the 1956 Suez Crisis when Egypt prevented Gulf oil getting to Europe by the simple expedient of closing the Canal. Then again in 1967 the Arab countries imposed an embargo on shipments of oil to Britain and the United States in the vain hope of forcing some solution over Israel. Neither the closure of the Suez Canal, nor the Arab embargo were effective for any length of time. The Arabs had underestimated the West's resourcefulness and the power of money in what was then a buyer's market. Indeed the closure of the Canal hastened the advent of supertankers and transcontinental pipelines, while the 1967 embargo was defused by the target countries obtaining their oil from elsewhere, Iran and Venezuela for example, and by stockpiling oil, a practice implemented to offset any such emergency.

The situation today is wholly different. Not only is there greater unity than at any other time among the oil producing countries through OPEC but western economies have become increasingly dependent on oil. Indeed not only have oil demands tripled since 1956 but the Middle East with more than half the known reserves of oil in

the world has become the major supplier. With demand increasing apace it would seem beyond dispute that even a relatively small fall in supplies could have wide repercussions in the west and precipitate great hardship.

The most important fact to appreciate is that oil, supplying more than 50 per cent of the world's total energy needs, completely dominates the energy scene. Moreover for the next 10 to 20 years nothing can adequately substitute for oil, especially in a world which is intent on rapid industrial expansion. Indeed, by the year 2000 when the world could be consuming four times the energy of today, oil will have to account for about 45 per cent of that consumption.

According to H. R. Warman, BP's exploration manager, the ultimate reserves of crude oil from conventional sources are likely to top out at around 2000 billion barrels, a figure which is not much more than double that which has already been found. Although the figure of the ultimate reserves has been increasing steadily with time—in the 1940s it was around 500 billion barrels—improved exploration techniques combined with a wide coverage from the Arctic to the Antarctic and embracing every environment from permafrost

in the North, heavy seas off the Shetlands and Amazonian jungles, make it unlikely that the figure will go on increasing. Indeed it has fluctuated around the 2000 billion barrel mark since the late 1950s. "There are bound to be some surprises," says Warman, "but they work both ways." Thus nobody would have forecast 10 years ago that the North Sea would turn out to be a prolific oil area and that the Arctic Islands, so promising after the discovery of Prudhoe Bay, and despite intense exploration would turn out to be so disappointing. "Nevertheless, through the improvement of seismic techniques to the present standard "very few giant fields escape detection," he says.

Warman also explodes one myth. Certain petroleum geologists, particularly those of the US Geological Survey, tend to include certain areas in their assessment of recoverable reserves when basic economics dictate against their inclusion. For example the cost of a platform for production in 400 feet of water in the North Sea is about £100 million including a share of production facilities and the cost of 25 or so wells such a platform can handle. "Even if one uses an after tax netback figure (excluding capital recovery) as high as five dollars per barrel, an average well productivity of 1000 barrels per day is required to pay off, without discounting, the initial investment," Mr Warman points out. "At current prices/profits an average recovery of 5000 barrels per day would be required for the same period. Only exceptionally large fields with very good reservoir conditions can meet these requirements. In the United States average well productivity is 18 barrels per day. Even in Louisiana with its large quota of modern offshore wells the average well productivity is only 100 barrels per

day. Thus a very large part of the reserves of the US would not under any conceivable economic climate within the next two or three decades constitute a recoverable reserve in the deeper offshore environment." Mr Warman also adds that to quote reserves per unit volume of sediment from a statistical estimate based on the history of American onshore areas "needs very critical analysis as a base for estimating recoverable reserves" and to suggest as one authority has done using such a concept that Europe has two-thirds the potential of the Middle East "is so unlikely as to be ridiculous".

How much is there?

Since 1948 the average rate of finding oil outside the eastern bloc has been 18 billion barrels per year. "Because the Middle East has its main impact on discovery rates, because there are no foreseen technological breakthroughs likely to have great impact on finding rates, and because of the picture emerging from current active exploration in most of the sedimentary basins of the world it is difficult to see any significant increase in finding rates over the next 10 or 15 years," says Mr Warman. "Thus it seems unreasonable to plan on future finding rates exceeding 20 billion barrels a year, in the longer term it is unlikely that this rate will be achieved". In fact Mr Warman anticipates that an actual decline in production of conventional oil will occur in the mid eighties, unless something quite unforeseen occurs.

What about non-conventional sources of oil, such as oil shale or tar-sands or even coal? The largest single source of heavy oil is in the Athabasca Tar Sands, for which a reserve of 300 billion barrels is often quoted. Although that reserve sounds like a Middle East quantity, "getting Middle East type levels of production is another matter," says Mr Warman. He reckons for the more ideal deposits the investment per daily barrel of oil will be in the region of 5000 dollars, and for the deeper, less easily worked parts of the tar sands the investment is unlikely to be less than 10,000 dollars per barrel per day. To produce five million barrels per day (which must be compared with the hoped-for figure of 44.4 million barrels of oil per day from the Middle East in 1985) the total investment would therefore be 50 billion dollars. Operating costs of between one and two dollars

per barrel per day would have to be added, and to cover these costs prices in excess of 10 dollars per barrel would have to be realised "without considering royalties and taxes."

Shale oil requires more intense heating and processing than tar sands and even then the yields are lower per volume of solid handled.

As for coal it is hoped to get yields of up to 4 barrels of oil per ton. Yet the technology for hydrogenation is still to be perfected and the ultimate cost is very uncertain. The National Petroleum Council of the United States estimates that by 1985 the tar sands could be yielding from half a million to one and one-quarter million barrels per day, oil shale from 100,000 to 400,000 barrels per day and coal around 80,000 barrels per day. The combined total of some 1.5 million barrels per day "is not very impressive" says Mr Warman, "when viewed in the context of a forecast of total demand in the US of some 29 million barrels per day by 1985, of which more than half will have to be imported".

What will it cost?

It is impossible to discuss future oil production without discussing money. Earlier this year the Chase Manhattan Bank published some highly relevant facts and figures concerning the finances of oil. In particular the bank blames the United States government for having precipitated the present shortages of refined oil on account of its faulty policies and its "insufficient understanding of all that is involved". Capital investment and adequate supplies of petroleum go hand in hand, says John C. Winger, vice president of the bank's energy economics division, "These elementary facts ought to be clear to all. But they are not unfortunately. Government continuously displays an active interest in ways and means of extracting additional tax revenue, but is unconcerned about the adequacy of the funds remaining after taxes."

The Chase Manhattan study group looked at the finances of what they termed "the Group", which represented more than three-quarters of the entire petroleum industry throughout the non-communist world. "Over the past four years" says the bank, "the taxes paid by the Group increased by as much as 112 per cent. But the combined earnings of the companies in

creased by only 2.9 per cent—an average growth of not even 1 per cent per year. Because of its inability to obtain from earnings enough money to satisfy its growing capital needs, the Group was forced to borrow much more heavily. As a consequence, its interest expense nearly doubled in only the last four years. Despite the much greater use of borrowed capital, the Group was unable to maintain an adequate level of capital spending. Over the four year period capital expenditures rose by no more than 16.6 per cent—far less than the amount necessary to keep pace with the expanding needs for petroleum. No wonder petroleum is in short supply."

In 1976 the United States' need for energy will be greater by 20 per cent than 1972, one reason being the considerable increase in people aged 20 to 25 years. "Environmental restraints are holding back the increased production of coal, and no more natural gas will be obtained in 1976 than in 1972," says Mr Winger. "There will therefore have to be increases in both nuclear power and oil, in fact one-third increase in oil will be necessary. Domestic sources cannot be relied upon, they are even likely to be lower and Alaska will not be ready in time. Imports will have to make up the difference. They will represent more than half of the then oil needs. From five million barrels per day in 1972 imports will have to rise to over 11 million barrels per day. But there is no likelihood we can bring in that much. We are short of refining capacity as they are likely to be outside the United States. Under the best circumstances there will be a 5 per cent shortage of energy in the US. It could be as bad as 15 per cent," says Mr Winger, "and we are likely to see a slowing down of GNP growth and an increase in unemployment."

Worldwide demand for oil from 1970 to 1985 is reckoned to be 350 billion barrels. To extract that amount, refine and get it to where it is wanted will necessitate capital expenditures of somewhere in the region of 1,300 trillion dollars (1.3×10^{12}) over the next 15 years. "That amount," points out Mr Winger, "is bigger than the total US GNP today, and to achieve it the petroleum industry will have to grow at a yearly rate of 18 per cent, for the next 15 years. To-date the industry has only achieved 8 per cent. Either consumers will have to pay so industry can

make the necessary expenditures, or the government will have to intervene through the pockets of the taxpayers. The oil exporting countries could also contribute."

According to the Chase Manhattan economist a 12 per cent increase in the cost of gasoline in the United States would be sufficient revenue for the oil companies there. Translated in costs to the consumer such an increase would represent a 4 per cent rise in the integrated running costs of a car.

No one is questioning that most of the additional oil requirement of the west will have to be met by oil from the Middle East. Japan derives nearly 90 per cent of its oil needs from the Persian Gulf, and its imports of less than five million barrels per day in 1972 may rise to some 12 million barrels per day by 1980. Western Europe derives just over half its supplies from the Persian Gulf. Because of the North Sea, European imports from the Persian Gulf may decline a little as a proportion of its total needs, nevertheless the actual volume of imports from the Gulf will continue to rise at a steady rate. According to Dr Robert Shaffer, vice president of the Bank of America, oil imports into West Europe may exceed 20 million barrels per day in 1980 from 14 million barrels per day in 1972. Indeed, to get the North Sea into perspective it must be appreciated that the possible "potential recoverable reserves" of around 40 billion barrels would last the world less than one year in the mid 1980s, assuming the oil could be got out at such a rate and the demand for oil continued as estimated. As for the United States, demand from the Persian Gulf could be some eight million barrels per day by 1980.

On the basis that such high oil demands will be met, both through immense capital expenditure of more than £55 million a day, and through the co-operation of the Middle East, it is obvious that certain member states of OPEC will be making a lot of money. "The major oil producers on the Arabian peninsula had an estimated income of about five billion dollars in 1972," says Dr Shaffer. "According to official US estimates this could increase to about 10 billion dollars by 1975 and between 20 and 30 billion dollars by 1980... If annual excess earnings were added to reserves, the holdings of these countries could be about 60 billion dollars by 1980. This is a very

A very large part of reserves of the US would not under any conceivable economic climate within the next two or three decades constitute a recoverable reserve in the deeper offshore environment.

substantial pool of dollars."

What will happen to this money should it ever be realised? On the assumption that the excess earnings enter directly into international financial markets in the form of foreign investments and foreign aid, "the expected volume by 1980 is more than twice the average net annual flow of real capital between the main industrial countries and the rest of the world (between five and six billion dollars) over the past three years."

One suggestion is that the Middle East countries should put their money back into oil. "But whatever the totals turn out to be," says Dr Shaffer, "the increase in financial resources of the major producing countries—however large—pales besides the anticipated financial requirements of the global petroleum industry—however estimated."

The Arab view

Yet whereas the west is very much motivated by money the same cannot be said with such conviction for the Arab member states of OPEC. Their obsession with Israel, for example, drives them into wars which they cannot yet win and in which they stand to lose much more than they can hope to gain. There is a great discrepancy in the present Arab attitudes. On the one hand they are taking over majority shares in their oil or nationalising it—a move which is now accepted by the oil companies so long as they receive fair compensation—on the other they are talking of limiting their output of oil. This schizophrenic but highly understandable attitude came out clearly in the talk by Dr Nadim Pachachi, who as an Arab was for two years secretary general of OPEC.

"If oil had been realistically priced, on the basis of its scarcity value," he said, "the producing nations would not have remained economically backward and incapable of absorbing the money generated by the sale of increasing volumes of petroleum. There would be

no talk of an impending energy crisis, because the world would have already developed other sources of energy... It is time to get rid of this obsession with cheap energy prices, not in the interest of the unborn generation of the producing countries, but in the interest of civilisation which will always need hydrocarbons for special uses, where no substitutes are available. In concrete terms we should permit oil prices to rise until it becomes economically feasible to construct commercial plants for the production of non-conventional oil. At a price of seven to eight dollars per barrel, non-conventional oil could successfully compete with OPEC crudes, especially considering the proximity of supplies to consuming markets."

Dr Pachachi believes that the Arab countries should ultimately acquire a 51 per cent participation in all oil companies operating in their territories, rather than outright nationalisation. "Such majority ownership would enforce and render more effective their right of permanent sovereignty over their petroleum resources. Nationalisation of all oil companies operating in Arab territories is likely to create more problems than it would solve," he said, "and would be fraught with difficulties and dangers which we are not at present in a position to face. Complete nationalisation of oil companies could antagonise some Common Market countries who have been sympathetic and friendly to the Arab cause. It is not in the Arab interest to arouse fears of the Europeans and Japanese..."

The prime reason why Dr Pachachi believes in participation rather than nationalisation is because he knows the Arabs cannot do without western technology and western capital. At the same time he realises that the west is in a jam because of its growing appetite for oil, and that the Arabs hold the cards, not all perhaps, but some good ones. "Thus," he says, "Arab countries are expected, or considered morally obliged, to cater for the growing energy needs of the United States which blindly supports and abets the arch enemy of the Arabs... In my opinion this moral responsibility on the part of the Arab oil producing countries should cease to exist, if the United States continues with its pro-Israeli policy and the rest of world community remains silent, or at best adopts resolutions merely condemning Israel's

actions while Israel continually defies and ignores such resolutions."

To put pressure on the US, Dr Pachachi proposes that all the Arab producing countries should adopt "a co-ordinated, unified policy to freeze their crude oil production at present levels until such time as Israel withdraws fully from all the Arab territories occupied during the 1967 war."

A cut-throat scramble

A big fear of the western oil companies is that oil shortage, creating a seller's market, could lead to a cut-throat scramble for oil. Already there has been some evidence of this, and Dr Nobuyuki Nakahara, director of Toa Nenryo, pointed out that Japan was doing her best to co-operate with other OECD member countries "to reach a mutually satisfactory plan for stockpiling and oil allocation in the event of an emergency."

"I consider that to raise the cost of oil by competitive bidding, as I admit some Japanese firms have done recently, is both undesirable and contrary to the interest of consumer countries as a group," he said, and he pointed out that the Japanese government had

The petroleum industry will have to grow at a yearly rate of 18 per cent, for the next 15 years. To-date the industry has only achieved 8 per cent.

recently prevented some oil and trading companies from making high-cost direct-deal contracts.

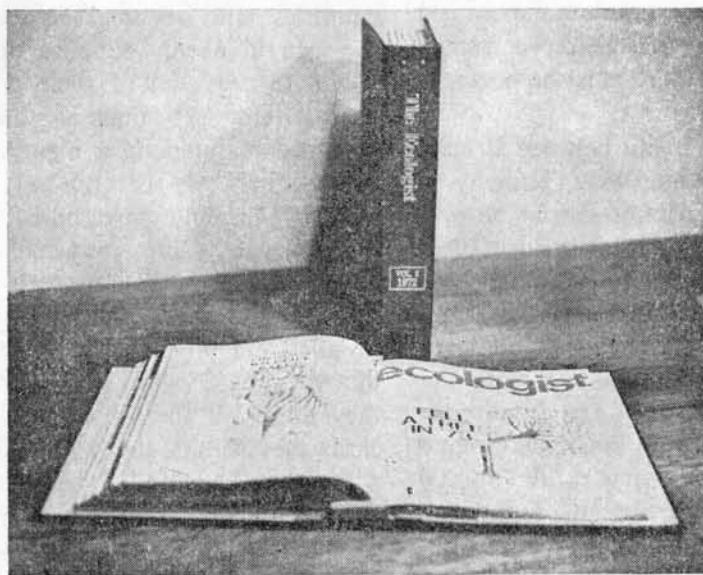
The picture which is beginning to emerge is of an awareness that there is likely to be a shortage of energy in the next five years which will be felt throughout the OECD countries and therefore throughout the world. To prevent oil prices from soaring uncontrollably the OECD countries, which are by far the greatest consumers of energy, aim to co-operate somehow in sharing out the oil resources, although no-one has yet stated publicly how such a scheme would be worked and who would have to take the brunt of such a shortage. The banks point out that capital must be made available now so that oil production can increase to keep pace with intended demand, and they call upon governments to reduce their takings in oil taxes or to

allow oil prices to rise to a point where the oil companies can get adequate returns. In addition they suggest that governments should help with the funding. As Reuben F. Richards of the First National City Bank in New York pointed out, by 1980 GNP in the US should rise to nearly 1.5 trillion dollars in the terms of 1970 dollars. "An economy of this size will provide a truly massive base to support necessary energy investments," he said.

Edmund de Rothschild, chairman of the Rothschild Bank, suggested that governments should be prepared "either by direct grants or underwriting" to assist ventures where the risk involved was greater than most companies with private money, or banks would care to take, as for example before exploratory work had been completed.

As far as the bank investment was concerned it could be regained through the bank purchasing oil in the ground, which provides its security, said Mr Rothschild. "The risks to be learned here are that he (the banker) has to learn to read a petroleum engineer's report rather than a balance sheet, and to understand the other hazards in the development of a field."

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Co-operation may be happening between the OECD nations, but it hasn't yet happened; governments may be considering putting public funds at the disposal of oil companies, but they haven't yet. Given too the long lead times—from anything up to 10 years—before a new venture comes to fruition whether it be the construction of a new power station, or the production of oil from a new field—it is apparent that little can be done to avoid shortages of fuel other than to reduce demand somehow, and one way to do that is to increase the efficiency with which energy is used. According to Charles J. DiBona, who is a special consultant to President Nixon for Energy Matters, no country has a better chance of reducing its energy demand than the United States.

"We have a great potential for reducing demand because we are profligate users of energy. We have big cars and a lousy mass transport system, and we are gadget-laden in the home. We are now embarking on a major energy reduction drive, a trend towards small cars for example, and the energy growth rate is falling. Up until June we were running 7 per cent ahead of the previous year. After June the increase has been only 1 per cent."

DiBona's plan is for the United States to increase its domestic supplies of oil; to use more coal; to embark on a gigantic R and D programme; to reduce energy demands either voluntarily or through taxation. And he states that the US will draw on world markets only when the prices are right.

And what about the alternative sources of energy such as nuclear power, geothermal energy or solar energy?

Nuclear hopes?

Several factors make it unlikely that nuclear power will make the big dent in the world's energy needs in the time stated by its backers, whether they be governments or utilities. First, there is indecision about which reactors to use, although the choice seems increasingly to fall on the gas-cooled High Temperature Reactor (HTR) and on the liquid metal fast breeder reactor, both of which systems have yet to prove themselves as safe and reliable for big-scale commercial use. Second, there is a considerable hold-up in the construction of nuclear power plants on order. In the US, environmentalists

are objecting to the use of light water reactors on the grounds that they are insufficiently safe and in Britain there have been delays to the construction of its new plants—the Advanced Gas Reactors (AGRs). Finally there will be a significant shortfall in the supplies of enriched uranium unless large, extremely costly uranium enrichment plants are constructed now or in the very near future. Here the uncertainty is whether to stick to the relatively inefficient but well-tried gaseous diffusion method or whether to try out the centrifuge method.

At present the nuclear generating capacity only amounts to approximately 6 per cent of the world's total electricity generating capacity, but is expected to increase to 28 per cent by 1985. This means an increase from the 49,300 megawatts electrical of today to 546,000 MW(e) in 1985. Just under half that amount—206,000 MW(e)—is now on order and under construction in the western world (mostly light water reactors). To provide those nuclear power stations with fuel the uranium-enriching processes will need to increase between seven and 10 times, says Dr D. G. Avery, of British Nuclear Fuels Ltd.

The United States is in the process of increasing the "separative work" from 17,000 tonnes per year to 30,000 tonnes per year. Britain has sufficient capacity to meet the needs of its AGR power stations which are now being installed. "Run-out date" is likely to be around 1983 in the western world, and for that reason, says Dr Avery, work on a new uranium-enrichment plant with its associated power supply of around 2000 MW must be begun in the next year or so.

Through the treaty between Britain, the Netherlands and West Germany on uranium-enrichment it should be possible to build a gas centrifuge plant doing 2000 tonnes of separative work by 1980 and 10,000 tonnes by 1985. Nevertheless by 1985 a total of 60,000 tonnes of separative work per year will be needed. The investment required to make up the 30,000 tonnes "SW" difference between the 60,000 tonnes and the American output, will necessitate a total capital investment of around £1,800 million, says Dr Avery, of which the European demand will account for around half.

Although there may be great potential in both geothermal and solar

energy, neither energy source will be exploited to any great extent over the next 10 to 15 years. It therefore seems that nothing, not even the pouring in of capital, can change the fact that governments and the major energy industries have on the whole miscalculated the investment and resources they should have been putting into energy production over the past decade. It has all been too easy for them, and now it is going to be difficult. Naturally they are looking for scapegoats and the environmentalist, with his obstinate refusal to allow power plants to be built and his antagonism to the production of oil from the Arctic and off-shore, is fair game. Sir Eric Drake, Chairman of BP, having claimed himself to be a member of every known conservation group in the country, blamed environmentalists for bringing about the shortfall in refined oil in the United States. He called for "sensitivity" in resolving the differences between environmentalists and those responsible for providing energy, but any conflicts must be resolved "with dispatch".

Can progress stop?

None of the western nations are in a fit state to call off the pursuit of progress and the demand for ever more energy. If there is talk of reducing demand it is out of immediate necessity and not because of some higher policy with its virtues of restraint. How the next few years will go is extremely uncertain. It is possible that the western countries will be able to weather a shortage in energy supplies of up to 10 or 15 per cent of their projected needs, until such time as they have managed to build up a highly sophisticated network of nuclear power plants. Certainly governments, with the banks and energy men behind them have set their sights on such a programme and the sooner they have it installed the safer they will feel from the vagaries of the Middle East. If they don't get there—and it's on the cards they won't—the industrial world will be in chaos and the likely consequences are an extremist take-over such as has recently occurred in Chile. Either way we are in for greater centralisation and greater authoritarianism: moreover, through taxation we will be called upon to support costly programmes for energy production and utilisation.



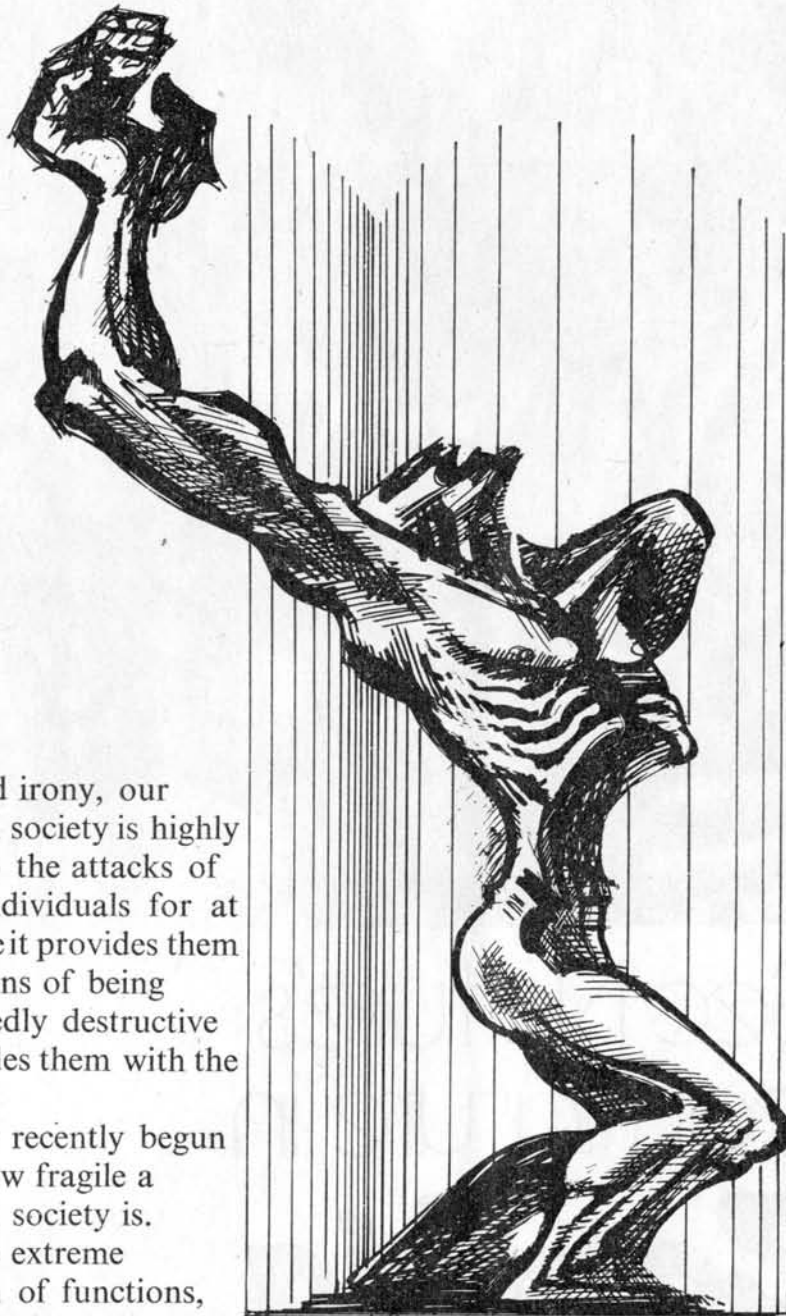
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TECHNOLOGY & *VIOLENCE*



By an unkind irony, our technological society is highly vulnerable to the attacks of aggressive individuals for at the same time it provides them with the means of being unprecedentedly destructive it also provides them with the motives.

It has only recently begun to emerge how fragile a technological society is. Owing to the extreme specialisation of functions, if any one function is knocked out, the greater part of society is soon affected—as we see when industrial action affects power supplies, newspapers, transport, etc. The physical violence of terrorists or vandals, coming without warning could be much more disruptive.

by **Gordon
Rattray Taylor**

Technological society depends on a high degree of co-ordination and control for its functioning and it is these information networks which constitute the weakest points. For instance, a bomb placed in the air-traffic control centre for southern England could bring half the air traffic of northern Europe, and many inter-continental flights, to a halt. It would probably lead to a few incidental collisions and crashes too. From Heathrow alone, 900 to 1,000 aircraft arrive or leave every day.

Or again, Britain's long distance telephone communications depend on about a dozen towers, carrying microwave aerials, of which the well known Post Office tower in central London is one. Some of these aerials form part of the country's defence network and no doubt carry information from radar receivers etc., as well as operational instructions. The details are secret. Successful destruction of two or three of the most central of these towers, would disorganise long distance telephone communication and if combined with an assault on the main P.O. cables from London to Manchester, Liverpool and Glasgow, would cause considerable havoc to business until repairs were effected. Indeed, an attempt to blow up the London tower was made in 1971 and though the tower did not fall—presumably the attackers underestimated the amount of explosive needed or placed it in the wrong spot—it is still closed to the public.

A third example: with the growth of data banks, physical wrecking of the computer or interference with the data stores could be disastrous. The old London County Council put its entire housing list of applicants on punched cards; today no doubt magnetic stores are used. Imagine the results of wiping out these records! It might be even more fun to wipe the records of the Inland Revenue. Police data banks, now computerised, are another obvious target. Computers offer the further

possibility of non-violent violence: a disgruntled programmer might substitute some inaccurate facts or feed in some wild instructions which would cause even more havoc than a simple obliteration of the data.

Next to information, energy is probably the most critical resource in a technological society. In western countries a small number of "grid" control stations bring into play an increasing number of generating stations as the demand for power mounts towards evening. If this is not done smoothly, the entire system packs up, voltage surges cause cut-out switches to trip and plunge an area into darkness. The imbalance then spreads to neighbouring areas, until thousands of square miles are affected. It follows that a bomb in a grid control station could cause disaster. Actually a bomb is not needed; an armed man who knew enough to throw the wrong switches could do the same. Indeed, a wave of imbalance could, I imagine, be triggered by judicious wrecking of a few (unguarded) transformer sub-stations.

The effect of such an operation would not merely be to inconvenience householders; it would also seriously affect industry, and if the pumping stations which supply cities with water and deal with sewage were stopped for any length of time, the city might have to be evacuated for fear of plague.

After energy comes transport: the tube tunnels under the Thames are the weak spot of London's transport system, as was realised during the war. But it is hard to get at them, and it would be easier to inject tear-gas or simply a gas with a horrible smell, like the rotten eggs of hydrogen sulphide, into the ventilating system. The old lift shafts, now replaced by escalators, are in many cases used for ventilating purposes and would be readily accessible.

In the United States, teenage vandals have discovered how to wreck the lifts in a block of flats or offices: by jamming the brakes you can use the lift motor to drag the guide rails out of their mountings, thus forcing everyone in the building to use the stairs—no joke for an old person on the twentieth floor. The additional fun of starting a fire at the same time is no doubt an added refinement. Destructive activities of this sort, usually less imaginative, are said to be due to boredom, and are dubbed "mindless". Recently, of course, we have seen destructive viol-

ence used or threatened for instrumental ends, whether political or personal. The robbers who threatened to fly their aircraft into an atomic reactor were profiting intelligently from the advances of technology.

Know-how is a two-edged sword

No need to multiply examples further: anyone with a little imagination can think of plenty more. What makes the exercise worth the effort is the hard fact that individuals with the motivation and know-how to attempt such feats exist and have the enterprise to attempt them. One of the most pathetic delusions of Fabian reformers was that if only the under-privileged could be educated, they would become model citizens and the millenium would be



round the corner. In William Morris's *News from Nowhere* everyone cheerfully pulls his weight. In his *Anticipations*, H. G. Wells described how a new order of "efficients" (later, impressed by Japanese progress, he called them Samurai) would emerge who would run the world rationally: democracy would be superseded. True, there would be a froth of wealthy idlers on top and a dregs of incompetents at the bottom, but basically the world was to consist of engineers, sober family men, who would repair your automobile or telephone. Wells' remark that we are involved in a race between education and catastrophe is probably his most quoted dictum.

Today we are beginning to face the uncomfortable fact that both social and

If the pumping stations which supply cities with water and deals with sewage were stopped for any length of time, the city might have to be evacuated for fear of plague.

anti-social people can absorb education: education does nothing to determine people's motivation, unless indeed it angers and frustrates them by showing them the follies, injustices and corruptions of the world in glowing detail. Know-how is neutral and can be used for social or for anti-social ends. Thus education can be the cause of catastrophe. The race is between catastrophe and socialisation, using the word in the psychological sense.

Today there are numerous people whose knowledge enables them to do more harm than if they had not been educated. The Californian kids who worked out how to wreck the elevators, like the students who rob the telephone system by phone-phreaking, are one end of a gamut which includes the manufacturers of do-it-yourself bombs in Belfast, New York, Brazil and elsewhere. (Naturally, I am not opposing education as such: I merely point out that the spread of education puts the world more at risk.) At the same time, the weapons available become more powerful. If a mediaeval peasant went berserk, he might kill one or two people, though more probably he would be over-powered. Given a rifle, a man who decides to kill can knock off twenty people, as was seen in Kansas recently. Given a bomb, and the fragility of aircraft, a terrorist can destroy two or three hundred.

This capability will certainly continue to increase. Indeed, an underground paper in London a few months ago printed instructions on how to make your own atom bomb, with advice on where to explode it. (Charing Cross, since that will destroy the Houses of Parliament, Buckingham Palace, the Army and Navy Stores and other centres of capitalist reaction.) In actual fact, to make an atom bomb which will not simply fizzle is more difficult than the writer seemed to think. Nevertheless, organised terrorists in, say, a Middle East country, could recruit the specialised knowledge, tools and materials, without too much ex-

Know-how is neutral and can be used for social or for anti-social ends. Thus education can be the cause of catastrophe.

pense and produce something which could cause a lot of trouble if they wished. Or, more simply, they could distribute radioactive materials in such a way as to cause appalling difficulties. (It is perhaps better not to be specific.)

Over the next thirty years we can expect to see many new weapons, more convenient and practical than these, become available. Already it is possible for any bright schoolboy to build a laser which can blind a man three miles away. (Kits are on sale for a few pounds.) The US Air Force has a huge funding for the development of a laser death-ray which would bring down a bomber or incinerate a guided missile. So we can assume that before the end of the century we shall have pocket lasers which will scorch, maim and blind, if not kill. They will be convenient to carry in one's pocket or handbag, in case attacked by drug addicts seeking money for a fix. (Hopefully, the drug addict will have hocked his own laser-gun.) But before they become side-arms (hand guns, as they say in America) vandals will have found out how to start fires with them at a safe distance, how to puncture tyres and stop clocks.

John Brunner, in his remarkable book *The Jagged Orbit*, has imagined many other outlets for the hate-filled violence which lies at the heart of this problem. These range from bacterial pastes which destroy steel (rub them on your nearest bridge) to strong monomolecular filaments so thin that they are invisible (stretch them across the road to slice vehicles and their occupants into neat halves.)

Resentment, frustration, boredom

But technological society does not merely provide the objective and the means; it also provides the motives. Obviously it is not possible in an article to explore the whole question of the origins of violence, a subject on which whole books have often been written, and one which would also involve considering other forms of violence, from

battered babies to judicial torture, and from rape to war. No need to rehash the controversies about nature and nurture, about instincts and learning, about physiological and psychological causes. The problem which confronts us is not why is man an aggressive species, but why does a small minority become so impervious to the controls which restrict aggression in most of us?

Three factors seem to stand out; one is well conveyed by a statement made to Tony Parker by a prisoner in Grendon Underwood and reproduced in his absorbing book *The Frying Pan* (Panther Books 1971). An Irish boy, resentful of being born a bastard, told him: "I wasn't wanted right from the start—that's plain enough for sure, and I think it makes you grow up on the defensive and hating other people be-



cause you know you are not a fully fledged member of their society. So you turn your back on it. You think 'Oh, sod the lot of them...!' " and he added "I hate everybody, that's the fact of it; and most of all I hate myself. Hatred, violence, I'm full of it. I think if I had a chance I'd destroy the whole world." In short, some destructive violence comes from being unwanted and unloved in infancy.

Secondly, there is the 19-year-old boy who wrote: "I feel so frustrated at times I feel like destroying everything in sight... if I read about a big job being done or a murder, I want to do the same, so that people will know I'm equal to anyone... I can't stand being taken a figure of no account."¹ It is striking that one of the Arab terrorists, whose motives were ostensibly political,

We can assume that before the end of the century we shall have pocket lasers which will scorch, maim and blind, if not kill. They will be convenient to carry in one's pocket or handbag, in case attacked by drug addicts seeking money for a fix.

commented that he had taken part "in order to *be* someone." Resentment, frustration, loss of identity and loss of zest.

Thirdly, with regard to "mindless vandalism" I want to cite Arthur Miller: "I have a single overwhelming conviction—that the problem underneath is boredom... People no longer seem to know why they are alive." As Miller points out, many current plays, novels and movies deal with this theme. "People seem to live in a state of psychological stasis, punctuated by a string of near-experiences."² (A major factor in drug-taking is the desire for some challenging change of routine.) In his book on the Glasgow gangs, James Patrick describes how the real purpose of the rumble is the sense of tension which builds up in the hours immediately preceding hostilities. The fact is, young men seek a physical challenge, something which will test their resource, courage and competence, and which will bestow status and provide a purpose. Modern society fails to provide such an institution for many of its members.³

Equally, it is the urbanised, specialised mass-society which deprives people of status, and which by the same token weakens the social controls which normally inhibit violence. If you live in an isolated community and needlessly attack your fellows, very strong pressure will be put on you to desist and psychologically you will lose more in companionship, help and approval than you gain by your self-indulgence. Above all, it is modern transport which enables you to dart into a strange community, where you have no emotional commitments or loyalties, commit a violent act and pull out again, escaping psychological as well as legal consequences.

But what of the loss of love and support in infancy which seems to breed a desire for universal revenge?⁴

Young men seek a physical challenge, something which will test their resource, courage and competence, and which will bestow status and provide a purpose. Modern society fails to provide such an institution for many of its members.

It would be absurd to pretend that, in pre-industrial society, all families were ideally supportive. And certainly in the early days of the industrial revolution, thanks to long hours of work, child labour, the loss of social structure consequent upon movement of unemployed to the towns and mills, and similar factors, the situation in industrial areas was often worse than now. I don't know of any research which attempts to put a figure on the proportion of families giving reasonable emotional support to children in modern industrial societies as against pre-industrial ones, but the impression given by anthropological studies is that the latter do better.

Without labouring the point further, I believe it is fair to say that technological society, as we know it, ensures the production of a number of vengeful personalities and ensures that many will be frustrated. There is no indication that these trends are ceasing to operate.

Of course, many of those who commit violent or terroristic acts claim to do so for a political motive, and it may be thought that I am blind to the injustices which such people say they seek to right. The injustices are, in many cases, real enough—yet the question remains, why do only a proportion of those who suffer from, or know of, such injustices turn to violence to solve them? The fact is, the injustices, however real, are seized on as an excuse or rationalisation. (This is not to say that the violent reformer is consciously insincere; few of us can honestly assess our own motives.) The truth of this assertion is emerging in Northern Ireland, where terror has become an end in itself, practised even when its effect is directly unfavourable to the political ends espoused. It follows that even if the injustices are righted, violence will not vanish; new excuses will simply be found.

The rationalisation of violence by intellectuals such as Fanon (even by Christians, as Jacques Ellul has complained.⁵) compounds this effect.

(In parentheses, I must add that the evidence is now strong that a surprisingly high proportion of violent acts is due to physiological and neurological imbalance. Temporal lobe disturbances, whether due to tumours, epileptic foci or minimal brain damage, seem strongly associated with violent behaviour. In one striking instance an epileptic girl called to a nurse for help as she felt an attack coming on, then stabbed the nurse with scissors so seriously she had to be hospitalised. Later these attacks were brought under control by electrode implantation.⁶ Since such cases can be identified by abnormal encephalogram traces, there is little excuse for leaving them untreated.)



The myth of deterrence

When violence is mentioned, there are always plenty of people who respond by invoking counter-violence. Bring back the cat! Give longer prison sentences! Restore the death penalty! In a journal like the *Ecologist* it is hardly necessary, I imagine, to say that such methods do not work. In the days when transportation for life was the penalty for minor crimes, people did not desist from crime. Such penalties are particularly unlikely to deter the dedicated terrorist, while the vandal does not expect to get caught. Learning theory tells us that negative rewards work best when they follow hot upon the stimulus.

To prevent technological society being wrecked by violence, we have to change the character of technological society itself.

An underground paper in London a few months ago printed instructions on how to make your own atom bomb, with advice on where to explode it.

In our courts, where cases may not come to trial for many months, penalties are rather ineffective deterrents, even when conviction is obtained. And probation or suspended sentences actually reinforce the lesson that you can get away with it. Deterrents are needed, to be sure, but when a saucepan is boiling over, it is more effective to take it off the fire than to clamp down the lid. The problem of violence in the technological society will only be solved, if ever, by reducing the forces which make for insensate aggressiveness and by strengthening those which make for purpose, status and social acceptance.

Only a society structured into communities, in turn structured into extended families—and this implies a much more cautious use of physical mobility, among other things—can hope to avoid serious pathology. Damaged personalities need care; inadequate parents need help and supervision; physiological defects must be identified and medicated. Above all, education must become education in how to live—in how to be a member of a community as well as in how to fulfil one's potentialities. And there are political and economic implications too.

In short, to prevent technological society being wrecked by violence, we have to change the character of technological society itself.

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The Effect of Wars Natural Disasters and Disease on Population Control



by F. M. Shattock

The traditional checks to an increasing population are wars, disease, famine and natural calamities, often acting together. Natural calamities involving a loss of lives of 10,000 or more are increasing and motor vehicles must now also be added as a serious cause of population control. Nevertheless wars are still potentially the most effective destroyers of man, especially when followed by famine and epidemics. The combination of a burgeoning population and ever more destructive weapons of war could mean a fearful fate for many millions in the future. In this article Dr. Francis Shattock shows how the lethality of war has increased over the ages and yet because of rapid population increase is making little dent on the total number of human beings surviving in the world.

Cruelty, inhumanity and revenge are not confined to the twentieth century. The Persian King Darius I ordered the crucifixion of 3,000 Babylonian prisoners of war and in A.D. 60 the Romans crucified 3,600 Jews after a rebellion. Nor are relatively large death rolls confined to the recent centuries since I Samuel IV records that when the Philistines overcame the Jews they slew 30,000.

In early wars disease usually killed more than the battlefield as is shown by the annual return of the 33rd Regiment in Flanders in 1798 when of 430 deaths only six were caused by the enemy. However, the outlook for soldiers wounded in battle was also very poor due to the primitive medical treatment and it has been estimated that fewer than 50 per cent of the casualties could be expected to survive even a minor wound. With no anaesthetic surgical shock was common. In the mid-19th century Crimean war over 60,000 died of wounds.

In early wars the armament was still primitive and the armies were relatively small but the mortality was increased

by the civilian population being decimated by the diseases spread along the lines of march and winter quarters and the famine which so often accompanied the armies.

At the battle of Crecy in 1346 King Edward III's army numbered 3,500 men-at-arms, 11,000 English archers and 5,000 Welsh light troops and King Philip's force numbered some 40,000. The battle resulted in 50 English dead and just over 31,000 French dead, including 11 princes.

By the early 1700s armies had not greatly increased—at Blenheim the French army numbered 56,000 and fought a combined English and Austrian army of 52,000.

In the Peninsula campaign Wellington's army numbered 17,000 British with 6,000 Portuguese and faced Soult's army of 23,000. Nor had the armies' weapons yet developed. "Brown Bess" was a muzzle-loaded musket fired by a flint-lock and was used at Waterloo after serving the army almost unaltered for 60 years. It had an accurate range of 50-100 yards with a maximum range of about 300 yards. Two rounds a minute was considered a good rate of fire.

By the early years of the nineteenth century the armies had increased in size so that during the hundred days following Napoleon's escape from Elba he was faced with a force of 300,000 Austrians, 170,000 Russians, 124,000 Prussians and 95,000 English and Dutch troops. By the middle of the nineteenth century in the Austro-Prussian War of 1866 each side was able to field about a quarter of a million men. By the end of the nineteenth century Germany could place 3,400,000 men in the field, France 3,500,000; Austria 2,600,000 and Russia 4,000,000.

The history of man's wars, revolutions, major riots, etc., between 1930 and 1971 makes sorry reading. Only 1933, 1937, 1940, 1941 and 1943 passed without the outbreak of a new war or revolution, although even in those years an "old" war was continuing: in 1933 the Bolivia-Paraguay Chaco War; in 1937 the Spanish Civil War and World War II in 1940, 1941, and 1943.

Indeed it has been estimated that between 1820 and 1945 wars had caused the deaths of 59,000,000 people.

Genocide became a prominent feature in World War II with over 20 concentration camps in Germany and German-occupied countries all seeking

the final solution of the Jewish problem. But genocide was not a new concept to mankind and one should not forget that over one million Armenians were slaughtered by the Turks in World War I, nor the countless pogroms mounted against the Jews and other minorities in a multitude of countries since the dawn of man's history.

World War I was responsible for 19 million battlefield deaths and World War II for 17 million. To this battlefield casualty list of World War II must be added the further five to six million Jews who were slaughtered by planned genocide. In Poland alone over 90 per cent of the country's three million Jews were slaughtered. One must also add the many hundreds of thousands killed by aerial bombardment and its consequences. In October 1943 the official German figures stated that a total of 1,200,000 civilians had been killed or were missing in air raids. On July 25th 1943 the fire storm in Hamburg following the bombing resulted in 20,000 dead. In a firestorm following incendiary bombing on the night of March 9th 1945 16 square miles of Tokyo were set alight and 78,000 killed.

In all it is estimated that World War II cost 22,060,000 civilian and military dead for all the countries involved, and a further 34,000,000 wounded.

In Vietnam the American forces have dropped more bombs than the combined total for Korea and World War II as well as the defoliants which will wreck the country's economy and bring famine for many years to come. Indeed to date over 45,000 U.S. troops have been killed—yet officially there is no war there.

Terrorist attacks can also produce heavy death tolls such as in the early 1950's when it was claimed that between 50,000 and 100,000 lives were lost in terrorists attacks in South Vietnam. Reprisals can also produce massive death—various observers claiming that between 200,000 and 300,000 so-called communists were slaughtered following the Indonesian coup of 1965.

In a document called "White Paper on the crisis in East Pakistan" at Islamabad it is alleged that over 100,000 had been killed in East Pakistan by Awami League workers, rebels and Indian infiltrators between March 1st and 25th—the period immediately preceding the armed intervention in which

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some 100,000 were killed and many millions forced to become refugees.

Prior to the secession of the Eastern Region from Nigeria and the resultant Biafran war it is claimed that 30,000 Ibos had been massacred by other Nigerian tribes. By the end of 1968 it was estimated that the deaths within unoccupied Biafra numbered three quarters of a million, conservative estimates putting the deaths at only half a million and other estimates put the Biafran death roll in Nigerian occupied areas at half a million.

Unknown millions have died in the various purges in Russia, including that of 1936-1938 in which over half the officer corps of the army was eliminated, including 90 per cent of all the army's generals and colonels.

Similar major purges have been undertaken in China. The Senate International Security Committee in their Report "The Human Cost of Communism in China" believes that there have been between 34 and 64 million deaths of Chinese since the nationalists started fighting the communists in 1927. It is estimated that 3,000,000 died in the civil war, the Sino-Japanese war and the Korean war; that several million landlords died during the 1949-1953 land reform; up to two million during the 1958-1961 Great Leap Forward and about half a million during the 1966-1969 Cultural Revolution as well as a further million in attempts to suppress various minorities such as in Tibet. To these totals must be added a further estimated 25 million dying in forced labour camps and up to 30 million in political liquidation campaigns between 1949-1958.

The impossibility of estimating the death rolls of various wars is shown by the varying estimates of the death roll from the religious war following the partition of India which range from 300,000 to one million.

The African continent has also had its fair share of wars and coups. Indeed between January 1963 and January 1969 Africa has suffered 27 coups affecting 19 different countries and presently has 13 military presidents or

In mid-1966 the world population is estimated to have been 3,356,000,000 so that the loss of one million dead represents 0.03 per cent of the world's population with approximately 64 million births a year in the world the loss represents the births of 5.7 days.

heads of governments, four generals, five colonels, three captains and one lieutenant. Some countries have been fortunate enough to have only one coup in this period—such as Uganda, Zanzibar and Upper Volta but in the same period Congo Kinshasa and Dahomy have had four.

In Rwanda-Burundi 10,000 Watutsi were killed bringing the estimated number of slain Watutsi to about 100,000 since about 1959 when Bantu Hutu tribesmen killed at least 50,000. The various estimates range from 80,000 to 130,000. In the Mau Mau rising starting in 1952 some 13,000 Africans were killed. In the Zanzibar revolution some 3,000 Arabs were killed. In the Sudan war it is believed that already 500,000 had died. As early as 1961 the guerilla leader Holden Roberto claimed that over 1,000 Portuguese and 12,000 loyalist Africans in Portuguese Angola had been killed and some 25,000 Angolan revolutionaries had been killed.

The 15,810 murders committed in the United States in 1970, a rate of one every half hour, pales into insignificance in the face of the national and international holocaust. But it has been estimated that there is one hand weapon for every adult male in the world.

The explosion of the first atomic bomb over Hiroshima ushered atomic war into mankind's history and following the concept of simple deterrence came the notion which was named by Sir Winston Churchill as the "Balance or Terror". Peace was to be kept by the fear of total destruction on both sides.

Thermonuclear weapons are now measured in megatons—a word which in itself means little until it is realised that a "modern" bomb of 30 megatons is the equivalent of 2,000 Hiroshimas¹.

Nor must the mortality from lesser modern weapons such as napalm and cluster bombs be forgotten when reflect-

ing that it has been estimated that a massive nuclear exchange even in a well sheltered United States could produce a death roll approaching 40,000,000.

It has been estimated that the existing nuclear weapons stockpile is equal to 20 tons of TNT for every man, woman and child on the earth and to this must be added biological and chemical warfare. The arsenal in Arkansas has been stockpiling seven "biological weapons" which can be introduced into the enemy's food or water supplies—botulism toxin (one of the most powerful poisons known to man) shellfish toxin which causes respiratory paralysis leading to death, staphylococcus toxin and four micro-organisms—causing anthrax, encephalitis, rabbit fever and Q-fever.

Almost two years after President Nixon's renunciation of biological warfare these agents are now being "deactivated" over a period of 11 months. However "laboratory quantities" will be preserved for "defensive research".

Wars, like natural disasters, produce many side effects which in turn can exert some influence as methods of population control such as starvation, disease and financial responsibilities which can affect the development of a country.

When a US team visited Vietnam² they found that defoliants had devastated about a fifth of the country's 14 million acres of commercial forests, worth some \$500 million. The team estimated that about half of the country's mangrove trees, mainly in the Mekong Delta region, had been completely destroyed with no signs of regeneration after three or four years. Not only did this pose the threat of coastal erosion but it reduced the country's major source of food and charcoal. Sufficient crops have been destroyed to feed 600,000 for a year. The team further estimated that nearly all the crops which had been destroyed would have been consumed by the civilian population.

The effect of wars on population control

The effect of wars as a measure of population control may be considered both as the time required by the populations increase to replace the war dead and also by considering the war dead as a percentage of the world

population at differing periods.

Thus in 1967 South Korea lost 670 troops in South Vietnam but at the 1966 birth rate this loss was replaced in 16.9 hours of births. A major loss such as the estimated loss of one million South Korean soldiers and civilians in the Korean war would represent 2.8 years of births. In 1966 the South Korean population was 29,208,000 so that the loss of 670 troops in 1967 represents a loss of 0.002 per cent of the population. The considerably larger loss of one million soldiers and civilians represents a loss of 3.4 per cent of the 1966 population.

In mid-1966 the world population is estimated to have been 3,356,000,000 so that the loss of one million dead represents 0.03 per cent of the world's population with approximately 64 million births a year in the world the loss represents the births of 5.7 days.

In considering the effect of a major war on population growth we can consider the rolls of war dead. First between Lisbon and Moscow Napoleon lost two million troops. Secondly, the total civilian and military deaths of World War II which numbered 22,060,000 and thirdly, the total American dead in her eight major wars. They were: The American Revolution with 4,434 deaths; the Mexican war with 1,733; the Civil War with 140,414; the Spanish-American war with 385 deaths, World War I with 53,402 deaths, World War II in which 291,557 American soldiers lost their lives, the Korean war with 33,629 deaths and the Vietnamese war with, up to the end of 1967, 13,519 American military deaths. A total of 539,073 military deaths.

Table I shows that high war death rolls represent an ever diminishing per cent of the world's population. The 22,060,000 total war dead of World War II represent 8.8 per cent of the estimated world's population in AD 1 but this will have fallen to only 0.4 per cent of the world's estimated population in AD 2000.

The same death rolls may be used to consider their "replacement time" at varying periods in time from the world population increases.

Table II shows that for a major death roll such as that due to World War II with its 22,060,000 military and civilian dead at the rate of population increase from AD 1 to 1500 it would take 220 years to replace, whereas at

War dead as a percentage of world population

Year	World population	Moscow-Lisbon 2,000,000 dead	World War II 22,060,000 dead	Eight U.S. Wars 539,073 dead
A.D. 1	250 million	0.8	8.8	0.2
1500	400 million	0.5	5.5	0.1
1798	1,798 million	0.1	1.2	0.03
1965	3,295 million	0.06	0.7	0.02
2000	6,267 million	0.03	0.4	0.01

TABLE I: The war dead of three wars expressed as a percentage of the world's population at differing periods.

Period required to replace war dead

Period	World population increase	Eight U.S. Wars	Lisbon-Moscow	World War II
A.D. 1-1500	150 million in 1,500 years	5.4 years	20 years	220 years
1500-1798	1,398 million in 298 years	1.4 months	5.1 months	4.7 years
1798-1965	1,497 million in 167 years	2.9 weeks	2.7 months	2.5 years
1965-2000	2,972 million in 35 years	2.1 days	1.1 weeks	3.1 months

TABLE II: The period required to replace the war dead by world population increases at differing periods.

the rate of world population increase between 1965 and 2000 it would take only 3.1 months.

From Tables I and II it can be seen that even the massive death rolls of modern warfare can be absorbed in view of the rapid population increases. With the known world population of 1965 the 22 million dead from World War II can only represent 0.7 per cent of the world's population. Therefore modern world war as waged in World War II will have little effect as a population increase deterrent. However since the atomic age has dawned, ushered in with the sudden death of some 260,000 from a single bomb burst at Hiroshima, man can at last achieve megadeath and this may well act as a considerable deterrent to the population increase.

Famine

Famine, like epidemics, closely follows the footsteps of war but can also occur in times of peace.

Between AD 10 and 1846 there were over 200 famines in the British Isles and between BC 108 and 1911 there were 1,828 famines in China³.

In 1706 the Irish population was under two million but had risen to four and a half million by the end of the century. Only the coastal areas had a cash economy or market economy. The whole hinterland depended on a subsistence economy with high rents, arrears and evictions. A cow and a potato patch could feed an entire family at a subsistence level. Small holdings were easy to get, the landlord system discouraged both improvements and savings and a large family was an insurance against personal disaster. The

net result was a national disaster—a huge rise in population but there was no way for the masses to rise above their low estate.

The failure of the potato crops in 1816 and in 1846 led to two massive famines in which just under two million died (some 40 per cent of the population) and a great migration.

In 1812 some 2,060,000 Koreans were starving and in 1813 a further 2,440,000 but the number of deaths is not known.

However in recent years massive famine has ceased to act⁴ as a deterrent to population expansion. In the Bengal famine of 1943, 1,500,000 died. In 1965 the Bihar State famine was relieved by international help but following the worst drought of the century famine again threatened 15 million people in 1966 and was again relieved by international help.

The Bihar State famine of 1965 was relieved by 10,000,000 tons of grains being brought to India. The 1966 famine was relieved by help from some 10 countries. The United States sent six million tons of wheat, one seventh of America's entire crop. The drought was relieved by the construction of half a million temporary wells and 1,000 permanent ones. A threatened smallpox epidemic was averted by the administration of some 220,000 doses of vaccine. This is a far cry from the last great famine in Europe, in Ireland some 120 years ago. Severe shortage of food lasted for six years and one of every eight persons born alive in 1846 died during the following five years.

Despite the abolition of the gross effects of famine by the ever-ready

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1669	Bengal	3,000,000 died
1769	Bengal	10,000,000 died
		it is said that one third of India's population died.
1816	Ireland	737,000 died
1838	North India	800,000 died
1846	Ireland	1,009,000 died
1860-90	India	15,000,000 died in ten famines
1876	North China	9,500,000
1921	Russia	3,000,000 some references state 5,000,000.
1943	Bengal	1,500,000 some references state 5,000,000.

Table III Some major famines in the World.

international help for an emergency it is estimated that 35 million persons a year are still dying from starvation and malnutrition and associated diseases and that one half of the children born today will never reach adulthood. The greatest mortality lies amongst the under fives whose mortality rate is so high in the developing countries. The infant mortality rate can range up to 20 times that of a developed country and the mortality rate of those aged one to four years can be 40 times as high as in developed countries.

Major famines, as such, now have little effect as deterrents to population increase since they are relieved by international action. However the chronic malnutrition and high under fives death rates do not excite such

Epidemics have been a most potent form of population control as they swept relentlessly through country after country, killing by the thousands. However, improved public health and immunisation have checked these as restraining influences on an increasing population.

action and these remain as deterrents although their effect will lessen with the continuing establishment of under fives clinics.

In India it is estimated that 50 per cent of the food grown is lost to rodents, insects, birds, rot and vermin either as a standing or stored crop. The losses are not much less in other developing countries. Due to this loss of crop, poor crop production, soil erosion, drought and flash floods it is estimated that out of every 54 persons in India only one is well fed, 46 are malnourished and seven are starving.

Epidemics

The oldest Chinese medical treatises seem to show that smallpox was present in 1122 BC and one of the earliest books of Indian medicine also describes smallpox. According to ancient Indian writings, cholera and leprosy were known before 200 BC. Egyptian mummies show evidence of spinal tuberculosis, smallpox and splenomegaly which may have been malarial.

Various unknown epidemics are also mentioned in the Bible. Samuel mentions an epidemic which killed 70,000 men in three days in 1017 BC: "and there died of the people from Dan to Beer-Sheba 70,000 men" (2 Samuel, XXIV, 15).

Epidemics not only followed wars but also accompanied them and at times even effected the outcome of the campaigns. In 1527 when the victorious French army lay outside Naples the army was struck by typhus. Within 30 days over half the army had died, some accounts relating that only 4,000 men of the 25,000 survived. Naples was saved.

In the First Crusade the Christian army of 300,000 was reduced to 60,000 mainly by epidemics, by the time

Jerusalem was taken. In the Second Crusade disease left only a handful of men alive out of the army's original half a million men. In 1632 typhus and scurvy destroyed 18,000 soldiers of the opposing armies and in 1801 22,000 of General Leclerc's army of 25,000 which was sent to put down a Negro uprising in Haiti died of yellow fever.

During the Crimean War the French, Russians and English suffered 150,533 wounded and 63,261 battlefield deaths. The sick from cholera, typhus, dysentery etc. numbered 662,917 and the deaths 104,494.⁵

The cry: "Bring out your dead" which rang through the streets of a London besieged by plague may only have been an echo of similar cries that rang through Nero's Italy when a "plague" raged throughout Italy leaving corpses in all the houses, "and many who had mourned a beloved victim died themselves with such rapidity that they were carried to the same pyre as those they mourned".⁵ At a later date another "plague" was brought to Italy by a returning army and caused so many deaths that cities and villages were abandoned and fell into ruin. In AD 165 the disease was temporarily arrested but broke out again in AD 180 and in AD 189 when it is recorded that there were 2,000 deaths a day in Rome. In AD 444 an epidemic in Britain caused so many deaths that: "the living could scarce suffice to bury the dead".⁵ In AD 540 an epidemic in Byzantium claimed 5,000 and later 10,000 deaths a day.

In the middle of the 14th century the Black Death swept through Europe killing an estimated 25 per cent of the population. The Great Plague of 1664-1665 killed one sixth of London's population and plague cemeteries can still be seen throughout Europe. Plague only killed in massive numbers as in 1771 when in one month in Moscow 27,000 died and in Cadiz in 1806 when 100,000 died. In 1628 in Lyons 60,000 died from plague and typhus during the 30 years war.

Plague remains as an indigenous disease in some countries but causes fewer deaths due to improved standards of public health. In Indonesia in 1911 tens of thousands died from plague but an epidemic in Central Java in February 1968 only killed 40 persons.

Typhoid and typhus have also claimed their fair share of victims. Typhus was present in Europe up to

the early years of the 19th century. Between 1816 and 1819 in Ireland typhus claimed 700,000 lives out of a population of six million. In Brittany in 1741 typhus together with smallpox claimed 80,000 lives. In Europe Russia between 1917 and 1923 there were an estimated 30 million cases of typhus with three million deaths.

Cholera epidemics have also been frequent and have caused many deaths. In 1832 in England 21,000 died, in 1848 and 1849, 53,000 died and in 1853 and 1854 a further 20,000 died. There had been no case in the 20th century in England until one case was reported in 1970. Major epidemics occurred in the New World in 1832, 1849 and in 1854. In combination with typhus, cholera was the main cause of deaths from disease in the Crimean war. In the Dongola Expeditionary Force cholera attacked 406 native troops killing 260. Of the 788 followers of the Force who also contracted cholera 640 died.⁶

Smallpox epidemics also carried a very great death rate, especially in a population not previously exposed to the disease. In 1520 one of Cortez's Negro slaves introduced smallpox in the Americas and three and a half million people died in Mexico alone. In 1633 about 40,000 red Indians in Massachusetts and Narragan were known but after a smallpox epidemic only a few hundred were left alive. In 1707, Iceland with a population of 50,000 suffered 18,000 deaths and in the same year 14,000 also died from smallpox in Paris. In 1770 three million died from smallpox in India and between 1873 and 1874 a further half a million in India died as well as 40,000 in England. In the Franco-Prussian war 200,000 soldiers contracted smallpox and 25,000 died. In 1890 3,000 died of smallpox in Egypt.

Malaria has also been responsible for many hundreds of thousands of deaths throughout the world and continues as a main killing disease in many countries. However the World Health Organisation has reported that over half the world's population that used to be subject to malaria is now free from that menace.

All other infections have been rampant throughout man's early and later history and have claimed many hundreds of thousands of deaths and continue to do so but on a much lesser and decreasing scale in the developing

countries. Measles remains in the developing countries as the second greatest killer of children under five. Moreover the measles seen today in the developing countries with its high death rate and high complications rate is the same as the black measles described in Europe some 100 years ago which had an equally high death rate. This was due to its combination with malnutrition in the vicious circle of early childhood.

Pandemics of plague 70 years ago and of influenza 40 years ago killed between a quarter to a half of the villagers of the Punjab. Between 1749 and 1764, 40,000 died in Sweden from whooping cough.

Measles, scarlet fever, influenza and tuberculosis as well as smallpox, were largely responsible for the decimation of the "virgin" tribes of the American Indians, Pacific Islanders, etc. who were exposed to them for the first time with no immunity. In reference to the New World it has been said that its discovery led to an exchange of both trade and disease. Smallpox, influenza, measles, scarlet fever and tuberculosis together with beads, blankets and fire-arms were exchanged for syphilis, gold, tobacco, Indian corn and potatoes.

Indeed in Fiji in 1875 40,000 or

28 per cent of the population died from measles which spread from a European ship.

Epidemics have been a most potent form of population control as they swept relentlessly through country after country killing by the thousands. However, improved socio-economic conditions, improved public health and immunisation have checked these as restraining influences on an increasing population. Thus in 1848 and 1849, 53,000 died from cholera in England but in the twentieth century there has been only one case. Smallpox has been eradicated in many countries as have plague, typhus, and malaria. Further the mortality of other killing diseases such as measles has been blunted by the better socio-economic conditions which lead to better nutrition. Presently in Europe of 10,000 cases of measles one death may be expected, whereas in a developing country the death rate from measles remains at about 10 per cent.

Therefore the traditional restraining influences on population increase no longer have their effect in the developed world and are having an ever-decreasing effect in the developing world. In the developing world sub-nutrition and malnutrition remain as controlling factors but are being actively combated—as best as possible

with the small budgets available from the countries' own resources.

The present population explosion is due to the developing world where a medieval birth rate co-exists with a decreasing death rate and in all these countries a very great effort is being made to further reduce the death rate—especially of the under fives. Inevitably the population position will worsen. Indeed in some developing countries the per capital income has actually fallen since the introduction of large scale public health measures. Thus by aiding developing countries we are but holding a loaded gun to our own heads as the spaceship Earth becomes more and more crowded, and polluted.

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Does building houses increase homelessness?



by Edward Goldsmith

Few people would dispute the proposition that the only way to solve a shortage of houses is to build more of them. It is the normal intuitive reaction, and the only one our society has to offer. But is it the correct solution?

Though growth is occurring throughout the world, the housing problem is everywhere getting worse. India in 1950 was short of 2,800,000 housing units, by 1960 the official figure had increased to 9,300,000, while in 1970 it has risen still further to 12,000,000.¹

In other Third World countries the situation is also grave. Our natural reaction, however, is to attribute this trend to their economic backwardness, ignoring that economically advanced countries such as the UK and the US are scarcely faring better.

In the UK, according to government estimates, there are in England and Wales alone at least 1½ million slums,

together with 2¼ million houses lacking basic amenities.² London alone is short of between 150–200,000; more than 500,000 people share accommodation, and a million live in houses regarded as inadequate.³

In the meantime, efforts to solve the shortage by building new houses appear increasingly inadequate. In 1967, 415,000 new houses were built; in 1969 only 378,000; in 1971 the figure had fallen to 364,000.⁴

In the US the situation is no better. The housing shortage in the big cities is acute, with terrible crowding in the slums. In 1969, 1.9 million housing units were built, as against the national goal of 2.6 million set by the Housing and Urban Development Act of 1968. According to conservative forecasts, housing will be required for another 100 million people in the next 30 years, in addition to replacing something like half all existing units, which by then will be obsolete.

If the housing problem is to be solved by building more and more houses, and if the UK and the US, with all their science, technology and industry are incapable of providing them—then it must be very unreasonable to expect that the Indians and other poorer non-industrialised nations could conceivably succeed.

Why are our efforts so unsuccessful? Is it possible that they might be misdirected and that the solution to the housing problem is of a very different kind?

What then could be the cause of the housing shortage? One of the most obvious causes is population growth. It is 2 per cent world wide. In Britain we have an extra 200,000 people a year, but even at two people per housing unit, this means no more than 100,000 houses per annum; whereas the demand is at least four times greater than this. What are the factors involved?

Urbanisation

An unavoidable feature of industrialisation is increased urbanisation, and this is occurring at an ever greater rate. At current trends, by 1980 50 per cent of the world's population will be urbanised. By the year 2000, somewhere between 70 per cent and 80 per cent.

Moving to the cities in search of jobs gives rise to a whole constellation of problems; from the housing point of view it means that houses are no longer where they are required; also accommodation in cities is more expensive.

Expenditure on the urban infrastructure per head of population (on sewage plants, roads, educational facilities, hospitals, etc) tends to increase with the size of a city, and in all cases are far greater than they are in the villages from which the vast majority of people migrate.

Cities throughout the world are over-saturated, at a terrible cost in human misery. In the UN report prepared for the Stockholm Conference on the Human Environment, it was recognised that "... the vast increase and migration of peoples represents one of the largest single causes of misery, insecurity and communal upheaval ever experienced by the human species".

It is extraordinary how little this global catastrophe, which is alone sufficient to eradicate what vestiges of civilisation remain in our industrial society, has influenced public policy.

Mobility

People do not necessarily settle in the urban area to which they have migrated. There is a tendency for them to move from one such area to another, according to the requirements of their work. Until recently, people were born, lived and died in the same place. Mobility was extremely limited. People were reluctant to leave their extended family and community within which they had a very precise identity, in order to lose themselves in an anonymous mass society.

With the disintegration of the family and the community, and their replacement as economic units (and to a certain extent as social ones, too), by business enterprises whose fortunes tend to rise and fall, people have become ever more nomadic in their habits.

In the US, where this socially disruptive process is most advanced, less than 15 per cent of people are said to

be living in the town or village in which they were born. From the housing point of view this creates a requirement for a surplus of houses over families, as the arrival in a particular locality of one family will not necessarily coincide with the departure of another. The required surplus must increase with mobility, and this appears to be a function of industrialisation.

It is significant that in the UK in 1969 there were 16,594,000 households for 16,281,000 families, a surplus of over 300,000 houses, which by 1972 had increased to around 600,000.⁵ In spite of this, there is still a housing crisis, in fact, it is getting worse.

Size of households

Possibly the most important factor to take into account in explaining the housing shortage, is the disintegration of the family. We have already seen some of its implications.

From the housing point of view, its most significant effect is the consequent reduction in the size of the household. Mark Abrams⁶ predicted in 1970, that by 1983 in London: "... of the total 2 million households, nearly one quarter will consist of one or two persons, and contain someone of pensionable age; indeed, one household in every ten will consist of no more than a man or woman (usually the latter) of pensionable age living alone".

This trend is reflected in a proliferation of households which leads to the paradoxical situation that, though the Greater London Council foresees a million less people living in London in ten years, the housing shortage is likely to worsen. In fact, there has been a 7 per cent fall in population in the last decade, while the number of households in London has remained about constant.⁷

In Victorian times there were between eight and ten people to a house. In 1951 the figure was 3.54, in 1968, 2.46. A recent survey,⁸ reveals that this trend is still continuing.

Since 1971, the two person household has become the most common one; 31.3 per cent of households being made up of no more than two people, compared with 22 per cent in 1947. As Abrams predicted, there has been a marked increase in the one person household. 17.1 per cent of people lived by themselves in 1971, as against 5 per cent in 1947.

Significantly, it was in rural areas

such as Scotland, which are less caught up within the industrial orbit, that this trend was least pronounced.

Second homes

A further factor is the systematic deterioration of the urban environment. In the name of modernisation, slum clearance, road improvement, all of which go under the heading of that most iniquitous of euphemisms: "development".

In spite of the fact that it is perhaps in Britain that one finds the greatest number of conservation-orientated amenity societies, it is also in this country that there appears to be the least respect for its cultural heritage. After the total destruction of the historic city of Danzig during the War, the Poles rebuilt it as it was; as the East Germans did in the case of Leipzig.

In Italy it is impossible to change a stone within the walls of its historic cities, though beyond them shapeless suburbs spread out chaotically in all directions. In France protection is also reasonably effective. Paris, one of the world's most beautiful historic cities, has the misfortune of being also the administrative and industrial centre of one of the fastest growing industrial nations in the world. It is thus subjected to continual pressures from would-be developers; yet on the whole and in spite of the monstrous Tour de Montparnasse and associated buildings, damage has been relatively small.

In Britain, on the other hand, we are witnessing the systematic sack of our most beautiful cities; Lincoln is being torn apart; Bath bulldozed, with more than 2,000 of its Georgian buildings destroyed in the past few years; Winchester is to be gutted to allow for massive new motorways. Everywhere one finds the same tragic situation.

Is it that the British are the Northern Barbarians that they have always been made out to be in Continental circles? The answer, I think, is rather to be found in what has come to be called the Protestant ethic⁹—the notion that work is virtuous, and that it is only by committing oneself wholeheartedly to industrial undertakings, that one can best make one's peace with God. It may also be that the British are imbued with a greater social conscience than their continental neighbours.

Development schemes, however monstrous, are interpreted as contributing

Since 1971, the two person household has become the most common one; 31.3 per cent of households being made up of no more than two people, compared with 22 per cent in 1947.

towards the welfare of the more unfortunate members of society, as a means of combating poverty, unemployment, ignorance and homelessness. For this reason, the British tend to feel virtuous as they see fine 18th Century buildings collapse before the bulldozers—wicked and undemocratic when they lift a finger to oppose these acts of vandalism.

One of the most depressing features of our social scientists' has been to under-estimate, in fact to fail to take into account altogether, the role played by aesthetics in human behaviour. If people prefer certain environments to others, and are willing to travel hundreds, sometimes thousands of miles to enjoy them, even if it be for a very brief moment, this cannot be regarded as coincidental, or as a whim of fancy dictated by the vagaries of fashion.

Aesthetics play an immensely important role. It is becoming increasingly clear that man does not thrive in an urban wasteland dotted with rectangular blocks of concrete, shoddily built, featureless, and conceived without any regard for the urban and natural landscape. Nor does he thrive in the noise, dirt and pollution caused by the ever increasing traffic that our urban conurbations are increasingly designed to accommodate.

Consequently, urban man is developing a corresponding need to extricate himself from the hell he lives in and seek refuge at periodic intervals in a more human environment. From a housing point of view this has meant an increase in the number of hotels, with all the associated installations, and weekend, holiday and retirement homes—which has led to a further aggravation of the housing crisis.

Indeed, something like 50,000 new hotel rooms have been built in the London area in the last few years to accommodate the tourist boom which has naively been taken to be permanent. Characteristically, this trend has been encouraged by the Government, which has provided a subsidy of £1,000 per room built. Fortunately, already

the tourist boom is subsiding, and many of these hotels are likely to be empty in the near future. Building them, however, has cost the tax payer about £60 million and has meant demolishing a large number of houses, further aggravating the housing shortage.

Weekend and holiday homes, together referred to as second homes, are becoming a growing requirement. Two reports have recently been published on this subject¹⁰. It appears that about 3 per cent of British families now have a second home, and that there are between 300,000 and 350,000 in England and Wales. Already there is a considerable outcry, because of the many people who do not have the first homes. On the other hand, as economic growth proceeds, the demand for them is almost certain to go on increasing. In Sweden 22 per cent of families have second homes. This would mean more than 2 million units in Britain.

There is no reason to suppose that it would stop there. At present in the UK they are still considered a luxury. Eventually they will become a necessity; just as has happened with the motor car. In fact, with the further disintegration of the family unit and the deterioration of the urban environment, it could conceivably one day become necessary for each family to have a third, or even a fourth home. Let us not forget that in the US the four-television-set and four-automobile-family is already regarded as quite normal.

Slum clearance programmes

Much of the demolition taking place in our cities is regarded as slum clearance. Characteristically, neither our Government, nor its advisers have ventured a definition of a slum. We look at a community which appears poor, where there is high unemployment, a high level of crime and delinquency, drug addiction and alcoholism and the other inescapable symptoms of social disintegration, ie in which the way of life displays the principle features of what Oscar Lewis calls "the culture of poverty"¹¹ and our attention is monopolised by a single one among many such features: the decrepitude and shabbiness of the houses and of the surrounding area.

It is then naively assumed that the basic character of such a community

can be modified simply by pulling the buildings down and providing it with a new physical infrastructure. By defining a slum in this way—as the disease of the physical infrastructure of a human community, rather than of a human community itself, it permits us to prescribe the only medication our culture provides: slum clearance. This is of course as much of a cure as to sand-paper the spots appearing on the face of a patient suffering from measles; though indeed for a doctor in possession of a limitless stock of sand-paper, with no other skill than the ability to use it to its best advantage, this may well be a clever tactical move.

At government level, these tactics are inexcusable, the more so since the information on the subject is now voluminous, both empirical and theoretical, and it all points to the same conclusion: the uselessness, in fact the counter-productiveness, of slum clearance programmes.

A recent incident in the U.S. is particularly illustrative: the Priutt-Igoe Project, St Louis, Missouri¹². This massive complex of apartment blocks was built in 1965-66 at a cost of 36 million dollars to the Federal Government. It was designed for a population of 10,000, packed into 33, 11-storey buildings, set row upon row on a 57 acre plot. The buildings were massive, shoddy and monotonous. Only those consented to live there who could not afford to live elsewhere. Eventually it became the dumping ground for people displaced by slum-clearance programmes, what we would call an over-spill town. The inhabitants, accustomed to living in slum areas, consisting of small, shabby houses were simply transferred from a horizontal slum to a vertical one. In no time, crime and vandalism reached epidemic proportions, and the cost of repairing the damage and maintaining the buildings in a precarious state of repair, became unsupportable. Eventually it was decided to pull the buildings down; the tenants are being pushed out, and by the Autumn of 1973 the last six occupied buildings are to be boarded up.

This is not an isolated episode in the history of slum-clearance. Though on a particularly impressive scale, it is typical of what is happening throughout America, where as many as 20,000 housing units are being abandoned every year for much the same reasons.

In spite of this, our Government is proceeding in the same old direction. Like the Bourbon's, it has neither learnt nor forgotten anything. Mr Robert Carr has recently been made responsible for co-ordinating all government actions to 'improve' areas of urban deprivation.

Expenditure on such projects is already massive. £26 million have been spent since 1969 on about 2,500 projects to improve urban areas where immigrants, who are perhaps the groups most vulnerable to social disintegration, in the alien and largely hostile social environment in which they have been plunged, have tended to concentrate.

According to a recent report on stress areas, slum clearance, which needless to say they regard as desirable, is not proceeding fast enough. Only 5,982 houses were pulled down in Greater London last year, as compared with 8,176 the year before, and 6,179 in 1970. Slum clearance, they feel, needs to be maintained "at an annual rate of at least 7,000 if we are to keep abreast of the rate of obsolescence".¹³

We are indeed fortunate that a slum is a social disease rather than a physical one, for if the latter were the case, in spite of the efforts of our planners, builders and do-gooders and politicians, we could never hope to get rid of them. Apart from the counter-productiveness of efforts at slum clearance, the world's physical resources and the associated financial ones, of nations developed and undeveloped, could not conceivably sustain the massive efforts required.

Consider that in most African towns having a population of over 100,000, between 25 per cent and 30 per cent of the inhabitants live in slums or squatter settlements, and the numbers are increasing. In Rio de Janeiro in 1947, 20 per cent of a population of 2,050,000 lived in slums; in 1957 it was 22 per cent of a population of 2,940,000; while in 1961 it had risen to 27 per cent of a population of 3,326,000. In the town of Bunoventuro in Columbia in 1964, 80 per cent of a population of 110,660 were living in slum conditions. In Lima, Peru, in 1957, 9 per cent of a population of 1,267,724 lived in slums; in 1961 it was 21 per cent of a population of 1,715,971; in 1969, 36 per cent of a population of 2,800,000. In Ankara the situation was even worse: in 1965, 47 per cent of a population of 979,000 were slum dwellers, and by 1970 the

slum population had increased to 60 per cent out of 1,250,000 inhabitants.¹⁴

What chance is there of reversing this trend in the conditions obtaining today, which are so increasingly unfavourable to large scale industrial enterprises? The answer is: none at all.

It is essential that we realise that a slum is a slum, not because its inhabitants are poor, nor because its housing facilities are bad, though these may be contributing factors. It cannot be turned into a sound and stable community by pumping money into it, nor by lodging its inhabitants in brand new blocks of flats. These measures, as in the Pruitt-Igoe Project, by reducing social bonds are in fact likely to do more harm than good.

This tends to be confirmed by the fact that the squatter communities that have appeared in many towns of South America, and who live in far worse physical conditions than the conventional slum communities display few of the symptoms of social breakdown.

According to Mangin¹⁵, the squatters establish themselves by taking over empty lots on the periphery of the big cities. If this were done in a haphazard way, they would be driven off by the police, so a sort of military operation is required whereby some thousand squatters take over the lot in one fell swoop under cover of darkness, so that when the morning dawns a new shanty town has appeared, too big to be demolished by the police without causing a serious popular outcry.

The city authorities react by refusing to recognise the very existence of the new shanty town. As a result, its inhabitants have to fend for themselves, organise their waste disposal system, police, schools, etc. For this purpose they form neighbourhood committees in which all participants elect their own leaders and soon develop relatively sound communities that contrast only too sharply with the conventional welfare-maintained slums. As Mangin writes: "Although poor, they do not live the life of squalor and hopelessness characteristic of the 'culture of poverty' depicted by Oscar Lewis".

Sub-standard housing

That demolition which does not take place as part of slum clearance programmes, is usually justified in order to get rid of obsolescent or sub-standard housing. In a recent White Paper¹⁶, we read that "two and a half

In the UK in 1969 there were 16,594,000 households for 16,281,000 families, a surplus of over 300,000 houses, which by 1972 had increased to around 600,000. In spite of this, there is still a housing crisis.

million people in England and Wales live in homes that still lack basic amenities of hot water, a bath or decent indoor sanitation; almost one household in six still lives in a house that is unfit, or lacks at least one of the basic amenities... in some cases conditions are getting worse, not better.

A fact that is unlikely to improve the situation is that modern capital-intensive housing is not built to last. On the whole, buildings appear to be designed for between 25 and 30 years, which means that the number of houses that have to be built to make sure that people do not live in obsolescent houses must go on increasing simply to keep up with demolitions. The justification is that acceptable standards for one generation may no longer be acceptable for the next.

The extension of the throw-away principle to housing provides in this way greater flexibility. The cost however is to put a further strain on society's capacity to provide housing.

The importance attached by our society to personal convenience is quite extraordinary. It appears to be a major ethical principle that life be organised in such a way that no effort need be made in the business of everyday living. If people want a hot bath, the turning of a knob must be the maximum effort they must make to obtain it. The turning of another knob is the most one can ask of our pampered citizens in order to regulate the temperature in their homes. If nature calls, it is regarded as highly unethical to force them to walk more than a few yards to a lavatory, and to press a knob is all one can expect of them in order to dispose of their excrement into the nearest waterway.

It might be worth considering that ours is the first society that has regarded personal convenience as the major goal of public policy. People have lived without bathrooms and wc's for millions of years without their being any the worse for it.

Modern conveniences are luxuries, and expensive ones at that, in terms of

real necessities, such as fresh water, unpolluted air, unadulterated food and a satisfactory social environment.

We are already suffering from a water shortage. Water is almost certain to be metered and charged for, possibly rationed in this country within the next few years. Each inhabitant at present uses 30 gallons a day of this precious resource, 60 gallons if we take into account what is required by industry to provide him with the consumer goods which he also regards as basic necessities of life.

If economic growth continues, and if each person were provided with the number of bathrooms that manufacturers, advertising agents, do-gooders and politicians try to convince him is his due, his consumption will have doubled by the end of the century. This, this country cannot afford to provide. It would mean damming most of our estuaries and flooding even more valleys, the cost of which simply in terms of reduced fishing catches and reduced availability of agricultural land, would be very difficult to support.

As for the water closet, this is undoubtedly one of the most harmful devices ever devised by man. By means of it there has developed a one-way traffic on a truly massive scale, whereby the soil is deprived of human excrement which constitutes a very considerable proportion of available animal wastes, while our waterways and estuaries are provided with an equally massive source of nutrients which must lead to their eutrophication with the consequent annihilation of fish life. By assuring the proliferation of water-closets, we must eventually succeed in depriving ourselves both of food from an increasingly less fertile land, and of fish from increasingly more polluted waters.

A further convenience is a private bedroom for each member of the household. At present there are 0.6 people to a room¹⁷ in British houses. No one has taken the trouble to consider why this should be an advantage. Man is a social animal. Total isolation within four walls, even during the night hours, is something he has never previously encountered during his evolutionary history, any more than life in a small modern house or flat designed for two people, in which he is to a large extent isolated from the inhabitants of similar small housing units in the same area or in the same building.

The extended family has, for possibly

two million years, been the normal unit for man to live in. It stands to reason that homes should be sufficiently large to house such a unit, not to accommodate that which emerges from its disintegration. Fortunately, there is no chance whatsoever of even seeing any large scale extension of the "convenience society".

In Malaysia there are still 3.1 people to a room; in the Central African Republic 3.4; in the urban areas of India 44 per cent of families live in one room houses; in Calcutta 77 per cent. These countries are poor, and are likely to remain so. Even at current trends, their standard of living will be much the same at the end of the century as it is today.¹⁷

Specialisation

Increased specialisation is also contributing to the demand for housing space. Rapoport points out that as economic growth occurs, so "spaces become more separated and differentiated, the number of types of spaces increases... Compare, for instance, the Japanese farmhouse, where living, stabling of horses and rearing of silk worms takes place in the same space; or in the village or town house, where the same applies to living, shop and workshop... with our own use of spaces, and separation of work and living".¹⁸

We require vast installations to manufacture the bare necessities of life, like food and clothing, that were once performed at the family level. Institutions of every type appear necessary for functions previously fulfilled by the family or small community, and the pressures on housing facilities increases proportionately.

The result is, of course, a proliferation of factories, office blocks and all sorts of institutions that in a decentralised society would have no *raison d'être*. These clearly compete with housing for space, materials, energy and funds.

Capital intensiveness of building

In a decentralised society, people are for the most part capable of building their own homes. In many tribal societies, professional builders are required only for the chief's house.

With economic growth there is an increased dependence on specialists requiring remuneration for their work,

which must reduce the society's capacity to satisfy an ever increasing demand for housing facilities.

Also, as urbanisation proceeds, supplies of traditional building materials are exhausted. Forests are cut down to provide wood pulp, and to free land for agricultural and amenity purposes. For prestige reasons traditional building materials tend to be abandoned in favour of fashionable, modern ones. In many parts of the tropics, galvanised iron roofs, which are excellent heat conductors, are substituted for traditional roofing materials, even though, as a result, the people that they shelter are condemned to intense discomfort during the summer months.

In addition, as the building industry falls into the hands of larger concerns bent on fully exploiting the economics of scale, so must there be a corresponding increase in the capital-intensiveness of the materials and methods used, thereby further increasing throughput, and further reducing society's capacity to provide its inhabitants with shelter. This trend is accentuated by a growing dependence on transport to provide materials once obtainable locally and now manufactured in centralised factories.

In other words, housing by becoming more and more capital-intensive, is becoming correspondingly more dependent on the use of non-renewable resources, most of which must be imported from abroad, and many of which are in ever shorter supply, as the building industry is hampered in the London area by a growing shortage of gravel, and as throughout the country it is affected by the growing world shortage of timber, which has caused the price of this commodity to more than double within a year.

It is also likely to be affected by the growing water shortage, and even more so by the world energy crisis, since energy is required today for making all the synthetic materials and transporting them to where they are required. The land shortage will also make itself felt on the cost of houses. Already the cost of land per house in London and the South East has increased from £1,731 in June 1970 to £4,953 in December 1972¹⁹.

The London Boroughs Association have recently warned Paul Shannon, Minister for Housing and Construction, that London's housing programme is jeopardised by rising prices. Tenders

for new buildings received by one London Borough were between 81 and 137 per cent above the maximum which renders a housing project eligible for government subsidies.²⁰

Prices can only increase, for the industrial world is today within the grip of inflation of a sort that does not appear amenable to conventional treatment.

The time-consecrated method for dealing with inflation is to increase the bank-rate so as to curb economic activity, thereby causing unemployment, a reduction in effective demand and a reduction in prices.

This is no longer feasible, for there is already an intolerably high level of unemployment, the dole is now so generous that were people put out of employment their demands for goods and services would not be reduced all that much, while the interest rate is already at the highest level it has been in modern times.

The fact is that we are suffering from a new type of inflation, one that cannot be understood in terms of conventional economic thinking. Industrialisation has only been possible because industrial enterprises have not had to pay the real costs, i.e. the biological, social and ecological costs of their activities. This has been so because no one has ever really worked out what these costs were, and because it is only now after 150 years of industrialisation that we are beginning to feel them seriously. Natural systems are very resilient and can take a lot of bashing. The point has now been reached however, where they can't take any more. Ever increasing damage to biological systems by pollution, chemical additives, physical stress etc, is now having to be paid for. In Britain the cost of the National Health Service is soaring, as the health of the population declines. We are already spending £2.7 billion and expenditure in this area is increasing faster than GNP. Damage to social systems has also become increasingly intolerable. One of the manifestations is the rising crime rate. This is becoming so expensive that in the US 20 billion dollars, almost half the British national budget, are being spent annually on burglar alarms, armoured cars etc, in a vain effort to reduce its incidence. Another manifestation is alcoholism. Still another is drug addiction which both further increase the cost of maintaining a semblance of law

and order.

Damage to ecological systems is reflected in reduced fish catches, soil deterioration, pest outbreaks, and even climatic changes. All these are becoming increasingly reflected in monetary costs. As already mentioned, resource depletion is beginning to make itself felt in resource shortages of different sorts and to give rise to even higher commodity prices.

All these, and many other associated problems are contributing to present runaway inflation. They cannot be combatted by conventional methods, and since they are the result of destroying natural systems with industrialisation, further industrialisation can only make them worse.

In the meantime, the massive government expenditure required to deal with these problems, however unsuccessfully, will nevertheless divert funds which could otherwise be spent on house building programmes. Homelessness is in fact only one of the many worsening problems which our government will have to face in the next decades, and it will have to compete with all the others for the funds required to "solve" it in the conventional way.

This is already being reflected in today's prohibitive mortgage rate, which is mainly the result of reduced funds available to Building Societies.

As we have seen, it is the indisassociable side-effects of industrialisation such as urbanisation, increased mobility, family disintegration, urban deterioration, etc which are causing the ever increasing demand for new homes. Since our society is committed to industrial growth (assuming industrial growth to be still possible), demand can only continue to increase. A solution to the housing problem that consists of building more houses, that depends on further increasing industrial growth, can thereby only further contribute to the problem.

Recent governments have been conspicuous for their short sightedness and cowardice. They appear content to continue applying conventional and hence accepted methods to the solutions of the problems that beset our society, often in the full knowledge that these are no longer applicable, and must inevitably fail. At least they are covered when an accusing finger is pointed to them after the inevitable failure. They can always say "look, we did what we could—in this case, we

Buildings appear to be designed for between 25 and 30 years, which means that the number of houses that have to be built must go on increasing simply to keep up with demolitions.

built 300,000 houses a year, there is no money, no labour and no materials to build more; what else could we have done?"

The real solution is so totally contrary to the accepted idea, its implications so totally alien to the most cherished values of industrial man, with which we have been imbued since our most tender youth, that no one is likely to accuse them for not having adopted it. Yet we have no alternative.

If economic growth is responsible for the trends that lead to a chronic housing shortage throughout the world, then it must be halted, in fact reversed. Our society must direct its steps in the very opposite direction to that dictated by present values and policies.

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The unhappy fate of *Salmo Salar*

by **Anthony Netboy**

Salmo salar, popularly called the Atlantic salmon, is universally acclaimed the prince of game fishes and is also universally enjoyed as a food morsel. Once the species roamed over half the northern hemisphere. They were found in numerous gulfs, bays, fjords and rivers flowing into the Atlantic and Arctic Oceans, from Portugal to northern Scandinavia and Arctic Russia in Europe, and from Ungava Bay to Long Island Sound in North America. Inland the salmon ventured as far as the foothills of the Urals to spawn and also inhabited cold, clear streams in the Swiss Alps.

In the United States Atlantic salmon abounded in more than a score of New England rivers and in streams flowing into Lake Ontario and Lake Champlain. The Lake Champlain fish were a sea-going variety who made their way to the ocean via the Richelieu and St. Lawrence Rivers, while the Lake Ontario salmon spent their feeding years in the lake and spawned in feeder streams.

So abundant were the salmon in both continents that in nearly every country where they existed we hear of periodic gluts. Indentured apprentices went on strike and refused to work unless their masters reduced the salmon ration to two or three times a week. In colonial America when a housewife in the Connecticut Valley went to

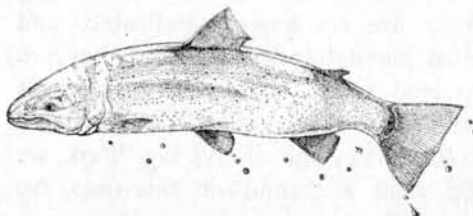
the fishmongers to buy mackerel or shad she might have had to take salmon as a tie-in sale because the market was glutted with these fishes.

The decline of the Atlantic salmon began with the industrial revolution and has continued relentlessly ever since. Today salmon have disappeared entirely from many countries. In this article Anthony Netboy looks into the causes of this tragedy.

Invention of the steam engine, spinning jenny and other textile machines, growth of the iron, steel and other metallurgical industries, all situated on running streams or near large bodies of water combined with the growth of cities which dumped their sewage directly into the rivers, sealed the fate of *Salmo salar*. England was the first nation to reap the fruits of the industrial revolution but she was also the first to pollute, blockade, canalise and render uninhabitable some of its best salmon rivers, such as the Thames, Tyne, Trent, Severn and Clyde, to mention but a few.

The United States was quick to imitate the mother country. For example, in 1798 a corporation known as the Upper Locks and Canal Company built a 16-foot dam across the Connecticut at Hadley Falls. The impediment was too high for the athletic salmon to climb, and there was no fish ladder. For some years the fishes battled their way upstream and managed to reach the dam but could not get beyond it to their spawning grounds and died. Thus the salmon became extinct in the 300-mile Connecticut and when in 1872 a solitary salmon strayed into a fisherman's net at Old Saybrook nobody then living in the vicinity could identify it!

Other New England salmon streams



suffered the same fate in the 19th century. The Merrimack is a notable example; a clear and sparkling river, it flowed out of Lake Winnepesaukee and Lake Pemigewasset in the Green Mountains. Hordes of salmon and shad used to come up from the ocean to spawn in its richly-oxygenated waters. Then the textile industry usurped the lower Merrimack. Indeed the great cotton mill at Lowell, Massachusetts, constructed in 1822, was the pride of New England, for it employed hundreds of people and produced immense amounts of yarn and cloth. Later an imposing cotton mill and 27-foot dam were built downstream at Lawrence. The dam was equipped with a fishway but few salmon could manage to surmount it.

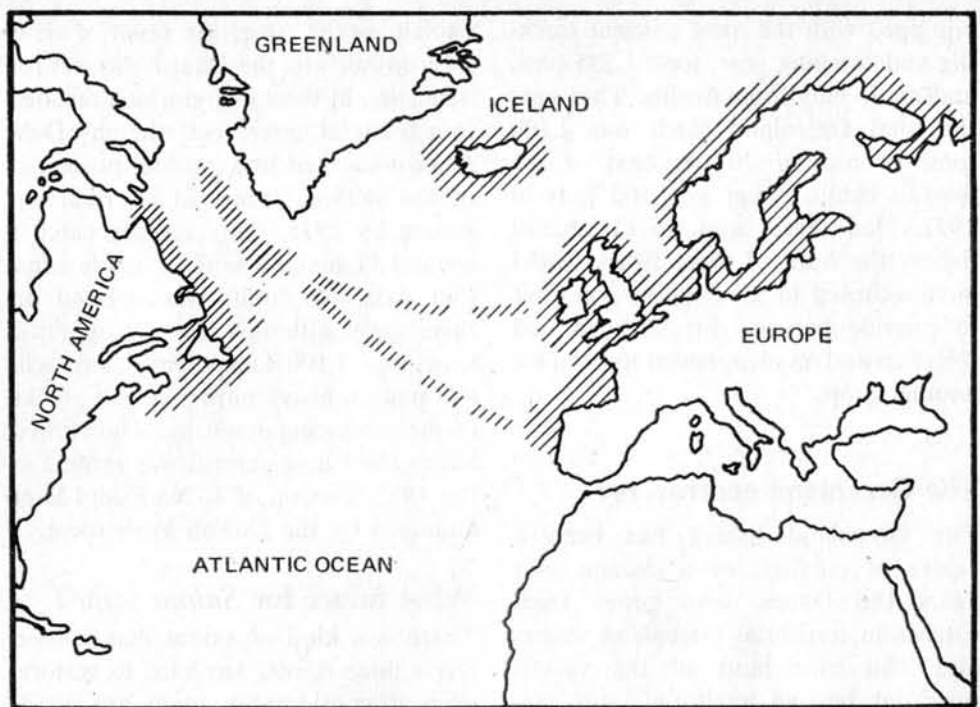
When Henry David Thoreau canoed on the river in the 1850s the anadromous fishes had vanished. In his book *A Week on the Concord and Merrimack Rivers* Thoreau said, with a wry sense of humour:

"Perchance after a thousand years, if the fishes will be patient, and pass their summers elsewhere, meanwhile nature will have levelled the Billerica dam, and the Lowell factories, and the river (will) run clear again, to be explored by migrating fish."

All the salmon rivers of New England were in time overfished, blockaded or polluted, so that by 1925 only the Dennys and Penobscot in Maine still attracted regular runs. By 1947 these two became sterile, the Penobscot having met the fate of the Tyne, the Trent, the Rhine and a hundred other major rivers in Europe, being fouled by pulp mill effluents, mountainous discharges of bark dust and logging debris, and other detritus of an industrial civilisation. There were laws on the statute books of Maine (through which the Penobscot flows) and in New England too—to protect the anadromous fishes but they were not enforced.

The sewers of Europe

The last salmon was caught in the polluted Thames around 1833 (and the recent improvement of the waters, though favourable for coarse fish, cannot provide any hope of *Salmo salar*'s return). Salmon no longer come up the Rhine, now called the longest sewer in Europe. Rhine salmon were highly regarded by gourmets in the days when the river ran clean from its headwaters in the Alps to the lower reaches in



Holland. Kings and princes used to serve Rhine salmon at their epicurean banquets as French monarchs served Loire salmon. The Loire too has virtually gone out of salmon production.

No nation frittered away its salmon resources more wantonly than England or France. France attained this unenviable distinction by permitting unrestricted netting through a curious monopoly granted by Louis XIV's minister Colbert to the veterans of the merchant marine: only they, called *Inscrits Maritimes*, were allowed to obtain licences to fish in tidewater. These privileges have been vigorously protested in recent time by fishery biologists and conservationists but to no avail. While the runs have been going steadily downhill the *Inscrits* protest their rights and despite existing conservation laws get away with it. In France the government owned power industry has steadily ignored the needs of the fishery while the central government has done little or nothing to abate pollution on the rivers. Catches nowadays in France total no more than a few thousand fish where 150 years ago Brittany alone produced almost a million annually.

The systematic destruction of salmon rivers in England and Wales in the past century has brought *Salmo salar* to a very low state. The total harvest by net and rods south of the Scottish border in the last couple of decades has rarely exceeded 50,000 annually, compared with the fact that the Tyne alone in the 1870s produced yearly hauls of over 100,000 fish!

A new calamity

Atlantic salmon runs in Western Europe and North America were steadily decreasing when a new calamity appeared in the late 1950s. Until then little or nothing was known about their feeding migrations in the sea—few salmon had ever been caught in the nets of fishermen in the ocean.

The mystery began to be unravelled when the Danish biologist Jorgen Nielsen, chief of the Greenland Fisheries Investigations, discovered that many salmon caught with the jib in the Greenland cod fishery were of foreign origin, as evidenced by their scales which indicated a freshwater life of two or three years, compared with the five or six years spent by Greenland salmon in freshwater. Soon hordes of salmon were seen feeding in Greenland waters and an industry sprang up. Catches in Greenland jumped from 60 tons in 1960 to over 1,500 tons in 1964, or about 15 per cent of the world catch. Scientific studies indicated that these fishes had been in the sea for at least two winters and recovery of tagged specimens showed that perhaps as much as 50 per cent emanated from Canada, 25 to 30 per cent from the British Isles, and the remainder from the United States, Iceland, France, and possibly Norway and Sweden.

In 1965 the Greenland fishery assumed a more fearful aspect as netting and longlining began beyond territorial waters. This assault reached a peak in 1969 when a fleet of 67 vessels, some of them up to 350 tons burden,

equipped with the most efficient tracking and catching gear, took 1,235 tons, and made handsome profits. That year the total Greenland catch was 2,100 tons, or around 20 per cent of the world's catch, rising to 2,160 tons in 1971. Had there been no Greenland fishery the bulk of these fishes would have returned to their native countries to provide harvests for netmen and rodsman and an escapement to produce another crop.

The Greenland controversy

The Greenland fishery has been a centre of conflict for a decade. For years the Danes, who profit from catches in territorial Greenland waters and who own most of the vessels operating beyond territorial limits, refused to consider any limitation on their activities. They argued there was no scientific proof that the runs were being affected in producing countries, despite the reports to the contrary of scientists mobilised by the International Council for the Exploration of the Sea. Protests by Britain were ignored by the Danish Foreign Office. West Germany and Norway usually sided with Denmark when the issue of the salmon fishery was aired at the annual meeting of the International Commission for the North Atlantic Fisheries (ICNAF). Only in 1969 did the Danes agree to some limitation of the Greenland catches—to the record 1969 levels.

At this point a new and potent factor entered the Greenland fishery controversy. A group calling itself the Committee for the Atlantic Salmon Emergency (CASE) was organised in Boston to bring the Danes to the bargaining table. Its biggest coup was to push "the Atlantic Salmon Act", through Congress. The Act stipulated that when the nationals of a foreign country are deemed by the Secretary of Commerce to be conducting fishing operations "which diminish the effectiveness of an international fishery conservation programme, Congress has the power to prohibit the import of any fish product from that country.

Since Denmark exports about \$10 million worth of fishery products to America every year the Atlantic Salmon Act had immediate results. Danish exporters were clearly worried about the American markets, and editorials and articles began to appear in Danish newspapers for the first time

explaining the American point of view. The upshot was the Danish request for a meeting in Washington which resulted in a bilateral agreement whereby Denmark consented to a gradual phase-out of the salmon fishery in international waters by 1976. Only inshore catches around Greenland will be made after that date. No limits were placed on this fishery, although it is not expected to exceed 1,100 tons a year. This will still place a heavy burden on the stocks of the producing countries. The United States-Danish agreement was ratified in the 1972 meeting of ICNAF and later endorsed by the Danish Parliament.

What future for *Salmo salar*?

There is a kind of axiom that salmon rivers once ruined are hard to restore, even if considerable funds are available. Apart from the problem of cleaning up the stream by forcing polluters to cease and desist, it is necessary to plant hatchery stock to start a run; this is an expensive undertaking, for breeding of Atlantic salmon smolts on a large scale must be subsidised by the national government, as it is in Sweden (where power companies cooperate but the money is returned through customers' bills), Canada, Finland, Russia, Ireland and the United States. Britain is doing very little in the field of artificial production of salmon.

There seems to be no possibility of *Salmo*'s return to the rivers of Portugal, Holland, Switzerland, and Denmark where they have vanished; the Rhine, the Tyne, Seine, and the Thames will probably never see these jumping fishes again. In Poland, West Germany, East Germany, France, Spain, and the United States (despite considerable production of hatchery salmon) there are only token stocks. The bulk of these fishes are now produced in Canada (which in 1972 sharply curtailed commercial netting of Atlantic salmon), Scotland, Ireland, Norway and Russia, and even in these countries their continued existence is not assured if industrialisation proceeds apace, with its accompaniment of dams to generate electric power, water pollution, and the like. In the contest between fish and corporate profits, or between fish and power, the fish invariably lose out, not only in Europe but in North America and Asia.

It is only because *Salmo salar* holds great fascination for many people, especially anglers who are usually in

the forefront of the conservation movement, that the stocks have been reasonably well protected in some countries, notably Scotland, Norway (where income from rodsman is important to the farmers who own the rivers), although the government has done little or nothing to stop Norwegian vessels from taking salmon at sea, Ireland (where excessive drift netting prevails) and Canada. In the United States the sportsmen are in the forefront of the movement to restore salmon to some of the Maine rivers and the Connecticut and Merrimack as well.

In England such organisations as the Salmon and Trout Association, the Atlantic Salmon Research Trust, and the Anglers' Cooperative Association as well as some river authorities, have worked hard in the cause of improving the runs of *Salmo salar* but relatively little has been accomplished. The various governments have been near-indifferent, and little public money has been available. Without generous subsidies by the taxpayers not much can be gained in fishery conservation. The best example of efforts to save the salmon in the wake of galloping industrialisation and generation of power is in the Columbia River where federal and state outlays on fish ladders and other devices to get the fish over the dams, on hatcheries, research, and allied programmes, now runs to over \$300 million, so that it is not an exaggeration to say that every salmon or steelhead trout caught on the river, or at sea, is worth its weight in gold.

Oddly enough, as the runs of wild fish tend to decrease, for all the reasons we have listed, remarkable progress is being made in artificial propagation of salmon, especially in saltwater culture. A firm in Norway now breeds *Salmo salar* in seawater in tanks, and claims it can produce several hundred tons a year, and ultimately more than is now produced by all the rivers of the country. Similar projects on a pilot plant basis exist in Scotland, other European countries, and in Canada. Saltwater culture is spreading in western Canada and the United States (Pacific salmon) and in Japan. These are nutritious fish which can be produced to pan size and are finding great favour with restaurants and inns and, when they are available, with the housewife. But they are not the lithe, romantic fishes which dwell in the rivers and are taken by anglers.

Notebook

Closed circuit

"The only thing that has ever been established by scientific research is that more money is required for scientific research." Gordon Rattray Taylor

The Luddites were wrong!

The following notice was seen at Farringdon Underground station in London: "Due to staff shortage the automatic ticket machines are not in use". *Daily Telegraph*, 27.9.73.

Technological tyranny

"The condition of man today I have suggested in *The Pentagon of Power* resembles the pathetic state of Dr Bruno Bettelheim's psychiatric patient; a little boy of nine who conceived that he was run by machines. 'So controlling was this belief,' Dr Bettelheim reports, 'that the pathetic child carried with him an elaborate life-support system made up of radio tubes, light bulbs, and a breathing machine. At meals he ran imaginary wires from a wall socket to himself, so his food could be digested. His bed was rigged with batteries, a loud speaker, and other improvised equipment to keep him alive while he slept'. Lewis Mumford, in "Technics and Human Culture", a paper presented at a conference on futurology, Frascati, September 1973.

Which is more impressive, the disease or the cure?

"If a thoughtful being from another world should visit us today, he would surely be astonished. What would he be more astonished at—the brilliance of our scientific and technological achievements, or the ugliness of our cities, the rising crime rates, and the depravity of the reading matter displayed at our railway stations? The progress of our medicine or the overcrowding in our hospitals? The skill of our dentists or the rottenness of our teeth? The speed of our transport or the length of time and discomfort of our journeys to work? The efficiency of our machines or the inefficiency of our system as a whole?" E. F. Schumacher, *Reflection on Growth and Changing Company Structures*, Frascati, September 1973.

Where it belongs

"One of the two Concorde supersonic airliner prototypes is to go on permanent view to the public at an airport in Britain at the end of this year". Arthur Reed in *The Times*, 15.10.73.

Technological intruders put in their place

King George III, in 1793, sent emissaries with gifts of manufactured products to the Manchu Emperor Chen Lung, of China. The object was to obtain trading concessions. The Emperor's reply reflected the right attitude toward such threats of acculturation. He wrote: "You, O King, live beyond the confines of many seas; nevertheless, impelled by your humble desire to partake of the benefits of our civilisation you have despatched a mission respectfully bearing your memorial... I have perused your memorial: the earnest terms in which it is couched reveal a respectful humility on your part, which is highly praiseworthy. In consideration of the fact that your Ambassador and his deputy have come a long way with your memorial and tribute, I have shown them high favour and have allowed them to be introduced into my presence. To manifest my indulgence, I have entertained them at a banquet and made them numerous gifts... As to your entreaty to send one of your nationals to be accredited to my Celestial Court and to be in control of your country's trade with China, this request is contrary to all usage of my Dynasty and cannot possibly be entertained... If you assert that your reverence for Our Celestial Dynasty fills you with a desire to acquire our civilisation, our ceremonies and code of laws differ so completely from your own that even if your Envoy were able to acquire the rudiments of our civilisation, you could not possibly transplant our manners and customs to your alien soil. Therefore, however adept the Envoy might become, nothing would be gained thereby. Swaying the wide world, I have but one aim in view, namely to maintain a perfect governance and to fulfil the duties of the State. Strange and costly objects do not interest me. If I have com-

manded that the tribute offerings sent by you, O King, are to be accepted, this was solely in consideration for the spirit which prompted you to despatch them from afar. Our Dynasty's majestic virtue has penetrated into every country under Heaven and kings of all nations have offered their costly tribute by land and sea. As your Ambassador can see for himself, we possess all things. I set no value on objects strange or ingenious, and have no use for your country's manufactures". Arnold Toynbee, *A Study of History*.

Re-cycling of bodies

"I have long contended that cremation is grossly wasteful of resources, when it is remembered that it takes one hour to burn a human body at very high temperatures. I have discussed this in my book *The Victorian Celebration of Death* (1972). The dead were buried without coffins in Europe and Britain during the Middle Ages. The churchyards were periodically cleared of their bones which were then placed in the parish charnel-house. Excess humus was spread over the fields, so bodies were effectively re-cycled. 'Chesting' or 'boxing' of bodies originated in an attempt to preserve the corpses for as long as possible from decay, this being encouraged by Christian belief in a material resurrection. The poor looked upon a coffin as a luxury which was even denied to them by law. Monarchs and the nobility were sometimes laid in lead coffins with an outer covering of wood or stone. The re-establishment of charnel-houses associated with cemeteries would be both economical as well as assuring the future use of cemeteries otherwise likely to close when 'full'. To Christians, the burial customs of the Middle Ages should appeal much more than post-Reformation pomp and vanity. The storing of bones in charnel-houses could add a new dignity to death as well as furnishing cemeteries with buildings of possibly great nobility and atmosphere. The saving in wood would be enormous, while the consumption of gas for cremation would cease. The expenditure on crematoria would also be brought to a halt, and a new ecological approach to the disposal of the dead based on logic and respect for the earth would be born". James Stevens Curl, in a letter to *The Scotsman*, 15.8.73.

Reports

In praise of potatoes

Every civilisation has been built on a storable basic food, usually a grain, as in the rice civilisations of the Far East, the maize of Central America, and the wheat of the west, but the Chavins of pre-Inca Peru built theirs on potatoes and so could we in a hungrier future. The potato can feed more than twice as many people to the acre as wheat and feed them better because of the high quality of its protein.

Experiments in Germany have shown that if our protein is supplied from the 2.1 per cent in potatoes, we can manage on only 30 grams a day of it (because of its excellent balance of amino acids), which is roughly $3\frac{1}{2}$ lb for an adult, which also supplies about half our daily need of Vitamin C. They are a poor source of this vitamin, but today we eat so few green vegetables, and salads or fruit, that potatoes are the main supply on a "chips with everything" diet.¹

If we were going to expect our potatoes to supply all our protein, we need to eat 10 cwt a year (present average 219 lb) of them or about a ton and a half for a family with two children. Good farm yields average 15 tons an acre so that quantity can be raised on 484 square yards, or in a garden with room for a potato bed 180 feet long and 25 feet wide. The potato is still the most productive crop that can be grown in a temperate climate with the least effort, using only forks and spades.

In terms of protein production per acre a 15 ton potato crop produces roughly 6 cwt, a two ton wheat one 3 cwt, a 17 cwt yield of Harrison's Glory peas for drying 4 cwt, and the 15 cwt that soya beans grow on an acre, just over 5 cwt, although not in Britain. The new Swedish variety Frisby's Original bred for cool climates is not yet available and no one knows what its yield will be, or if it will produce its ideally balanced amino acids under our conditions.

Where the potato fails is on the calories, the energy (and fat) building

part of our diet. That $3\frac{1}{2}$ lb a day holds only about as many calories as there are in a 1 lb packet of starch reduced slimming biscuits, though, unlike the biscuits, it holds the minerals and vitamins to break down its carbohydrates. Those who wish to slim should give up the biscuits and the white sugar they buy, rather than the potatoes they can grow in their own gardens.

Like every other foodstuff, potatoes are not a complete diet, and "The Potato Eaters" by Van Gogh shows us the effect on Belgian miners in the late 19th Century driven by poverty to live entirely on them. The white bread and water diet in British prisons at this time produced far worse nutritional disasters in as little as six weeks in the case of John Burns, the Labour leader, imprisoned in 1887.²

The people of Tristan da Cunha with fish, adding phosphorus, and milk for extra calcium with their basic potato ration lived long and healthy lives with perfect teeth, though, like the Chavins (to judge by their painted drinking cups and wall paintings) they were never fat. The Irish near the coast with fish, or where they obtained buttermilk cheap for calcium, lived moderately well, and the oatmeal that they ate as porridge in the "meal months" of July and August before they lifted their heavy yielding main-crop varieties, probably supplied the manganese missing from potatoes. The strong tea that the Irish have always enjoyed may well be unconsciously craved as a source of this trace element, and the fluorine for good teeth in a land of soft days and soft water. The "garden where the praties grow" was about a quarter acre, and fed a pig (which was sold to pay the rent) as well as a family on an average of five tons of potatoes a year. This amazing yield was possible from the "lazy bed" system, named cynically because it demanded the kind of hard work that built the muscles of the Irish "navvies" who dug our Navigation Canals, as these 18th and 19th Century equivalents to motorways were first called.

The peaty soil was spaded into raised beds holding about five potato rows each, and the channels between drained the peat bog, so air was drawn in to allow bacterial breakdown of the humus to release plant foods. So they grew potatoes year after year without rotation, cashing the tannin-locked

fertility from the water plants of the past, burning the peat to cook their average of thirty-two pounds a day for a family, always baked or boiled in the skins, which kept the then unknown Vitamin C near 22 mg. per 100 grams, instead of in single figures.

Monotonous though it was, the diet was better than many in Africa today, and on it the population of Ireland rose from $4\frac{1}{2}$ million in 1800 to over 8 million in 1845, when the fungus *Phytophthora infestans*, or Potato Blight, struck. Between then and 1860 over a million Irish starved to death, a bigger death toll than nuclear weapons have claimed so far, and the only white famine in history on an Asian scale³.

There was grain, meat, milk, cheese, butter, bacon and eggs enough in Ireland to feed those millions of starving people, but it went in rent to landlords in England and the Irish cities, and was exported, just as South America exports fishmeal which would be an ideal diet supplement for protein hungry children to feed our factory-farmed livestock.

Could we feed ourselves if the hungrier world decides to eat its own soya beans, lentils, groundnuts and fishmeal, or to send them where the need is greatest?

If we ever have to, the potato could become our basic foodstuff, with modern blight resistant varieties such as Maris Peer (which also resists scab), eelworm resisters like Maris Piper, and low moisture kinds like Record for flavour and drying to the crisps to last over good harvests and bad that were invented by the Chavins three thousand years ago.

Lawrence D. Hills

Pollution and the Pit

Coal mining in the North-East has been practised for centuries, but whereas now the only working mines are the deep coastal pits the early mines were shallow pits in which only the exposed or easily accessible coal seams were worked. When the "winning" became difficult, the pit closed or another shaft was sunk. This led to many small mines with low pit-heaps of shale. Coal was removed from these pits by horse-drawn trucks or "chal-drons" driven along wagonways.

A wagonway can vary in width from

six to, exceptionally, twenty-five yards and can be several miles in length. County Durham is particularly rich in them where they cover hundreds of acres. To maintain an even gradient they were either banked with small coal or cut into the hillside. The rails for the wagons were usually secured to stone sleepers but in most cases these have been removed. Nowadays, these wagonways are overgrown and are sometimes impassable, but can be recognised by the remaining hawthorn hedges which once lined them.

Because of their low fertility and inconvenience farmers have ignored these ways for over a century but a detailed examination of the flora shows the extent of natural reclamation. Rough grasses, hawthorn and gorse thrive on

the poor soil while most wild flowers of woodland, scrub and marsh can be found. Of course, the paucity of the soil results in smaller examples and smaller populations but the variety is there. Some plants have adapted well; the wild strawberry has become abundant and violets, cowslips and german speedwell are there in profusion.

Along the length of a way, the cuttings and embankments provide every type of habitat from marsh-like to well-drained and dry. For the fauna, the gorse has another function. In restricting large animals it provides an adequate shelter for the small. Even the occasional fox finds it a refuge.

Very little remains of the original pit-heads except an occasional low wall, hidden in undergrowth, and the inevit-

able spoil heap. The infertility of the shale and clay slowed down the encroachment of surrounding plant-life but these heaps are usually covered in hawthorn, dog-rose, gorse and couch grass. The older heaps, like the wagonways, are populated by local flowers, notably; strawberry, violets, speedwell and milkwort, which says as much for the tolerance of these plants as it does for the effect of time. Today a number of the heaps are indistinguishable from the surrounding scrub but the hilly nature of Western Durham is no small factor in their disguise.

Unfortunately, these wagonways are now threatened as local farmers are clearing the level sections to increase their fields; and the shallow cuttings are used as tips for abandoned cars and other refuse. At the moment there are still miles of untouched wagonway. Their historical and ecological value increases with time.

D. P. Newton



Westerton Wagonway near Chilton

ERRATUM

In Penny Anderson's article "Planning a Wood" (*Ecologist*, October, 1973), p. 385, col. 2, line 12, the word "not" was unfortunately omitted. The sentence should read "...and therefore should not be planted preferentially".

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

22 January 1974—Science Policy, Systems Analysis and World Models. One of a series of meetings arranged by the Society for General Systems Research. Speaker, Prof. C. Freeman, Director of the Science Policy Research Unit, University of Sussex. Details from F. R. Janes, Dept. of Systems and

Coming events

Automation, The City University, St. John Street, London EC1V 4PB.

30-31 January—Pet Animals and Society. Symposium arranged by the British Small Animal Veterinary Association, at the Meeting Room, London Zoo. Details from M. D. Keeling, The Veterinary Surgery, Gardner Road, Guildford, Surrey.

19 February—The Impact of Systems Thinking on the Behavioural Sciences. One of a series of meetings arranged by the Society for General Systems Research. Speaker, Prof. J. Beishon, Systems Group, The Open University. Details from F. R. Janes, as above.

Summer Term 1974—One term course for serving teachers of the eight to 13 year 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. Enquiries to Dr. S. H. Jenkins, c/o Upper Tame Main Drainage Authority, 156/170 Newhall Street, Birmingham B3 1SE.

13-17 November—Anti-Pollution Exhibition, Milan. Details from Peter R. Smith, The Birmingham Engineering and Building Centre Ltd., Broad Street, Birmingham B1 2DB.

Friends of the Earth

Constructors and Destructors

One of the slight problems associated with this page is the need to write it some weeks in advance of publication. (That, I'm sure, betrays no in-house secrets of our hosts on the *Ecologist*.) In consequence what is said here is always in some danger of being superseded by events before it appears in print. In no field of FOE activities is that situation more acute than in that of the North Sea Oil Coalition. The time-scale of decision-making in offshore oil operations is, despite (or perhaps because of) the sums of money involved, measured in days or at most weeks. Since our headlong plunge into the fray we have been learning to respond on a like basis but it doesn't half leave you breathless. Accordingly, it will be necessary to sketch herein a couple of alternative scenarios, to some extent mutually exclusive.

First, to recap the background: FOE and ConSoc agreed at a meeting in Dundee at the end of May this year to form a coalition to keep an eye on the oil operators. But we realised quickly that our concern would need to be focused initially not so much on the oil companies themselves as on the construction companies scrambling madly for oil-related onshore work. Of course the oil companies (with the connivance of the government) are the generators of the precipitate haste, and as we gradually draw in the precise outlines of an FOE energy policy the oil companies will certainly be primary targets. However, the abbreviated time-scale of events has dictated the need to respond at once to Taylor Woodrow and John Mowlem, who want to set up massive civil engineering sites on the West Highland coast, to build concrete oil production platforms. (See "A new monster in the lochs", *New Scientist*, 4 October, for details.)

Without putting ourselves, as out-

siders, in the forefront of the battle, we have undertaken to provide back-up, especially information and media coverage, to the local people of Loch Carron and Loch Broom, as they dig in to defend Drumbuie and Ullapool against the constructors. FOE spent an exhilarating week in Wester Ross in September, holding councils of war with the South West Ross Action Group, defending Ullapool. The issues are clear-cut. Even the impact analysis of platform construction at Loch Carron, officially commissioned by the Scottish Development Department from Sphere Environmental Consultants, is unenthusiastic, endorsing virtually all the points made by the Action Group. A site is likely to be a short-term development, involving the import of hundreds of mainly at best semi-skilled labourers, distorting economic levels in the area, putting acute pressure on housing, and offering little discernible benefit either to the local people themselves or to their community—while disrupting social and cultural patterns to a possibly drastic extent. The jobs offered are unlikely to tempt the bright young people of the area to remain or

to return, while the presence of such a monolithic industrial site will in all probability dissuade any other more appropriate scale of industry from venturing into the area.

None the less the constructors and the Scottish Office, scenting multi-million-pound contracts, are rushing through planning procedures. The public inquiry on the Drumbuie application was to begin in Kyle of Lochalsh on 12 November. It is possible, to be sure, that the Ross and Cromarty County Council, meeting on 22 October, may by that time have come out against planning permission: in which case they, the National Trust for Scotland (who own the land) and the South West Ross Action Group, representing the local people, may have petitioned Scottish Secretary Gordon Campbell to refuse planning permission without going through the motions of a public inquiry. Were that to happen, all our efforts would then be directed to the Ullapool application, due to be heard at a public inquiry beginning late in February 1974. It is, unfortunately, more likely that the Drumbuie charade will have to run its foreordained course.

In either event the local groups, with their Drumbuie Fighting Fund and Lochbroom Defence Fund respectively, will have to find several thousand pounds each to cover their legal and other costs. Campbell could, under section 267(7) of the Town and Country Planning (Scotland) Act 1972, direct that the constructors pay the costs. And, of course, pigs might fly. FOE will in any case be in Drumbuie and Ullapool again before the end of this year, and the phonecalls and letters will continue to flow between both ends of the country. Make no mistake: the Scots have been pushed around by profit-hungry outsiders too many times. This time they intend to fight back. And we, for our part, shall be lending them all the help we can muster.

Walt Patterson



Books



Nature, farm and city

FARMING AND FOOD SUPPLY, THE INTER-DEPENDENCE OF COUNTRYSIDE AND TOWN by Sir Joseph Hutchinson. Cambridge University Press. £3.

Our food supply depends upon the inter-dependence of nature, farm and city: it is a pity that nature was not included in the title. If this trinity is anywhere divided, then there is catastrophe. Civilisation is not the product of the *civis*, or city, but of the combined operations of nature, farmers and urban workers. It is a rural-urban activity. As Sir Joseph emphasises, farming made the town possible by its increased efficiency. But if the last partner in the trinity, the city, forgets its obligations to nature and the farmer, and compels the farmer to demand more of nature than nature can provide, then the city destroys itself. Because it is the feed-back between country and town that has in the past enabled our civilisation to develop, it is overlooked that this feedback may become unbalanced. This is the dilemma, in my view, in which Prof. Hutchinson finds himself. And it results in him pulling his punches. In view of his immense knowledge and insight this is a pity.

He seems to me to step off on the wrong foot. On the first page of the preface he says that the purpose of his essay is to refute the argument that agriculture must be a declining industry because of its continuing reduction of numbers. If we are to reckon the state of agriculture in terms of manpower, then we had better hand it over to the technological gimmickry that would put sheep indoors all their lives—as it has already done with

poultry, pigs and beef and would like to do with dairy cattle—and breed them to produce multiple litters like pigs. The final aim is to have farming automated on the model of the best mass production industries and integrated into the vertical monopolies of big business. This is farming in decline and its decline is due to the attempt to substitute machines, chemicals and factory methods for people.

In spite of his devotion to the “efficiency” of agriculture Prof. Hutchinson is far more aware of the hazards to good husbandry that arise from modern industrial pressures than most of his profession:

“Advanced western communities are pressing on their environment even more heavily than the multitudinous but poor populations of Asia. It can be argued that there is still room that the problem is not numbers but distribution. This is not tenable. Any society needs for security an environmental margin of safety. Storage gives security against year to year climatic hazards. Only a margin of unexploited resources can give assurance against long term climatic change. Damage to the environment is inevitable as man experiments with new materials and new techniques. Recovery is possible, but only if there is a margin, and the damaged resources can be put out of production for regeneration. Western communities are like Allan’s (1965) husbandmen practising shifting cultivation who have so encroached on the degenerative phase that a progressive decline in productivity becomes inevitable.”

Where could you find a more admirable expressive of our situation than that? But one has to go further and ask, so what do we do? Prof. Hutchinson acknowledges the futility of substituting machines for labour where

there is no alternative employment and of using fertilisers before the structure of the soil has been established by a system of husbandry that builds up its organic content. After puzzling over the contradictions between this ecological good sense and the optimistic conviction that all our problems can be solved, a great light dawns: it is that this phase of good husbandry provides the take-off for high yielding modern agriculture which can then be harmonised with an industrial progress providing ever more jobs for the people progressively released from the land. History will repeat itself. When the good husbandry is no longer economic it will become possible “to make good nutrient deficiencies cheaply and effectively from the fertiliser bag.” (p. 51). The preceding era of good husbandry has corrected all natural imbalances.

Can we then at this stage say goodbye to good husbandry and mixed farming because we can resort to the fertiliser bag? Prof. Hutchinson’s remarkable refusal to consider the fallacies in the nutrient theory on which modern fertiliser practice is based seems to me to stem from a fear of having to admit that the assumptions by which we live—the Victorian assumptions—are not viable. For example, our high yields are not compatible with nutrient quality or the conservation of soil structure: we have to aim at optimum yields. This will be as true in India and Africa as it is now in Britain.

Such fundamental questioning involves political answers: and that is why, I think, they are not clearly answered. I do not see how Prof. Hutchinson can avoid them. All his own reasoning and evidence point in that direction:

“On the stockless farms, problems of the maintenance of good soil structure are increasing. Fertiliser applications are disproportionately high where fertility conservation is not practised, and under near monocultural farming, inputs of pesticides and herbicides are at a level that is expensive, and damaging to the wider environment.... The great advances in western agriculture were made by those who devised the system of fertility conservation known in Britain as the New Husbandry, and the high production of modern British agriculture is still founded on the excellence of the

soils established thereby."

I question how "fertility conservation" can be practised except by practising the principles of the New Husbandry—mixed farming. On another page Prof. Hutchinson writes: "It is the greatest achievement of British farming that British farmers have proved sufficiently enterprising and receptive to new ideas, to have made these vast changes and to have acquired the management skills to organise their farming on a scale and at a pace not hitherto contemplated." This seems to me like having your cake and eating it: for the farmers who have acquired these management skills are also those who have sacrificed the principles of good husbandry. They have not so much modernised farming as commercialised it.

My own irritating opinion is that Prof. Hutchinson knows this as well as the staff of the *Ecologist*. How else could he have written? "It is well to remember that most of man's great achievements were accomplished by small communities living in small independent states. The greater part of our cultural heritage was generated in small city states where there was the intimate relation between town and countryside that facilitates the deployment of the work force according to social need. In such states arose the art, literature and architecture of India, of Italy and of England. Tudor and Stuart England had no larger population than modern New Zealand but it gave birth to Shakespeare, Marlowe, Milton and the founders of the Royal Society of London.... That so much has been done in the small communities of the past gives us hope for the future.

"The problems with which the developing world is faced will be solved, not by the enlargement of world trade, but by the deliberate establishment of a balance between farm production, the crafts, industries and services, not only within states but also in the smaller communities with which they are composed.... It is not easy to develop an alternative to large scale industrialisation.... The Gandhian philosophy still motivates many people in India, and Nyerere's (1967) views on the structure of the society he wants to build are wise and timely. It is from this kind of thinking that an alternative to western industrialisation will emerge." (p. 122).

Hurrah! But it will have to emerge in the West as well if the West is to survive. And if Prof. Hutchinson really believes this, let him harmonise all this thinking consistently along these lines whether in the West or in the under-developed countries.

So after all my carping about the inconsistencies and contradictions, *Farming and Food Supply* really is a splendid book. I wish it cost less than £3 so that it had a popular sale. Although the note of urgency is not so strong as it should be, maybe that is the best way to break it to the world that the problems of farming and food supply involve a revolution in our way of life.

Robert Waller

Science in the dock

WHAT IS SCIENCE FOR? Bernard Dixon. Collins £2.50.

Science has so insinuated itself into the very fabric of society that there's hardly a human-based activity which is free from its pervasive touch. We can no longer breathe, eat, move or sleep without our lives being governed by science, and paradoxically the more science appears to offer us freedom from want and suffering the more it constrains us and our activities into a humdrum routine of living; a routine symbolised by the regular swallowing of pills to see us through the day. Accordingly it has become of paramount importance to try and understand the nature of something which though derived essentially from an exercise of the intellect has yet the power literally to move mountains.

Bernard Dixon in his own words have written his book for the general reader rather than for the specialist, but there's many a scientist who would benefit greatly from his comprehensive account of science and its practitioners. Moreover with crystal clear perception Dr Dixon manages to bring out not just the different approaches to problem-setting and solving but also the different kinds of scientists involved. And for those who are ignorant or careless enough to lump all scientists into a homogeneous, indistinguishable group the author makes it very clear through some well chosen and vivid examples that there is an unbridged

chasm between the ability and thought processes of the first rate scientific thinker and those of the run of the mill scientist.

Like Heisenberg's uncertainty principle it is impossible for anyone to lay their finger precisely on the nature of science or even to explain away the miracle that science actually works. Perhaps it is asking too much of Bernard Dixon to answer satisfactorily the question he poses for himself in the book's title. Yet there is something disappointing about the book, for having cleverly marshalled facts and thoughts the author then slides out and leaves controversy hanging and unanswered. Nowhere was that feeling more in evidence than in one of his best chapters "Reason in Perspective" in which he discusses reductionism and its antithesis; for Dr Dixon gives no more than a glimmer of a hint whether he prefers the atheistic convictions of a Monod or the God-believing ones of a Thorpe. But no single book can be perfect or complete and the fact that Dr Dixon has stimulated the reader to look elsewhere for answers he cannot find in his book should only be gratifying.

The one attitude Bernard Dixon makes no attempt to conceal is his belief in the value and necessity of science. To be fair to him his pro-science attitude is an extremely critical one and he denounces that kind of science which is applied to war and to the authoritarian manipulation of one human being by another. Yet history has clearly shown that it is in the very nature of science for theories to be tested out and, if successful, to be applied in what can amount to an earth-shattering fruition. Indeed what first begins as an adventure of fantasy can in the hands of less scrupulous men finish up as a programme to control or destroy peoples and their cultures. It is a myth to expect scientists to be responsible for their actions, or men in power to let scientists alone with their consciences. The logical consequences of more and more science are not unfortunately likely to lead to a better, more free society but to greater repression and to a world which may be less worth living in. Nevertheless to turn away from the pursuit of knowledge is to turn away from the creative pulse in man. It is that nihilism which Dr Dixon most obviously fears.

Peter Bunyard

Letters



Economists as propagandists

Sir,

In your issue of May 1973, John Adams reviewed *The Economics of the Environment* "Propaganda for what?" edited by Peter Bohm and Allen Kneese (London: Macmillan, 1971). To say that his review was negative would verge on understatement. I have a paper in that volume—"Models for the Investigation of Industrial Response to Residuals Management Action"... and was disappointed to find that Adams had nothing to say about it. Ordinarily, one would be pleased to escape a public drubbing, but given the reviewer and the forum, I am finding it professionally embarrassing to have been ignored. There have been suggestions that Adams might have *liked* my piece. This seems improbable to me since I was discussing the pedestrian (and to Adams apparently "irrelevant") matters of industrial pollution and its control, rather than the grand and appealing concepts of changing life styles, stopping growth etc. Others have suggested that as my paper was the last in the book, Adams had simply run out of insults by the time he got to it. Whatever the reason, this silence is causing me concern, and I would be very pleased if the matter could be cleared up publicly.

Yours,

Clifford S. Russell,

Resources for the Future, Inc.,
1755 Massachusetts Avenue, N.W.,
Washington D.C. 20036.

Sir,

I apologise to Clifford Russell for any professional embarrassment I might have caused him by my failure to comment on his paper. I would like to reassure him that I did not like it. My comments on his paper were

excised from the original version of my paper, rather arbitrarily I confess, in order to reduce its length.

I do not, as he supposes, consider problems of industrial pollution irrelevant. It is the "solutions" to such problems advanced in *The Economics of Environment* that I find irrelevant. They are all thumb-in-dyke solutions. When the water appears about to wash over the top of the dyke, sticking one's thumb in one of the smaller holes is at best irrelevant. Exhorting others to join in this activity is to distract attention from a much more serious problem. This problem was described by Kneese in a footnote on page 2 of the book: "The distinguishing feature of contemporary environmental pollution seems to be the large-scale and subtle degradation of common property resources."

It is this large-scale subtlety that renders the crude digital instruments displayed in *The Economics of Environment* so ineffectual. Let us observe Russell's way of dealing with some of the least subtle complexities of a local scale pollution problem:

"...the conceptual model outlined above (a model for dealing with industrial residuals generation and discharge) is of limited usefulness. This is so primarily because of the great difficulties in identifying the form and estimating the parameters of the basic neo-classical production functions at the heart of the first phase optimisation. To avoid this problem, our approach in constructing working models is to attempt to identify only some relatively small set of discrete production alternatives, to cast these in the form of unity activity vectors... and to condense the two phase decision process into a single phase represented by a linear programme. The objective of the firm may be taken to be *profit maximisation, cost minimisation for given output, or any other convenient variant.*" (p. 145, my italics)

My pointing out that the book, Russell's chapter included, *avoids* rather than confronts what Kneese identifies as the distinguishing feature of our pollution problems lays me open, it seems, to the charge of being negative. Those with their thumbs in the dyke shout above the roar of the sea. "At least we are doing something positive. What are you doing?" Not very much I am sure. Perhaps nothing more than suggest that it might be more helpful to confront problems rather than avoid them.

Russell is dismissive of the idea that the core of our problems might lie in our attitudes to economic growth. But the unquestioned pursuit of corporate profit maximisation (albeit subject to a few environmental constraints conjured up out of a sea of ignorance and uncertainty) which forms the basis of his model can only be construed as a commitment to economic growth. And such growth can only increase the scale and subtlety of problems that his techniques can only avoid.

Yours sincerely,

John Adams,

Department of Geography,
University College London,
Gower Street, London WC1.

Sir,

John Adams (*Ecologist*, May 1973) must be applauded for, characteristically, providing some useful insights into economics as seen from the standpoint of a non-economist. Unfortunately, the overall effect of his article is largely counterproductive.

The implication throughout is that the motley collection of articles Adams chose (or was asked) to review is in some way representative of the way economists view the environment. This is very far from being the case. It is true that much of the literature on environmental economics, particularly the rash of so-called "textbooks" from the USA, regards pollution as an instance of a social cost and hence as fitting neatly into standard neo-classical welfare theory. Equally, natural resource problems are viewed as exercises in observing how the price mechanism rations resources over long time horizons. But such a characterisation does not do justice to the seminal work of Boulding, to Herman Daly's advocacy of "steady state" solutions, to Georgescu-Roegen's emphasis on

the importance of entropy, to the recent European writings of people such as Kapp, Sachs, Kade, and, may I humbly suggest, the writings of my own Department. If for "economists" we read "some economists" (albeit vocal ones on occasion) in Adams' article, we get a fairer picture.

Second, Adams seems to think that he has discovered something new in stating that economics is value-ridden. But, as he even notes himself, *any* discipline which ultimately aims at prescription must of necessity have value premises. Whereas Professor Beckerman may well be confused about the distinction between positive and normative, economics, more than any other discipline, proceeds on the basis of setting what—to use the jargon—we would call an "objective function"—i.e. saying what it is what we aim to maximise or achieve—and looking at problems in this light. We are all free to debate the objectives, and economists do exactly that. What, I wonder, is the objective function of applied ecology? I think I know, and I think I like what it is, but it is no tribute to the discipline of ecology that it is so difficult to find out what values underline processes such as ecological grading. And while we are at it, what do geographers maximise? My suggestion is that, while John Adams is right to repeat the constant warning about making values explicit, he might more profitably have turned his attention to other disciplines which, by comparison with economics, fail miserably to say what it is they are trying to achieve.

Third, Adams' article reveals something about the nature of other-discipline comment on economics. Whatever we think of Professor Beckerman's tirades against the scientists, the *Blueprint*, Meadows, etc, he was right in remarking that non-economists are over-eager to comment on a discipline they know nothing about. Rightly, he took them to task, albeit in a context of prescriptive economics that I, for one, find unpalatable. Adams falls fairly neatly into the category of persons Beckerman was out to bite. While I agree that the Bohm/Kneese volume, *Economics of Environment*, cannot, by any stretch of the imagination, be regarded as an historical contribution to anything, it is incumbent on a reviewer who decides to review a given volume to understand

what the articles say. Occasionally, Adams gets it right. More than once, he does not, as with his comment that "rational policy" cannot result from questionnaires based on ignorance. Such a phrase indicates that Adams has little idea of even the statistical foundation of Bohm's article.

It is good to have comments on economics from other disciplines. Let us hope the *Ecologist* will continue to foster it. Let us also hope that the comments will generate some interdisciplinary discourse which, hopefully, will resolve many of the misunderstandings. And lastly, I hope John Adams will accept some of my strictures just as I accept some of his ridicule of some of the sillier aspects of my own profession.

Yours sincerely,

David Pearce,

Department of Economics,
The University, Southampton.

Christianity and nature

Sir,

I'm sure the Rev. Henderson and Mr Honniball, who defend Christianity's attitude to "Nature" in your June issue, are theologically correct: it should be the opposite of exploitative. Yet the fact is that Christianity has *not* in the past noticeably stood against the exploitation of the planet, and it is worth considering why this should be so.

I would suggest that three points are especially relevant:

1. The metaphor of "Creation" sets God apart from Nature. No doubt the word meant something rather different for the early Jews; but to the modern it is only too compatible with the notion of the world as a piece of insentient machinery, to be tinkered with at will. One of the attractions of the Occult at this time is that it avoids this metaphor: it sees the physical world as the outer fringe of manifestation of the divine, as part, that is, of a vast unitary organism—a picture very much more readily compatible with ecological thinking.

2. No doubt, as Rev. Henderson says, Christ came to "redeem Creation", not to "save souls". But to how many modern Christians would it occur to say so? Christianity as ordinarily presented is man-centred to the point of megalomania: no-

where more spectacularly than in the Catholic attitude to birth-control. And the Incarnation may be seen in more than one way: as an heroic statement of God's presence in the "creaturely", or as an arrogant statement of God's presence exclusively in man.

3. Thirdly, Mr Wych's point (February) is very important: in Christianity, men alone have "souls". It is no coincidence that there are two environments in which we see mankind cut off from all other living creatures: in the modern city, and in Christian visions of the day of Judgment. No doubt this bias arose in counter-balance to "pagan" attitudes; but a triumphant counter-balance is then an imbalance.

I am not at all wishing to disagree with the people who see Christianity favourably: I am trying to learn to do so myself. But I think we will do Christianity no service until we see how the misunderstanding has arisen, and then proceed with some sympathy for it.

Yours faithfully,

David Black,

28 Fellows Road,
London NW3.

Down to Earth

Sir,

I enjoyed the literary flow of Mr Hills' report "Thalidomide Tomatoes" (issue dated October) but would have preferred more accuracy and less emotion. He refers to "The Deposit of Poisons Act"—I know of no such legislation and must assume he means the Deposit of Poisonous Waste Act. He also does Mr Gowan the injustice of getting his name wrong. If such reports are to be given the credence they should merit, surely the authors ought to try harder to be accurate.

Yours faithfully,

Henry Vinall,

Environmental Pollution Management,
680 Garratt Lane,
London, SW17 ONP.

Eco-power to the people

Sir,

Although I usually find reading the *Ecologist* profitable and interesting, the article by Brian Johnson in your July issue was pretty awful.

I suppose it is only human to publicise a family member when one is an

associate editor, so I can understand seeing Rafe Pomerance's name prominently featured. In any case, he is a good man and is involved in a lot of good fights.

What I find objectionable is the inaccuracy and poor writing in Mr Johnson's article, "Eco-power to the people". The article implies that The Highway Action Coalition was the prime lobbyist supporting more federal highways. In fact, The Highway Action Coalition is the prime reason that the Highway Trust Fund was finally "busted". Mr Johnson inaccurately ascribes this role to the Urban Environment Conference (UEC) which Rafe Pomerance heads. For a more accurate evaluation of this subject I refer you to the 6 August issue of *Time* magazine.

The next bone I would like to pick with Mr Johnson concerns the Shell strike, which is now over. This part of his article was clearly cribbed from an article by Catherine Lerza in the magazine *Environmental Action*. An article which was accurate, however. A good deal of what Mr Johnson ascribes to the UEC was actually carried out by The Committee to Support the Shell Strike, of which the UEC was a valuable member. The Committee to Support the Shell Strike working closely with the Oil, Chemical and Atomic Workers (OCAW) co-ordinated citizen

and organisational support nationally and has been credited by Anthony Mazzochi of the OCAW with having played a decisive role in the Shell workers getting such favourable terms as they did from Shell.

All of the above makes one wonder if other articles, not so easily checked in the United States, are as badly written. I hope not, preferring to believe this one is the exception. Perhaps, however, the *Ecologist* will be more careful in the future.

Very truly yours,
Richard C Dalsemer,
4355 Klinge Street, N.W.,
Washington, D.C. 20016.

Sir,

Mr Dalsemer, who finds my article *Eco Power to the People* (July issue) so filled with inaccuracy, should bother to check on his own facts before letting fly. It is true that my reference to the Highway Action Coalition was distinctly ambiguous, but it was not directly misleading. I certainly do not deny the central role of the Highway Action Coalition in finally opening up the Highway Trust Fund. This is not the point, however. The article, if Mr Dalsemer had paused to consider it a little more carefully, was designed to illustrate the way in which new groupings were widening the constituency of people interested in "environment" to

include urban poverty groups etc. This was not the role of the Highway Action Coalition, whatever its other strengths and virtues.

As regards Mr Dalsemer's criticism of my reporting of the Shell strike, the same thing applies. It may be that a more important role was played by a group other than the Urban Environment Coalition, but again, the point that was being made was the sources of the support represented by the Coalition. Mr Dalsemer's statement that a part of my article was "clearly cribbed" from a piece by a lady named Catherine Lerza is merely imagination. I built the article entirely from pressure-group hand-outs and documents at the meeting on which I was in fact reporting, together with discussions with participants. I have never heard of Miss Lerza.

More broadly, Mr Dalsemer's letter illustrates one sad reality about the lobbying—especially Washington lobbying—business. Groups' reputation for influence, always an ephemeral thing and impossible to assess accurately, is their most prized asset. Any belittling of their role is analogous to poaching onto the territory of a company or government department.

Yours sincerely,
Brian Johnson,
Bryckden Place,
Waldron, Heathfield, Sussex.

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