

The

# Ecologist

Journal of the Post Industrial Age

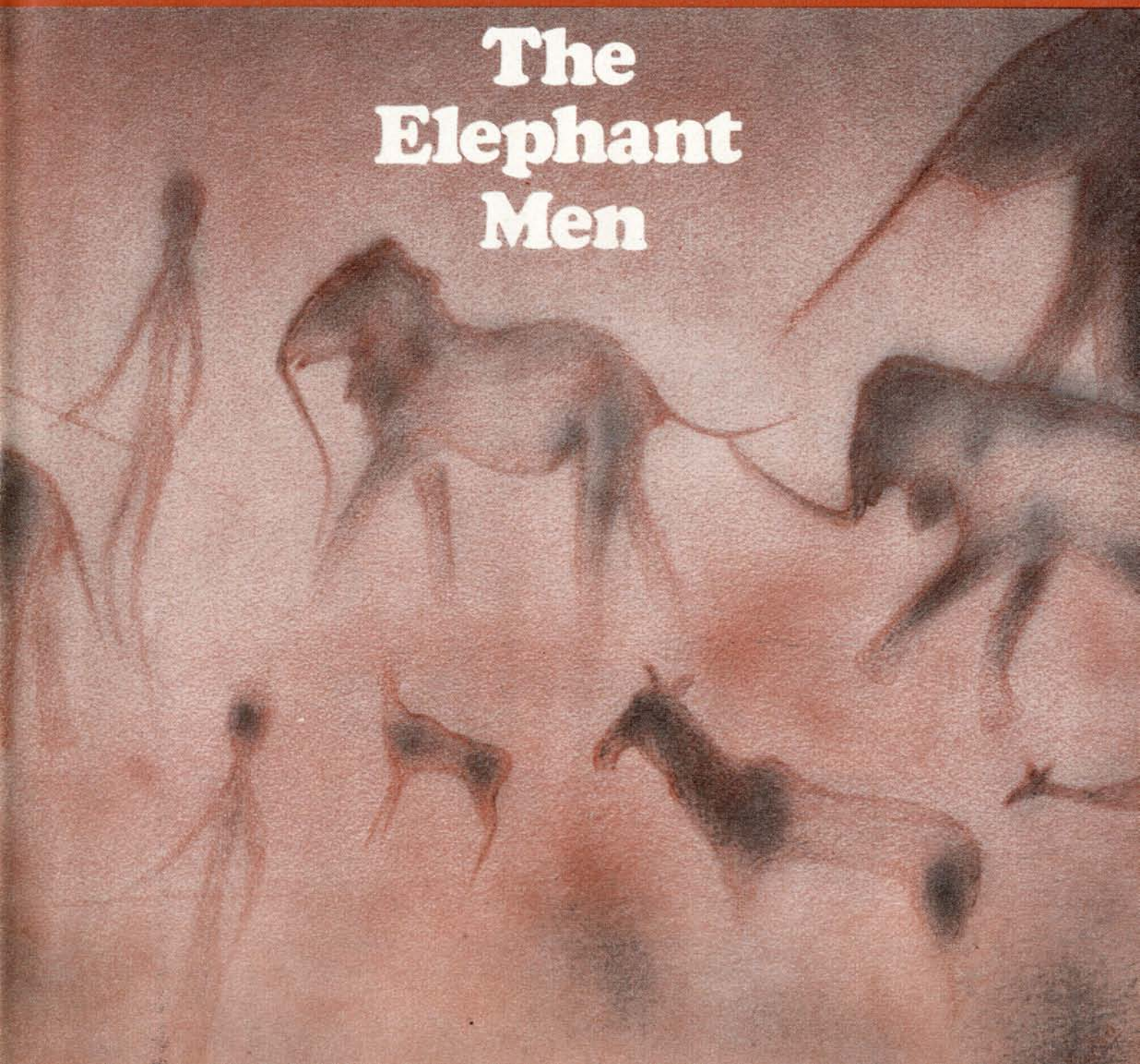
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INDUSTRIALISATION AND POVERTY IN THE THIRD WORLD • THE ECOLOGY OF UNEMPLOYMENT

ENGLAND'S GREEN REVOLUTION • ENERGY AND SOCIAL DISRUPTION

## The Elephant Men





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# Comments

## Britain's ecological party

What is this election about? Does anyone really know? Have either of the major parties worked out a constructive long-term policy? Have either of them told us where we are going, what sort of society they are creating for us? The answer is unfortunately no. They are simply criticising each other over their respective handling of such secondary issues as the Miners' strike or Britain's entry into the Common Market. Both parties intend to go on muddling through on a day-to-day basis dealing with each problem as it occurs, in that way which is most politically expedient, accommodating each new trend, however socially disruptive it might be, rather than making any attempt to reverse it.

All this was possible while Britain was rich and powerful and when political blunders could only lead to problems on a limited scale. This is no longer so. Britain is poor, nearly bankrupt, and its social fabric has been insidiously undermined by 150 years of industrialisation. In addition political and economic activity will soon be carried out on such a mammoth scale that a single wrong decision on the part of a government could have global repercussions, cause areas the size of Britain to become uninhabitable and lead to the deaths of tens of millions of people.

In these unprecedented conditions it is essential that we have the courage to do something we have never done before; that is face reality however unpleasant it might be. We must also be determined to elect to power people who are not the ordinary run-of-the-mill politicians, people who can think beyond political expediency, who do not try to win votes by promising all sorts of petty benefits which they are not in a position to provide, save per-

haps at an intolerable social and ecological cost, and who can move our society along that course most likely to provide our children with a tolerable future—clearly a very different course from that to which we are committed today.

Consider the problems our politicians are concerned with today: the balance of payments, the value of the pound, industrial productivity, the level of exports.

It is assumed without question that these are the important issues, but on what grounds? We are told that these are basic economic priorities. But even if this were so, why should economic considerations be paramount?

The object of economics after all is to ensure the optimum distribution of resources within a society, not torture it out of shape so that it may be capable of absorbing the resources which economists have arbitrarily decreed its inhabitants should consume. Economics, it should be evident to everyone, except perhaps to economists, should be subordinated to social requirements, not the other way around.

At this point one might ask where is economic growth actually taking us. Is it really creating a better world? Technologists, inebriated with their apparent conquest of nature, never tire of describing the technological paradise they are creating for us. But is it really a paradise? Are we sure that we want such a world?

Do we really long to live in skyscrapers half a mile high in cities of a hundred million people? Do we pine for a man-made cement and plastic world in which the brash artefacts of mass society have been effectively substituted for the varied and subtle works of nature, in which everything which does not directly contribute to man's immediate material comforts will have been systematically eliminated—a

world in which we are to be pampered from birth to death by an all pervasive state welfare system which deprives us of all initiative, all responsibility, all risk?

Do we really regard such things as supersonic transports, individual flying-kits, radar devices that plug directly into our brains, cyborgs, or man-machine hybrids and the remaining paraphernalia of a futuristic space-aged society as anything more than the puerile gimmickry of what were once avant-garde comic strips?

Man has undoubtedly suffered from many things during his tenancy of this planet—but never from not possessing a wrist-watch television set or a radar device plugged into his brain, no more than our society at present suffers from not possessing a third airport, a channel tunnel nor a fleet of Concorde.

These may well be very ingenious things. But they are irrelevant. They solve no human problems and can play no part in a strategy of survival.

Besides it is essential that we realise the cost of achieving this technological nightmare. To get the massive supplies of oil at the right price to keep our industry expanding, we shall have to undertake a massive crash programme of oil production in our coastal waters.

We shall be forced to disregard its inevitable repercussions on coastal communities and on the environment. The North Sea is already very seriously polluted, and even if it were shown beyond any shadow of a doubt that these activities would transform it into a lifeless waste, even if it were clearly demonstrated that the villages and towns on the Scottish and Cornish coasts would be transformed into a stretch of squalid urban slums, we would have to persist undaunted in our designs, totally disregarding such minor considerations.

It would mean continually finding

new ways of disposing of the ever greater quantities of some 500,000 different pollutants which the atmosphere, our rivers and the surrounding seas are ever less capable of absorbing. It would mean damming up more estuaries and flooding more valleys to satisfy industry's limitless water requirements. And even if we make these terrible sacrifices we would only assure, at best, a further decade or two of economic growth. This destructive process clearly cannot be sustained indefinitely in a world of finite resources with a finite capacity to absorb human and industrial wastes. In fact, long before the end of this century the impact of our activities on the natural environment would become intolerable. At this point our industrial society would undoubtedly collapse, and the more we commit ourselves to economic growth the more dramatic would be the consequences of that collapse. The only course open to us if we wish to avoid human misery on an unprecedented scale is to reduce the impact of our activities on the natural environment and re-design our economy so that it consumes less resources (which in any case shall not be available to it) generates less pollution and has a less disruptive effect on social systems.

But if we modify our society in this way, how can we combat poverty, unemployment, homelessness, disease, crime, and all the other problems whose solution requires massive expenditure on scientific research, technological development and industrial growth? Are we sure, however, that these problems can really be solved in this way? Immense sums of money have already been spent throughout the world towards this end but what has been the result? These problems are everywhere getting worse. Are we sure that we really understand them, that we have not interpreted them in that way which makes them appear amenable to a technological solution simply because this is the only one our society has to offer, while we refuse to adopt that lifestyle which would, in fact, provide their only real solution?

The more we examine the situation, the more it is apparent that our society is moving in a totally wrong direction. It may be providing us with all sorts of apparent benefits, but few of us have taken the trouble to examine at what cost. Few realise that economic growth is a process whereby a new organis-

ation of matter, the technosphere or the world of human artefacts, is systematically substituted for the biosphere or the world of living things, and that the one can only expand by diverting resources from the other. As the former expands therefore the latter must inevitably contract. Now the biosphere has been developed over thousands of millions of years, and is of the most incredible subtlety and perfection, while the technosphere is pathetically crude and rudimentary in comparison. Also man is an integral part of the biosphere, not of the technosphere, which means that this substitution is depriving us of our essential biological and social environment. Thus as industrialisation proceeds, all sorts of maladjustments are created as basic biological needs become increasingly difficult to satisfy. In the US it is becoming increasingly difficult for urban dwellers to drink non-polluted water. A recent survey shows that even bottled water contains traces of human sewage, as well as unacceptably high levels of heavy metals. At the same time it is increasingly difficult to obtain unadulterated foods. The average American is said to consume more than 5 lb of chemicals a year, just by eating the normal American diet—which contains more than 3,200 additives, very few of which have been adequately tested.

Man's social needs are also increasingly difficult to satisfy. The family unit cannot survive in an industrial economy in which most of the economic functions normally fulfilled at a family level have been usurped by supermarkets and other vast commercial organisations. Nor can it survive in an economy in which the mother is forced to relinquish essential maternal duties in order to earn money in a job that may take her every day to a place of work often at a great distance from her home. The survival of the community is also very difficult when economic activity is on a scale that renders the community redundant as a unit of economic behaviour, and when people are increasingly made to take up residence outside their community according to the requirements of their work.

*The more we look at it the more it is apparent that economic growth is a device for providing us with the superfluous at the cost of the indispensable.*

What then do we do? In January

1972 the *Ecologist* published what has now become a famous document: *A Blueprint for Survival*. It attracted a great deal of attention and has since been translated into 16 languages. It has also given rise to political parties in New Zealand, Tasmania and Alsace, and has at last done so in Britain. People is a new party. It has adopted the Blueprint as its basic theoretical statement. It already has 40 active groups throughout the country and in June is organising a convention to which there should be 1,000 participants. At this election it is putting forward at least six candidates who will contest seats at Hornchurch, Liverpool, Leeds, Eye and two at Coventry. At the next election it will field 600 candidates.

People badly needs your help—contact

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## References

Blueprint for Survival, the *Ecologist*, January 1972.

Does Building Houses increase Homelessness? *Ecologist*, December 1973.

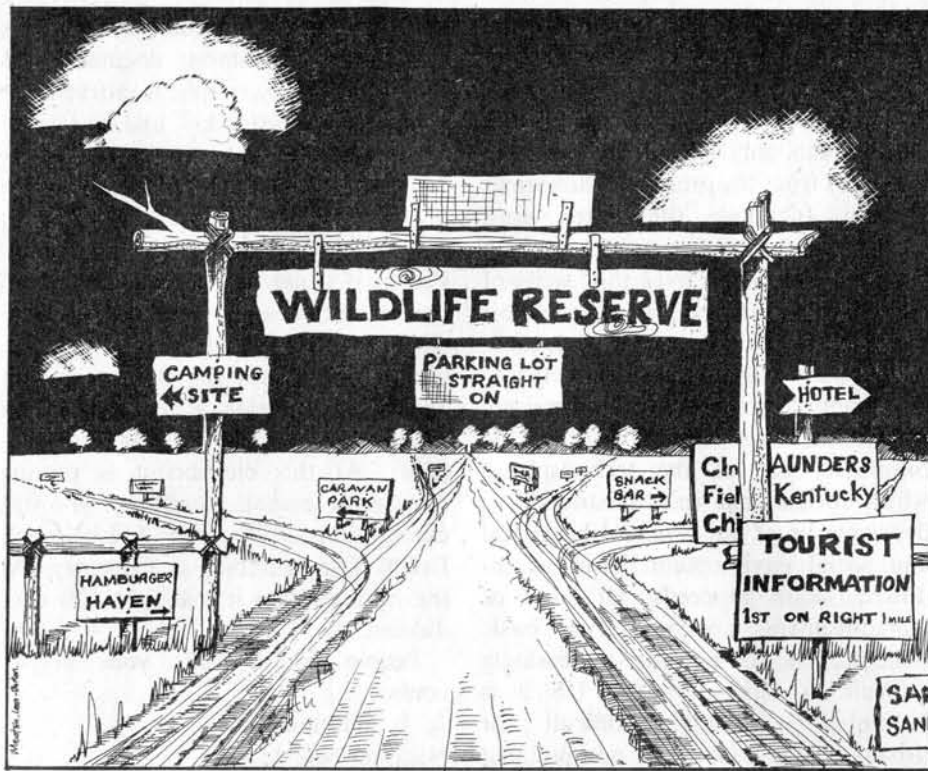
Education, What For? *Ecologist*, January 1974.

See also this issue for:

The Ecology of Unemployment,  
Poverty in the Third World and Energy  
and Social Disruption.

Edward Goldsmith





# The Economics of Wilderness

by Garrett Hardin

To some it may seem anathema to mention wilderness and economics in the same breath. Certainly, in the past, some of the most dangerous enemies of wilderness have been men who spoke the economics lingo. Despite this historic tar I think the brush of economics is a proper one for painting a picture of wilderness as a problem in human choice.

Economics may be defined as the study of choice necessitated by scarcity. There is something odd, and even improper, in speaking of the "economics of abundance" as Stuart Chase once did. With true abundance all economics cease, except for the ultimately inescapable economics of time. Of the economics of time there is no general theory, and perhaps cannot be. But for the *things* of the world there is an economics, something that can be said.

Although there really is no such

thing as an economics of abundance, the belief that there is, is one of the suppurating myths of our time. This belief had its origin partly in a genuine economic phenomenon, "the economy of scale". For complex artifacts in general the unit cost goes down as the scale of manufacture increases. In general, the more complex the artifact, the more striking the economy of scale; the cost per unit to build a million automobiles per year is far, far less than the cost per unit when only one is manufactured. Because artifacts are so pervasive in modern life, most of us unconsciously assume, "the bigger the better", and "the more the cheaper". It takes a positive effort of imagination to realise that there are things the supply of which cannot be multiplied indefinitely. Natural resources in general, and wilderness in particular, fall in this group.

This is obvious enough to Sierra Club members. It should be obvious to everyone, but it is not. Not long ago, for example, discussing some proposed improvements in a national park, the *Toronto Financial Post* said: "During 1968 and early 1969, campsites will be

expanded and roads paved to enable the visitor to enjoy the wilderness atmosphere that was nearly inaccessible only a few years ago." This is an astonishing sentence, but I will bet that one would have to argue with the writer of it for quite a while before he could be made to see the paradox involved in speaking of building a road into the wilderness.

Wilderness cannot be multiplied, and it can be subdivided only a little. It is not increasing; we have to struggle to keep it from decreasing as population increases. Were we to divide up the wilderness among even a small fraction of the total population, there would be no real wilderness available to anyone. So what should we do?

The first thing to do is to see where we stand, to make a list of possibilities without (initially) making any judgement of their desirability. On the first level of analysis there are just three possibilities.

1. The wilderness can be opened to everyone. The end result of this is completely predictable: absolute destruction. Only a nation with a small population, perhaps no greater than one per cent of our present population, a nation that does not have at its disposal our present means of transportation could maintain a wilderness that was open to all.

2. We can close the wilderness to everyone. In a limited sense, this action would preserve the wilderness. But it would be a wilderness like Bishop Berkeley's "tree in the quad" when no one is there; does wilderness really exist if no one experiences it? Such an action would save wilderness for the future but it would do no one any good now.

3. We can allow only limited access to the wilderness. This is the only course of action that can be rationally defended. Only a small percentage of a large population can ever enjoy wilderness. By suitably defining our standards, and by studying the variables in the situation, we can (in principle) work out a theory for maximising the enjoyment of wilderness under a system of limited access. Whatever our theory, we shall have to wrestle with the problem of choice, the problem of determining what small number among a vast population of people shall have the opportunity to enjoy this scarce good, wilderness. It is this problem of choice that I wish to explore here.

\* This article is taken from *Natural History* June-July 1969.

What I have to say applies not only to wilderness in the sense in which that term is understood by all good outdoorsmen, but also to all other kinds of outdoor recreational areas—to national parks, to ski areas, and the like. All of these can be destroyed by localised over-population. They differ in their “carrying capacity”. The carrying capacity of a Coney Island (for those who like it, and there are such people) is very high; the carrying capacity of wilderness, in the sense defined by Howard Zahniser, is very low. In the Wilderness Bill of 1964 Zahniser’s felicitous definition stands for all to admire:

“A wilderness, in contrast with those areas where man and his own works dominate the landscape is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain.”

The carrying capacity of Coney Island is, I suppose, something like 100 people per acre; the carrying capacity of a wilderness is perhaps one person per square mile. But whatever the carrying capacity, as population inexorably increases, each type of recreational area sooner or later comes up against the problem of allocation of this scarce resource among more than sufficient number of claimants to it. It is at this point that the problem of limited access must be faced.

How shall we limit access? How shall we choose from among the too abundant petitioners those few who shall be allowed in? Let’s run over the various possibilities.

First: By the marketplace. We can auction off the natural resource, letting those who are richest among the sufficiently motivated buy. In our part of the world and in our time most of us unhesitatingly label this method of allotment “unfair”. Perhaps it is. But don’t forget that many an area of natural beauty available to us today has survived unspoiled precisely because it was preserved in an estate of the wealthy in past times. This method of allotment has at least the virtue that it preserves natural treasures until a better, or perhaps we should merely say a more acceptable, method of distribution can be devised. The privilege of wealth has in the past carried many of the beauties of nature through the first, destructive eras of nascent democracy to the more mature, later

stages that were capable of appreciating and preserving them.

Second: By queues. Wilderness could be made available on a first-come, first-served basis, up to the extent of the carrying capacity. People would simply line up each day in a long queue and a few would be allowed in. It would be a fatiguing and wasteful system, but while it would be “fair” it might not be stable.

Third: By lottery. This would be eminently “fair”, and it would not be terribly fatiguing or wasteful. In earlier days, the decision of a lottery was regarded as the choice of God. We cannot recapture this consoling belief (now that “God is dead”), but we are still inclined to accept the results of a

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**No one should be able to enter a wilderness by mechanical means. He should have to walk many miles on his own two feet, carrying all his provisions with him.**

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lottery. Lotteries serve well for the allocation of hunting rights in some of our states where big game abounds.

Fourth: By merit. Whether one regards this as “unfair” or “fair” depends on the complexion of one’s political beliefs. Whether it is fair or not, I will argue that it is the best system of allocation. Anyone who argues for a merit system of determining rights immediately raises an *argumentum ad hominem*. He immediately raises the suspicion that he is about to define merit in such a way as to include himself in the meritorious group.

The suspicion is justified, and because it is justified it must be met. To carry conviction, he who proposes standards must show that his argument is not self-serving. What I hereby propose as a criterion for admission to the wilderness is great physical vigour. I explicitly call your attention to this significant fact: I myself cannot pass the test I propose. I had polio at the age of four, and got around moderately well for more than 40 years, but now I require crutches. Until today, I have not traded on my infirmity. But today, I must, for it is an essential part of my argument.

I am not fit for the wilderness I praise. I cannot pass the test I propose. I cannot enter the area I would restrict. Therefore I claim that I speak with objectivity. The standard I pro-

pose is, not an example of special pleading in my own interest. I can speak loudly where abler men would have to be hesitant.

To restrict the wilderness to physically vigorous people is inherently sensible. What is the experience of wilderness? Surely it has two major components. The first is the experience of being there, of (in Thoreau’s words) being refreshed “by the sight of inexhaustible vigor, vast and titanic features”, of seeing “that nature is so rife with life that myriads can afford to be sacrificed and suffered to prey on one another; that tender organizations can be so serenely squashed out of existence like pulp . . .”.

The experience of being there is part of the experience of wilderness, but only a part. If we were dropped down from a line by helicopter into the middle of this experience we would miss an important part of the total experience, namely the experience of getting there. The exquisite sight, sound, and smell of wilderness is many times more powerful if it is earned through physical achievement, if it comes at the end of a long and fatiguing trip for which vigorous good health is a necessity.

Practically speaking, this means that no one should be able to enter a wilderness by mechanical means. He should have to walk many miles on his own two feet, carrying all his provisions with him. In some cases, entrance might be on horse or mule back, or in a canoe, or by snowshoes; but there should be no automobiles, no campers, no motorcycles, no totebags, no outboard motors, no air-planes. Just unmechanised man and nature—this is a necessary ingredient of the prescription for the wilderness experience.

That mechanical aids threaten wilderness is already recognised by managers of our wildernesses. Emergency roads, it is said, should be used sparingly. I submit that this cautious policy is not cautious enough. I submit that there should be no emergency roads, that the people who go into the wilderness should go in without radio transmitters, that they should know for certain that if an emergency arises they can get no help from the outside. If injured, they must either somehow struggle to the outside under their own power or (if lucky) catch the attention of another rare wanderer in the wilderness and get him to help. For people

who are physically prepared for it, the wilderness is not terribly dangerous—but such danger as there is is a precious part of the total experience. The knowledge that one is really on one's own is a powerful tonic. It would be cruelly sentimental to take this away from the wilderness adventurer.

There is not even a public interest in making the wilderness safe. Making great and spectacular efforts to save the life of an individual makes sense only when there is a shortage of people. I have not lately heard that there is a shortage of people.

There is, however, a public interest in making the wilderness as difficult and dangerous as it legitimately can be. There is, I think, a well-founded suspicion that our life has become, if anything, too safe for the best psychological health, particularly among the young. The ever greater extension of the boundaries of legal liability has produced a controlled and fenced-in environment in which it is almost impossible to hurt oneself—unless one tries. The behaviour of the young clearly indicates that they really try. Drag races, road races, “rumbles”, student sit-ins, marches, and tauntings of the police—all these activities look like the behaviour of people looking for danger. I do not wish to deny that some of the activities may arise from other motivations also, e.g. idealistic political beliefs. I am only saying that it looks like deliberate seeking of danger is part of the motivation of our obstreperous young. I think it is an important part. I think we would do well to tear down some of the fences that now deprive people of the possibility of danger. A wilderness without rescue services would contribute to the stability of society.

There is a second way in which the interest of society is furthered by a rigorous wilderness. From time to time a president of the United States endeavours to improve the physical condition of the average citizen by resorting to a rhetorical bombardment. The verbal ammunition consists principally of the words “responsibility”, “duty” and “patriotism”. These rhetorical duds no longer move the young. The negative motivation of shame is, in general, not as effective as the positive motivation of prestige. A wilderness that can be entered only by a few of the most physically fit of the population will act as an incentive to

myriads more to improve their physical condition. The motivation will be more effective if we have (as I think we should) a graded series of wilderness and park areas. Areas in which the carrying capacity is reckoned at one person per thousand acres should be the most difficult to enter; those with a capacity of one per hundred acres should be easier, those with one per ten, still easier, and so on. Yosemite Valley should, I suggest, be assigned a carrying capacity of about one per acre which might mean that it could be opened to anyone who could walk ten miles. At first, of course, the ten mile walkers would be a very small class, but once the prestige factor took effect more and more people would be willing

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**The heritage of wilderness must be open only to those who can earn it again for themselves. The rest, since they cannot gain the genuine treasure by their own efforts, must relinquish the shadow of it.**

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to walk a distance. Then the standard should be made more rigorous.

I am sure other details of such a system would eventually have to be faced and worked out. It might be necessary to combine it with a lottery. Or some independent, easily administered test of physical fitness might be instituted. These are details, and in principle can be solved, so I will not spend time on them. But whatever the details it is clear that many of our present national parks and national forests and other recreation areas should be forever closed to people on crutches, to small children, to fat people with heart conditions, and to old people with the usual state of physical disrepair. On the basis of their lack of merit, such people (and remember, I am a member of this deprived group) should give up all claim of right to the wilderness experience.

The poet Goethe once said “We must earn again for ourselves what we have inherited”, recognising that only those things that are earned can be precious. To be precious the heritage of wilderness must be open only to those who can earn it again for themselves. The rest, since they cannot gain the genuine treasure by their own efforts, must relinquish the shadow of it.

We need not be so righteous as to

deny the excluded ones all experience of the out-of-doors. There is no reason in the world why we cannot expand our present practice of setting up small outdoor areas where we permit a high density of people to get a tiny whiff of nature. Camping cheek by jowl with thousands of others in an outdoor slum does not appeal to me personally—I have not visited Yosemite Valley in 30 years—but there are people who simply love this slummy togetherness, a fact that Sierra Clubbers sometimes forget or find hard to believe. By all means, let us create some al fresco slums for the people, but not in the likes of Yosemite Valley, which is too good for this purpose. But there will be little loss if some of the less attractive forest areas are turned into outdoor slums to relieve the pressure on the really good areas. We must have lakes that fairly pullulate with water skiers in order that we may be able to set aside other lakes for quiet canoeing. We must have easily reached beaches that fairly writhe with oily bodies and vibrate to a steady cacophony of transistor radios, in order to keep up other beaches, difficult of access, on which we can forbid all noise makers.

The idea of wilderness is a difficult one, but it is precisely because it is difficult that clarifying it is valuable. In discovering how to justify a restricted good to a nation of 200,000,000 people that is still growing we find a formula that extends beyond wilderness to a whole spectrum of recreational activities in the national commons. The solution of the difficult case erects a framework into which other cases can be easily fitted.



# Pollution by Tourism

by Edward Goldsmith

In 1971, 181 million tourists visited another country, 7 per cent more than the year before. In 1980, if current trends continue, the figure is likely to be close to 325 million. Many would regard such wholesale tourism as a major triumph of industrial society. Foreign travel, once the privilege of the few, has become the prerogative, some would even say the right, of the many. But is it doing anyone any good, and at what cost to the environment?

In the past the traveller set off intrepidly, armed with flower press-book and sketch-book to record the curiosities of yet uncharted lands. Today the tourist is packed off with a batch of his fellows to a resort that has been carefully prepared to cater for his every whim and fancy. There he will be treated above all as a consumer of what has become, throughout the world, very standard fare.

As Baldwin points out in the "Travel Agent": "There is little to differentiate between a high-rise hotel in Ibiza and one in Oahu." As far as the guests are concerned "If you could employ a giant helicopter to transfer them overnight, hardly anyone would notice it. The swimming pools, sleek coffee-shops, souvenir stands, even people would all bear the same jet-age patina, the same plastic conformity."

What in fact is the tourist likely to see which will add to his knowledge of the world, of the people who inhabit it or of the societies and cultural forms that they have developed? The answer is very little. As Rivers writes in "The Restless Generation", the tourist is "lucky to... meet any inhabitants apart from waiters, guides, taxi drivers and gift sellers.... The manufactured scene is a blend of an environment to make him feel at home and an atmosphere in keeping with the country's promoted image."

A cursory look at standard advertis-



ing material indicates that what the tourist seeks are nothing other than the four Ss—sun, sea, sand and sex. All of which can be provided remarkably cheaply—sufficiently so to make of tourism the multi-billion dollar business which it is. But does the price paid actually represent the true cost. What about health hazards both to the endemic population and those who are travelling? The common cold is for us a mild if inconvenient complaint. We have built up our natural resistance to it. Many people, such as the Eskimos, have never encountered it before. The common cold for them could be lethal. Similarly when we visit foreign countries we encounter germs

and viruses which have little effect on the local population but which can be harmful to us. Rivers lists among the health problems encountered by tourists "diarrhoea, headaches, unexplained fatigue, digestive upsets, loss of weight, typhoid, para-typhoid, cholera, dysentery, brucellosis, infectious hepatitis, worms, malaria, kala agar, yellow fever and sleeping sickness". Venereal disease is also a hazard. In 1970 15 per cent of the new cases of syphilis in the UK were contracted abroad, and at least nine diseases are associated with people swimming in waters polluted with human faecal matter.

Worse still mass tourism is having a devastating effect on local inhabitants.

In the Dutch half of the Island of St Martin a resident population of 7,000 plays host to 130,000 visitors a year—all in an area of 16 square miles. In Spain the Tourist Development Plan caters for 49.5 million tourists in 1980 compared with a resident population of 35 million. The Madrid newspaper ABC is already accusing the 25 million tourists who visited Spain last year of turning large parts of the country into "an alien land where foreign languages are spoken, foreign currency is accepted and Spaniards discriminated against. In 1001 small and big things" the paper continues "one can detect the existence of a new colonialism—tourism—being imposed on them in a way which is dangerous".

People naturally suspicious of foreigners have their suspicions confirmed by some of the very visible consequences of mass tourism. Inevitably land values increase. More often than not prices rise so steeply that it becomes difficult, often impossible, for local people to buy themselves a house. Often too, land required for housing is taken up by hotels and other tourist amenities. In London, if present plans materialise, hotel construction is due to take up another 660 acres of valuable building land while house-building programmes are already compromised, because of a shortage of more than 5,000 acres.

Another consequence of mass tourism is the change it has on local employment patterns and hence on the society's economy. In St Lucia for instance, the tourist boom has caused a flight from the land, and since the peak of the tourist season coincides with the harvest and fruit-picking time, the effect on agriculture has been disastrous. This is also true in the Seychelles where it is increasingly difficult to find workers for the plantations. While in North Africa, as Julian Pettifer puts it, "the Bedouins have left their flocks to shepherd the tourists and the ship of the desert has become a pleasure boat". This tendency towards replacing agriculture by tourism has many disadvantages, some of which have already been mentioned. It is often the case that tourists tend to eat imported food, also that the hotels are foreign-owned and profits thereby leave the island, and often, as in St. Lucia, tourist undertakings are exempt of tax. Another disadvantage is that workers in the tourist industry must often be

imported. In Britain, a very large proportion of them are foreigners. It seems unreasonable to import any more into what is already one of the most overpopulated countries in the world. In Switzerland, the hotel industry is clamouring for another 40,000 workers. The quota at present is for half this number. If they are obtained, then half of the workers in the hotel industry would be foreigners.

Work in the hotel industry tends to be poorly paid. Hours are very long, so much so that this sort of work must have some effect on family life. Work as maids and waitresses gives full scope to the opportunity for marital infidelity. This is the theme of Dr. Francis Cottrington who has gone so far as to link growth in the tourist industry with an increase in the divorce rate.

Most depressing of all is the effect of mass tourism on local cultural patterns which are distorted for touristic purposes. Premier James Mitchell of St Vincent recently said "the tourist dollar alone unrestricted is not worth the devastation of my people. A country where the people have lost their soul is no longer a country." In Mexico, the choice is very much between the tourist dollar and the Mexican soul. Here 60 per cent of the tourist revenue comes from 90 million United States citizens, driving over the border in order to spend 900 million dollars in the red light areas of Tijuana, Ciudad, Juarez etc. As Sir George Young (*Tourism*) points out, "these 'boys towns' as Americans call them or 'zones of tolerance' as the Mexicans describe them, are visually unattractive and act as a magnet for crime and prostitution. Were it not for the foreign exchange they generate they would have been unquestionably closed years ago". Most eloquent of all is the response of the Holy Synod of the Greek Orthodox church. In 1971 it published a new prayer. "Lord Jesus Christ, Son of God," it reads, "have mercy on the cities, the islands and the villages of our Orthodox Fatherland, as well as the Holy Monasteries which are scourged by worldly touristic ways. Grace us with a solution to this dramatic problem and protect our brethren who are sorely tried by the modernistic spirit of these contemporary western invaders."

It is unnecessary to dwell at length on the devastating effect of mass tourism on the physical environment. Practically no accessible area of great

natural beauty which is close to the sea is entirely exempt. A large part of the coast of Southern Spain, of the South of France and of the Italian Riviera have already been mutilated beyond redemption with countless hotels together with their associated amenities. The Mediterranean is already so badly contaminated with sewage, oil and industrial works that in a few decades it may be transformed into a near-lifeless waste. The Baltic and the North Sea are probably in an even worse state. The Black Sea too is extremely polluted. This terrible damage obviously cannot all be attributed to tourism but it has certainly played its part. An island which has suffered particularly from tourism is Hawaii. This once beautiful island is disfigured with countless skyscrapers. Six lane highways cater for over 300,000 cars and, during the season, every ten minutes a jetliner lands with a new cargo of tourists. The pilot, as Wehrheim points out (*Paradise Lost, The Ecologist*, Vol. 1 No. 10) "need not check his instruments or consult his navigator to know when his plane is nearing its destination. He can spot the murky grey-brown pall that hangs over the city while still miles out to sea. Looking down into the ocean he can see its natural blues and green are discoloured with erosion, industrial waste and raw sewage".

The damage caused by tourism is rapidly becoming apparent to even the blindest among us, and is at last beginning to be reflected in monetary costs. Already 6,000 registered beaches in Italy are dangerously polluted—some have a bacterial count five times higher than the accepted limit.

Experts can always be found who claim no harm can come from swimming in human excrement. But for how long are people going to believe such myths. For how much longer are they going to spend their holidays being shepherd in ever worse discomfort from one airport to another, to ever more contrived and artificial surroundings in an increasingly deteriorated landscape?

The decision may have already been taken out of their hands. Mass tourism is likely to be one of the first victims of the energy crisis. This is very good news for the environment and probably not really such bad news for the tourists.

Edward Goldsmith



## *The Juggernaut*

# *Energy and Social Disruption*

by Ivan Illich

It has recently become fashionable to talk of the energy crisis. This euphemistic term conceals a contradiction and consecrates an illusion. It masks the contradiction implicit in the joint pursuit of equity and industrial growth. It safeguards the illusion that machine power can indefinitely take the place of manpower. To face this contradiction and betray this illusion, it is urgent to clarify the reality that the language of crisis obscures: high quanta of energy degrade social relations just as inevitably as they destroy the physical milieu.

The proponents of an energy crisis confirm and continue to propagate a peculiar vision of man. According to this notion, man is born into prolonged dependence on slaves which he must painfully learn to master. If he does not employ prisoners, then he needs motors to do most of his work. According to this doctrine, the well-being of a society can be measured by the number of years its members have gone to school and by the number of energy slaves they have thereby learned to command. This belief is common to the conflicting economic ideologies now in vogue. It is threatened by the obvious inequity, harriedness and impotence that appear everywhere once the voracious hordes of energy slaves outnumber people by a certain proportion. The energy crisis focuses concern on the scarcity of fodder for these slaves. I prefer to ask whether free men need them.

The energy policies adopted during the current decade will determine the range of social relationships a society will be able to enjoy by the year 2000. A low energy policy allows for a wide choice of life styles and cultures. If, on the other hand, a society opts for high energy consumption, its social relations must be dictated by technocracy and will be equally distasteful whether labelled capitalist or socialist.

At this moment, most societies—especially the poor ones—are still free to set their energy policies by any of three guidelines. Well-being can be identified with high amounts of per capita energy use, with high efficiency of energy transformation, or with the least possible use of mechanical energy by the most powerful member of society. The first approach would stress tight management of scarce and destructive fuels on behalf of industry,

whereas the second would emphasize the retooling of industry in the interest of thermodynamic thrift. Both attitudes necessarily imply huge public expenditures and increased social control; both rationalise the emergence of a computerised Leviathan, and both are at present widely discussed.

The possibility of a third option is barely noticed. While people have begun to accept ecological limits on maximum per capita energy use as a condition for physical survival, they do not yet think about the use of minimum feasible power as the foundation of any of various social orders that would be both modern and desirable. Yet only a ceiling on energy use can lead to social relations that are characterised by high levels of equity. The one option that is presently neglected is the only choice within the reach of all nations. It is also the only strategy by which a political process can be used to set limits on the power of even the most motorised bureaucrat. Participatory democracy postulates low energy technology. Only participatory democracy creates the conditions for rational technology.

What is generally overlooked is that equity and energy can grow concurrently only to a point. Below a threshold of per capita wattage, motors improve the conditions for social progress. Above this threshold, energy grows at the expense of equity. Further energy affluence then means decreased distribution of control over that energy.

The widespread belief that clean and abundant energy is the panacea for social ills is due to a political fallacy, according to which equity and energy consumption can be indefinitely correlated, at least under some ideal political conditions. Labouring under this illusion, we tend to discount any social limit on the growth of energy consumption. But if ecologists are right to assert that non-metabolic power pollutes, it is in fact just as inevitable that, beyond a certain threshold, mechanical power corrupts. The threshold of social disintegration by high energy quanta is independent from the threshold at which energy conversion produces physical destruction. Expressed in horsepower, it is undoubtedly lower. This is the fact which must be theoretically recognised before a political issue can be made of the per capita wattage to which a society will limit its members.

Even if non-polluting power were feasible and abundant, the use of energy on a massive scale acts on society like a drug that is physically harmless but psychically enslaving. A community can choose between Methadone and "cold turkey"—between maintaining its addiction to alien energy and kicking it in painful cramps—but no society can have a population that is at once autonomously active and hooked on progressively larger numbers of energy slaves.

In previous discussions, I have shown that, beyond a certain level of GNP, the cost of social control must rise faster than total output and become the major institutional activity within an economy. Therapy administered by educators, psychiatrists and social workers must converge with the designs of planners, managers and salesmen, and complement the services of security agencies, the military and the police. I now want to indicate one reason why increased affluence requires increased control over personnel. I argue that

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**Even if non-polluting power were feasible and abundant, the use of energy on a massive scale acts on society like a drug that is physically harmless but psychically enslaving.**

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beyond a certain median per capita energy level, the political system and cultural context of any society must decay. Once the critical quantum of per capita energy is surpassed, education for the abstract goals of a bureaucracy must supplant the legal guarantees of personal and concrete initiative. This quantum is the limit of social order.

I will argue here that technocracy must prevail as soon as the ratio of mechanical power and metabolic energy oversteps a definite, identifiable threshold. The order of magnitude within which this threshold lies is largely independent from the level of technology applied, yet its very existence has slipped into the blindspot of social imagination in both rich and medium rich countries. Both the United States and Mexico have passed the critical divide. In both countries, further energy inputs increase inequality, inefficiency and personal im-

potence. Although one country has a per capita income of \$500 and the other of nearly \$5,000, huge vested interest in an industrial infrastructure prods both of them to further escalate the use of energy. As a result, both North American and Mexican ideologues put the label of "energy crisis" on their frustration, and both countries are blinded to the fact that the threat of social breakdown is due neither to a shortage of fuel, nor to the wasteful, polluting and irrational use of available wattage, but to the attempt of industries to gorge society with energy quanta that inevitably degrade, deprive and frustrate most people.

A people can be just as dangerously overpowered by the wattage of its tools as by the caloric content of its foods, but it is much harder to confess to a national overindulgence in wattage than to a sickening diet. The per capita wattage that is critical for social well-being lies within an order of magnitude which is far above the horsepower known to four-fifths of humanity and far below the power commanded by any Volkswagen driver. It eludes the underconsumer and the overconsumer alike. Neither is willing to face the facts. For the primitive, the elimination of slavery and drudgery depends on the introduction of appropriate modern technology, and for the rich, the avoidance of an even more horrible degradation depends on the effective recognition of a threshold in energy consumption beyond which technical processes begin to dictate social relations. Calories are both biologically and socially healthy only as long as they stay within the narrow range that separates enough from too much.

The so-called energy crisis is, then, a politically ambiguous issue. Public interest in the quantity of power and in the distribution of controls over the use of energy can lead in two opposite directions. On the one hand, questions can be posed that would open the way to political reconstruction by unblocking the search for a post-industrial, labour-intensive, low energy and high equity economy. On the other hand, hysterical concern with machine fodder can reinforce the present escalation of capital-intensive institutional growth, and carry us past the last turn-off from a hyper-industrial Armageddon. Political reconstruction presupposes the recognition of the fact that there exist *critical per capita*

quanta beyond which energy can no longer be controlled by political process. Social breakdown will be the inevitable outcome of ecological restraints on *total energy use* imposed by industrially-minded planners bent on keeping industrial production at some hypothetical maximum.

**The model American male spends more than 1,500 hours per year on his car; driving or sitting in it, parking or searching for it; earning enough to pay for the vehicle, the tolls, the tyres, the insurance or the highway taxes. These four hours per day or gathering his resources for it do not include his transport-related dallying in hospitals, traffic courts, and garages, his sitting time before the TV to be sold a new model, or the time needed to earn or enjoy the travelling on his vacation. In terms of life-time invested, the average American attains four miles an hour. In countries without any transport industry, people walk at this rate wherever they want to go...**

Man, unaided by any tool, is quite efficient when he moves. He carries one gram of his weight over a kilometre in 10 minutes by expending 0.75 calories, which makes him thermodynamically more efficient than any motorised vehicle and most animals, such as rats or oxen. He is still less efficient than horses or sturgeon...

A century ago, however, the bicycle appeared. It lifted man's self-powered mobility into a new order, beyond which there can be no further progress... On flat ground he can travel three to four times faster than on foot and do so using only one-fifth of the calories he would have expended walking. He can now carry one gram of his weight over one kilometre expending only 0.15 calories. Equipped with a bicycle, man does better not only than any machine but also than any animal.

*Ivan Illich*

Rich countries like the United States, Japan or France might never reach the point of choking in their own waste, but only because their societies will have already collapsed into a socio-cultural energy coma. Countries like

India, Burma and, for another short while at least, China, are in the inverse position of being still muscle-powered enough to stop short of an energy stroke. They could choose, right now, to stay within those limits to which the rich will be forced back at an enormous loss in their vested interest.

The choice of a minimum energy economy compels the poor to abandon distant expectations and the rich to recognise their vested interest as a ghastly liability. Both must reject the fatal image of man the slaveholder currently promoted by an ideologically stimulated hunger for more energy. In countries that were made affluent by industrial development, the energy crisis serves as a whip to raise the taxes which will be needed to substitute new, more sober and socially more deadly industrial processes for those that have been rendered obsolete by inefficient over-expansion. For the leaders of people who have been disowned by the same process of industrialisation,

**Inevitably the poor abandon the option for rational technology when they choose to modernise their poverty by increasing their dependence on energy.**

the energy crisis serves as an alibi to centralise production, pollution and its control in a last-ditch effort to catch up with the more highly powered. By exporting their crisis and by preaching the new gospel of Puritan energy worship, the rich do even more damage to the poor than they did by selling them the products of now outdated factories. As soon as a poor country accepts the doctrine that more energy more carefully managed will always yield more goods for more people, that country is hooked into the race for enslavement to maximum industrial outputs. Inevitably the poor abandon the option for rational technology when they choose to modernise their poverty by increasing their dependence on energy. Inevitably the poor reject the possibility of liberating technology and participatory politics when, together with maximum feasible energy use, they accept maximum feasible social control.

The energy crisis cannot be overwhelmed by more energy inputs. It can only be dissolved, along with the illusion that well-being depends on the

number of energy slaves a man has at his command. For this purpose, it is necessary to identify the thresholds beyond which power corrupts, and to do so by a political process that associates the community in the search for limits. Because this kind of research runs counter to that now done by experts and for institutions, I shall call it counterfoil research. It has three steps. First, the need for limits on the per capita use of energy must be theoretically recognised as a social imperative. Then, the range must be located wherein the critical magnitude might be found. Finally, each community has to identify the levels of inequity, harrying and operant conditioning that its members are willing to accept in exchange for the satisfaction that comes of idolising powerful devices and joining in rituals directed by the professionals who control their operation.

The need for political research on socially optimal energy quanta can be

## Cyclists Today

are an important factor in conserving the countryside, minimising pollution and noise, reducing traffic congestion, saving fuel. They deserve every encouragement from town and country planners—better facilities—greater protection from powered traffic... The interests of

## cyclists today

are looked after—as they have been for nearly a century—by the CTC, a strong national association with over 20,000 individual members. Its policy on all matters affecting cyclists is summarised in a booklet called

## 'Cyclists Today'

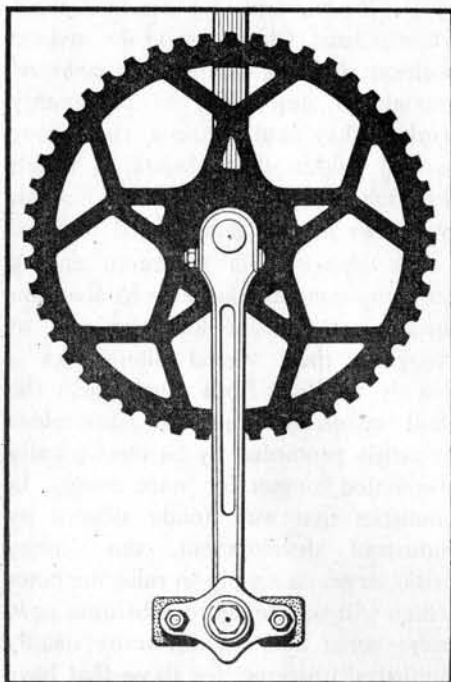
Send for a free copy, and also details of how YOU can help the CTC's vital work by joining as a member.

**CTC**

**THE CYCLISTS' ASSOCIATION**  
National Headquarters  
69 Meadow, Goldalming, Surrey

clearly and concisely illustrated by an examination of modern traffic. The United States put 45 per cent of its total energy into vehicles: to make them, run them and clear a right of way for them when they roll, when they fly and when they park. Most of this energy is to move people who have been strapped into place. For the sole purpose of transporting people, 250 million Americans allocate more fuel than is used by 1,300 million Chinese and Indians for all purposes. Almost all of this fuel is burnt in a rain dance of time-consuming acceleration. Poor countries spend less energy per person, but the percentage of total energy devoted to traffic in Mexico or in Peru is greater than in the USA, and it benefits a smaller percentage of the population. The size of this enterprise makes it both easy and significant to demonstrate the existence of socially critical energy quanta by the example of personal carriage.

In traffic, energy used over a specific period of time (power) translates into speed. In this case, the critical quantum will appear as a speed limit. Wherever this limit has been passed, the basic pattern of social degradation by high energy quanta has emerged. Once some public utility went faster than  $\pm 15$  mph, equity declined and the scarcity of both time and space increased. Motorised transportation monopolised traffic and blocked self-powered transit. In every Western country, passenger mileage on all types of conveyance increased by a factor of a hundred within fifty years of building the first railroad. When the ratio of their respective power outputs passed beyond a certain value, mechanical transformers of mineral fuels excluded people from the use of their metabolic energy and forced them to become captive consumers of conveyance. This effect of speed on the autonomy of people is only marginally affected by the technological characteristics of the motorised vehicles employed or by the persons or entities who hold the legal titles to airlines, buses, railroads or cars. High speed is the critical factor which makes transportation socially destructive. A true choice among political systems and of desirable social relations is possible only where speed is restrained. Participatory democracy demands low energy technology, and free people must travel the road to productive social relations at the speed of a bicycle.



## PEDAL POWER

By PHILIP BRACHI

The bicycle is the most efficient means of transport known to man. Once astride it any man, woman or child can outperform any racehorse, humming-bird or flashing salmon—let alone the cumbersome car! 1,500 miles per gallon is a fair figure for what rider plus machine can expect.

As any cyclist will confirm, there are reasons a-plenty for preferring pedal-power: enjoyment, exercise, and an unrivalled economy and convenience are the ones most often mentioned. In another age, another culture perhaps, one might hope that the case for the bicycle would not require numerical proof. A source of pleasure and mobility perfectly suited to the human scale, neither endangering others nor bruising their freedoms; comprehensible, with a transparent honesty of form and operation; ecologically meek; such a device should need no defence.

What are modern bikes made of? Stripping down my own £36, 28 lbs steed produced the following: about 20 lb of mild steel, 3 lb rubber, 2 lb aluminium alloy, 1 lb plastics, 1 lb batteries,  $\frac{3}{4}$  lb leather, and a few ounces of Derby mud. The total "energy cost" of mining and manufacturing these materials is about 250 kilowatt-hours, or about the energy of seven gallons of petrol. By comparison, the average 1970 European car weighed 1,953 lb and consumed resources costing nearly 60 times as much energy as my bicycle.

Providing for riding is easy. A 12-foot bikeway has five times the people-per-hour capacity of a 24-foot road; and more than just precious land is saved. Materials are similar, but roads are thicker and stronger, costing about six times as much per square yard as a bikeway. On this basis provision for bike traffic is 60 times more efficient than building equivalent roads. Even the hardened motorist should welcome bikeways, because separating cars from cycle and foot traffic can treble the capacity of an ordinary road.

And at journey's end, compare the monster now looming over so many hitherto attractive town centres, the multi-storey car park, with the multi-slot bike-rack. The planners' standard for car parks is 220 square feet per car, including the necessary aisles. Racks and aisles for bicycles would put thirty, (yes 30), on the same space.

Finally, the riding itself. Any old 40 lb bicycle with a non-athletic 14-stone aboard can manage a leisurely 10-12 miles per hour; and doctors say that a person cycling 5 hours daily will add about 1,500 calories to his diet. So, with 40,000 food calories equal in energy to a gallon of petrol, any cyclist can do a cool 1,500 miles per gallon!

In environmental impact the journey to work is crucial. The election-swaying power of the urban roads issue is now clear to everyone; less obvious to the electorate is the fact that all such roads are designed around rush-hour traffic. And the DoE tells us that half of the nation's car-borne commuters travel less than  $3\frac{1}{2}$  miles.

Consider the possibilities as congestion, pollution and destruction mount, and the cost of fuel soars. It is no coincidence that Americans, the most motorised people on Earth, are now buying more bicycles than cars: last year 8 million were sold.

The energy and resource limits of a finite Earth mean that the private car can never be everyone's. Belatedly the mood is changing. The rediscovered bicycle is the soft technology approach to personal mobility, valid for all people for all time.

Philip Brachi is co-author of "The Bike Book", covering all aspects of cycling and concentrating especially upon environmental, political and planning issues; an inexpensive and copiously illustrated paperback. All enquiries to Eco Publications, 6 Cavendish Avenue, Cambridge.

# The Elephant Men

by Roger Gomm.

The Waliangulu are a hunter-gatherer tribe of South Kenya. They are specialists in hunting elephants which they have probably done for thousands of years and in which they have predictably become extraordinarily proficient. Recently, however, for various commercial motives, their life has been seriously interfered with, with predictably disruptive effects on both their society and elephant populations.



The setting is the arid hinterland of the Kenya coast. Here 20-40 miles inland, remnants of the coastal forests give way to plains of thorn bush and open grassland which stretch inland to the foothills of the Kenya Highlands. This vast area is aptly named the "Nyika" or wilderness and stretches with unrelenting monotony southwards into Tanzania and northwards to grade into the deserts of Somalia, Ethiopia and Northern Kenya. Like many semi-arid regions with unreliable rainfall the ecosystem here is delicately balanced and over the past 100 years or so has been in a state of flux, wavering from dense thorn forest through open grassland to semi-desert and back again. Human factors have played a part in the ecology of the region out of all proportion to human population densities.

One hundred years ago the lords of the land were still the Oromo Galla: Hamitic tribesmen who had swept down from the north in the seventeenth century alternately besieging and trading with the Arab statelets along the Coast and with the Arab or Portuguese rulers of Mombasa and displacing Bantu cultivators like the Pokomo, the Giriama and the Duruma. The Galla pastoralists grazed their herds of Borana cattle, camels, sheep and goats across the wilderness, retreating to dry season settlements in the forests along the coast and along the major rivers and especially along the Tana River and the lower Galana and in the coastal region between.

Living among the Galla were a hunting and gathering people called variously, the *Waliangulu*, *Ariangulu*, or *Wasania*. But these are the names of other tribes for these people. They call themselves *Watta*. I shall refer to them as *Waliangulu* simply because this is the name which most frequently appears in published references to them.

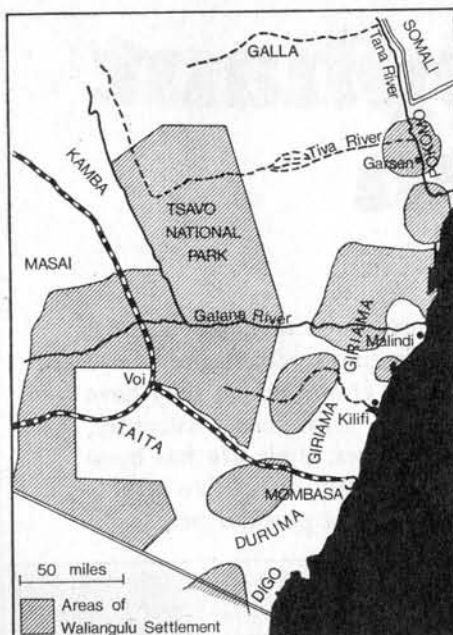
Like other peoples calling themselves *Watta* or *Wat* living among Hamitic Pastoralists or Amharic cultivators in Kenya, Somalia and Ethiopia the Waliangulu were helots, a subject people to their cattle-keeping overlords. The exact nature of the relations between the Galla and the Waliangulu are lost in time but it seems that a patron and client relationship of tribute and service and reciprocal obligations existed between clans of Waliangulu and clans of Galla. Among the obliga-

tions of the Waliangulu was the payment of tribute in ivory tusks, and in honey and beeswax, presented in small carved wooden barrels. The Waliangulu also played an important part in the funeral ceremonies of the Galla—a common role in Africa for a subject and despised people.

It is something of a mystery as to what advantages accrued to the Waliangulu from their thralldom. We know that cloth (obtained by the Galla from the Coastal Tribes) was given to the Waliangulu on certain ceremonial occasions and it is possible that the Waliangulu received cattle products. It is difficult to imagine that the subservient position of the Waliangulu could have been maintained if the Waliangulu had not colluded in it. However one group of Waliangulu obviously found the Galla yoke too irksome, for according to their oral tradition they moved south to the Taru desert in the 1880s or '90s to escape the Galla.

Tribute in ivory is important. It has been suggested that one tusk of each elephant killed by a Waliangulu hunter was the rightful property of a Galla and although this obligation would have been easy enough to avoid it seems certain that a significant proportion of the very large quantities of ivory exported from this coast in the nineteenth century came from Waliangulu hunters via the Galla. The ivory from this part of Kenya is of a soft variety, highly prized in India, for the best Indian carvings are in African ivory, and especially prized were the long straight tusks suitable for walking sticks. Likewise, rhino horn, beeswax and honey would have found a ready market for export on the coast and featured in the nineteenth century landings of Arab dhows.

In the last decade of the nineteenth century the Galla hold on the area weakened and the Galla retrenched northwards. Their cattle were a tempting prize for the Kamba and the Masai to the west and the Somali to the east coveted their grazing lands as well as their cattle. From the coast the Arab-Swahili statelets mounted campaigns against the Galla which reached their fiercest at this time. However disease and ecological factors probably played a more important part in breaking the Galla hegemony than did political factors. Successive waves of rinderpest and bovine pleuropneumonia decimated



their cattle; the source of their livelihood and the basis of their social organisation.

The most severe of these plagues seems to have been the rinderpest epidemic associated with the Italian campaign in Somalia in 1887, which spread into Africa from the Horn along the major routes of cattle-trading and cattle-raiding. It spread from the Somali to the Galla, and from the Galla to the Kamba and Masai, reaching Masailand with raided cattle in 1889. Cattle losses to disease intensified cattle-raiding and increased raiding no doubt increased the risk of inter-tribal infection. The Galla seem to have been the major losers, although the same factors helped to break the power of the Masai.

Some ecologists would argue that the dice were already loaded against the Kenya Galla; that over-grazing in the Nyika and a regime of annual burning for a green-bite, had reduced the area to one of semi-desert with a reduced carrying capacity for cattle.

The full story of the interaction of ecological and political factors is obviously complicated and has yet to be told in full; but after the 1911 pleuropneumonia epidemic there were few Galla herds left south of the Tiva River. Most of the pastoral Galla had moved north although some, now without cattle, became assimilated to their erstwhile helots, the Waliangulu.

An important consequence of the presence of the Galla had been that the whole of the Nyika and vast tracts

of the coastal forests had been closed to cultivators. During the nineteenth century those Bantu tribes who were not subjected to the Galla were concentrated around fortified settlements near the coast and the forest was preserved from axe and hoe. Forest and Nyika formed one unified ecosystem not only for pastoralists and hunters but for the wildlife which travelled between forest and wilderness with the changing of the seasons. With the decline of the Galla, the Bantu cultivators spread voraciously through the forests, felling and burning the trees and planting their fields of sorghum and maize, and where conditions permitted, tree-crops of coconut, mangoes, and later kapok and cashew. The process continues today with cultivation spreading into ever more arid areas. Once extensive semi-deciduous forest is now represented only by remnants, and the once rich fauna has been replaced with dwarf cattle and goats, the latter exercising their tremendous potential for destroying woody vegetation.

The Waliangulu meanwhile found other outlets for their hunters' products, and ivory and rhino horn continued to reach the coast as before. They also found their services demanded as magicians and herbalists.

One of the characteristics of the Waliangulu on which almost every observer has remarked is their chameleon-like nature, their ability to appear to become completely assimilated to their neighbours. Thus the Waliangulu took over styles of housing, patterns of agriculture, cattle and goat husbandry and palm-wine drinking from their neighbours and they became bilingual adding a Bantu language to Watta and later adding Swahili. But they did all this without quite losing their identity as a separate people, for the heart of Waliangulu culture was elephant hunting.

The Waliangulu were not merely hunters, they were highly specialised hunters. They seem to have had little interest in hunting anything but elephants, except perhaps rhinos. Their language is rich in terms for elephants in different stages of development, and makes it possible to distinguish with great accuracy between different individuals and different types of tusk and different tracks. The Waliangulu bow is an enormously powerful affair with a pull exceeding 100 lbs, far more

powerful than other African bows, and a great contrast to the usual small bow of East and Central Africa. The arrows with detachable foreshafts carry a huge dose of acacantha poison, and the bow is used at close range, its enormous power penetrating elephant hide easily. Tribute to Waliangulu bushcraft and tracking skills has been paid by all those who have observed them in action.

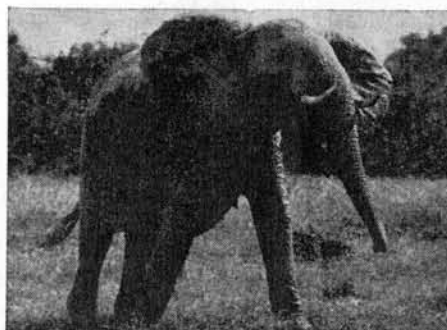
One can imagine that Waliangulu hunters always took a heavy toll of elephant. In the wet season they were on the move in small family groups, killing, camping by the carcass, and then moving on. In the dry season when elephants concentrated around scarce watering points, hunting was easier and the Waliangulu lived in larger groups and performed their tribal ceremony of initiation; the *forforikian*. When elephants were plentiful only the choicest cuts of meat and the entrails were consumed and there would have been little incentive to preserve meat for future use. Like the elephant itself the Waliangulu were wasteful feeders. Such a pattern of life could easily have accounted for a kill of 1,000 elephants a year for a Waliangulu population of 600 (my estimate of the current population in traditional areas). Evidence suggests that the Waliangulu were once much more numerous.

Until 1948 the Nyika was, to the British administration, an empty area devoid of interest except to White Hunters; a barrier to be crossed as quickly as possible on the route from the coast to the White Highlands. The Waliangulu attracted only the interest of a few administrators and travellers with an ethnographic bent. But when in 1948 some 8,000 square miles were arbitrarily marked out as Tsavo National Park the Waliangulu became of immediate interest as their hunting way of life became illegal overnight.

Preliminary surveys showed that hundreds if not thousands of elephant were being killed all over the Nyika, both within and without the National Park and especially along the Galana River. And it was not merely elephant; leopard, rhino, lion, buffalo, giraffe, and buck were being slaughtered in numbers which staggered those who had to establish the new park. The National Park warden and the Game Department began a dedicated campaign of investigation and arrest.

The story of the anti-poaching cam-

paign has been vividly told in Dennis Holman's book *The Elephant People* (John Murrey 1967), and I do not propose to retell it in detail here. The combined efforts of the Game Department, the National Parks staff and the Police uncovered an intricate underground network of contacts, reaching from the hunters in the bush through middlemen to Asian traders on the coast: a network which carried money, arrow-poison and palm wine into the bush and ivory, rhino horn, skins, furs, meat and other game products to Mombasa. The anti-poachers also discovered thousands of dry-season hunting camps along the Galana and elsewhere, and thousands of tuskless elephant carcasses—all this an anathema to men whose brief was conservation.



To the anti-poachers there appeared to have been a recent radical change in native hunting activities in the Nyika, and so to a certain extent there had been. There is no doubt that the market for ivory and other game products was at its peak and that hunting activities were more intense and the marketing infra-structure better developed at this time. One mistake of the anti-poaching brigade however was its conclusion that increased poaching could be attributed largely to an increase in the hunting activities of the Waliangulu. It is probably true that Waliangulu were killing more elephant than traditionally, and that their hunting activities had become more orientated towards killing for ivory for sale. However the Game Department's own evidence suggests that the significant increase in poaching was not due to Waliangulu, but to members of other tribes who were not traditional hunters and who had begun to exploit the Nyika. The Waliangulu hunted little except for elephant and some rhino. The animal whose survival was most threatened was the leopard, largely a victim of Kamba hunters. Again one of the most serious threats

to wildlife were poachers who used snares and traps, men of almost every tribe except the Waliangulu. Even in their traditional pursuit of hunting elephant, the Waliangulu were joined by numbers of Giriama and Kamba, often indifferent hunters whose ineffectual shots caused great pain and suffering to the wounded prey. It seems that having met the Waliangulu, the anti-poaching brigade became so mesmerised by their skill and prowess as elephant hunters that the "poaching problem" became defined as the "Waliangulu problem". Moreover almost every Waliangulu male was a hunter, they lived on the spot, and they could be more easily prosecuted than migrant hunters from other tribes. The natural pride of the Waliangulu in their personal hunting exploits and their natural honesty led them to convict themselves out of their own mouths.

For an anthropologist the anti-poaching campaign had a sinister look, for it was an exercise in forensic anthropology directed against the interests of the people themselves. Genealogies and details of social relationships were collected and tabulated so that contacts could be traced along kinship links and so that the psychological shock of apparent omniscience could be used in interrogation. The personal marks made by hunters on their arrows were collected and filed in order to identify carcasses and abandoned hunting camps. Interpersonal grievances were exploited to gain information. In addition, midnight swoops, paid informants, and psychological tricks of interrogation were used. As an anti-poaching campaign it was highly successful.

It was also a highly successful exercise in ethnocide; the anti-poaching campaign destroyed Waliangulu society and culture. One index of this was the wave of homicides which accompanied the campaign as the relatives of those imprisoned took vengeance on informers. By 1957 some 400 Waliangulu were in prison with hard labour; almost three-fifths of the adult males of the tribe.

The supreme irony of the whole affair came when it was realised that elephant populations were rapidly increasing inside and around the park and were constituting a serious threat to the whole ecology of the region. Indeed it was suggested first that 2,500 and then that 5,000 elephant be shot in



one crash kill to cut back the elephant population explosion. Crash kills were never carried out because of the National Parks Ordinance which forbids the slaughter of animals in a conservation area. Set against an annual poachers' bag of perhaps 2,000 elephants, suggestions of crash kills of 5,000 make one wonder what the anti-poaching campaign was all about.

When in 1958 the majority of Waliangulu were released from prison, many did not return to the bush. They went instead to Voi or Mariakani or Mombasa where they still loaf around the *hotelis* making a living by odd-jobbing or theft. Those who returned to their settlements were bitter and forlorn. They saw elephant-hunting as denied to them but permitted to white men who could afford a licence. They were suspicious of their neighbours, hostile to those whom they suspected of having informed against them, angry with those who had taken their wives while they were in jail.

Meanwhile in some settlements they were kept under constant watch by the Game Department. Those who returned to hunting were quickly arrested and sent to prison again.

The answer to the new elephant and Waliangulu problem seemed to lie in the proposals of the Galana River Game Management Scheme—a scheme to harvest surplus elephants, manned by the Waliangulu themselves, under the strict supervision of the Game Department. In theory the scheme would have served various ends; the rehabilitation of the Waliangulu released from jail, the provision of a legitimate income from ivory and other game products, and the possibility of regulating elephant populations on a

scientific basis.

The scheme was mainly concerned with elephant. An area of 2,000 square miles was set aside North of the Galana River. Although the annual quota of 200 was less than a quarter of the Waliangulu kill prior to the anti-poaching campaign the prices on the legitimate market would have been far higher than the two shillings a pound obtained on the black market, and in addition the meat was to be marketed.

The Game Department looked on the scheme with great enthusiasm. The Waliangulu were less enthusiastic. Having been rounded up and jailed once for practising what was to them their legitimate way of life, they were suspicious that this was a trick by the government to get them back to jail again. It is possible that this barrier might have been overcome had it not been for other features of the scheme.

The Waliangulu objected to being told how, when and where to kill elephant. They were after all more proficient and experienced than those who were to supervise them. The elephant were to be shot with guns; weapons which the Waliangulu held in low esteem compared with the big bow. Some of the best hunters refused to participate when they learnt this, and those who learned to use a gun were often indifferent shots. The marketing of the products of the scheme were placed outside of the control of the Waliangulu hunters. The Government insisted that the proceeds from the sale of meat and ivory should go into general revenue and that Government would allocate an approximately equivalent amount to the scheme. This meant that Waliangulu hunters were to be paid for their kills up to 12 months

after making them, an arrangement hardly designed to gain their confidence in the first year. Worse, since almost no provision was made for transporting meat, little reached the market and the scheme relied almost entirely on the sale of ivory.

The design of the scheme invalidated Waliangulu bushcraft bowmanship and autonomy. It separated action from reward by months and allowed the Waliangulu no control over marketing. It was inadequately equipped. Given that the scheme followed an intensive persecution of the tribe it is not surprising that the scheme flopped. In the first year the target of 200 elephant killed under the terms of the scheme was not attained, while elephants continued to be killed illegally and the poachers arrested and sentenced to hard labour—although poaching never reached the levels of before the anti-poaching campaign.

By the end of the second year the elephants killed under the terms of the scheme were killed by paid employees of the Game Department, including paid Waliangulu. However even this small measure of Waliangulu participation was whittled down over the next two years as the Game Department dismissed Waliangulu for unreliability and drunkenness. The elephants themselves set the final seal on the debacle by abandoning the area of the scheme for the safety of the Tsavo National Park. The use of guns in the scheme seems to have been important here, confirming Waliangulu wisdom on suitable weaponry.

By 1965 such work that was done within the scheme was indistinguishable from the elephant control work done by the Game Department on the bound-

aries of settled areas and in 1967 the rights of elephant hunting were transferred to a private company which has begun to develop the area as pasture for Borana cattle—a throwback to 60 years ago.

The Waliangulu themselves are now a dispirited and suspicious people. Those who still live in traditional areas eke out a living from maize cultivation, goats and dwarf cattle, in areas markedly unsuitable for agriculture. They gain casual employment as trackers and camp servants for white hunters. They cut charcoal in regions where the trees are already threatened and where it takes several acres of thorn bush to make a few bags. A large proportion of the cash from charcoal is spent on palm wine, just as was the money from illicit ivory, and the lorries which come to take the charcoal away bring palm wine in 40 gallon drums—enough to reduce a community to a state of paralysis for two days and nights. A few Waliangulu continue poaching and from time to time are arrested and go back to prison. Waliangulu communities, situated as they are on the fringes of inhabited territory, have become natural hideouts for

criminals and the Government constantly toys with the idea of resettling them nearer to asphalted roads.

The tragedy is that Waliangulu culture has been both destroyed and placed beyond investigation, for having been persecuted through applied anthropology they now politely but firmly refuse to answer any questions bearing on their social organisation.

With the elephant hunters inactive, elephant populations have grown to crisis levels. In the Tsavo area hunting seems to have been the main factor in controlling elephant populations until recently. It appears from empirical evidence that with limited hunting, elephant populations are capable of increasing at rates of 8 to 10 per cent per year. Elephants consume about 4 cwt of vegetable matter a day, picking and choosing over a large area, damaging more than they consume. When leaves or fruit are too high for comfort the elephant simply rips off the branches or pushes the tree over. When eating grass, huge clumps are pulled up by the roots and often discarded half-eaten. Serious damage is done to trees by elephants scratching themselves on the bark to dislodge ticks, and by

barking trees to obtain moisture, which makes otherwise fire-resistant trees susceptible to fire-damage during the dry-season.

The interaction between fire and overpopulation by elephants has now reached a new and more sinister stage—turning grassland into desert, thereby threatening other species of wildlife. In addition hundreds of elephant perish in the dry-season from starvation and thirst.

The crash-kill is still talked about, but the National Parks Ordinance still holds for Tsavo and with the Kenyan economy heavily reliant on tourism there is strong political resistance to reducing elephant herds to levels where they would have to be searched for by safari parties.

It is easy to be wise in hindsight and to see that human hunting activities were an essential regulating component of the Nyika ecosystem. Far from "hunting themselves out of existence" as one conservationist put it, the role of the Waliangulu appears to have been that of preventing the elephant from eating itself and other species out of existence.

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## England's Green Revolution by Nicholas Gould

All we learn from history (to paraphrase Hegel) is that nobody has ever learned anything from history. But there is a morbid pleasure to be derived from observing the extent to which the mistakes of the past are repeated, usually with the best intentions, to become the mistakes of the present. The "Green Revolution" in the Third World is a good example: for no one who has studied English history could fail to see resemblances here to our own Agricultural Revolution. In each case we see a short-term material gain (measured according to the over-simplifying standards of the official economists) achieved only at the price of irremediable social damage: in each case we see agricultural "improvement" going hand in hand with industrialisation, each stimulating the other to further inhumanities.

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Having said this much, of course, we must also recognise the difference of scale, and, perhaps more important, of time-scale. Our Agricultural Revolution affected a few million people and was spread over several centuries. (The changes were most noticeable from about 1750 to 1850, but some of them were only the culmination of processes which began in the late Middle Ages.)

The Green Revolution, on the other hand, affects hundreds of millions of people, and will have succeeded or failed utterly within a decade or so. Succeeded or failed, that is, by its own terms of reference if the analogy with England's experience holds good, the long-term consequences of success may be worse than those of failure.

England in 1750 was a pre-industrial country, in which a large part of the population was directly supported by agriculture. Subsistence farming in the strict sense was already becoming uncommon, but the market was a marginal rather than a dominant factor. The total population was about 6 million, of whom over 80 per cent were rural. Numbers had increased only slightly in the preceding century. But by 1850 the population had grown to about 18 million, an almost "modern" rate of increase. Various explanations for this explosive growth have been offered: probably the main factor, as in the Third World today, was a fall in the death rate, in particular the infant death-rate. Yet in 1850 this vastly greater population was still supported very largely by home-produced food. Simply in terms of increased productivity, then, the Agricultural Revolution must be pronounced a success. How was this increase achieved?

Mechanisation was not in this period a very important factor. Even the horse-drawn drill, described (but not invented) by Jethro Tull in 1733, was not much used for sowing corn before the middle of the 19th century: and in 1900, or perhaps even 1940, the muscles of men and horses were the most important source of power on the average English farm. An ominous portent had appeared in 1786, however: this was the threshing machine, which could be

driven by horse, water or steam; it caught on rapidly, and its widespread use in the south of England, with the consequent winter unemployment among farm workers, was a major factor in the Labourers' Revolt of 1830. The extensive mechanisation of English agriculture, and the resultant steady reduction of the rural labour-force, is a phenomenon of the last hundred years: a Second Agricultural Revolution, following inevitably from the First. Earlier propagandists wrote as if the population of the countryside was declining; but the statistics prove them wrong. Between 1750 and 1850 the rural population grew from about five million to nine million. Of course, at the same time the urban population grew even faster, from one million to nine million, and much of this increase was the result of a drift from the countryside. (What did decline was the number of independent farmers: the typical countryman of 1750 was a peasant small-holder, but his grandson in 1830 was almost certain to be a landless labourer.) The parallel with today's Third World is fairly close: for there too the population engaged in agriculture is rising, but not as fast as the urban population. In each case we have the phenomenon of a *relative*, rather than *actual*, rural depopulation. And in the Green Revolution, as in the Agricultural Revolution, mechanisation is not of the first importance, though the changes which *do* matter are perhaps preparing the way for future mechanisation and, eventually, a real decline in the numbers engaged in agriculture.

### The New Husbandry

The key to the massive increase in England's food production after 1750

seems to lie in changes in land use. In particular, there was the development of convertible husbandry, that is, the alternation of arable and grass on the same land, instead of the traditional division of the land between permanent arable and permanent pasture. Also an important part was played by the introduction of new crops, particularly fodder crops such as turnips and the nitrogen-enriching legumes like clover and lucerne. Increased fodder meant increased livestock, hence more manure and even bigger crops. Herbicides and pesticides were virtually non-existent: nor did imported or artificial fertilisers play much part in increased production before the 1840s. Ecologically, in fact, the Agricultural Revolution in itself was no bad thing: especially when we add to the above the effect of the enclosure of 6,000,000 acres of common land, and the consequent planting of thousands of miles of hedgerow. Any comparison in this respect is definitely unfavourable to the Green Revolution, which depends on the growth of identical varieties year after year on the same land, an abuse of good husbandry only made possible even in the short term by repeated doses of artificial fertilisers.

The relevance of the Agricultural Revolution to us today is rather a consequence of the change of *attitude* it involved: it is this which made possible all the evils which have since plagued our agriculture. The really significant change was that from a *subsistence* to a market economy. As long as organic methods remained the best way to quick profits, the market-oriented farmer would continue to use them: but if some new method offered even quicker profits, he would adopt it eagerly, and regard the long-term health of the land as no concern of his. The subsistence farmer, on the other hand, tends to take the long view: he is in no hurry to change the crops and techniques his grandfather and father used. This stubborn conservatism, infuriating to would-be reformers, is the peasant's safeguard against ill-considered innovations: wisely, he prefers the methods which have stood the test of generations of successful use, to new ones offering the *possibility* of greater rewards in return for *certainty* of greater risks. He will change at times, but by cautious steps, not wild leaps.

Peasants or small farmers, in fact,

are just a nuisance to a society attempting to achieve rapid expansion and greater "efficiency". They may be vilified, as the 18th century "Improvers" denounced the open-field farmers as "Goths and Vandals" who "must die off before new ideas can become generally rooted"; they may be paid to disappear, the method preferred by our present government with its subsidies for small farmers who sell out to big ones; or they may simply be allowed to wither away in the unfavourable climate of a free market economy. For where farming becomes primarily a commercial enterprise, the small man will always be at a disadvantage, with relatively higher overheads, smaller capital resources and a greater vulnerability to price fluctuations. This is the reason why the Agricultural Revolution struck a death-blow to the English peasantry: and it is against this tendency that the FAO, in its report *The State of Food and Agriculture 1972*, pleads for "arrangements... for making credit and other public facilities

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**FAO states in its 1972 report "there is abundant evidence of greater labour-intensity on the smaller farms and of higher productivity per hectare."**

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ties more readily available to small and marginal farmers" and states that "effective measures to remove the constraints which the small farmers face are essential: inadequate tenure arrangements, lack of inputs, lack of access to marketing and credit facilities etc., are all constraints which seriously limit the adoption of the new... technology". The peasant needs so little help to survive, that it is all the more scandalous how seldom he gets it. In only a few English parishes was the tendency towards consolidation resisted by granting allotments to the poor in compensation for their lost rights of common; and in such parishes it was noticed how few families had to resort to poor relief or the workhouse. As late as 1885 the slogan "Three acres and a cow" sufficiently expressed the aspirations of the rural working-man. Needless to say, this modest wish was not granted. It remains to be seen whether the peasants of Asia, Africa and Latin America will be more fortunate: but since they are up against essentially the

same opposition as their English predecessors, one cannot feel very optimistic about their chances.

### New technology not neutral

The FAO report, which may be presumed to be broadly in favour of the Green Revolution, nevertheless neatly sums up the above criticism of it. "A good deal of the new technology is not *scale neutral*." (My italics.) "It works better or more economically on large rather than small farms, especially if the latter are fragmented, as frequently they are. This applies particularly to mechanisation, to some aspects of pest and disease control, and even to irrigation. Even those techniques which are relatively scale neutral in theory, such as use of fertilisers or herbicides, require cash or credit for their purchase, and since smallholders are poor credit risks and lack liquidity or security they find it more difficult to obtain inputs than their richer neighbours... It is only quite recently that the magnitude of the rural employment problem has alerted planners and scientists to the fact that a technology is needed which is not merely effective in its impact on output or quality, but which is also socially and politically acceptable."

The supporters of agricultural innovation have in both "Revolutions" tended to assume that the hardships inflicted on the smallholders, however regrettable, were necessary in the interests of increased production. But in each case there is good reason to suppose that production could have been increased as much or more by working with the small man instead of sweeping him aside. For the real aim of the commercial farmer is not productivity, but profit. Where commerce is king, a bountiful harvest ruins more farmers than a bad one. Also it may not be "economic" to use land for the purpose for which it is best suited. In 19th century England the best wheatlands, the heavy Midland clays, went out of production because they were more demanding of labour, and hence less profitable, than the lower-yielding light soils of East Anglia. The same process is to blame for the recent destruction of the chalkland pastures of southern England to meet an increased demand for barley. On the other hand, poorer-than-average land may not be farmed at all—it "doesn't pay". This is another problem currently facing the Green Revolution: to

quote the FAO report again, "there is also the danger of a widening income gap between areas of favourable environment, where the high-yielding package can be very profitable, and poorer areas where inadequate or excessive moisture, limiting temperature, or soil or slope problems impede its economic use." Yet the favourable areas are only about 30 per cent of the total.

Indeed, a basic confusion of vocabulary lies hidden here. Productivity in agriculture can be measured *per man* or *per acre*. The commercial farmer will generally use the former standard: and when politicians today speak of the advantages of mechanisation and other modern methods, and of the increased efficiency these make possible, what they mean is, roughly, the same amount of food produced by less men. Yet it should be obvious that what matters in a hungry world is the amount of food produced per acre: for the acreage is fixed (indeed, that available for agriculture is diminishing), whereas the human labour-force is all too abundant, and growing fast. Now, it can almost be stated as a general rule that productivity per acre is in inverse proportion to productivity per man. Hence, the smaller the farm, the more productive the land. A *reductio ad absurdum* of this was the estimate some years ago that when a housing estate is built on farm land, food production from the area goes *up*, thanks to the loving care lavished on all those little kitchen-gardens. The statistics tell the same story—yield per acre drops as farm size grows. Even the FAO is beginning to realise the need to assist the small farmers of the Third World for *economic* as well as social reasons: and in its 1972 report admits that "there is abundant evidence of greater labour intensity on the smaller farms and of higher productivity per hectare."

## New varieties need more labour

Paradoxically, the high-yield varieties of cereals which form the cornerstone of the Green Revolution are not in themselves detrimental to the interest of the small farmer: for they actually demand a higher labour input than traditional varieties. For example, in Japan HYV rice takes up to 180 man-days per hectare, even with the most highly mechanised agriculture in Asia:

this is three times the figure for traditional varieties in some countries. (It is tempting to ask how much more productive the old strains might be, given an equivalent amount of care and attention: for, as every gardener knows, there is a big difference between *adequate* and *perfect* cultivation, and it is hardly possible to spend *too* much time looking after one's plants.) The new varieties are not intrinsically unsuitable for small-scale cultivation: but commercial pressures are bound to make them so, without government action sufficient to outweigh those pressures. And so far few governments have shown themselves willing to make more than token gestures in this direction.

The social effects of the industrialisation of agriculture are hardly separable from those of industrialisation in general. The immense industrial expansion of 19th century England would not have been possible without a steady flow of workers from the country to the towns. This flow the Agricultural Revolution conveniently provided. Deprived of the commons which had been a source of fuel as well as food, subjected as hired labourers to the worst effect of periodic slumps, bad harvests, seasonal unemployment, the rural poor naturally drifted to the cities. (No doubt an increasingly urban-oriented culture contributed to this process: for one of the effects of industrialisation is to make urban life appear the norm or the ideal, and to persuade the country dweller that he is in some way odd or inferior.) Thus the urban proletariat was created. And by precisely the same process it is being created now throughout the Third World: in Lagos and Rio de Janeiro, in Cairo and Calcutta, we can see the squalor and degradation of Victorian London being recreated on a world-wide scale and at a greatly accelerated pace.

Does it matter? The technological optimists argue that the growing pains of industrialisation are justified by the end-product. The fact that Britain went through similar sufferings on the road to her present affluence would seem to them to prove that the Westernising of the Third World will pay off in the long run. But it is at precisely this point that the historical parallel breaks down. Britain in the 19th century became the "workshop of the world", and could maintain continuous industrial expansion by a steady growth of trade. For

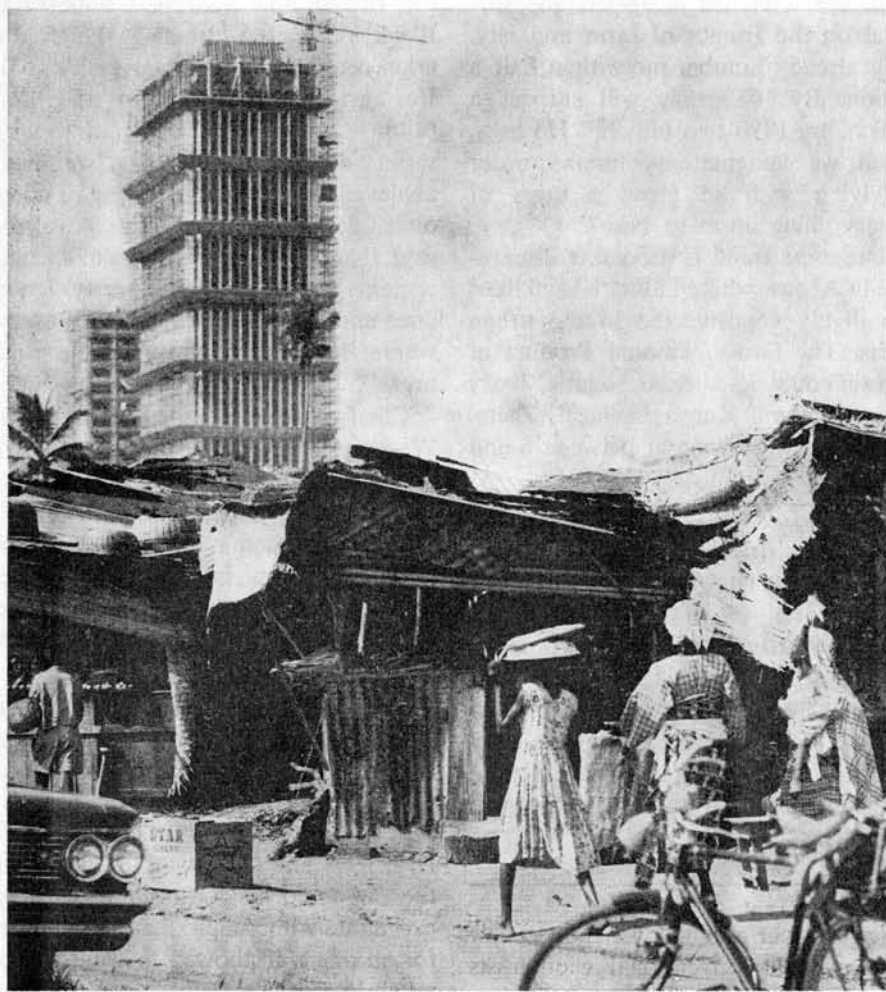
the first nations to industrialise, the change brings enormous prosperity: for the last ones to do so, industrialisation may prove a useless burden. It is significant that urban unemployment on a vast scale is already afflicting the developing countries, whereas the dispossessed peasantry of England did at least find work in the cities, if only as factory-fodder. The historians of the future will probably see industrialism as a dead-end, a mere episode briefly made possible by an abnormal combination of circumstances. Tragically, the Third World nations are trying to jump on to the band-wagon at the precise moment when it has become apparent that it is heading for a precipice.

## Farming and energy

The ephemeral nature of industrial society is nowhere better shown than in its farming. I spoke above of two distinct meanings of the word productivity, as applied to agriculture. There is yet a third, hardly recognised at present: but in the end, it is likely to prove the most important. *This* productivity is measured by the ratio of output to input in terms of energy. Western agriculture depends on the lavish use of fossil fuels—not merely to run the machines, but to make them, and to extract minerals, manufacture chemicals, transport goods to and from the farms. In this way, as much as five calories of fuel has to be expended to obtain one calorie of food. By contrast, in peasant subsistence agriculture output is actually *greater* than input: for all the energy used in cultivating the land is gained from the land, and a surplus remains for use in other activities. In real terms, it seems, the peasant is a marvel of efficiency, and the Western farmer an ignorant, wasteful parasite on the land. Yet in an industry-oriented society a Gresham's Law of Agriculture seems to ensure that bad farming drives out good. Left to operate freely, this law will crush the peasant out of existence, in Asia and Africa as formerly in England: yet it is not mere sentiment, but far-sighted realism, to insist that the survival of small-scale agriculture is the best defence we have against world-wide starvation, and to wish that the controllers of the Green Revolution could learn from the mistakes made in our own Agricultural Revolution.

# INDUSTRIALISATION AND POVERTY IN THE THIRD WORLD

Jimoh Omo-Fadaka points to the dramatic rate at which poverty and unemployment are increasing throughout the Third World in spite of all the efforts made by governments and international bodies to apply the conventional cure—economic growth, and suggests that efforts should be diverted into a very different direction.



Why industrialisation? Because, so the conventional answer goes, it is the only means by which to combat poverty and unemployment. But does it really do this?

The First United Nations Development Decade (1961-70) has come and gone. We are almost half way through the Second Development Decade (1971-1980). What has been its effects? Very little development seems to have taken place. Many of the countries are not only poor, but poorer still. Poverty is now on such a scale that it is not only threatening the "Quality of Life", but life itself. Ex-President Salvador Allende of Chile in his opening speech in April 1972 to the Third UNCTADIII, in Santiago, Chile, warned that "If the present state of

affairs continues, 15 per cent of the population of the Third World is doomed to die of starvation."

Unemployment is also on the increase. The proportion of adult inhabitants is growing rapidly by 2.31 per cent per annum, which is likely to increase to 2.6 per cent between 1970 and 1976. According to the International Labour Organisation (ILO) about 300 million jobs will be needed between 1971 and 1980—the United Nations Second Development Decade.

## Industrialisation—(Urban Areas)

A major growth area has been Latin America. During 1971 the real growth of the Latin American economies as a whole was approximately 6.6 per cent, equal to the average of the three pre-

vious years and well above the cumulative annual increase of 5.1 per cent in the years 1961-67.<sup>1</sup>

One American study, published in 1972, notes that the Brazilian economy grew by an estimated 11-15 per cent in 1971, surpassing its average annual growth rate in 1968-1970 of 9.3 per cent. What was the social effect of this increase in Gross National Product on the people themselves? Was it reflected in an improved standard of living for the masses?

The report, lists "certain weaknesses ... which national economic policies should seek to correct in the future":

(a) Unemployment—open or disguised—estimated at 26 per cent of the labour force in 1960 and rising steadily since.

(b) The inequitable pattern of income distribution which tends to hinder the expansion of the national or regional markets.

(c) Price instability, which is attributed to factors including slow expansion of food production as a result of stagnation in the agricultural sector.

However the report makes no attempt to provide a solution to these problems.

In the Carribean, Jamaica boasted of a wonderful economic performance—an increase in the Gross National Product between 1950 and 1965 at an annual rate of 7.2 per cent. But for the three successive five-year periods there was a progressive decline in per capita national income—7 per cent for 1950-1955; 3.7 per cent for 1955-1960; 3 per cent for 1960-1965. At the last recorded count, unemployment in Jamaica was 19 per cent in the urban areas and 10 per cent in the rural sector. Nor was the situation improving. Although the 140 factories built in 14 years up to 1966 under the various incentive laws for foreign investors and industrialists provided about 9,000 jobs, more than 10,000 jobs were lost in the sugar industry alone through mechanisation, while the labour force was growing by at least 20,000 annually.

As Chedi Jagan—former Prime Minister—points out, the cost of living is soaring in Guyana and unemployment is now approaching 25 per cent of the labour force. About one third of the youth is unemployed in a country where 60 per cent of the population is below the age of 20.<sup>2</sup>

The Asian situation is even more alarming. The problems of poverty and unemployment, after years of industria-

lisation are simply staggering.

During the last successive five-year plan of India, urban-based heavy industries were given priority and rapid industrialisation was regarded as the symbol of development. And yet according to Mansur Hoda, "urban-based heavy industrialisation has not proved to be the cure for the country's ills. Excessive concentration on raising GNP has not solved the problems of unemployment and poverty. On the contrary, there is ample evidence to suggest that it has succeeded in creating severe imbalances in the economy and acute strains in the society."

The failures of industrialisation are invariably attributed to technical faults in the implementation of an industrialisation programme rather than to the principle of industrialisation itself. Thus Mansur Hoda considers that failure was due to industrial development policies not being matched by policies promoting the development of other sectors. "Our policies lacked a comprehensive approach to the problems of development," he said.<sup>3</sup>

Mr M. M. Mehta, an International Labour Organisation Regional Manpower Planning and Employment Adviser attached to the United Nations Asian Institute for Economic Commission for Asia and the Far East (ECAFE), Bangkok, emphasises the effects of mounting unemployment in most of the non-industrialised countries of Asia.

(a) "In India, the total number of unemployed persons, estimated at 5 million in 1961 and 9-10 million in 1966, stood at 15-20 million in 1971, and that of under-employment around 30-45 million."

(b) "In the formerly undivided Pakistan, the Fourth Five-Year Plan (1970-75) estimated the total number of unemployed and underemployed to amount to some 7.5 million or 17.7 per cent of the labour force in 1970."

(c) "In the Philippines, the Fourth Four-Year Plan (1972-75) gauges the number of totally unemployed persons to be around 86 million; visibly underemployed 1.1 million and invisibly underemployed 1.4 million."

(d) "In Indonesia, the Ninth National Convention of GASBIIDO; estimated the number of totally unemployed persons to be 4.5 to 5 million (10-11 per cent of the labour force); and under-employment 14-15 million in 1970."

(e) "In Sri Lanka (formerly Ceylon),

the Five-Year Plan (1972-76) reports totally unemployed persons to number approximately 550,000, about 12 per cent of the total labour force in 1972." (f) "In Malaysia, the Second Plan (1971-75) estimated the number of unemployed to be around 275,000, about 7.3 per cent of the labour force."<sup>4</sup>

According to Mehta, "the marginal men, the wretched strugglers for survival on the fringes of farm and city, may already number more than half a billion. By 1980 they will surpass a billion, by 1990 two billion." He asks, "Can we imagine any human order surviving with so gross a mass of misery piling up at its base?"

The same trend is becoming discernible in Africa, where industrial activities are highly concentrated in the urban areas. The Gross National Product of certain countries such as Nigeria, Ivory Coast, Gabon, Kenya, Senegal, Zaire, etc has been growing at between 6 and

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7 per cent per annum over the last few years, which conventional economists have found very impressive.

The ILO reports on Kenya that its growth rate since independence in 1962 has been sustained at 6 per cent or 7 per cent a year, which is better than in most countries in Africa, Asia and Latin America. But the increased wealth has failed to reach the poorest citizens.

The result, according to the report, is that 11 years after independence 6 million people (half of the population) have no jobs, another 2 million households have an income of less than £200 a year, a quarter of all children suffer from malnutrition, and illiteracy runs at 80 per cent to 85 per cent.

The report suggests that the fault lies in the actual structure of the economy, which was designed in the colonial era to support a tiny minority in great comfort and a very large majority in poverty.

It notes: "The divisions were incomparably greater than in most countries of Asia or Latin America." Kenyanisation has replaced the British elite with a local one, but not changed the structure.<sup>5</sup>

The chancellor of the University of Ife, Nigeria, has drawn attention to similar trends in Nigeria, supposedly the richest and wealthiest country in Black Africa. Addressing the graduation ceremony of the University at Ile Ife, he said that in spite of the "fortuitous boom in oil", resulting in a rapid economic growth, "we have achieved very little in the way of economic development". Chief Awolowo said that "our per capita real income remains as low as ever. Poverty, ignorance and disease are in evidence everywhere, more particularly in the rural areas".

Chief Awolowo noted that in the Western State where the standard of living was among the highest, 71 per cent of the people were within a "nominal" income range of 2 to 100 naira per annum in 1971, while 28 per cent were in the 101-200 naira range. And the position had not changed substantially since then.

Chief Awolowo then warned: "It is pertinent to remind ourselves that a situation such as we now have, under which the good things of life are assured to a small minority of Nigerians, and almost totally denied to the vast majority of our countrymen, is pregnant with unpredictable dangers for all of us, if allowed to continue for much longer."<sup>6</sup>

### Theoretical considerations

It is not really surprising that industrialisation is failing so dismally to prevent poverty and unemployment in the Third World. There are many reasons why it cannot conceivably succeed in doing so. Firstly, the rich countries of today were industrialised during a time which was far more favourable to this process than is the present one. In those days non-renewable resources were cheap and plentiful, today they are increasingly expensive and scarce. In those days the biosphere had yet to be devastated by industrial activity on the massive scale at which it is being carried now. Today it is fast reaching the limits beyond which we can pollute and devastate it no further. In those days society was psychologically ripe for the introduction of the

industrial way of life. People really believed in it. Today disillusionment with the industrial way of life is spreading throughout the world, especially among our youth. More important still, industrialisation among the rich nations was a slow and gradual process, whereas in the Third World today it is occurring far more abruptly. People, in fact, are being forced to abandon the simplest possible pre-industrial techniques in order to adopt the most sophisticated and capital-intensive technology within a matter of years. As Nicholas Gould points out (see *Britain's Green Revolution*), the industrial revolution in Britain caused the same problems which industrialisation is creating today in the Third World, but they were on a smaller scale and very much more gradual.

The main reason why one can predict that industrialisation will not solve the problems of the Third World is that it has not even solved those of the rich countries, even though it occurred there, as we have seen, under the best possible conditions. Consider America. In spite of the fact that that country now has a standard of living some 50 times higher than that of Nigeria, it still has a serious unemployment problem and 25 million Americans are still officially classified as poor. If industrialisation cannot suppress poverty in the US, the richest country in the world, what grounds have we for believing that it can do so in the poor countries of Africa, Asia and South America?

That industrialisation and large-scale capital intensive technology can eradicate poverty is thus but a pious hope. As Mansur Hoda points out, "Development does not only mean increased production of goods—but also the development of people—the stimulation of their innate abilities, giving them a feeling of self-determination and enthusiasm, self-respect, self-reliance and enthusiasm. Unless people are involved in the process of development and are given a chance to do something worthwhile, to grasp new ideas, acquire new skills and develop a sense of their own worth, no society can move out of misery and poverty."

"Indeed, development is almost a meaningless word when a large percentage of the population can neither contribute to the nation's progress nor benefit from it."

Although technology is an important

factor in development, it is by no means the decisive one. It is people, not technology, that are decisive. The fight to alleviate poverty is not to be won by technology and economic power, but by human power and social organisation. Technology and economic power are wielded by the people. What needs to be achieved is a social system in which man lives in harmony with nature and not against it. Technology to suit such a system will of necessity emerge from the people themselves, at grass roots level. Such a technology will be subordinated to social and human needs, not the reverse, as is the case today.

If the non-industrialised countries wish to avoid the inevitable side-effects of industrialisation, the best hope for them is to develop a different social system with its appropriate technology which takes cognisance of the indigenous and cultural realities of each country. Such a technology should

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have the lowest impact on ecosystems, and must enhance rather than disrupt the life of rural communities.

It should be designed for relatively "closed" economic and political communities at village or community level. It should be cheap and available to everyone and not just a few privileged people.

It should be suitable for application on a small scale.

It should be labour-intensive, to reverse trends towards increasing unemployment.

It should be capable of being produced locally, thereby encouraging indigenous industries.

There is a need for a new type of literature in the non-industrialised countries for the rural population—literature of ecologically-based low-impact technology for support of small scale decentralised communities. Such literature should contain information on low-cost building materials, low-cost dams, low-cost energy, e.g. wind, water,

solar and other renewable energy use, low-cost medicine, low-cost transport, labour-intensive methods, workshop technology and all those things which the village needs to be self sufficient and largely self-governing.

Third-World leaders wish to solve the many problems that beset their countries, then they should look to simple technology and rely on human effort and ingenuity rather than on the large-scale capital inputs and the slavish imitation of western industrial methods. Unless they are prepared to do this then there is very little hope.

## References

1. "Socio-Economic Progress in Latin America". Published by the Inter-American Development Bank (IDB) 1972.
2. Jagan, Chedi. "Poverty—Cause and Cure in Developing Countries" in *New Perspectives*, Journal of the World Peace Council, Vol. 12, No. 5, September–December, 1972. P.72. Helsinki, Finland.
3. Hoda, Mansur S. Address to the International Conference on the Indian Government's Document, *Approach to the Five-Year Plan 1974–79*, held at the Imperial College of Science and Technology, London 30th June–1st July 1973. Mimeographed.
4. Mehta, M M. "Wanted 200 Million Jobs by 1980" in *Ceres: FAO Review on Development*. Vol. 5 September–October, 1972, pp 31–32.
5. "Employment, Incomes and Equality: A Strategy for Increasing Productive Employment in Kenya". Published by the International Labour Office (ILO) Geneva, 1972. 600 pages.
6. Quoted in *West Africa*, No. 2941, 22nd October 1973. London.



Drawing by Richard Willson. From Stockholm Conference Eco, Vol II.

# The Ecology of Unemployment

by Edward Goldsmith.



It is assumed without question that the cure for unemployment is economic growth. Goldsmith on the other hand argues that such growth paradoxically must eventually lead to increased unemployment and should be abandoned as a goal of public policy.

Economic growth is often justified on the grounds that it will reduce local unemployment; and industrial enterprises are then established—petrochemical, tin smelting, aluminium and oil refining works for instance—which are evidently undesirable on environmental grounds.

As we all know, it is increasingly

difficult to site such undertakings: people simply do not want them around, and there have been several instances (such as recently in the State of North Carolina) where plans for building plants of this sort have been turned down in spite of local unemployment.

Many such enterprises are unsatisfactory on another count, the work involved requires skills that are not necessarily available in the area where they are to be located. This means that very often a large number of people must be brought in from the outside. Thus, in Alsace, the car manufacturer, Peugeot, was induced to start a large car manufacturing plant in order to contribute to the solution of the local unemployment problem. 2,500 acres of

a singularly beautiful forest were destroyed to provide a site. When at last the factory was built, the locals refused to work in it and thousands of Turks had to be imported and buildings put up to house them, causing still further environmental disruption. This is but a rather spectacular instance of a recurrent theme. Often too, the industrial enterprises are short-lived, as in the case of the mining industry. Take the case of the North Sea Oil Boom—massive installations are going to be built all along the North and East Scottish coast. Undoubtedly too, much skilled labour will have to be imported. The oil will probably last 20–30 years. What happens then? Local life will have been transformed, cultural patterns disrupted, and the population considerably increased in order to adapt to a freak situation. There will be nothing left to do but pray for a miracle to avert social chaos, and massive unemployment.

The problem is becoming more serious with the scale of modern economic enterprises, whose establishment, as well as whose demise, can only cause large-scale social changes. For instance, when such enterprises collapse it is increasingly difficult to find somewhere for the workers to emigrate in an increasingly overcrowded country and in a world in which constraints on immigration are certain to increase.

The most obvious argument against economic growth as a cure for unemployment is that in spite of the fact that everywhere economic growth has been the fundamental aim of Government policy, unemployment has still continued to rise, in the case of the Third World, to ever more dramatic levels. (See Jimoh Omo-Fadaka: *Poverty and Industrial Growth in the Third World*.) This trend is partly the result of population growth, urbanisation and the increased capital-intensiveness of industry, which inevitably accompanies the spread of Western influence. As these trends occur, so more and more people are brought within the compass of the cash economy. In the early stages of industrialisation it is largely the men who take up employment, the women tending to stay at home. As development proceeds however, and the material requisites for survival in an urban setting correspondingly increase, so does it become necessary for women to take up employment as well.

The process further increases the demand for jobs.

According to Mr. Wood, Minister for Overseas Development, the "working" population in the developing countries is expected to increase by 25 per cent in the next 10 years. This means finding 170,000,000 jobs. How does he suggest we do this? Needless to say—by further economic growth.

Let us look a little more closely at the reasons why economic growth cannot, in the long term, solve the unemployment problem.

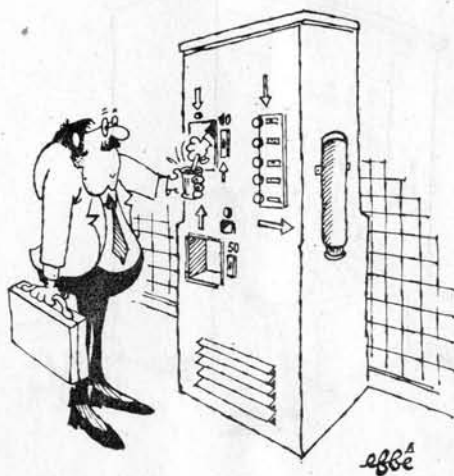
One of its basic features is that for industry to be competitive, machines must constantly be substituted for labour. This is "economic" because the non-renewable resources and in particular the energy required by these machines are charged, or at least, have been up till now, at a ridiculously low price, thereby increasing capital-intensiveness.

By doing this we are continually increasing the need for more capital-investment. Work, by becoming more capital-intensive and hence more "productive" can be increasingly well remunerated. This is necessary to compensate people for the growing deterioration of their physical and social environment and the increasing monotony of their work, also to increase their purchasing capacity, as industrial society can only function if producers are also consumers. In this way, effective demand continues to grow, thereby stimulating further production. The inevitable concomitant of this process is a reduction in the number of people employed for a given degree of capital-investment and for a given level of economic activity.

The capital-intensiveness of industry, in the meantime, is increasing faster than GNP, which means that every unit of GNP will provide an ever smaller number of jobs. Consider the British chemical industry. It employed 407,000 in 1961 for a turnover of 4,875 million dollars. In 1967 it employed slightly less people, 406,000 people, for a turnover of 7,589 million dollars. Looked at slightly differently, sales were 55 per cent less efficient in providing jobs. If we presume an average reduction in efficiency of 7 per cent per annum, then, in this industry, turnover must double every seven years to ensure the same level of employment—which we know to be very unlikely indeed.

In the British textile industry, the number of people employed has fallen from 719,000 to 584,900 between 1961 and 1968, and this in spite of a marginal increase in investment (from 257 million dollars to 271,300,000 dollars). Employment has thus fallen by 3 per cent per annum, while investment has risen by 0.5 per cent. (Sources: the Chemical Industry, the Textile Industry, OECD 1969-70 and 1968-69.) At this rate, by the year 2106, investment will have doubled while employment will have fallen as low as 18,000.

The capital-intensiveness of industry and the increasing cost of providing a job is well illustrated by the present proposal to build an iron-ore terminal at Hunteerton on the Clyde. This is to cost £26 million and is expected to provide a mere 200 jobs. This works out at £130,000 a job. At this rate, with a GNP of £40 billion, the country can afford to provide no more than



300,000 jobs. It should be quite obvious that if this trend were to continue much longer we would be faced with unemployment on a massive scale.

### The Automation Race

This tendency is accentuated by competition between companies, and as the scale of economic activity increases, between countries, a competition which is increasingly taking the form of an automation race which has much in common with the armaments race. Thus, even if it is undesirable to introduce containerisation into the Port of London, which means reducing very considerably the number of dockers employed, there is, under the present regime, very little choice, since the alternative is to give another port, such as Rotterdam, an advantage which

would enable it to capture business which would otherwise have gone to London. This, of course, would have the effect of reducing employment still further. As in the case of the armaments race, the situation can only deteriorate, since whether we win the race or lose it, employment can only fall. It is very much a "heads you win, tails I lose" situation.

### Dependence on the Technosphere

Of course the basic feature of economic growth is that it involves creating a totally new organisation of matter, the technosphere, which is in competition with, and is systematically made to replace, the biosphere of which we are an indissociable part. This substitution has serious implications. For instance, it means that man is systematically isolated from the natural environment to which he has been adapted by millions of years of evolution, and which has always been capable of satisfying his basic biological and social needs.

Until the agricultural revolution, he probably never had any difficulty in obtaining food and fresh water nor in finding the material with which to build a shelter, but now he is made to live in a vast built-up area and spend the better part of his day in a factory contributing in some way towards the manufacture of objects unrelated to his personal needs or to those of his family. He is in fact forced into the unenviable situation of having to purchase the necessities of life.

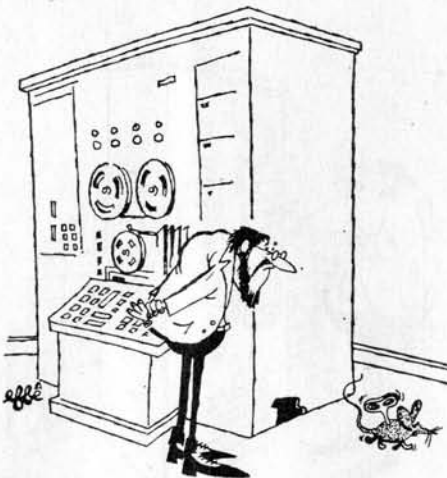
The same is true of social needs. Man previously lived as a member of his family and community and these provided him with the optimum social environment, that which best satisfied basic social needs. In industrial society however, everything conspires to destroy the family unit as well as the community. Thus, the state largely usurps the functions normally fulfilled by the father. It provides his children with free education for instance, and a free health service, reducing thereby the father's responsibilities. Large companies usurp the mother's functions, since most of the things that a woman would normally have to make for her family, clothes, pottery, bread and other staple foods, are now available at the supermarket, while functions that would normally be fulfilled by the children and possibly by some elderly relations, such as helping in the house, and washing up, have largely been taken

over by domestic appliances. The family in industrial society has thus very much more reduced functions and becomes correspondingly more fragile. The community fares scarcely better. Mobility is normally such that people are rarely in the same place long enough for strong communal bonds to be established. They usually live in housing estates or residential areas, which are not real communities, since people work elsewhere, often at a considerable distance from their homes. To a large extent, the business enterprise a man works for, provides him with a surrogate communal environment. At his work he has an identity, which he lacks elsewhere. His work also provides him with a goal-structure, a sense of accomplishment and a corresponding measure of self-esteem. It is for this reason that unemployment is so intolerable. Even if the dole prevents an unemployed man from suffering serious material deprivation, he is nevertheless deprived of that essential, albeit surrogate, social environment which his job previously provided him. It is almost certainly the psychological effects of unemployment that render so many men in the ghettos of the larger American conurbations incapable of fulfilling their family functions, establishing permanent relationships with their women, and looking after their children.

### Employment in Primitive Societies

It is important to realise that this dependence on paid employment was unknown among our paleolithic forbears, who, let us not forget, represent 99 per cent of all the people who have ever lived. The reason is simple. Contrary to what is generally supposed, hunter-gatherers were not normally short of food. On the contrary, it appears that they never actually consumed more than about a third of available food supplies, very much as do insect populations. Also the amount of work required to satisfy their material requirements was minimal a few hours a day at the most; the rest of the day being spent in such pursuits as gambling, gossiping and visiting friends. (Lee and Devore: *Man the Hunter*.) It is not surprising that the very concept of work was unknown to hunter-gatherer societies and that in their various languages one finds no word for it. The gathering of roots and berries, the hunting of wild animals, were simply part of a day's routine, not

to be distinguished from other ways of passing the time, such as gossiping and gambling, and almost certainly equally enjoyable. Among tribal societies that have given up the hunter-gatherer way of life in favour of pastoralism or subsistence agriculture, very much the same is true. However by advancing this far along the road to "progress", the amount of work they must do to keep alive increases correspondingly. Animals must be penned and fed, when previously they went free and fed themselves. Fields must be tilled and their produce harvested, when previously food plants grew profusely without human intervention. As Sahlins suggests (Marshall Sahlins: *The Original Affluent Society*) the amount of leisure decreases as society "advances".



Among such societies, trade was as much to reinforce social ties by creating dependencies and obligations, as to satisfy material requirements. People produced the essential for themselves and traded largely what was to them superfluous. Economic activity took place at the level of the family—the basic economic unit, and occasionally families would co-operate to undertake special projects at a communal level. Wage labour did not, and could not exist. As Mungo Park, the famous traveller wrote towards the end of the last century, "Paid service is unknown to the Negro, indeed African languages ignore the word". (Burton, *A Mission to Gelele*.)

Under such conditions, there can be no unemployment in our sense of the term. What can happen, however, is

that a population can grow to that point where it can no longer be usefully employed on the land, which would cause surplus people to drift to the cities in search of work. This is in fact what is happening today throughout Africa, but only because of Western interference which has led to the introduction of labour-saving devices into agriculture, and also to the suppression of those cultural controls which had previously maintained a check on population growth. It is important to realise that with the absorption of tribal peoples into the cash economy, they are now not only at the mercy of the vagaries of nature but also of those of the market economy, that our most learned economists are increasingly at a loss to predict, still more to prevent.

It is also interesting to consider that wage labour only appears in a society where, in the words of Maine, "contract" has replaced "status" (Maine's *Primitive Law*) as the basis of economic obligations. Contract provides a very flimsy basis on which to build a lasting structure, status a very much stronger one.

Status depends on tradition and involves mutual obligations. Thus a man could not be deprived of his means of livelihood unless he committed what was regarded as a sufficient crime against society to justify his being ostracised: the direst penalty imposed on tribal man, and this was only possible with the concurrence of the tribe as a whole. To break a contract with an anonymous member of a mass society is far easier. A skilful lawyer is the most that is needed.

The manorial system, though much maligned, was based on status rather than contract. It was very much a system of mutual obligations. The serf could not leave his land, but neither in practice could the lord eject him. (Pirenne, *An Economic History of Mediaeval Europe*.) It is true that it was open to abuse since the lord was in a stronger position than the chief, let alone the council of elders, of a tribal society. It was undoubtedly less perfect a social system than the traditional tribe, far more perfect, however, than the type of society that replaced it. It was probably during the 13th century that the manorial system broke down in Western Europe. This was caused by increasing international trade and the development of markets, which in Pirenne's view had been impeded

for a long time by the Arab stranglehold on the Mediterranean. The ecological advantage of the manorial system was that the manor produced for itself. It did not over-produce, and disrupt the environment as a result, as there was no market to which surplus produce could be sold. With the development of markets came over-production, deforestation, and slowly the manorial system broke down, the serf was freed and wage labour became the rule. Polanyi regards the switch from a subsistence to a market economy as one of the greatest calamities to have befallen western man (Karl Polanyi—*The Great Transformation*).

### Resistance to Wage-Labour

As we have already noted, one of the principal pretexts for establishing industrial enterprises in areas that have so far escaped their ravages is the provision of employment. It is ironic to note just how strongly man, living in a traditional society, always resisted being transformed into a unit of wage-labour. In Assam, nothing would persuade the tribal Assami to work on the tea plantations, and labourers had to be imported from already over-populated Bihar. In Ceylon, British planters had to introduce Tamils from southern India to work on the plantations. In the West Indies the Spanish recruited for this purpose the indigenous Caribs. So little however, were they suited for this soul-destroying work, that it did not take long for the entire race to become extinct. As a result, Negroes were imported from Africa, as they were in North America. Akpapa provides a good illustration of this principle. He describes the difficulties encountered by the Enugu coalmining industry in Nigeria, in obtaining labour for its mines. (Akpapa *Problems of initiating industrial labour in a pre-industrial community Cahiers d'Etudes Africaines*, Spring 1973). Labourers it appears had to be press-ganged into working in the mines. Every day 700 of them disappeared never to be seen again, unless they had the misfortune to be "grabbed" again.

Eventually the chiefs were employed to force their subjects into working for the mining company, and they were paid so much for each wage-labourer they provided. Those who refused to obey their chiefs were originally fined, eventually however, it became necessary to sentence them to varying periods

of hard labour.

This gives some idea of the difficulties involved in persuading people, leading a perfectly satisfying, self-fulfilling life within their tribal units, to leave their family and community in order to indulge in monotonous, soul-destroying work in some large enterprise. Ironically, the setting up of such enterprises in areas lived in by tribal peoples has always been and still is justified on the grounds of relieving chronic unemployment.

### Conclusion

As we have seen, people were perfectly well employed before there was a market economy, before in fact wage labour was even thought of.

Economic growth is in fact, not the only means of providing employment but the only means of providing employment of a specific type—capital-intensive employment. Though it is probable that such employment is far less agreeable than any other type, it does permit, temporarily at least, a higher standard of consumption of manufactured goods. It is only in this way that producers can also be consumers and on a scale sufficient to maintain the industrial machine functioning at the required rate. On the other hand, the only reason why people

require these jobs and the material goods which they enable them to procure, is that we have developed a particular type of society in which the requisites of life must be purchased; in which people are so far removed from their natural environment that they can no longer produce them themselves, and that their essential social environment has been so disrupted that people have become dependent on a surrogate one, that can only be maintained by working for some vast enterprise involved in activities totally divorced from the realities of their family and social life.

The argument that further economic growth is required to provide further employment is only true if we insist on observing the rules of our industrial society, if we remain intent in further extending the technosphere at the cost of the biosphere, and in further increasing the capital-intensiveness of economic activities. It is not true if we reject these goals and opt out of the automation race. The choice is not as we are told between unemployment and economic growth but between unemployment, economic growth (with more unemployment at a later date) or the development of a labour-intensive economy in a sustainable decentralised society.

## This month's authors

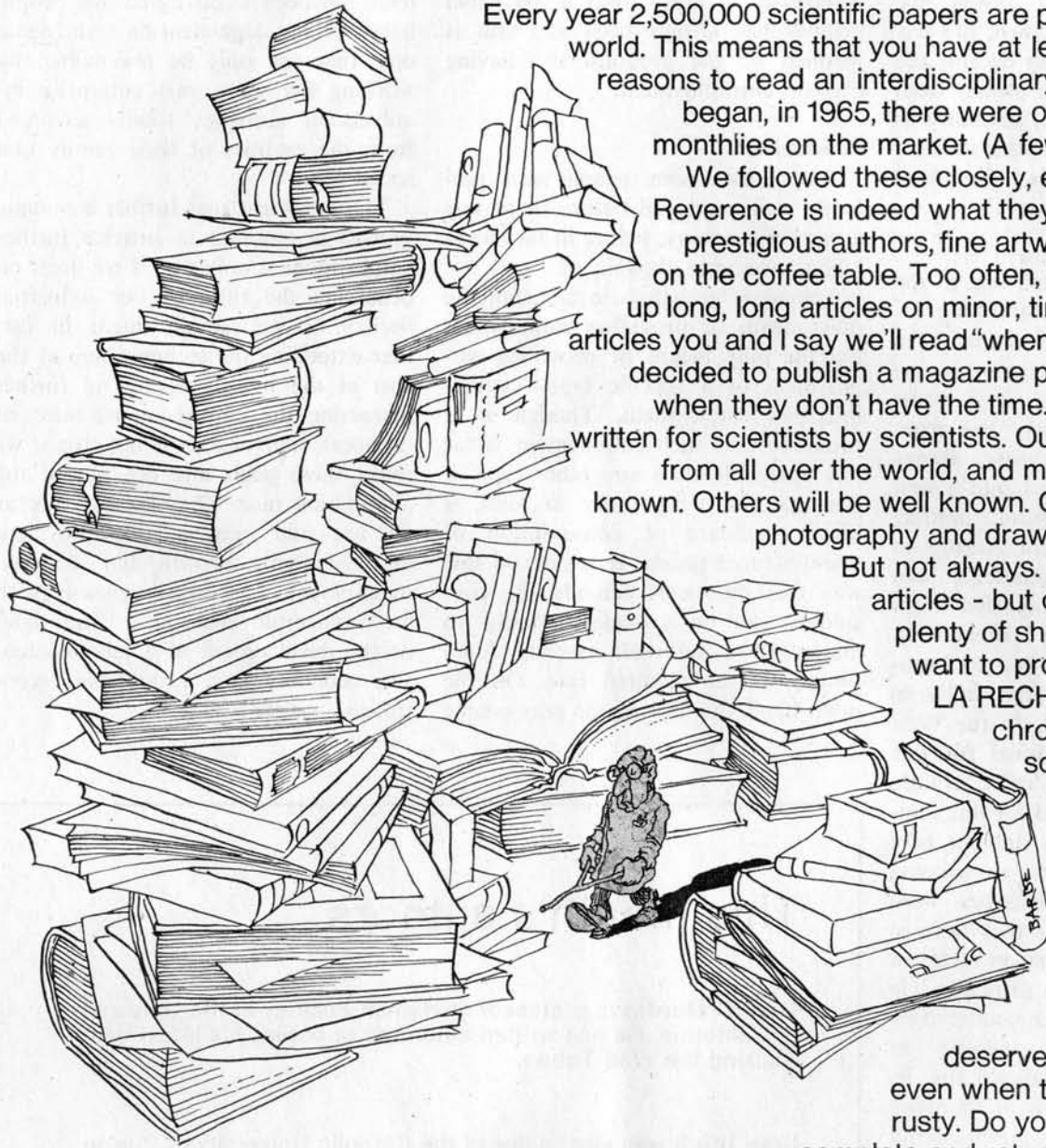
**Garrett Hardin** is professor of Human Ecology at the University of California. He has written a number of books, his latest being *Stalking the Wild Taboo*.

**Ivan Illich** was vice rector of the Catholic University of Puerto Rico in the early 60s and is now seminar leader at his Centre for Intercultural Documentation at Cuernavaca Mexico.

**Philip Brachi** is involved in Biotechnic Research and Development in Montgomery, Wales. He is also co-author of *The Bike Book*.

**Roger Gomm** is a lecturer in sociology at Stevenage College. He was given a research grant by Oxford University to study the Waliangulu. His interests are anthropology and primitive agriculture.

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# Travel Feature

By Philip Barron

One welcomes the efforts of the travel trade to arrange itineraries of special interest to people who, even if they would not call themselves naturalists, prefer the kind of holiday that doesn't revolve around man-made entertainments.

Mind you, the package tours on offer at the top end of this market are not really much help to the average family man. Not many readers of this magazine could aspire, one imagines, to the three-week wildlife tour of the Great Barrier Reef offered by Houlders (from £990) or the Everest Trek (Cooks Adventure Club, £495), although the latter was so well supported in 1973 that an "overspill" party had to be organised.

Presumably it is mostly well-heeled ex-Scouts and their kin who traverse South Africa "In the Footsteps of BP" (Cooks, £545) but fortunately there are less expensive options.

Taking foreign travel first, the biggest bargains are of course those available to students and campers. Youth Hostels still offer marvellous value for money and only in Switzerland and Bavaria is there an upper age limit (in Scandinavia and Israel some hostels have rooms set aside for families). But if this is not your style, you can choose from a wide range of possibilities.

For European destinations, the Ramblers' Association and the Holiday Fellowship continue to offer good, if not particularly cheap, hotel-based walking holidays. Parts of Austria and Switzerland remain unspoiled and these countries are featured by Ecology Travel, a new agency which tries to strike a balance between the rigours of hostel accommodation and the high prices of de-luxe tours.

A week based in the Engadine resort of Pontresina, for example, works out at £91 including Swissair day flights London/Zurich, full board at a hotel and a Swiss Holiday Pass giving free

travel on the State-owned trains and post buses. This tour features visits to the Swiss National Park and to an organic farm. There are reductions for children.

Also from Ecology Travel comes a two-week holiday course providing an introduction to Alpine ecology (3 to 18 August). This is based in Obergurgl, the Tyrol's highest village, at a centre associated with Innsbruck University. Fans of rail travel will enjoy the run on the Arlberg Express to Otztal, followed by a spectacular drive up the valley to Obergurgl. Children over 10 are welcome at the centre and smaller ones can be put up in the village. Total cost for adults is about £100 and there's 30 per cent off for under-14s.

For those with some scrambling or climbing experience, the Austrian Alpine Club provides a variety of well-planned arrangements. Experience is not essential on all the tours and one can book an independent deal which gives return rail travel London/Innsbruck and 14 hut vouchers.

Greece and its islands are among the places featured by Peregrine Holidays. £195 buys you a place on a 15-day tour to Crete to see the island's fascinating birds and flowers, departing by air on 2 or 7 April. A tour of Greece, at the same price, combines visits to historic sites with botanical interest. This party leaves on 4th April and there are two leaders: Dr John Pinsent and Gaye Dawson.

For those who can afford inter-Continental travel, Zambia is one of the African nations richest in wildlife and a few package arrangements are now available to keep down the cost of a visit. Peregrine, in conjunction with the Fauna Preservation Society, have a three-week tour departing in September which takes in the enormous Luangwa National Park, a Zambesi river cruise and the Victoria Falls. The all-in price of £575 is reasonable when

one considers that the cheapest excursion air fare to Lusaka, alone, is £273.25.

"Full of strange life and things found nowhere else on earth" is how Twickenham Travel describes the Galapagos Islands, a remote wildlife paradise which can now be visited for as little as £400 (approximate cost for 14 days). For an extra £50 one can also see something of the Amazon Basin. The usual route to the Galapagos is by air to Quito, Ecuador (the Amazon Basin trip comes in at this point), then by boat from Guayaquil (reached by air from Quito). Giant tortoises and four-foot-long iguanas are but two of the species found in the Galapagos, some of which are unique to the islands.

Nearer home, Twickenham Travel offers economical villa holidays (with car hire if required) in Southern Spain and Portugal. A 14-night holiday of this type, in the Algarve, using scheduled flights to Faro, can still be done by a family of four for about £250 plus spending money. Off-season prices for Spain are lower.

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The London/Agadir leg of the tour is covered by air. Two days' journey by vehicle brings one to Zagora, where the camel-trek starts (10 days, camping rough). Then it's back to Agadir via Marrakesh. The whole trip takes three weeks, is priced at £195, and there are several departures between October and March.

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Closer to home, one can escape from the technological bedlam to such places as the Cowley Wood Conservation Centre, Parracombe, North Devon, a 77-acre nature reserve on Exmoor. There's an "environmentally designed" caravan site and limited B & B accommodation; attractions include ecological demonstrations and discussions. A brochure can be obtained from the Centre.

A country guest house that grows its own vegetables by organic methods (there's a "house cow" too) is South Heathercombe, at Manaton, near Newton Abbot, where part board costs about £20 per week. The proprietors, Mr and Mrs Chapman, tell me they welcome "quiet" children.

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### Some addresses

Youth Hostels Association, Trevelyan  
House, St Albans, Herts. (St Albans 55215).  
Ecology Travel, 10 Croham Mount,  
S. Croydon, CR2 0BR. (evening calls to  
01-657 5131).

René Dee Expeditions Ltd, 24 Old Steine,  
Brighton, BN1 1EL. (Brighton 681523).

Twickenham Travel Ltd, 22 Church Street,  
Twickenham, TW1 3NW. (01-892 7606).

Youth Hostels Association, Trevelyan  
Peregrine Holidays, Town & Gown Travel,  
Summertown, Oxford. (Oxford 54517).

Highland Wildlife Enterprises, Cannich,  
Beauly, Inverness, IV4 7LY. (Cannich 327).  
Cape Clear Bird Observatory: details from  
Mrs Rachel Hutchinson, 6 Tower Court,  
St John's Road, Dublin 4.

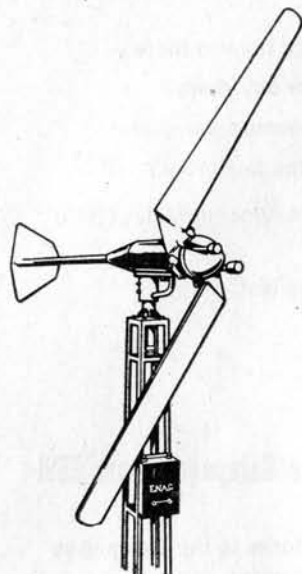
Mountain & Wildlife Ventures, St Monan's  
Private Hotel, 34 Thornton Road, More-  
cambe, LA4 5PE. (Morecambe 418577).

Highland Guides, Inverduie, Aviemore,  
Inverness-shire. (Aviemore 729).

Nurtons Field Centre, Medhope Grove,  
Tintern, Chepstow, Mon.

Starlings Castle, Bron-y-Garth, near  
Oswestry. (Glyn Ceiriog 464).

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## Friends of the Earth

The Government's new Protection of the Environment Bill, if it goes through, both extends and restricts individual activity to protect the environment.

Clause 21 stops the taking for re-use of goods from builders' skips and litter bins, on the assumption that the local authorities will be doing it all. Many things are useful when in their original form (furniture and carpets, for example) but smashed or irreparably filthy by the time they have gone through the system. Good building timber is expensive but not very likely, in fact, to be extracted by the local authority for use in doing repairs to council houses, and it will probably just be burned. Even if all the energy generated by its burning is harnessed, this will still be a net loss in overall resource terms. This theoretically sensible restriction on skip-hunting is therefore in practice not a desirable innovation.

Part II of the Bill replaces assorted legislation on water pollution with similar, though generally wider, terms, but removes certain restrictive provisions.

In 1961 river pollution legislation which had been in existence for 10 years was suddenly made subject to non-disclosure of information given in applications for consent to discharge into rivers, and of analysis of samples of effluent, backed up by criminal sanctions. Generally speaking this would have little practical effect on local water authorities (in those days river authorities) who were not going to throw this information around anyway. When Merseyside FOE wanted to make testings of their river water, they were told by the river authority that they would be liable to prosecution if they made public the analysis of their samples. This was based on a very restrictive interpretation of the legislation and it would almost certainly not have stood up in court; but it had the effect at the

time of preventing the intended action. All this is now, however, to be swept away, except for information already obtained in the administration of the existing legislation, and some very obscurely worded provisions about not disclosing manufacturing information but which only apply to officials of the water authority. Even with all this clarified, you still have to get your sample and prove where it came from. [If it is taken from an inspection chamber installed as a condition of being allowed to discharge into the river, or if the water authority agrees a point with the owner at which samples are to be taken, any sample from there is assumed a true sample of the discharge from those premises. These points however are likely to be on the discharger's land and not open to the freelance enforcement agency.] If you hold a jam-jar under a spout discharging into a river on which you have a right to row a boat and if you can convince everyone that your sample is properly representative, you can then pay £30 a sample to have an analysis done, and even then, unless you can tell the analyst more or less what you are looking for, you may still have problems with some industrial effluent.

You may send your results to the water authority, who will then feel their prerogative impinged upon and their competence questioned. You can publish the results, if that is going to be helpful. If you happen to have a private interest in the water being polluted, or the public interest is so adversely affected as to create a public nuisance, you can go to court to stop the discharge. All these courses have potential drawbacks, and probably the most certain, most dramatic and nastiest way of getting at the polluter is to bring criminal prosecution, which can lead to a fine or even imprisonment; [there are also provision for getting at directors who try to hide behind the corporate identity of their company.]

Nevertheless, the 1961 clampdown stopped prosecutions except those brought by a water authority or with the consent of the Attorney General. The Attorney General is a paid-up politician, a Government minister, but also, by virtue of being a party politician with some legal background, the (temporary) head of the legal profession. He is not inclined to dish out to private individuals authorities to prosecute. The provision therefore effectively restricts

non-water authority prosecutions to those where the political establishment of the day wishes to make a political point.

In 1963 the Water Resources Act, which deals with underground water, also incorporated these provisions with the substitution for the Attorney General of the Director of Public Prosecutions. As the Director of Public Prosecutions is the Civil Service arm of the Attorney General, this is insignificant. [The only water pollution provisions not now covered in this way are some which relate to discharge of trade effluent into public sewers (and even they are subject to the secrecy provisions).]

All this restriction, surprisingly but commendably, is to disappear under the proposed legislation and the citizens of England and Wales (Scots have never had such a right anyway under their legal system) are to resume their centuries-old powers of ridding themselves of criminals if the authorities decline to perform their public duty. There is a growing tendency to restrict the rights of prosecution to agents of the establishment, and possibly if the right is actually taken advantage of the civil servants at the Dept. of the Environment will try to restrict our "privilege" once more. Meanwhile the chance is being offered.

*David R. Pedley,*

Friends of the Earth, 9 Poland Street, London W1V 3DG. Tel: 01-434-1684.

David Pedley, LLB, is a solicitor who has just started work as full-time legal adviser to Friends of the Earth. It is hoped that in future more use can be made of such legal devices as private prosecutions.





## Books

### Predator and Prey

SERENGETI: A KINGDOM OF PREDATORS by George B. Schaller. Collins, £4.

THE NORTH AMERICAN BUFFALO by F. G. Roe. David and Charles, £9.50.

THE WATER'S EDGE edited by Bostwick H. Ketchum. MIT Press, £1.60.

AT THE TURN OF THE TIDE by Richard Perry. Croom Helm, £3.50.

There are some ideas which, once we are aware of them, continually recur in our reading to an almost uncanny extent. Ecology is a good example: thus these four books, almost random gleanings from the review shelf, all illustrate in their different ways one great theme—the *interdependence* of living things. That said, the works have little else in common.

Typical of the new, ecologically-aware zoology is our changed attitude to predators. "Nature red in tooth and claw" turns out to have evolved a balance beneficial to eaters and eaten alike. This is the main theme of Schaller's book: three years spent studying the carnivores of the Serengeti Park in Tanzania led him to conclude that "predators have become excellent wild-life managers, far more discerning than man." In the Serengeti, they "help maintain an equilibrium in the prey populations within the limits imposed by the environment, prevent severe fluctuations in the number of animals and condition of the habitat, ... weed

out the sick and old, keep herds healthy and alert". Schaller's full scientific report, *The Serengeti Lion*, appeared a year ago: *Serengeti, a Kingdom of Predators* is the "popular" version, with a short but informative text, and a profusion of colour photographs by the author, of superb quality and outstanding interest.

Natural predators benefit their prey: when civilised man becomes a predator his role is less kindly. The American buffalo or bison was reduced in a few decades from perhaps 40 million to a few hundred: and this massacre, incidentally, had *inter alia* the avowed aim of undermining the way of life of the Plains Indians, who had existed for centuries in mutually advantageous symbiosis with the bison. Roe tells the squalid story from a historian's viewpoint, not a naturalist's: but as he points out, the bison as a truly *wild* species no longer exists—to study it in a state of nature must inevitably be a task for the historian. Here, then, in exhaustive detail, is the Decline and Fall of one of the most spectacular species of mammal that ever inhabited the earth.

My two remaining books deal with the borders between land and sea. *The Water's Edge* presents the findings of an "inter-disciplinary environmentally oriented workshop" on Critical Problems of the Coastal Zone. It is largely concerned with the American coast, but much of the discussion is equally relevant over here. This is a heavily academic work, strictly for the ecological egghead; the coast does present a particularly complex environmental problem, owing to its biological richness and its unfortunate suitability for all manner of human activities.

*At the Turn of the Tide* deals with one aspect of the natural coast of Britain, its wild birds. This is Richard Perry's first book, originally published over 30 years ago and condemned by the war to undeserved neglect. Undeserved—for this book ought to become a classic. Skilled observers of wild life are fairly common today; but how few have literary gifts to match their observation! With this book, Perry joins a select company—White, Hudson, Jefferies, Williamson—and proves that the art of transmuting zoology into literature is not dead in England.

### A MARX FOR THE TWENTY-FIRST CENTURY?

The writings of Ivan Illich. *Celebration of Awareness* (Calder and Boyars 1971, Penguin Educational Special 1973); *Deschooling Society* (Calder and Boyars 1971); *Tools for Conviviality* (Calder and Boyars 1973); *Energy and Equity* (Calder and Boyars Open Forum Series 1974).

Illich may have been the first major critic of industrial society to lay his basis in ecology. What separates him from culturalist thinkers\* is that he limits his analysis to what he calls "an epilogue to the industrial age". He does not proceed to consider the cultural values of societies in general in relation to their social dynamics.

Nevertheless, his arguments—stated with the zeal and clarity of a Jesuit missionary—as to why "the next generation will experience the gruesome apocalypse predicted by many ecologists", make him one of today's foremost post-Marxists and anti-liberal explorers.

Each of Illich's books requires, indeed demands, separate review. In the brief compass of this short essay, all that can be done is to point the reader towards his ideas, and set them in some critical framework. In these four short but exciting excursions into human and institutional interrelationships, Illich offers a technique of thinking, but not yet a system of thought. He does not so far approach Marx in the depth or completeness of his theory.

Between them, these four books evolve a view of institutional behaviour as forming two distinct watersheds. The basis of this view emerges from *A Celebration of Awareness*, a collection of essays written between 1956 and 1970. Here the wrecker's ball of his mind swings against the values and organisations of men which he experienced as assistant pastor in an Irish-Puerto Rican parish in New York City in the 50s, as Vice Rector of the Catholic University of Puerto Rico in the early 60s and as seminar leader at his Centre for Intercultural Documentation at Cuernavaca Mexico since then. The rubble that his early essays makes of American cultural imperialism, catholic bureaucracy, Third World schooling, family planning

\* Edward Goldsmith and Robert Allen, for example.

propaganda and "planned poverty" (technical assistance) forms the foundation for the constructive proposals in *Deschooling Society* and *Tools for Conviviality* (his major work so far).

Illich's epigrammatic style is linked, like Plato's lyricism, with the content of his thought. Sometimes it leads the reader out onto some shaky limbs of logic. Getting back can cast doubt on the factual strength of his whole intellectual tree, for he offers little statistical support for his statements, and no footnotes.

The tree's roots are sound, though. They go deep into the clay of real experience with poverty. The trunk, too, is sturdy. A growing canopy of insights and proposals is supported by his analysis of the two watersheds in institutional behaviour.

These match two phases of the industrial revolution. The first was generally beneficial. This watershed involved the setting of certain modest modern objectives by society at large. Illich takes the year 1913 as approximating to the first watershed in medicine: the time by which a patient began to have a more than 50-50 chance that a medical school graduate would give him a specifically effective treatment for a "standard disease" of the time. By 1945, the second watershed in medicine was at hand. By then had emerged the process whereby institutionalised medicine had gone on to the next stage of claiming to define what constitutes disease and its treatment. The second watershed in institutional development is marked by the take-over of the specialist in defining his institution's purpose. To Illich this second phase of growth is cancerous, a development of anti-social disease. Besides medicine, education, the mails, social work, transportation, "and even civil engineering" (why "even"?), have all, according to Illich, followed this course of evolution. And from the second watershed springs the beginning of managerial fascism.

In *Deschooling Society* and *Energy and Equity*, Illich traces the symptoms and prescribes some cures for second watersheds in schooling (as opposed to education) and in energy, especially as employed in modern transport systems. Of the two books, *Deschooling Society* is the more complete, thought provoking, and constructive treatment. It is already world famous as a devastating polemic on how schooling by its very

nature sanctions, imposes and achieves acceptance of, inequality.

If the book has real historical importance, though, it will lie in its prescriptive chapter on "learning webs". This offers a fascinating intellectual outline for an alternative approach to learning. It is Illich's thesis in this chapter that "technology is available to develop either independence and learning, or bureaucracy and teaching". Illich proposes to use modern technology for a network of reference services for educational objectives, skill exchanges (or systems of mutual apprenticeship), peer-matching, (or computer dating for convivial mutual education), and finally a limited role for independent educators, as the schoolmaster withers away, like Marx's state.

Both in *Deschooling* and *Tools for Conviviality* Illich advocates "counterfoil research" to develop and test his hypotheses, and to combat the glibber assumptions of high technology solutions. Such research is to be welcomed as the next stage in testing Illich's ideas. It is the necessary counterpart, too, to Illich's appealing though high-flying aphorisms and his lack of factual support and footnotes.

Illich's principal critics so far—mostly they have been liberal and Marxist social scientists—have not been slow in pointing out one obvious gap in his thought. One cannot achieve deschooling until one settles the sort of political system in which his goals of "survival, justice and self-defined work" would be born. (Must all social activity be deinstitutionalised in anarcho-syndicalist village systems à la *Blueprint for Survival* but with a redistributive ethic?). This void remains. Though *Tools for Conviviality* and *Energy and Equity* both knit—and knit impressively—across part of the whole.

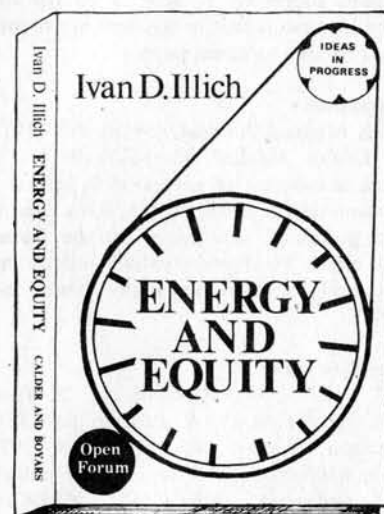
The second gap, however, is more problematic. This is the void—or avoidance—regarding cultural norms, and the role that they play in assuring any society of guidance for its stability and viability. Illich is commendably concerned with equity. But will his removal of social barriers in education, transport, medicine and the other fields that he has so far scanned, assure the individual of some basis for coming to terms with the harsh world's real inequities in the distribution of awareness, intelligence and creativity? Does Illich not raise the danger of a new

release of expectation to be followed by a further and still greater frustration in the new market place of a theoretically universal potential for fulfilment and happiness? How much of the old Jesuit seeking souls for a mono-spiritual system lies concealed or unmentioned behind the new Ivan?

Illich states his hope that "one day a general theory of industrialisation will be stated with precision". If his epitaph on industrial society, when completed, achieves this precision, he may well have laid the basis for an influence comparable to that of Marx. But if his value system remains clouded and obscured by unstated assumptions of catholicism, then, despite a Marxian influence he will lack Marx's intellectual stature.

Brian Johnson

See page 49  
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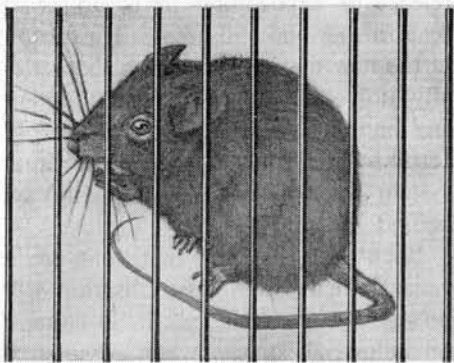
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# Journal Review

## Hernia in the West

D. P. Burkitt and P. A. James, *Lancet*, II (7821) 128 (1973). To the ills attending a fibre-depleted diet may now be added hiatus hernia, one of the most prevalent afflictions of the gastro-intestinal tract of western man.

## Post Harvest Deterioration

P. E. Wheatley, *Chemistry and Industry*, (22) 1049 (1973). The problems of maize storage in Africa are considered and some solutions suggested. In Kenya, 23 per cent of the harvest is lost in the first six months of storage due to insect pests.

## Nitrosamines

*British Medical Journal*, (5889) 372 (1973). The British Medical Journal calls for an urgent assessment of the possible effects of nitrosamines on public health. This carcinogenic group of substances can be formed from nitrite food preservative and amines, compounds present in many foods and tissues.

## Better than nature

M. Elliott, A. W. Farnham, N. F. Janes, P. H. Needham, D. A. Pulman and J. H. Stevenson, *Nature*, 246 (5429) 169 (1973). Patent applications are in for new chlorinated pesticides (NRDC143, NRDC146, NRDC147) based on naturally occurring pyrethrin. The trouble with the pyrethrins has been their instability to light and air and this has precluded their agricultural use. The new compounds combine low toxicity to mammals and high toxicity to insects with increased, although still moderate, environment stability. Work is however continuing as we still need to know that breakdown products are produced from them.

## Limits to Growth

F. E. Burke, *Nature*, 246, (5430) 226 (1973). This author finds more hope for our future by using a different pattern of models from

those employed by Forrester and by Meadows.

## Crowding without stress

P. Draper, *Science*, 182, (4109), 301 (1973). Kung bushmen in the Kalahari Desert live in small but extremely crowded settlements, with space used to minimise privacy. Yet these hunter-gatherers show none of the physiological signs of stress.

This may be because real strangers are rare in this remote area and because conflicts are readily settled by easy mobility between settlements.

## Sun power for Australia

R. N. Morse, *Nature*, 246 (5431) 271 (1973). In spite of Australia's substantial coal reserves, Morse sees solar energy as an important long-term answer to the continent's energy needs. There exists a small but efficient solar energy based industry providing 60°C heat for domestic and commercial applications, and this is being extended to 120°C heat. Transportation needs might ultimately be met by making synthetic fuel from cellulose... solar energy stored in trees.

## Cutaneous hazards for construction workers

C. D. Calnan, *Chemistry and Industry* (21) 1019 (1973). Skin disorders are an occupational hazard in the road and building industries. In the latter, 200,000 days are lost each year through dermatitis. A major factor is the chromate content of cement. There are problems with synthetic resins and moulding oils too. Preventive measures are suggested.

## Asbestos and the worker

P. C. Elmes, *Chemistry and Industry*, (21) 1022 (1973). While a health survey of insulation workers in N. Ireland showed no detectable difference from a group of workers in other employment, the survival record of a group of 1940 insulation workers to the present day showed that deaths, particularly deaths from respiratory cancer, have been higher than normal in this group. Mesothelioma, a cancer resulting mainly from the inhalation of asbestos particles, may take up to 40 years to develop. The author calls for an analysis of the groups of workers at risk on a nationwide basis.

## The success of the Clean Air Act, 1956

A. Aulicciems and I. Burton, *Atmospheric Environment*, 7 (11) 1063 (1973). Current wisdom that the Clean Air Act has had a measurable effect in improving air quality is doubted. Long term data on smoke concentrations at Kew are analysed. Recent improvements in air quality appear to be but the exact continuation of trends operating before 1956 anyway (e.g. the displacement of the domestic coal fire and the increasing use of oil in industry). Short term records from Norwich, Brighton and Plymouth support this view.

## PCB

K. P. Shea, *Environment*, 15 (9) 23 (1973). A survey of the ubiquitous organochlorine PCB compounds.

## Trace elements in the sediments of New York Bight

D. J. Carmody, J. B. Pearce and W. E. Yasso, *Marine Pollution Bulletin*, 4 (9) 132 (1973). Over ten million tons of waste from metropolitan New York are dumped at sea annually. Chromium, copper, lead, nickel and zinc levels in a 60 sq km area of sediment near the disposal site are 10 to 100 times those of uncontaminated areas. Current action causes "tails" of contamination to spread 30 km to the south east and 12 km north east.

## Trace elements off the east coast of England

J. W. R. Dutton, D. F. Jefferies, A. R. Folkard and P. G. W. Jones, *Marine Pollution Bulletin*, 4 (9) 135 (1973). Levels of zinc, manganese, nickel, copper and cadmium have been measured in the water and organisms of the southern North Sea to provide a "base line" against which any future pollution can be measured. Levels were lower than published data for parts of the west coast. Highest values tended to occur near estuaries.

## A threat to the mangroves of Florida

A. Rehm and H. J. Humm, *Science*, 182 (4108) 173 (1973). *Sphaeroma terebrans*, a wood-boring crustacean, is destroying the roots of the red mangroves of the S.W. Florida coast. This poses a serious threat to this entire environment.

## Gonadotrophin

L. Elbling, *Nature*, 246 (5427) 37 (1973). Hormonally induced ovulation in mice using gonadotrophin can lead to malformations in embryos and have other effects.

## Crown-of-thorns starfish

R. F. G. Ormond, A. C. Campbell, S. H. Head, R. J. Moore, R. R. Rainbow and A. P. Saunders, *Nature*, 246 (5429) 167 (1973). Although immense aggregations of crown-of-thorns starfish have been much publicised, they are commonly observed living at quite low densities. It now appears that a critical factor which when combined with other factors leads eventually to the high density situation may be a chemical attraction mechanism by which one feeding starfish will draw others to itself.

## Wasting waste gas

T. A. Croft, *Nature*, 245 (5425) 375 (1973). A night time photograph of much of Europe and Africa taken from space reveals, as well as the lights of major cities, the lights of fires where excess gas from oil fields and refineries are burned. For whatever economic reasons, this represents a waste of natural resources. Fires were noted in Algeria, Libya, Nigeria, around the Gulf of Suez and in Russia.

## Sorghum "miracle" grain for world protein shortage

D. Shapley, *Science*, 182 (4108) 147 (1973). Shapley reports that Purdue University scientists have indentified two strains of high protein value, and are working to develop seed stocks for wide use. Sorghum grows in soil too poor for wheat and maize

and provides the basic food for 300 million people in Africa and Asia. It has however a poor protein value.

#### Power, fresh water and food from the sea

D. F. Othmer and O. A. Roels, *Science*, 182 (4108) 121 (1973). Vast quantities of solar energy which warm the surface layers of the oceans might become accessible to human use. The cold deep ocean currents are rich in nutrients and offer possibilities for farming the sea.

#### Premature births and pesticides in sea lions

R. L. DeLong, W. G. Gilmartin and T. G. Simpson, *Science*, 181 (4105) 1168 (1973). 1970 measurements show organochlorine pesticide and PCB residues were two to eight times higher in the tissues of premature California Sea Lion pups and their mothers than in full-term sea lions and their offspring.

#### Air pollution and pulmonary cancer

B. W. Carnow and P. Meier, *Archives of Environmental Health*, 27 (3) 207 (1973). Studies in the USA suggest a reduction of 60 per cent in urban air pollution would reduce pulmonary cancer deaths by 20 per cent in all smokers.

#### Health effects of exposure to automobile emissions

S. M. Ayres, R. Evans, D. Licht, J. Griesbach, F. Reimold, E. F. Ferrand and A. Criscitiello, *Archives of Environmental Health*, 27 (3) 168 (1973). Substantial physiological effects are documented in New York City road tunnel and bridge employees who are exposed continuously to very high levels of car fumes (63 ppm carbon monoxide for a 30 day period) in the course of their work.

#### Energy and the weather

J. T. Peterson, *Environment*, 15 (8) 4 (1973). Good summary of what we know about ways in which waste heat can influence the weather. With the prospect of nuclear power and ever increasing energy demands, this is an important subject.

#### Effects of sulphur dioxide and suspended sulphates on acute respiratory disease

J. G. French, G. Lowrimore, W. C. Nelson, J. F. Finklea, T. English and M. Hertz, *Archives of Environmental Health*, 27 (3) 129 (1973). Studies on 20,000 children and adults in four areas in the USA show that excessive respiratory illness can be expected in children and adults who are exposed to at least three years elevated ambient levels of sulphur dioxide and suspended sulphates. In children, there is the danger of such illness leading to chronic bronchitis in later life.

#### More organochlorines

D. R. Buhler, M. E. Rasmusson and H. S. Nakaue, *Environment Science and Technology*, 7 (10) 929 (1973). Oregon scientists find hexachlorophene, a germicidal component of soaps and cosmetics, and pentachlorophenol, an industrial slime control agent, pass to a considerable degree unchanged through sewage treatment plants and eventually turn up again in tap water.

#### Distribution of alkyl arsenicals in a model ecosystem

A. R. Isensee, P. C. Kearney, E. A. Woolson, G. E. Jones and V. P. Williams, *Environmental Science and Technology*, 7 (9) 841 (1973). Organic arsenic compounds are used as herbicides. Experiments show that the arsenicals, cacodylic acid and dimethylarsine (a breakdown product) have but a low potential to biomagnify in an aquatic ecosystem.

#### Plastic bottles

*Chemical and Engineering News*, 2 (October 22, 1973). Almost no growth was experienced in the US plastic bottle industry this year. The problem was shortages in high density polyethylene, and, to some extent, polyvinylchloride. The big bottle for the future lies in nitrile polymers.

#### Atmospheric fluoride levels in urban areas

A. W. Davison, A. W. Rand, W. E. Betts, *Environmental Pollution*, 5 (1) 23 (1973). Although coal and shale contain fluorine compounds, ground level fluoride levels in the air in urban coal burning areas have seldom been measured. Results are presented of air fluoride levels from some mining villages. Concentrations were locally very high near burning pit heaps. Levels encountered could damage sensitive plants and might contribute to fluorosis problems in animals.

#### Occupational exposure to mercury vapours

R. R. Lauwerys, J. P. Buchet, *Archives of Environmental Health*, 27 65 (1973). Increased blood and urine mercury levels and changes in certain biochemical parameters are documented for workers exposed to average air mercury levels below the U.S. threshold limit value, even though the workers are apparently completely healthy.

#### Drought in Upper Volta

J. Seaman, J. Holt, J. Rivers, J. Murlis, *Lancet* (7832) 774 (6 Oct. 73) Results of a survey undertaken in July by the Save the Children Fund into the drought situation of the Sahara.

#### Lakes beneath antarctic ice

G. K. A. Oswald, G. de Q. Robin, *Nature*, 245 (5423) 251 (1973). Seventeen lakes exist beneath 3000 to 4000 metres antarctic ice. Their discovery questions suggestions to dump radioactive waste in Antarctica.

#### Occurrence of some New Sunflower Diseases in India

S. J. Kolte and A. N. Mukhopadhyay, *Pans* (Pest Articles & News Summaries), 19, (No. 3), 392 (1973). Sunflower (*Helianthus annuus*) has been grown at the Crop Research Centre, Pantnagar, since 1969 to investigate its potential as an oilseed in India. Surveys have been conducted to ascertain the occurrence, distribution, and severity of sunflower diseases, and the presence of a number of diseases new to India has been revealed in two varieties.

#### Shading out aquatic weeds

No name, *Pans*, 19 (No. 3), 401 (1973). A product, Aquashade, is being marketed in the United States to control aquatic weeds by shading them from light. It is used at a level of 5 parts per 6 million of water, and is claimed to be without hazard to humans, livestock, fish, or other wildlife.

#### Shell thinning in snails due to pesticide

A. S. Cooke and E. Pollard, *Pesticide Biochemistry & Physiology*, 3, 230-236, (1973). Roman snails (*Helix pomatia*) have been treated with DDT from two weeks of age until hibernation. Relatively low doses significantly reduced shell and operculum weight, whereas higher doses did not. Shell thinning is likely to have occurred in some heavily treated agricultural regions if other species of snail resemble the Roman snail in this respect.

#### An investigation into the fate of aircraft food waste at London Airport (Heathrow)

A. F. Baldry, *The State Veterinary Journal*, 28 (No. 84), 215-221 (1973). Much of this material is of foreign origin and could be regarded as a potential hazard for the importation of exotic animal diseases. Most is treated as waste (rather than swill) and is put down sewers and on approved tips. Despite the possibility of some disappearing in unauthorised directions, it is concluded that the risk from this source is very low indeed.

#### Imitation high-grade meat

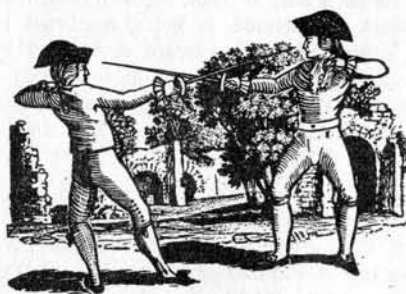
No name, *Food Processing Industry*, 41, (No. 491), 56 (1973). "Used in conjunction with the injecting and tumbling equipment illustrated on these pages the ABR Meat Press will mould hams prior to cooking or transform offcuts and strips of lower-grade meats into tender, juicy and attractively shaped steaks".

#### The formation of carcinogenic nitroso compounds from nitrite and some types of agricultural chemicals

R. K. Elespuru and W. Lijinsky, *Food & Cosmetics Toxicology*, 11, 807-817, (1973). Seemingly innocuous urea and carbamic acid derivatives, which are in common use as pesticides and herbicides, are all capable of combining with nitrites to give nitrosamines or N-nitroso derivatives, or both. Since nitrites are present in many foods, a carcinogenic hazard to man could exist when food containing residues of these agricultural chemicals is simultaneously present in the stomach.

#### Toxicity of hexachlorophene

A. G. Ulsamer and F. N. Marzulli, *Food & Cosmetics Toxicology*, 11, 625-633, (1973). Hexachlorophene is a common germicidal ingredient of cosmetics and soaps which damages the central nervous system. From measurements of its level in human blood and fat after the use of these preparations it was deduced that exposure to high concentrations for short periods may be less dangerous than more continuous exposure to low concentrations.



# Letters

## Thinking about the future

Sir,

I read with interest Brian Johnson's review of our book *Thinking About the Future* in the September issue of the *Ecologist*. There is one particular point to which I would like to draw your attention, because it is in error.

This is Johnson's criticism of our (Cole and Curnow's) backward running of the World models. I think it is appropriate for me to ask you to draw your readers' attention to a recent article in *Nature*.

It would be a pity if silly comments such as Johnson's were to interfere with the discussion of the more serious issues considered in *Thinking About the Future*.

Yours faithfully,

H. S. D. Cole,

The University of Sussex,  
Science Policy Research Unit.

Sir,

Mr Sam Cole, in his letter of 16th October, refers to my criticism of his and Curnow's "backcasting" of the World 11 model of the MIT Group as "silly", and he refers to a recent article in *Nature* explaining and justifying this sort of exercise.

But what I'm afraid his refutation stresses is the dreadfully narrow gauge of Cole's and Curnow's thinking. The analogy I drew between their "backcasting" and trying to explain an aircraft's ability to land by reversing a certain set of data useful in describing how it is able to take off, stands. It is unaffected by the *Nature* article, as this refers to a purely mathematical exercise useful for checking formulae in linear situations, but unable to deal with some important characteristics of behaviour (no amount of computation will make an aerofoil section supply lift when pulled backwards through the air). This error of inadequate con-

ception was adequately dealt with, on a technical basis, in *A Response to Sussex* (Futures Magazine, Vol. 1 No. 5, February 1973).

The importance of this misconceived "backcasting" in confusing—or excusing—official thinking has, unhappily, been further demonstrated since I wrote of the amused reaction of a member of Lord Rothschild's Think Tank to news of the Sussex Group's rebuttal. Speaking to an important recent session of the UN's Population Commission with reference to the preparations for the forthcoming World Population Conference the Brazilian representative said in what he stressed was an official policy speech, "The Dennis Meadows-Forrester model of crisis could not even resist a few years of retrapolation in the computer of the Sussex University, since it indicated the beginning of mankind in the year 1881, which turns our fathers and grandfathers into the long-searched 'missing links...'"

If Mr Cole describes my criticism of his use of "backcasting" as silly, I would be interested in his assessment of this direct result of his efforts at retrapolation.

Yours sincerely,

Brian Johnson,

Acting Director,

Institute for the Study of International Organisation,

The University of Sussex.

## Backcasting and behaviour

Sir,

I have carefully examined your article "Backcasting of the World Dynamics Model". I consider your thesis to be based on at least three misconceptions.

(1) You say that there is "No mathematical reason why the properly posed model should not run as well in a backwards direction as it does in the forwards direction".

There may well be no mathematical reason but there are very good behavioural ones.

As you undoubtedly know, one of the main contributions of cybernetics and of general systems is that they have revealed the basic similarity of behavioural processes that appear very different to the outside observer, such as phylogeny, ontogeny, day-to-day behaviour mediated by the brain (which one could call neurogeny), and these at all levels of organisation including that of the biosphere as a

whole which is what Meadows is concerned with. One of their basic features is that they are goal-directed—and that this goal is the maintenance of stability or homeostasis. How, as C. H. Waddington points out, they can never be really homeostatic, in that it is impossible for them to return to the same ground position after a disturbance. They can only return to a new position which will differ from the original one in inverse proportion to the stability of the system involved. It is for this reason that Waddington proposes the term *homeorhesis* (from the Greek *homeo*—same and *rhesos*—to flow). Behavioural processes are flowing or moving in a given direction. Their goal—stability—is not a point in space and in time but a course or trajectory, what Waddington calls a "creode". All this is the same as saying that behavioural processes are irreversible.

Another basic feature of behavioural processes is that they proceed from the general to the particular; that is to say that basic instructions formulated in the informational medium used by a system are differentiated as the process occurs and of course monitored at each step. In this way, they permit adaptation to environmental requirements all the way along the line. The same thing happens when a general commanding an army hands out his instructions for a particular military operation. These instructions act as guide-lines only, for at each echelon they must be modified so as to be adapted to specific local requirements. The same principle obtains in what would appear to be a very different sort of behavioural process—that of the development of an embryo though in this case instructions are not modified to anything like the same extent given the predictability and hence the order of the environment within which the process occurs. I suppose it is possible to imagine an environment displaying absolute order, and presenting no challenges to a system associated with it. In such circumstances there would be no need for adaptation and hence no information need be added from the environment to the original information contained in the system. This is in fact the only sort of process where the deductive method provides 100 per cent results, where it is possible to deduce all the particularities

from the generalities. This is also the only type of process which is truly reversible. Unfortunately, it is also hypothetical. It cannot occur in practice. The role of behaviour is precisely to counteract challenges that have either occurred or that can be predicted as likely to occur. Only in this way can a system be maintained along its optimum course or trajectory. If there are no challenges then there can be no behaviour. If a model is mathematically capable of running backwards when the process it represents can only run forwards then all I can say is that it must be wrong and must be abandoned forthwith.

(2) Even if a behavioural process were reversible, the sort of model we would build to represent behaviour would be very different from that required to represent de-behaviour. One of the basic features of behavioural processes is that only a small part of that information contained within the system is actually made use of. Thus a cell contains a complete set of the hereditary material. In learning to fulfil its specific functions within an organism only a fraction of it is used. The same is true of an embryo which only makes use of a minute part of the information contained in the fertilised egg, and also of a population, which at any given moment represents only one of a large number of different possible populations which its associated gene-pool could have given rise to. Thus a behavioural model must represent a process in which a single situation is selected from a very large number of possible situations. A de-behavioural model must represent precisely the opposite process—one in which a single situation which has actually occurred “gives rise” to a very large number of possible ones. Even if a de-behavioural model were possible, it would be an extraordinarily complex one and would be quite useless for the purpose of representing behaviour.

(3) Thirdly, you write that a model should be able to “backcast, otherwise it is beyond the reach of normal scientific criticism”. If this is your interpretation of the Empiricist Theory of Knowledge then it is wrong. According to this theory propositions are acceptable if they can be observed to be the case. It has never been suggested, to my knowledge, that a process must be reversed in order to

verify its acceptability.

The Epistemological criterion implicit to the systems approach, is that a proposition is most acceptable, which fits in best with the model one has built of the situation it refers to, i.e. which is obtained by simulation. The same is true of the model itself which is acceptable to the extent that it fits in with a larger model, ideally that of the ecosphere as a whole. The operational test of course permits a final verification of the proposition and of the model or models.

For reasons already given neither of these tests can conceivably involve “backcasting” procedures.

Yours truly,

*Edward Goldsmith.*

### Backcasting still justified

Sir,

I have received your reply to my recent letter concerning the issue of “back-casting” with the World Dynamics models and I read with interest the points you raise, and am grateful for the trouble you have taken in replying. The point at issue is whether the World Dynamic models really are “systems” in either Waddington’s sense or in the sense of being behavioural.

The world models are only a *partial* representation of the “real world” processes they attempt to describe. This is by definition true of any model. During the interpretation of a model’s results other factors, excluded from the model, are taken into account. One of the factors excluded from the World Models is the irreversibility of most “real” processes. Irreversibility arises for the reasons you give as well as for thermodynamic reasons in non-learning, apparently non-goal directed physical systems—hence our comment that the models are non-probabilistic. Just as a celestial mechanical representation of a planetary system ignores directionality so do the World Models. Essentially both types of model are sets of conservation equations.

There is thus no reason why such properly posed models should not run backwards—addition becomes subtraction and so on. (I repeat the phrase “properly posed” here because it has a strict mathematical definition which does not mean “complete”.) A planetary system runs equally well backwards as forwards although over long time periods some differences in orbit would arise for “thermodynamic”

reasons. Cybernetic and social systems don’t run backwards.

Actually as noted in the Nature article—the World Models, in *running forwards*, actually assume that information etc will be lost—for example, technological and social changes depend only on the current state of the model and not on its history—so one could certainly argue as we do in our book “Thinking About the Future” that such models should contain a more complete representation of these processes.

In short therefore, although I accept your remarks, they are not actually relevant to whether a Systems Dynamics model should run backwards although they do help to explain why the “real world” doesn’t. Consequently I cannot agree with you that the Nature article is based on a misconception. Its terms of reference were made clear in the title.

Yours sincerely,

*H. S. D. Cole.*

### Limits and the Club of Rome

Sir,

In your October issue you published a letter by Gerald Leach complaining about two errors in quotations made “by the Club of Rome” in reply to criticisms of “Limits”. This complaint is insofar justified as the two quotes in question are not formulations of Dr Borlaug himself but of Mr Leach and Prof. Borgstrom in a discussion with Dr Borlaug, the latter answering in one case “I wouldn’t disagree”, in the other case “I agree absolutely”. I accept the blame, having been responsible for that part of the reporting, but I do feel that my argumentation is not reduced by this inaccuracy as to its validity. It certainly is not based “heavily on the views of one man”.

Speaking about inaccuracies: Mr Leach refers in his letter to a meeting of the Council of Europe on “The Limits to Growth” “in which the Club of Rome replied to the criticisms of ‘Limits’ made by Mr John Maddox, the World Bank, and others”. This is not correct. The meeting in question did not involve other persons than European parliamentarians. It was, however, based on two reports solicited by the Council, one submitted by John Maddox, the other by Aurelio Peccei and myself expressing our personal views and explicitly denying to speak on behalf of the Club of Rome.

Yours sincerely,

*Manfred Siebker.*

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