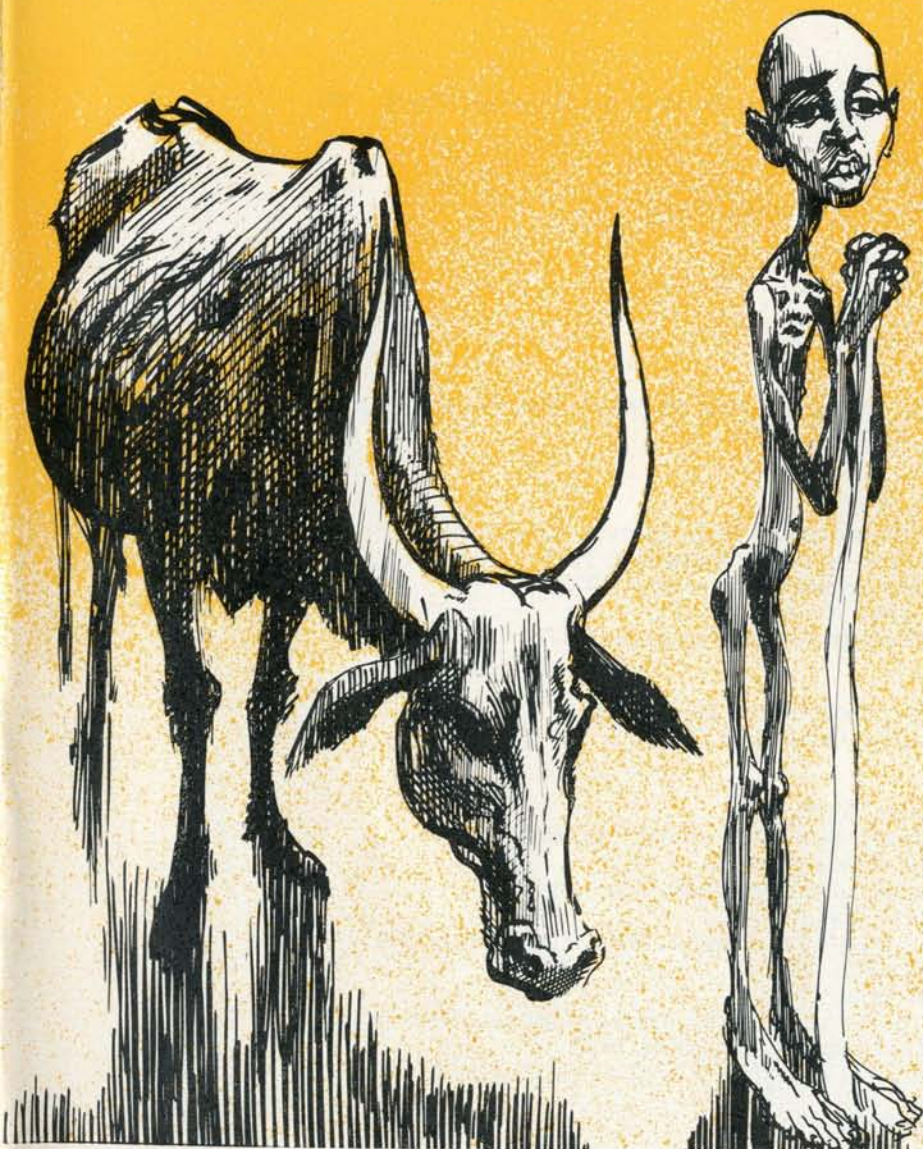


ecologist

Vol.3 No.10 October 1973

25p



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BRAD WILSON

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Comment

World grain outlook

The world food crisis is upon us. Until a few months ago, august food experts were telling us that all was well, and that the world would have no difficulty in feeding 15, even 30, billion people (four or eight times the present world population). As usual, the experts were wrong. Most people's hopes rested on three things: the success of the Green Revolution, the reserve of agricultural land currently out of production in the US, and the huge American grain surpluses.

The Green Revolution, as anyone with a basic knowledge of ecology could have predicted, has been a failure. It has temporarily increased production in a few selected areas, but at colossal cost in terms of inputs of fertiliser, pesticides, irrigation water, machinery, ecological damage and social disruption.

By the end of this year, half the 50 million acres of reserve crop land in the US will be back in production. According to Lester Brown (*US News and World Report*, 13 August 1973) "most of the remaining crop land is so marginal that some of it may never come back in." In the meantime, the American surplus has gone.

In spite of prospects for a record grain harvest this year, the situation is becoming critical, "we are actually on the verge of a panic", writes Mr Uhlmann, President of Standard Milling

Company of Kansas City.

The reason simply is that production can no longer keep up with world consumption caused by population growth and rising affluence, which has jumped by 60 per cent (in the case of grain) in barely 20 years.

Lester Brown calculates that the average availability of grain in the developing countries is about 400 lbs per person per year—about 1 lb a day, most of which, by necessity, is consumed directly.

As incomes go up, so does grain consumption. In the US and Canada it is currently about 1 ton of grain per person per year, of which only about 150 lbs are consumed directly. The rest is eaten in the form of meat, milk and eggs, the grain having served to feed the animals. The Americans' *per capita* beef consumption alone has increased from 55 lbs in 1940 to 117 lbs in 1972.

Demand from abroad is also increasing dramatically, and the US has been quick to seize the opportunity to export agricultural produce to pay for increasing imports. Thus, exports of agricultural commodities went up from \$6 billion five years ago, to an estimated \$11 billion in 1973.

As Lester Brown points out, many people don't grasp fully the magnitude of the Soviet grain imports. In the year ending 30 June 1973 the Russians

imported far more food than any country in history—an estimated 28 million tons, of which about 16 million tons came from the USA. This is nearly three times more than India imported during the food crisis years of 1966 and 67.

Lester Brown thinks that imports will continue. "We're moving into a very interesting situation in the world food economy in which two countries which have historically turned to the oceans for their animal-protein supplies—Japan and the Soviet Union—may be in trouble because of depleted world stocks of fish. If these two nations have to turn to world grain markets to offset a decline in fish supplies, we will undoubtedly see some very keen competition among the Japanese, the Russians and the West European countries for available food exports."

As it turns out, Russian orders for American wheat have fallen this year. But this fall has been more than compensated by orders from other countries, such as China, India and Japan.

The problem is going to be exacerbated by the exorbitant cost of producing America's food. I refer to the real costs in terms of resources, energy and environmental damage; which at last are becoming better reflected in monetary costs.

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World grain continued from page 361

Every year it is estimated that American tractors alone consume about 8 billion gallons of fuel, whose energy value alone is equal to that of the food crops consumed in the US ("Farming with Petroleum", Michael J. Perelman, *Environment*, October 1972).

American farmers, in addition, consume about 2.5 per cent of all electricity used in the US, the equivalent of 350 trillion BTU's of fuel. It has been estimated that more than 10 million BTU's of energy are used for each acre of land cultivated in the US (Perelman). In fact, about five times more energy is used by farmers than is consumed in food, and this does not take into account the energy required to produce the farm equipment, nor that used to store and distribute the food.

Consider that about 7 per cent of the total US rubber production, and about one third as much steel as goes into the automobile industry, are used to make products bought by farmers.

In 1969 US farms consumed about 7.5 million tons of nitrogen fertiliser, requiring for its production the equivalent of about 1.5 billion gallons of petroleum, and, it must be remembered, nitrogen fertiliser makes up only one fifth of total commercial fertiliser consumption.

As Perelman points out, Chinese wet rice agriculture can produce 53.5 per cent BTU of energy for each BTU of human energy expended. A Chinese farmer gets back 50 times his energy input, the American farmer barely a fifth. On this basis, Chinese wet rice agriculture is 250 times more efficient than US agriculture, 250 times cheaper in terms of ever more costly inputs (without taking into account those going into production of agricultural equipment).

America cannot afford her agriculture. The world cannot afford to provide her with the unbelievable quantities of the various inputs it requires, at an economic price (that is why prices are rising so dramatically). On the other hand, the world cannot afford to be without American wheat, feed grains, and vegetable oils.

This leaves us with a nice little dilemma to tax the ingenuity of our enlightened politicians and their august experts!

Edward Goldsmith

Comment

Hunterston: the rape of Scotland?

The Secretary of State for Scotland, Gordon Campbell, has acquired a reputation for making decisions about future development in Scotland which are contrary to the recommendations of public inquiries and even of government-sponsored reports and investigations. Either public inquiries are a farce and not to be taken seriously by any sensible person—despite their considerable cost—or the government, believing it knows people's desires and needs better than they do themselves, has decided to reject the vestiges of democracy. Take what is happening at Hunterston, once a "grey" area where development was restricted and now, if Campbell, the government, Ayr County Council and industry have their way, destined to become another Teesside.

Set on the southerly edge of the Clyde Estuary, Hunterston is in an area described as one of "outstanding natural beauty" and Glaswegians, together with people from all over

Britain, traditionally go there to enjoy the fabulous views and unsullied coastline. Except for the electricity board's two nuclear reactors just around the point from Portencross there is absolutely no industry to spoil a broad sweep of coastline all the way from Largs to Ardrossan some 12 miles to the south. But Hunterston has been blessed with deep sheltered water which as the Clyde Estuary Development Group saw in 1968, would make an ideal deep water port.*

Deep water ports are good for two industries in particular—the oil industry and the steel industry—both of which are bringing their cargoes in to Britain in bigger and bigger ships. The British Steel Corporation, for example, aims to bring iron ore from South America in 250,000 ton lots, and what better place than Hunterston, which could then be used as a terminal for the steel corporation's modernised steel works at Ravenscraig, some 40 miles

to the east?

Once it was made clear that Hunterston was to be a likely spot for development, both BSC and Chevron, an American oil company, put in proposals; the steel industry for a traditional open cast iron-ore terminal and possibly a steel-works, and Chevron for an oil terminal and possibly a refinery.

Just how anyone could tumble for the notion that oil with its very shaky future and a port for bringing in iron-ore could make a new Scotland seems beyond comprehension. But possibly because it did not want to miss out on the veritable explosion of development that was beginning to hit Scotland as a result of the oil boom or possibly because of its own demoralising problems of a high unemployment rate and industrial depression around Ardrossan, the Ayr County Council embraced the proposals with utter enthusiasm. Moreover with a truly



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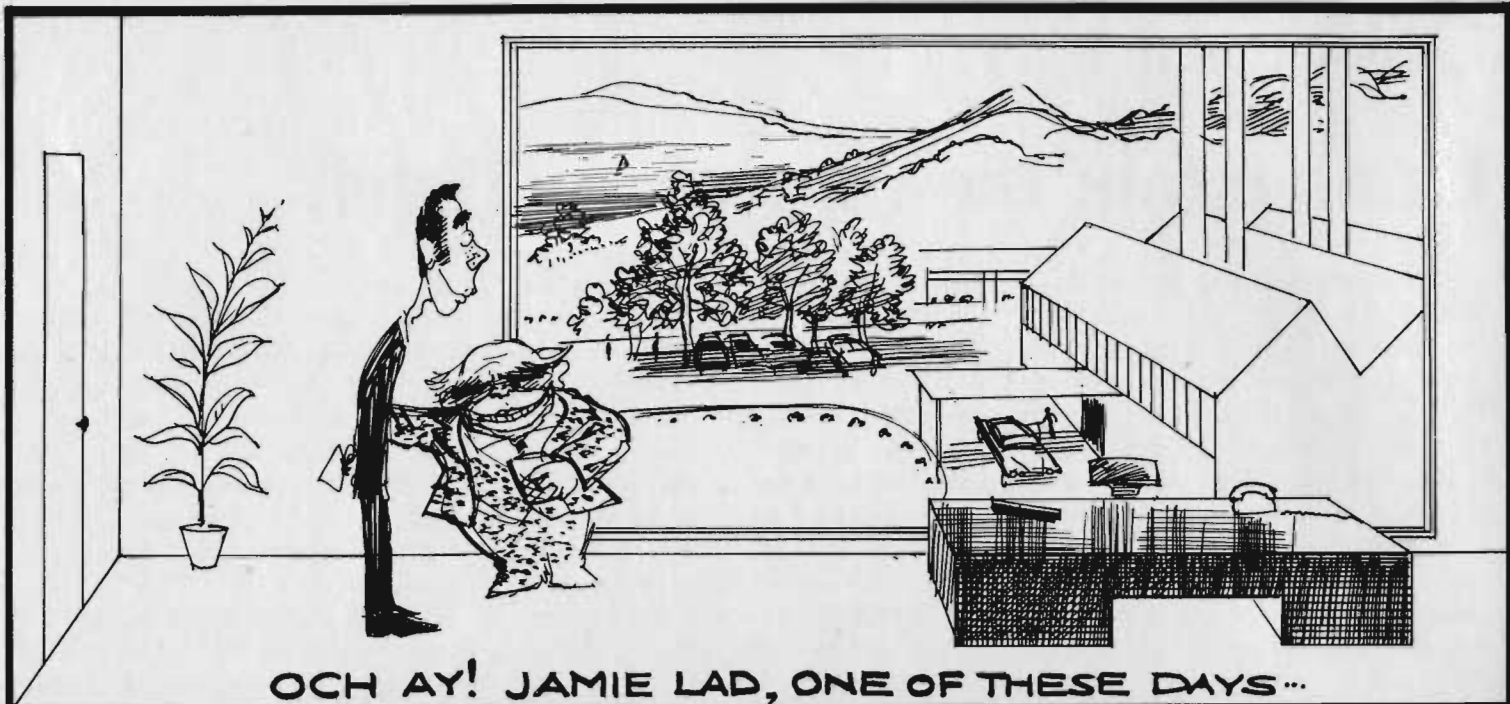
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undemocratic lack of concern for the people likely to be uprooted by the development the council did not let the cat out of the bag until the last possible moment.

Inevitably there was a public inquiry, and this decisively rejected Chevron's proposals together with those for a steelworks, but recommended if it were absolutely necessary for BSC to have an iron-ore terminal that it should be of the most up-to-date kind.

Indeed evidence was given at the inquiry of terminals that handle nothing but iron-ore slurry which is pumped straight from the ships into pipes and thence to the steelworks which may be some distance away. Such terminals have no mountains of iron-ore scarring the landscape, no railway sidings, or trucks, no dust and very little noise.

Moreover, according to an engineering consultant, John Busby, a slurry scheme would cost no more than one third that of a traditional open-cast terminal. And as Busby points out, it would make more sense to have a slurry scheme carrying iron-ore to Ravenscraig, where millions are already being spent on modernisation, than to contemplate building a new steelworks at Hunterston. Busby has also suggested that Ravenscraig could produce iron briquettes in a direct reduction process. The briquettes could then be shipped via Grangemouth to Europe where there is a shortage of steel for reinforced rods.

In reply, BSC said that the slurry system could only be used for iron-ore of a certain quality which is known as "fine ore" and that the ore coming from South America was unlikely to be consistently of that quality.

With apparent disregard for the recommendations of the public inquiry Gordon Campbell gave the go-ahead for the deep water port and for the traditional type of iron-ore terminal, and left open his options over the steelworks and the oil terminal and refinery. In the meantime the Scottish Office asked the Hunterston Development Company to produce its own report on the area. At a cost of £120,000 the HDC got prominent industrialists, industrial consultants and even landowners to investigate Hunterston and they came up with a conclusion that would have dashed the enthusiasm of the most avid developers, for it was their opinion that nothing

short of a major integrated steelworks was worthwhile, otherwise the site should be left alone. A Dutch expert on reclamation called in by the HDC could not repress a remark that if they had "this type of scenery in Holland they wouldn't dream of desecrating it."

Undaunted by a report which he himself had asked for or perhaps totally confused as to what to do next, the Secretary of State for Scotland is still mulling over in his mind what to do with Hunterston. But now instead of just BSC and Chevron, other companies have entered the arena, and according to Mrs Brenda Dick of the Fairlie Action Group, "they're like dogs over a bone, and the whole place has become a land-grabbing area."

One of the new companies is Orsi—the Italian Group Oil Refining Services International—and it wants to build a giant refinery with a capacity of 24 million tons a year at a cost of £150 millions. The Chevron refinery would have a capacity of 10 million tons a year, costing some £85 millions, and would provide some 550 jobs. To make their proposals more attractive both oil companies have suggested selling gas to BSC, which could then use it on site in a direct reduction steel plant. In its bid Orsi has also proposed bringing in a steel pipe and beam mill to be built by Eurosider Ltd and an engineering works. Orsi claims that its combined scheme will provide for at least 2,000 permanent jobs.

The sudden renewed interest in Hunterston has shaken BSC into some sort of activity and not only is the steel corporation negotiating with both Orsi and Chevron for the gas, but it is now trying to purchase the land for the terminal and steelworks. But the owners will not sell and BSC, through Ayr County Council, is trying to get a compulsory purchase order. The Council has agreed, but on condition that BSC pays all its costs. The situation has now reached a stalemate owing to the objection of the West Kilbride District Council.

With the possibility of yet another public inquiry over the sale of land the situation has become almost farcical. Sir Fitzroy Maclean, MP for the area, feels that the present mess has been brought about in part through the death of Lord Melchett, who was chairman of BSC. "He always assured me," said Maclean, "that Hunterston was the wrong place for a greenfield site."

If Campbell opened the door to all development there can be no doubt that Hunterston would become hideously polluted, for there is little worse than the combination of steelworks and oil refineries. And would Scotland benefit at all, either in the short term, let alone the long term when it would have to cope once again with derelict industrial sites because the industries they had once sustained had long since been outdated and abandoned? All the companies have talked about employment, but what they mean in fact is highly skilled labour and most of the jobs are likely to go to outsiders, not to local Scots. As to the companies' profits, they will go back to the countries of origin, whether the United States, Italy or the City.

But even if there were no lovely coastline to ruin and no thriving tourism, and even if development could be justified on economic grounds, there is one thorny obstacle to all the proposed developments—except perhaps that of an iron-ore terminal—which Gordon Campbell has studiously managed to avoid. That obstacle is none other than the nuclear power stations. To have oil terminals and refineries, mammoth tankers, a steelworks and gas flowing between the two, all within a mile radius of the Hunterston power station would be courting disaster. In the words of a nuclear physicist "it would be quite ridiculous to put oil next door". The Nuclear Safety Advisory Committee are now considering the proposed developments at Hunterston as well as the possibility of two more reactors in addition to those already there. Should the committee decide that the oil and steelworks are no threat to the nuclear power stations it will indeed be a fundamental change in policy towards nuclear installations; a change which should be challenged, and not allowed to pass.

It remains to be seen what will happen at Hunterston and whether Gordon Campbell remains true to form in his determination to fly in the face of public opinion. But even if he does give the go-ahead once again to the developers, there is hope for Hunterston, for as has been seen with the Third London Airport, the Channel Tunnel, the Motorway Box, if there is enough confusion, nothing happens.

Peter Bunyard

* Bunyard, Peter and Maclean, Charlie. 1971. *Ecologist*. 1.11.4.

DROUGHT

in Sahelia

who or what is to blame?

by Reid A. Bryson

From the 1920s to the 1960s the monsoon rains over the southern Sahara extended well to the north. The rains, together with well-intentioned aid involving mass campaigns to eradicate disease in man and his livestock have brought about an unparalleled surge in numbers of both man and beast in the six countries of the Sahel zone—Mauretania, Mali, Niger, Senegal, Chad and Upper Volta.

That unchecked growth now looks like being checked; for tragedy has struck in a form that can least be countered by man. Over the past decade and in the last five years in particular, the monsoons which bring rain to the Sahel and indeed also to north west India, have not only fallen well below average, but they have also been decreasing year by year. Faced with drought on an enormous scale millions of nomads, farmers and their cattle have been migrating southwards, leaving behind them barren desert and a trail of corpses.

Droughts have obviously occurred before in the Sahel, but never before has the environment been so heavily taxed with people and animals. The present climatic change has therefore been compounded in its effect by over grazing and human mis-management. What can be done? At the recent symposium on drought in Africa held at the School of Oriental and African Studies, London University, Dr. D. Winstanley pointed out that the desert climate will probably continue to shift southwards for a century or more—a devastating conclusion. All solutions would therefore have to be long term. He in fact discussed three solutions: first to modify the climate; secondly, to increase the availability of water in other ways; and thirdly, for the nomads to shift permanently southwards with the rains.

“Even if it were technically feasible to modify climate on this scale”, he says “it would be highly irresponsible to do so

until we have sufficient understanding of the physical factors and processes at work in climatic change—and this we do not have at present. Research has demonstrated the unity of the general circulation of the atmosphere and that climatic changes in one zone are accompanied by changes in all the other zones.

In contemplating changing climate on this scale, we will probably always be faced with the question ‘Can we afford to rob Britain, or Germany, or Russia of rainfall in order to pay Mauritania, or Chad or India?’

“The second solution—that of increasing the availability of water by such methods as building reservoirs, desalinating sea water and constructing huge water pipe-lines—is subject mainly to economic and technical limitations. In trying to increase the availability of water on a continental scale, in a zone where there is liable to be less and less precipitation in the long-run, these limitations could

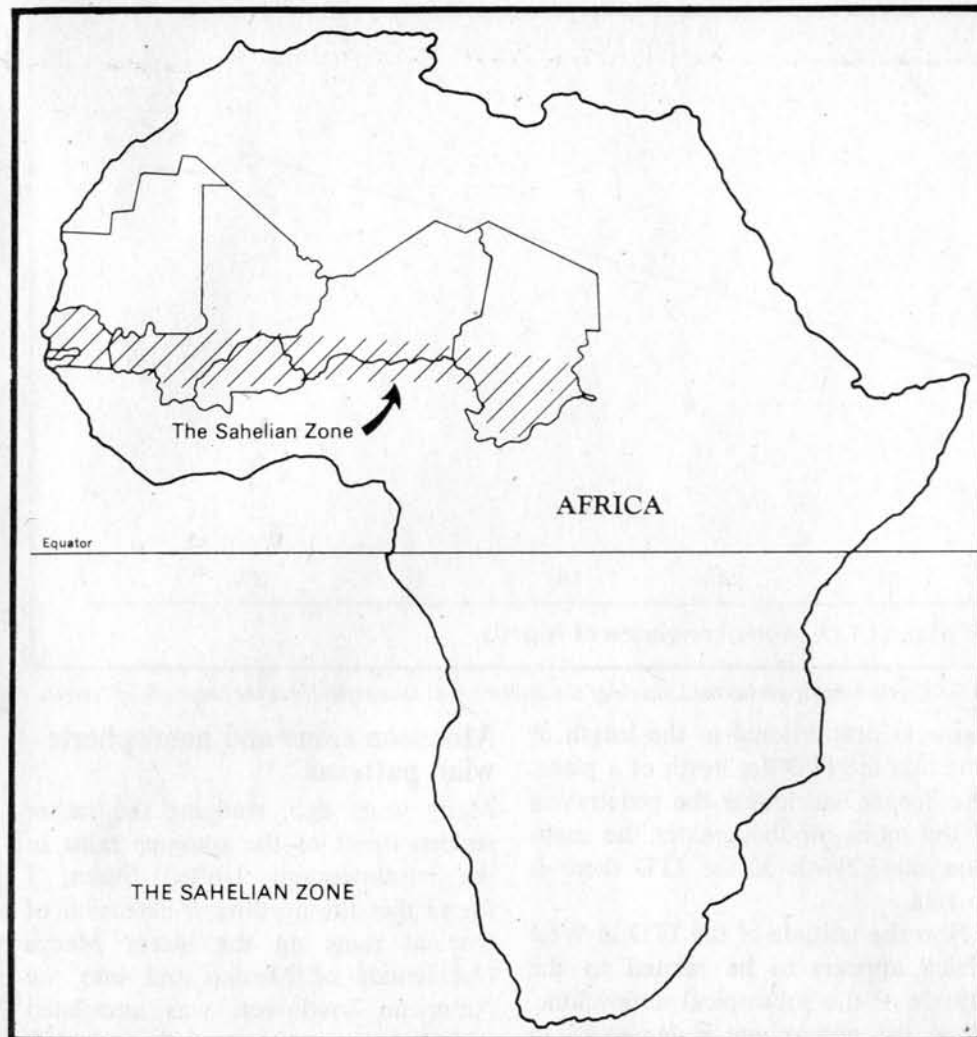


Figure 1: Most of the population live in the southern region with more than 10 inches of rainfall annually

prove to be prohibitive. The question that arises in this case is 'Are we prepared to give massive international aid to maintain the independence and economic viability of the Sahelian states, in face of increasingly adverse climatic conditions?'

"The third possibility—that of adapting to the climatic changes and shifting the population southwards with the rains—is the natural solution for the nomads; but is probably unacceptable in the Sahelian states, and to the states such as Nigeria and Ghana in the south, which would have to absorb between about 10 and 20 million people".

Like many of us in the west Dr. Winstanley does not see much hope for the drought-ridden nomads of the Sahel, especially in the face of a

natural event beyond man's control. Yet it is unquestionable that western industrialist man, through his programme of aid and development, has been partially and indeed grossly responsible for the extent of the plight in which the nomads now find themselves.

Professor Reid A. Bryson, director of the Institute for Environmental Studies, the University of Wisconsin, believes that industrial man could be responsible for a lot more than having given ill-conceived aid to the Sahelian States. He thinks it possible that the climatic change which has taken the monsoons southwards away from the areas where rain is desperately needed to areas which already have adequate rain, could have been caused through industrialisation. In this article he explains how.

The drought

On May 11, 1973, the Food and Agricultural Organisation in Rome issued the following (abbreviated) communique:

"An appeal for airlifts and for immediate additional aids... for six drought stricken West African countries was made today by the Food and Agriculture Organisation of the United Nations, FAO.

"In making the appeal FAO Director General Addeke H. Boerma stated...:

"'In some areas there now appears serious risk of imminent human famine and virtual extinction of herds vital to nomad populations.'

"Dr Boerma stated that his special representative for problems of the Sahelian Zone... had reported that... 'the situation is still deteriorating.'

"In order to ensure the survival of populations until the next harvest, it is imperative that the maximum possible supplies be delivered to areas by, at the latest, mid-June when transport is expected to be cut off by the rainy season...:

"Sahelian is the term applied to a broad belt of arid land extending some 3,000 kilometres along the southern edge of the Sahara. The zone is shared by all six countries. The countries are Mauretania, Senegal, Mali, Upper Volta, Niger, and Chad (Fig. 1).

"Within the Sahelian Zone, now in its fifth year of drought, millions of cattle and other domestic animals have perished in recent weeks. An FAO official for African affairs estimated last week that out of a population of 30 millions in the six countries 'about one-third are now weakened by hunger and malnutrition and some people are dying.'"

According to *Newsweek* (4 June 1973) Mourtada Diallo, a regional director of the United Nations Economic Commission for Africa, said "If the problem is not solved in two months, nearly six million people may die." During June the estimate rose dramatically.

Across Asia the story was similar: the drought-prone regions of India had suffered a harvest estimated at nearly 60 per cent below normal in 1972; Bangladesh suffered a short fall of 2.5 million tons in its rice harvest (enough to just sustain about 10 million people!); in Sri Lanka (formerly Ceylon) drought caused crop losses of

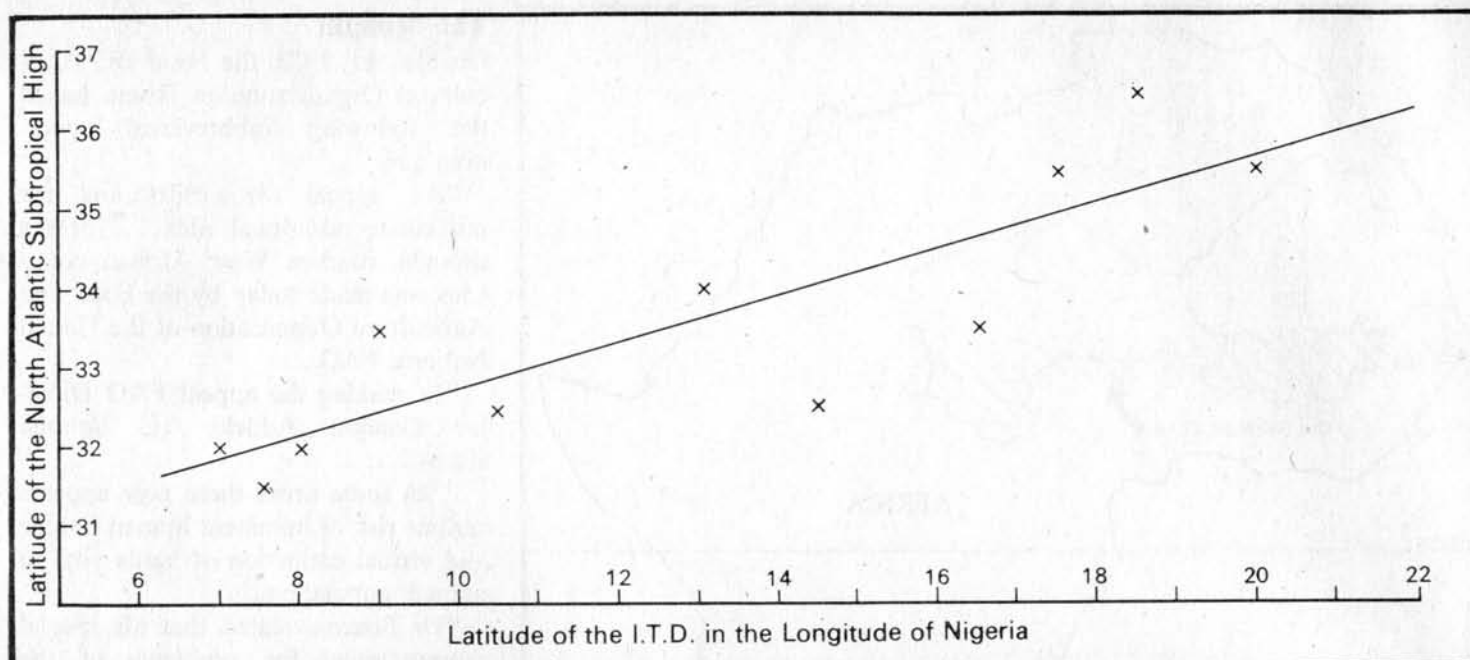


Figure 2: The latitude of the subtropical anticyclones in the North Atlantic versus the latitude of the Intertropical Discontinuity in the longitude of Nigeria.

30 per cent of the expected harvest; Chinese newspapers spoke openly of drought and famine.

In the Americas, drought ravaged the Central American maize and Mexico lay in the throes of a drought. In all the monsoon lands the story was similar, as well as in the lands with the monsoon-like climates. The monsoon rains had failed in 1972, but in West Africa the failure was the fifth in a row. What perversity of nature had withheld the life-giving rains in the most hunger-ridden part of the world? Or was it entirely nature?

The monsoon rains

The rains of the Sahelian zone come in summer, when they do come, in common with most regions just south of the subtropical deserts. They are seasonal northward extensions of the tropical rains. During the monsoon, moist air from the equatorial seas enters the continents, replacing the dry, subsident air of the subtropical anticyclones. This occurs when the anticyclones move poleward in summer.

Usually there is a sharp change in the moisture content of the air at the advancing edge of the moist monsoon airstream, which is often called the intertropical discontinuity (ITD) because the origin of the moist air may be traced to the tropics of the opposite hemisphere. In the monsoon regions of the world, the rains occur on the equatorward side of the discontinuity. In West Africa, the monsoon rains increase steadily southward from the position of the ITD for about 800 kilometres, and the length of the rainy

season is proportional to the length of time that the ITD lies north of a place. The deeper and longer the penetration of the moist air the greater the monsoon rain. North of the ITD there is no rain.

Now the latitude of the ITD in West Africa appears to be related to the latitude of the subtropical anticyclone. When the anticyclone is far south in winter, so is the ITD, and when one is far north, so is the other (Fig. 2). Year by year, the relationship appears to be true, also, though the data is hard to come by and complicated by other factors. There are some interactions between the pattern of pressure waves in the middle latitude westerlies and the monsoon rains, also, but the dominant relationship is that between the subtropical anticyclones and the ITD. The controls on the latitude of the ITD are a central issue because, as Ilesanmi (1971) has shown, a displacement of one degree in the latitude of the ITD results in a change of seven inches in the annual precipitation in northern Nigeria. When the usual annual total is marginal for food production, a reduction of seven inches is catastrophic! Yet that kind of catastrophic decrease is what has happened all across Sahelia since 1957, according to Winstanley's data (1973).

"In some areas there now appears serious risk of imminent human famine and virtual extinction of herds vital to nomad populations."

Monsoon rains and hemispheric wind patterns

Many years ago, studying the rather sudden onset of the summer rains in the south-western United States, I found that the northward extension of tropical rains up the Sierra Madre Occidentale of Mexico and into the American south-west was associated with the concomitant northward shift of the eastern Pacific anticyclone (Bryson and Lowry, 1955). These rains are monsoon-like in character, occurring with a change from dry to humid air. This fact is recognised in the old Zuni proverb: "When the scalp locks on the wall of the Kiva feel moist, the rains will come." The hygroscopic hair on the cool, underground wall metered the advent of moist air. If the anticyclone doesn't move north, the tropical rains do not move north. This relation is complicated a little by the fact that when the anticyclones are unusually far south, the trough pattern between them also appears to change and there is more rain than one would expect on the basis of the latitude of the anticyclones alone.

In India, the monsoon onset has been found to follow the shift of the jet stream to the north of the Himalayas (Yin, 1949). This is equivalent to saying that the anticyclones have shifted, for the jet-stream is near the southern edge of the westerlies and the subtropical anticyclones are at that southern edge. Indeed, there is even a significant correlation between the position of the ITD in India (the penetration of the monsoon) and the

latitude of the North Atlantic anticyclone. This is hardly surprising, for the subtropical anticyclone belt is an integral component of the hemisphere wide atmospheric circulation system.

The "Z Criterion"

Some years ago, Fultz (1961) found that he could distinguish two clearly different circulation regimes in his laboratory simulations of the atmosphere. Working with a rotating circular tank of water in which he could produce the equivalent of an equator-to-pole temperature gradient, he found that with small temperature gradients and small rotation rates he produced a direct, vertical cellular circulation. This "convective" type of vertical circulation regime is now widely called a "Hadley regime" because of Hadley's description of it in 1735 (though Halley had hinted at it four decades earlier).

With higher rotation rates and stronger temperature gradients, Fultz found meandering lateral circulations very much like those seen on upper air charts of the polar and mid-latitude regions, and a weaker Hadley circulation. This meandering type of circulation is now called the "Rossby regime" because of Rossby's extensive discussion of it in the late 1940's and early 1950's (though it was described a century earlier by Dove).

Now one can reason that low rotation rates of the earth's surface about the vertical are characteristic of the tropics, and the Hadley regime should be found there, with rising motion in equatorial regions and sinking motion in subtropical latitude. This is observed. High rotation rates are found at higher latitudes, and the Rossby regime is found there. The equator-to-pole temperature gradient is minimal in summer, thus the Hadley regime should extend to higher latitudes in summer than in winter, and this is also observed.

One would expect that the descending branch of the Hadley circulation would thus be found at the equatorward edge of the westerlies of the Rossby regime, moving poleward in summer and equatorward in winter, and such is observed. For dynamical reasons this sinking branch must be associated with high pressure and anticyclonic motion. It produces the major deserts of the world.

In autumn when the equator-to-pole temperature gradient is the same as it

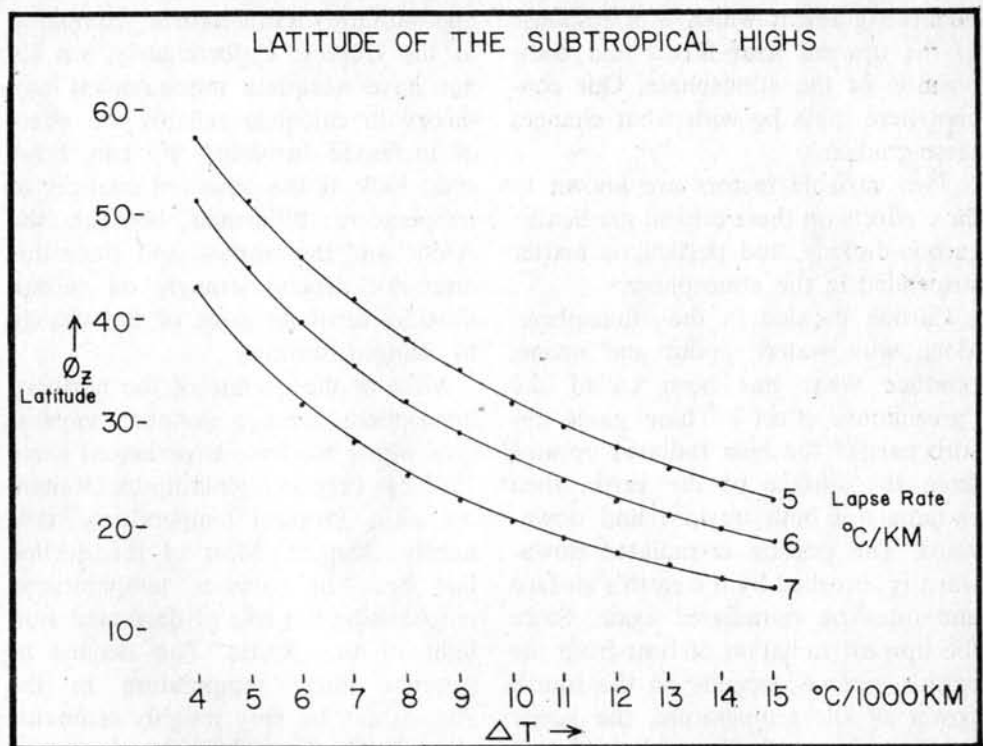


Figure 3: The approximate latitude of the subtropical anticyclones, estimated from Smagorinsky's Z criterion, as it depends on the north-south temperature gradient, ΔT and the vertical temperature gradient (lapse rate)

is in spring, the subtropical anticyclones, which represent this sinking portion of the Hadley circulation, are found farther north than in spring. A meteorologist would argue that this is due to a greater static stability of the atmosphere in autumn, i.e., the temperature difference between the earth's surface and the air aloft is smaller in autumn than in spring.

All of this summed up says that desert-making climates should be farther south, displacing the monsoons when the equator-to-pole and surface-to-upper-air temperature differences are greater. This was quantified on theoretical grounds by Smagorinsky in 1963. He developed what is called the "Z criterion" which can be viewed as an estimate of the latitude of transition from the Rossby regime to the Hadley regime, i.e., the latitude of the subtropical anticyclones, and in turn the desert climates. This is summarised in Figure 3.

According to *Newsweek* (4 June 1973) Mourtada Diallo, a regional director of the United Nations Economic Commission for Africa, said "If the problem is not solved in two months, nearly six million people may die." During June the estimate rose dramatically.

The striking feature of Figure 3 is the sensitivity of the sub-tropical anticyclone latitude to really quite small changes in the world distribution of temperature. We can add one more link to the chain of relations, however. Ilesanmi's data for northern Nigeria (op. cit.) shows that one degree latitude change in the position of the ITD is adequate to explain the Sahelian drought. If we compare the monthly position of the ITD in Nigeria with the monthly position of the North Atlantic subtropical anticyclone, we find that one degree change in the ITD position means only one-third of a degree change in the position of the high—35 km. This is an almost unobservable change! Figure 3 shows that, for summer, this one-third of a degree change can be brought about by a decline of Arctic temperatures of about 0.3°C or an increase of upward temperature gradient of 0.06°C/km . Arctic temperatures have declined compared to tropical temperatures, and what data we have so far indicates that the magnitude of the decline is quite adequate to produce the Sahelian effect.

Nature and/or man?

There is a natural equator-to-pole temperature gradient, resulting from the response of the spheroidal earth/atmosphere system to solar radiation. There is also a natural vertical tem-

perature gradient which is a response to the upward heat fluxes and composition of the atmosphere. Our concern here must be with what changes these gradients.

Two variable factors are known to have effects on these critical gradients: carbon-dioxide, and particulate matter suspended in the atmosphere.

Carbon dioxide in the atmosphere, along with water vapour and ozone, produce what has been called the "greenhouse effect". These gases absorb part of the heat radiated upward from the surface of the earth, then re-radiate it both upward and downward. The portion re-radiated downward is absorbed by the earth's surface and must be re-radiated again. Since the upward radiation of heat from the earth's surface depends on the fourth power of the temperature, the larger the "greenhouse" absorption of terrestrial radiation, the higher the surface temperature—but not the temperature aloft. Thus, not only does increased carbon dioxide in the atmosphere increase the surface temperature of the earth, but the vertical temperature gradient as well (Manabe and Wetherald, 1967).

The carbon dioxide content of the atmosphere has increased over the past century, largely from the burning of fossil fuels, and appears to be growing at an increasing rate. The calculated increase of temperature at the earth's surface as a result of this increase in carbon dioxide is on the order of 0.1°C since 1940. If the effect is assumed to be nil at a height of 3 km, then the latitude of the subtropical highs should have moved equatorward by about 15 km and the northern Nigerian rains (perhaps all Sahelian rains) decreased by three inches or so. If so, this decline can be directly attributed to air pollution—man, not nature.

Particulate material suspended in the atmosphere (turbidity) reduces the intensity of sunlight (Bryson, 1972; Reitan, 1971). According to Machta (1972), most of the increase of particulate matter has been at higher latitudes, as shown by the reduced intensity of sunlight at the stations for which data were summarised by Budyko (1969). Even if the increase were uniform, however, the longer path length of the sunlight passing through the higher latitude atmosphere would yield a greater reduction of sun intensity there than in the tropics. This should reduce

high-latitude temperatures compared to the tropics. Unfortunately, we do not have adequate measurement and theory to calculate reliably the effect of increased turbidity. We can, however, look at the observed changes of temperature difference between the Arctic and the tropics, and since this does not depend strongly on carbon dioxide, attribute most of the change to changed turbidity.

Most of the decline of the northern hemisphere average surface temperature which we have experienced since 1945 has been in high latitudes (Reitan, op. cit.). Tropical temperatures have hardly changed. Most of the decline has been in summer temperatures, emphasising the role of decreased sunlight in the Arctic. The decline of summer mean temperature in the Arctic may be very roughly estimated at 0.5°C , thus giving an increased equator-to-pole temperature gradient of 0.1°C or so per 100 km. This, according to Figure 3, would however lower the latitude of the subtropical highs and deserts by somewhat over half a degree and decrease the northern Nigerian rainfall by 10–14 inches.

What part of this turbidity contribution to the Sahelian drought and the suppression of the monsoons in general can be attributed to man made pollution depends on the relative contributions of human and non human factors to the production of the particulates. My own analysis suggests that over the past century about 17 per cent of the temperature variance created by turbidity has been due to agricultural, industrial and other human activities. However, it appears that in recent decades the human contribution has been closer to 30 per cent or so, the remainder being largely due to volcanic activity (Bryson 1972).

It seems rather ironic that during the

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past five years, while drought afflicted the Sahelian zone, the scientific discussion about the climatic effects of carbon dioxide and turbidity has centred on whether one would make the earth warmer or the other make it cooler. There was even the suggestion that neither was important because the two effects would balance. If the analysis in these pages is correct, this either/or argument become irrelevant, for increased carbon dioxide and increased turbidity *both* act to suppress the monsoons of the world!

The future of the monsoon lands

If my analysis of the situation is correct, an unpleasant view of the future unfolds.

Prior to 1920 or so there was much more volcanic activity than in the 1920–1950 period. The subtropical anticyclones should have been at lower latitude and drought should have been more frequent in the monsoon lands. The North Pacific anticyclones is the only one for which I have data, but in the 1899–1918 period its summer latitude was 1–1.5 degrees lower than in 1919–1939. Occasions with only half the normal rainfall were half again as frequent in India in the period before 1918. The drought in Sahelia is said to be the worst in 60 years, i.e. since 1913.

Now the carbon dioxide is increasing rapidly to exacerbate the suppression of the monsoon, volcanoes are once more active, and a more-than-doubled human population—rapidly industrialising—provides a "human volcano" source of turbidity.

Will mankind give up burning fossil fuels to aid the people of the monsoon lands? No way!

Will the volcanoes please settle down? Probably not, since they were unusually quiet from 1920–1955.

Will mankind go easy on particulate air pollution by careful pollution controls on factories, slow, careful construction, dust-free agriculture (including no slash-and-burn)? Even the monsoon land nations resist this strongly.

Will the monsoon return? Probably not regularly in this century.

In terms of feeding a rapidly growing population, the present climatic trend is a central fact. In the perspective of history, however, it is not something unusual. What seems to be unusual is what we think of as normal climate. Figure 4 shows the course of

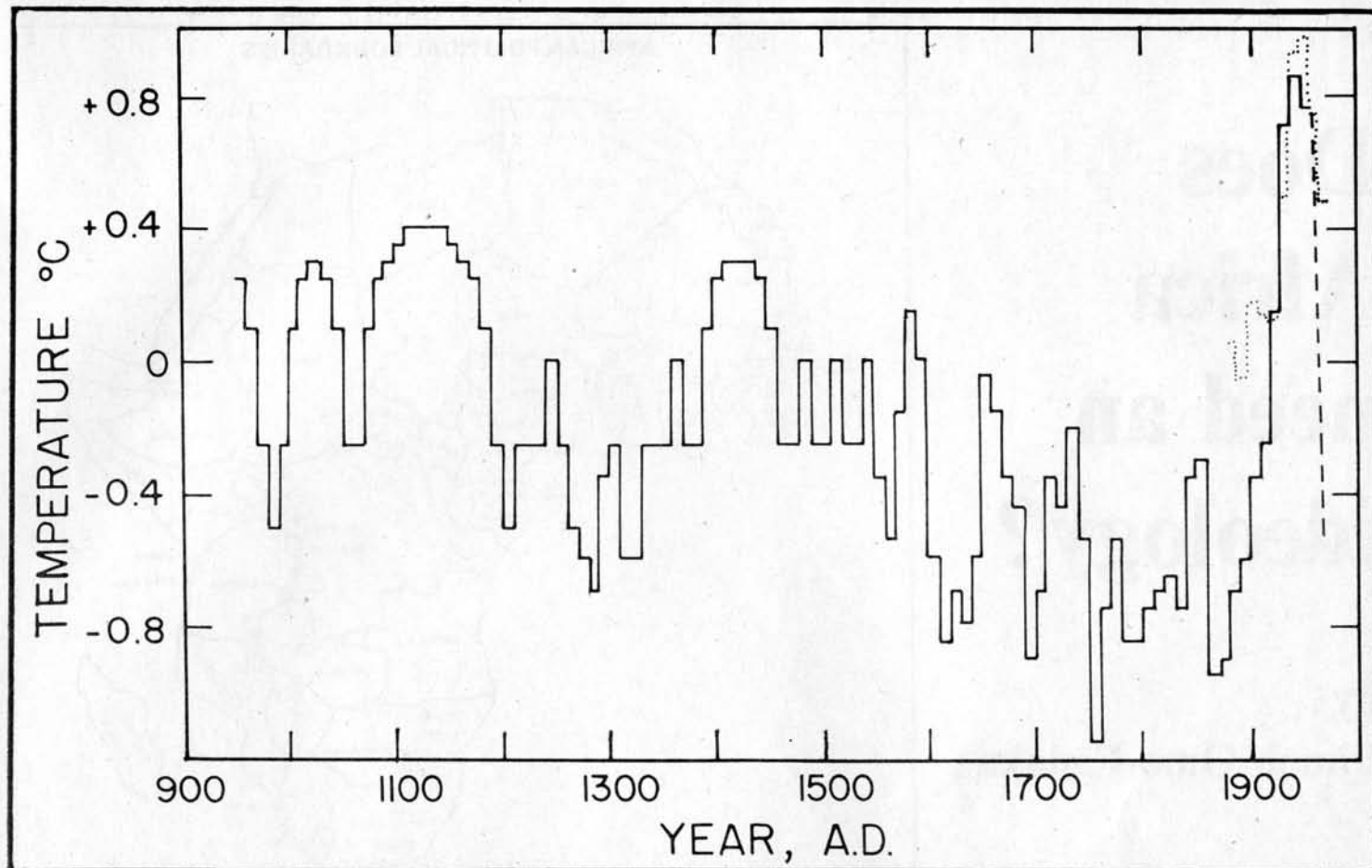


Figure 4: Mean annual temperature in Iceland over the past millenium (after Bergthorsson). The dashed line indicates the rate of temperature decline in the 1961-1971 period, and the dotted line shows the variation of northern hemisphere mean temperature plotted to the same scale.

mean annual temperature in Iceland as reconstructed by Bergthorsson (1962). To be sure, Iceland is a rather small country, but it is quite representative of the critical region of main Arctic cooling and warming. The figure shows that the period designated as normal by international agreement, 1930-1960, is the most unusual period in the last millenium. This is a period during which the population of the earth nearly doubled, during which most of the readily arable land was occupied, and during which industrialisation became worldwide. We have become "locked in" to that climate which seems to have been a brief interruption of the "Little Ice Age" of the preceding three centuries. When the earth entered that period between A.D. 1450 and 1600, the Mali Empire collapsed and the magnificent Indian city at Fatehpur Sikri was abandoned as its water supply failed. Do such events lie ahead?

Our climatic data for the Sahelian Zone is rather scanty and our knowledge of the dynamics of the monsoons inadequate. The inter-action of the westerly troughs and the monsoon, mentioned by Winstanley (op. cit.) may perturb the equatorward march of the subtropical deserts. Let us hope so.

But aided by the hindsight of climatic history and climatological science let us not assume that the Sahelian drought must soon end as the region returns to an unlikely "normal."

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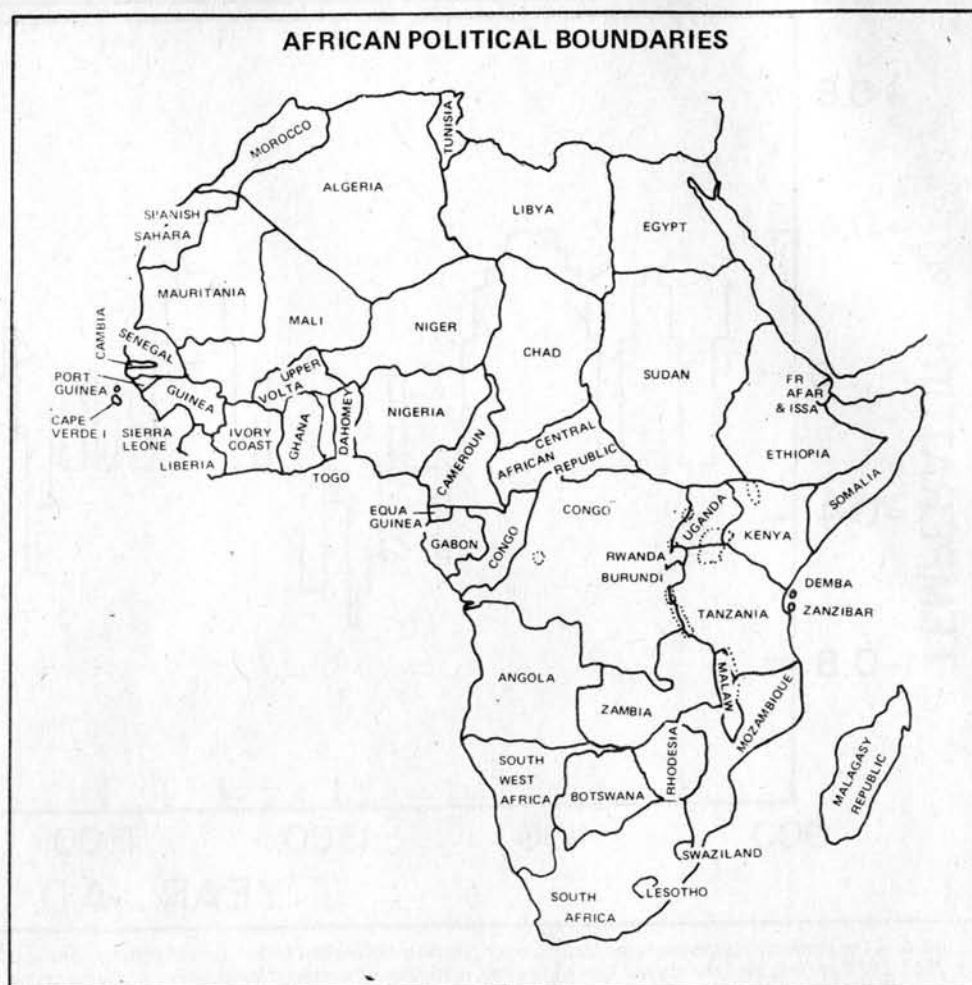
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Does Africa need an ideology?

by
Jimoh Omo-Fadaka



The African nations of today are new, not only because most of them have only recently emerged from colonial rule, but also because they do not correspond to traditional social groupings. Their history as nation states for all practical purposes began with colonialism and their first cultural influences were Islam and Christianity. These have been profound experiences, and have modified traditional value systems and social economic organisations throughout Africa.

"Modern" African societies are poor because they are in a state of social and economic disequilibrium. Poverty, which we are beginning to realise is more than material deprivation (or else there would be no

poverty in America) is possibly above all social and ideological deprivation, and from these modern African nations undoubtedly suffer.

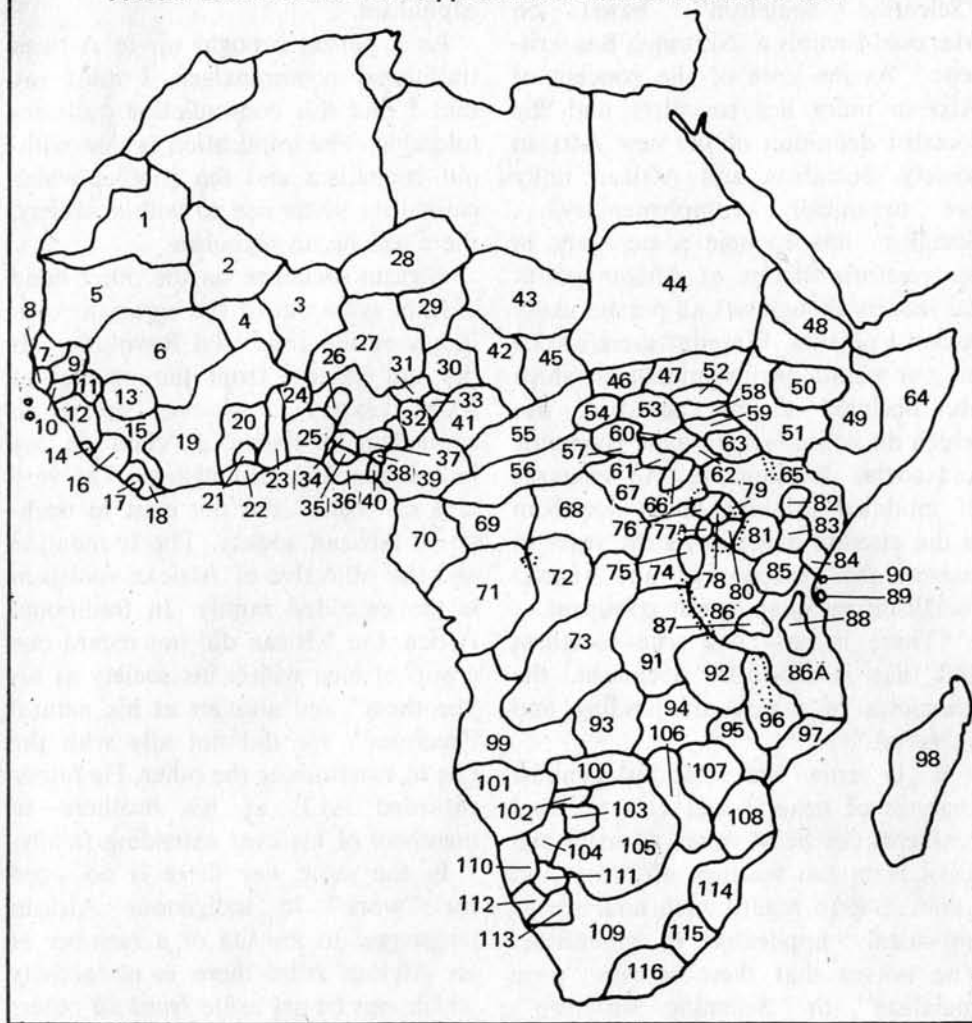
Frantz Fanon was probably right when he observed, "For my part, the deeper I enter into the cultures and the political circles of Africa, the surer I become that the great danger that threatens Africa is the absence of Ideology."¹

When there is cultural contact between a traditional society and a modern industrial one, the tendency is for the former to be profoundly affected, often to the point of disintegration. Then a reaction sets in, often via some Messianic movement and a new equilibrium position is eventually reached—one which incorporates that part of the old value system that can be reconciled with the

realities of the situation. The process is dialectic.

The inevitability of this change is felt by all. Most would call it "progress". However, unless one can clearly define the ultimate goal of social development, this term has very little meaning. Some African political leaders and writers believe that only socialism can ensure economic independence, which, in turn, is the only way to solve the problem of "under-development". Socialism however is a very loose term. The type of socialism we have seen in modern European states may not be appropriate. There has been much discussion on the form it might take in Africa. Terms like "Negritude", "Scientific Socialism" and "African Socialism" have been much in evidence in this context.

African Ethnic Boundaries (approximations) South of the Sahara



- 1 Maure-Arab of Berber origin
- 2 Arab (non-Berber origin)
- 3 Peul
- 4 Toucouler
- 5 Bambara
- 6 Tuareg
- 7 Fula
- 8 Wolof
- 9 Jola, Serere and Aku
- 10 Balante
- 11 Mandjak
- 12 Temne, Mende and Limba
- 13 Malinke
- 14 Creole (Descendants of freed slaves)
- 15 Mandingo
- 16 Mende Tan; Mande Fu and Via
- 17 Creole (Americo-Liberian, descendants of freed slaves)

- 18 Kru
- 19 Mossi
- 20 Konkomba, Frafra, Kassena, Nankami, Tampolense and Vagala
- 21 Fanti, Ga and Akan
- 22 Ashanti
- 23 Ewe
- 24 Fon
- 25 Yoruba
- 26 Nupe
- 27 Hausa
- 28 Djerma
- 29 Desert (uninhabited)
- 30 Kanuri
- 31 Hausa-Fulani
- 32 Fulani;
- 32A Tiv and Birom;
- 32B Others (mixed) negroid
- 33 Others (mixed) negroid
- 34 Edo (Bini)
- 35 Urhobo

- 36 Ijaw
- 37 Ibo
- 38 Efik
- 39 Dubi
- 40 Ibibio
- 41 Lari
- 42 Others (mixed) negroid
- 43 Arabs (mixed blood African-Arab)
- 44 Arab
- 45 Others (mixed) negroid
- 46 Bagara
- 47 Nuba, Shaluk and Dinka
- 48 Eritrean
- 49 Tigrean
- 50 Amhara
- 51 Mundari and Lutoko
- 52 Nuer
- 53 Dinka
- 53 Fertit
- 55 Banda, Bongo, Moru
- 56 Baya
- 57 Zande
- 58 Lau
- 59 Murle
- 60 Bari
- 61 Kakwa
- 62 Latuka
- 63 Toposa
- 64 Somali
- 65 Luha, Kipsigi and Nandi
- 66 Madi
- 67 Ba-Mongo
- 68 Others (mixed) negroid
- 69 Fang Okak
- 70 Fang
- 71 Ba-Kongo
- 72 Ba-Yeke
- 73 Ba-Lunda
- 74 Lugbara, Itesots, Karamajong, Sebei
- 75 Bahutu, Batusi and Batwa Pygmy
- 76 Banganda
- 77 Banyoro
- 78 Bantoro and Banyakole
- 79 Alur, Acholi, Lango, Badhola and Labour
- 80 Lake Victoria
- 81 Luo
- 82 Kalenjin
- 83 Kikuyu
- 84 Kamba
- 85 Masai
- 86 Others (mixed) negroid
- 86A Others (mixed) negroid
- 87 Wagogo
- 88 Sukuma
- 89 Arabs, Wapemba, Watumbata, Wahadimu and Afro-Shirazi
- 90 Ditto
- 91 Ba-Luba
- 92 Bemba
- 93 Lozi
- 94 Others (mixed) negroid
- 95 Ditto
- 96 Ditto
- 97 Ditto
- 98 Malay, Polynesian, Arab, Afro-Shirazi
- 99 Others (mixed) negroid
- 100 Okanavo
- 101 Ovambo
- 102 Others (mixed) negroid
- 103 Bushman
- 104 Herero
- 105 Tswana
- 106 Matebele
- 107 Others (mixed) negroid
- 108 Mashona
- 109 Venda, Pedi, Thonga and Swazi
- 110 Damara
- 111 Rehoboth
- 112 Desert (uninhabited)
- 113 Nama (Hottentots)
- 114 Zulu
- 115 Sotho
- 116 Xhosa

African personality

Leopold Seda Senghor, President of Senegal, is a poet and also a socialist. Though he favours the notion of a return to African traditional communalism, he nevertheless insists that the "positive contributions" of colonial rule be retained. In this category he includes centralisation of political infrastructure, and the French educational system. Needless to say, these reflect the socio-political philosophy of France, not of traditional Senegal. This

is incompatible with communalism, and just how he can reconcile such divergent goals is impossible to imagine.

Senghor's plan to refashion African society is based on his view of the African's personality which he considers to be different from that of other people's. For him, the African is a "field of pure sensation". He does not measure nor observe, but "lives" a situation. This way of acquiring "knowledge" by intuition he regards as speci-

fically "Negro-African". It is the main feature of "Negritude". It is diametrically opposed to the "Hellenic" means of acquiring knowledge, which is by reason. In his book *African Socialism*² he suggests that we "consider the Negro African as he faces the other"; by which he means the rest of nature: "God, man, animal, tree or pebble, natural or social phenomenon."

"In contrast to the classic European, the Negro-African does not draw a line between himself and the object, he does not hold it at a distance, nor does he merely look and analyse it. After holding it at a distance, after scanning it without analysing it, he takes it, vibrant in his hands, careful not to kill or fix it. He touches it, feels it, smells it. The Negro-African is like one of those third day worms, a pure field of sensations. . . . Thus the Negro-African sympathises, abandons his personality to become identified with the OTHER. He does not assimilate, he is assimilated. He lives a common life with the OTHER. He lives in symbiosis."

Senghor's admiration for French culture and his belief in "*la mission civilisatrice française*" have led him to misinterpret the European personality. The European's knowledge is obtained by the same intuitive process as the African's. The culture of industrial man is made up of a set of beliefs, values, and rituals that are as subjective as those of any African tribe.

Another of Senghor's illusions is that science is capable of providing man with a viable cultural behaviour pattern. This would only be true if behaviour were determined by one's conscious knowledge—knowledge obtained in universities, during adolescence and adulthood. We know that this is not the case. Such knowledge influences but the particularities of one's behaviour. It is knowledge obtained in childhood which determines its generalities, and such knowledge is part of a Society's traditional cultural heritage; it is this knowledge which transmitted from generation to generation ensures society's continuity. That is why, as Goldsmith says, "there is no substitute for the traditional society".³

Scientific socialism

Then there are African leaders like the ex-President Kwame Nkrumah of Ghana, who regard Socialism as an international ideology and who main-

tain that there is only one true form, "Scientific Socialism", based on Marxism-Leninism. Nkrumah has written: "At the core of the concept of African unity lies socialism and the socialist definition of the new African society. Socialism and African unity are organically complementary. . . . Socialism has become a necessity in the platform diction of African political leaders though not all pursue really socialist policies. We must therefore be on our guard against measures which are declared to be 'socialist', but which do not in fact promote economic and social development. An example of muddled thinking about socialism is the attempt made in recent years to suggest the existence of an 'African socialism' peculiar to our continent."

"There is only one true socialism and that is Scientific Socialism, the principles of which are abiding and universal."⁴

It is true that Marxist-Leninist analyses of general and also of local problems can be of value. Africans can learn from the writings of Marx and Lenin. But to regard such analyses as universally applicable is unrealistic. The notion that there is one "pure socialism", or "Scientific Socialism", for which the recipe is already known is, to say the least, simplistic.

As Nkrumah himself admits, socialism in Africa should be "in keeping with the humanist and egalitarian spirit which characterised traditional African society, though it must be applied in a modern context".⁵ But the analysis and solution of the Communist Manifesto are incompatible with the communalism of traditional African society.

Secondly, the Scientific Socialists insist on analysing everything in terms of the class struggle.⁶ Marxist socialism is the product of the agrarian revolution in Europe and the Industrial Revolution which followed it. The agrarian revolution gave rise to the "landed" and the "landless" classes in society, and its apostles sanctified the conflict itself into a philosophy, the "class struggle", which became the basis of a whole way of life. Henceforth the European socialists could not think of

There is no equivalent for the word "class" in any indigenous African language. The very idea of "class" did not exist in traditional African society.

their socialism without its father—capitalism.

As a person brought up in African traditional communalism, I must say that I find this contradiction quite intolerable. The implication is that without capitalism and the conflict which capitalism gives rise to within society, there can be no socialism.

African socialism on the other hand did not grow out of the agrarian revolution or the Industrial Revolution. It did not emerge from the conflict of social "classes" in society. There is no equivalent for the word "class" in any indigenous African language. The very idea of "class" did not exist in traditional African society. The foundation and the objective of African socialism is the extended family. In traditional Africa, the African did not regard one group of men within his society as his "brothers" and another as his natural "enemies". He did not ally with the one to exterminate the other. He rather regarded ALL as his brothers—as members of his ever extending family.

In the same way there is no word for "work" in indigenous African languages. In the life of a member of an African tribe there is no activity which can be set aside from all others and regarded as constituting "work" as against "leisure". Everything that a man did in the course of a day was relevant to his personal, family and social life, which is no longer obviously so in a large scale capitalist economy.

In the same way, if there is no word for "work", there can be no word for "unemployment". Also, the notion of a "proletariat" is even more alien to African tradition. To try and interpret African society in terms of this set of variables borrowed from a totally different social system, that of semi-industrialised Europe of the 19th century, is quite preposterous.

Africans do not need to be "converted" to socialism, any more than they need to be "taught" democracy. Both are rooted in their past—in traditional society. What is required of modern African socialism is the recognition that it can draw from its traditional heritage, and regard society as an extension of the basic family unit.

Thirdly, the advocates of Scientific Socialism say, and quite rightly too, that African states of today are not traditional, that is communalistic. In acknowledging the disequilibrium between what was and what is in terms

of African societies, they attribute the differences to the importation of European colonialism. However, they hold the view that the defeat of colonialism and neo-colonialism will not result in the automatic disappearance of the imported patterns of thought and social organisations, and that these patterns have taken roots and are in varying degrees basic features of contemporary African society. They say that Africa is faced with contemporary problems which have arisen from political subjugation, economic exploitation, educational and social backwardness, increased population, familiarity with the methods and products of industry and modern agricultural techniques. These, as well as a host of other complexities, in their opinion, cannot be resolved by returning to a communalistic society, and anyone advocating such a return must be caught in insoluble dilemmas of the most excruciating kind.

Strong central governments

For them the way out is to defeat colonialism and neo-colonialism and then build up monolithic states with a strong central, bureaucratic and authoritarian government. This they feel is necessary because they argue that post-colonial African societies cannot function on their own without the requirements of strong central governmental cement to hold them together. The aim of the Scientific Socialists is to build up a state by the development of a single culture out of the diverse cultures of the various ethnic groups that make up an African state; or in the last resort to create a unitary state by force.

In the first place, a state must have executive authority and this authority must come voluntarily from the various communities or ethnic groups within a country. It cannot be based solely on centralised authority. It was in the struggle to break the grip of colonial rule that most African ethnic groups learnt the need for unity. The nationalist leaders claimed to speak on behalf of all the ethnic groups in their countries. But have the various ethnic groups always stood together since independence?

The reaction has often been "NO", we are not Nigerians, but Yoruba, Ibo, Hausa, Bini; not Kenyans, but Kikuyu, Luo; not Ugandan, but Baganda, Acholi; not Burundians, but Hutu, Tutsi, etc. Where the official policy is

In Africa any society that does not take into account the fact that the loyalty of any African is first to his ethnic group, next to his region of origin and only finally to the nation state is likely to be unstable.

one of levelling out and ignoring ethnic diversity the reaction often is: "We must see to it that our identity is not ploughed under and sacrificed to a merely formal unity."

Since independence the governments of many of the countries have found difficulty in maintaining their authority. Why? The answer is very simple. The continent remains marked by frontiers imposed often arbitrarily during the colonial period. They do not correspond to Africa's natural landscape of language, culture and traditions.

Many countries do not possess a dominant indigenous political culture, and the successors of the colonial administrators do not constitute a coherent political class or a national one. Consequently they find difficulty in establishing a secure system which commands respect. Except where there is a dominant culture as in Somalia, Morocco, Egypt, Algeria, Tunisia or an association of relatively small tribes as in Tanzania, the political climate is one of instability and the political leaders expend a great deal of their energy and resources simply to maintain a semblance of unity.

Most of the parties are organised on ethnic lines, which means that they are not parties in the European sense of the term. Government by compromise is impossible in such conditions. Also the absence of a common language is a serious handicap.

The irony of the situation is that although opposition parties have usually been banned, and governments centralised into one party states, and although force has often been resorted to, such actions have not ensured instant acceptance of authority. Many of the governments are weak because their authority is not based on the traditional loyalty of a unified people.

The analysis and solution of the Communist Manifesto are incompatible with the communalism of traditional African society.

People's loyalties in these countries are still first and foremost to their ethnic groups. In spite of having been members of centralised states for long periods and in spite of having been subjected to ever-increasing propaganda against tribalism and in favour of national states, particularistic sentiments are still undiminished. The people do not want to be simply "faces in a crowd"—alienated, anonymous members of a family, a village, a clan, a tribe. In Africa any society that does not take into account the fact that the loyalty of any African is first to his ethnic group, next to his region of origin and only finally to the nation state is likely to be unstable.

Political instability is inherent to the artificial centralised nations which do not correspond to real nations but to random assemblages of totally distinct ones. Throughout the continent, this is leading to endless civil strife, as different nations try to break away from states into which they have been arbitrarily merged, and seek to join up with countries with which they have more in common, or alternatively to seek their own independence.

Unity via disunity

Indeed no one national group cherishes the idea of being ruled by the other. It is clear that if political stability is to be achieved, the different ethnic groups should be allowed to develop separately without fear of political domination of one section by the other. There is no way of removing this fear other than by granting them political autonomy. If the present leaders in Africa want "unity" or "union" they must have "disunity" or "disunion" first. Once this fear is removed, full economic, social, cultural and military co-operation could lead to that unity which so far has eluded nearly all African states.

"A nation cannot be created by the edict of a politician any more than by the pen of a lawyer nor for that matter by the barrel of a gun. It can only be the product of slow and gradual evolution". Even if it could, it is plain commonsense that the most lasting associations must be those freely entered into rather than those enforced from a position of strength. Not until this essential and inescapable fact is understood is peace likely to be restored to our continent.

Finally, some African leaders,

prominent among whom are Presidents Nwalemu Julius K Nyerere of Tanzania, Kenneth Kaunda of Zambia; Amilcar Cabral, founder and Secretary-General of the Guinean Liberation movement, Partido Africano da Independencia da Guine e Cabo Verde (PAIGC) of Portuguese Guinea and the late Eduardo Chivambo Mondlane, President of the Mozambique Liberation Front, Frente Libertação de Mocambique (FRELIMO), have accepted the view that traditional African societies were communalistic. They want to revive the philosophy of co-operation in production and sharing in distribution which was an essential part of traditional African society.

Their literature on African socialism, like those of the Scientific Socialists, suggests that today's African societies are no longer communalistic. Like the Scientific Socialists, the African Socialists also blame European Colonialism, noting that although Africans have got rid of foreign governments, they have not yet rid themselves of the individualistic attitude they learned from them.

African socialism

The African Socialists do not believe that the transformation of society should be by State initiative alone. They do not believe in a highly-centralised government. As President Nyerere has said: "This is a technological age, and many decisions cannot be taken directly by the masses. Tremendous responsibilities therefore rest upon those of us who have the privilege to higher education. We have been educated out of the resources of the people. Now we have, on their behalf, to deal with complex administrative and technical matters, and to make choices which affect their welfare. We have the responsibility to give advice to the people on issues where the implications may not be clear. All these things we must do to the best of our ability. But we must recognise too that our function is to serve, to guide the masses through the complexities of modern technology—to propose, to explain, and to persuade. For our education does not give us the right over the people. It does not justify arrogance, nor attitudes of superiority.

"The justification for bureaucracies, for industries, or for universities is the greater well-being of the human beings who constitute the society. And unless

we who have power—whether it be political or technical—remain at one with the masses, then we cannot serve them."

African Socialists are opposed to a mass society. All the various communities or ethnic groups should be allowed to develop independently. Local communities could join with others and co-operate in matters of common interest.

On ethnic unity, Amilcar Cabral has written: "...we consider that there are many more contradictions between what you might call the economic tribes in the capitalist countries than there are between the ethnic tribes of Guinea. Our struggle for national liberation and the work done by our Party have shown that this contradiction is really not so important; the Portuguese counted on it a lot, but as soon as we organised the liberation struggle properly, the contradiction between the tribes proved to be a feeble, secondary contradiction; we reject both the positions which are to be found in Africa—one which says: there are no tribes, we are all the same, we are all one people in one terrible unity, our Party comprises everybody; the other saying: tribes exist, we must base parties on tribes. Our position lies between the two, but at the same time we are fully conscious that this is a problem which must constantly be kept in mind; structural, organisational and other measures must be taken to ensure that this contradiction does not explode and become a more important contradiction."

PAIGC, under the leadership of Cabral, has liberated half of the country from the Portuguese rule and is the effective government in these areas. According to Richard Gibson: "...PAIGC was solidly in control of at least 50 per cent of the country and militarily dominant in another 10 per cent."

Finally it is the view of the advocates of African Socialism that what Africa needs is a society in which power is structured organically on the basis of

human relationships, not mechanically on the basis of assumptions about economic growth. They advocate that African societies should embody an increasing number of small, self-reliant human communities, and that if Africa is to survive at all, these small groupings will need to replace the large and highly centralised mass societies which are tending to dominate the continent today.

In this way they hope that there will emerge an African society of innumerable free, democratic, autonomous small scale communities none of them big enough to threaten the peace in their countries, all of them big enough to secure the good things of life for their members.

Today's conflict is between the small society which provides the individual with the optimum social environment and the big one, which forces him to become a member of a massive dehumanised socio-economic machine.

Only those African states will survive which respect the cultural patterns and traditions of the ethnic groups that they include; whose authority is based on them, and whose government is sufficiently decentralised to give them their full expression.

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Jimoh Omo-Fadaka was born and raised in Nigeria. Graduate of London School of Economics and Political Science and the British Institute of Management and Fellow of the Royal Economic Society in London.

Travelled extensively in Africa, now Director of African Cultural Research Project and Associate Editor of the *Ecologist*. Currently writing a book entitled *Traditional Pride, the Only Hope for Africa*.

To try to interpret African society in terms of a set of variables borrowed from a totally different social system, that of semi-industrialised Europe of the 19th century, is quite preposterous.

Development in Africa: The Human Factor

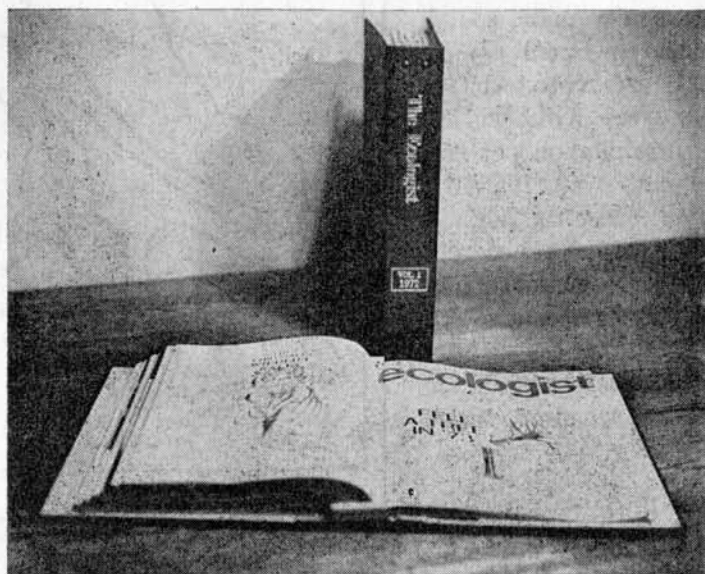
The coming of independence to a new nation means, besides self-government and management of its resources, responsibility for the total welfare of the population as a whole. When options are available, what is the wisest way to development?

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

The problem confronting African countries today is poverty. This poverty is characterised by unemployment, underemployment, illiteracy, malnutrition, diseases and starvation. How is this problem to be solved?

Further information may be obtained from Tim Brooke, General Programme Organiser, Africa Centre, 38 King Street, London WC2E 8JT. Telephone 01-836 1973.

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Acid rains in Scandinavia

by Arild Holt-Jensen

Since the early 1960s the rain and snow falling over Scandinavia has become increasingly acid and the area subjected to this acid precipitation has spread northeastward until now it covers a large part of Sweden and Norway. Scientific opinion in Scandinavia holds that this change in the composition of the precipitation is caused by industrial air pollution originating in northwest Europe, and especially in Britain, and public opinion blames mainly the British.

In Britain, the control of air pollution has been concerned mainly with the reduction of particulate emissions and so the

British view is that efforts to improve the cleanliness of the air have been highly successful.

In this article a Norwegian geographer describes how the acidity of precipitation has changed and the effects it has had, especially on soils that are naturally acid. He explains, too, the arguments that lead him to join with his colleagues in laying the blame on the heavily industrialised regions of northwest Europe—including Britain.

The factual material cited in the article was supplied by the Norwegian Institute for Air Research.

Increasing acidity in precipitation

In the beginning of the 1960's it was first noted that the monthly average concentration of acid and sulphate in precipitation was gradually increasing. The first comprehensive evaluation of these observations was presented by Oden¹, in 1967. By plotting the yearly average values of pH in precipitation on maps of western Europe, he was able to show that a central region with highly acid precipitation was expanding from year to year. This development was accompanied by a parallel trend in the quantity of sulphate ions falling in rain, indicating the increasing use of fossil fuels for heat and energy production. Oden pointed out the effects this would have on the ecological systems, in particular on the biological life in rivers and lakes and on forest growth.

The data collected by the meteorological

stations in western Europe have since been further examined. A statistical evaluation by Persson in 1968² showed a definite trend towards higher concentrations of acidity and sulphate at all stations, except those situated south and west of the main source areas. Results from a recent compilation by Granat³ are reproduced in Fig. 1, where the excess hydrogen ion concentration in precipitation per km² is given for the years 1960, 1965 and 1970. The contour lines for sulphur, corrected for sea salts, give a similar pattern. These results leave little doubt with regard to the general conclusions of Oden; a central area in western Europe with highly acid precipitation has been gradually expanding during the last 15 years.

Sources of the acid precipitation

Eastern Germany emits nearly 5 million tons of SO₂ yearly. This gives perhaps the highest value in Europe per km² and is due to the extensive use of brown coals. Poland and Czechoslovakia also emit considerable

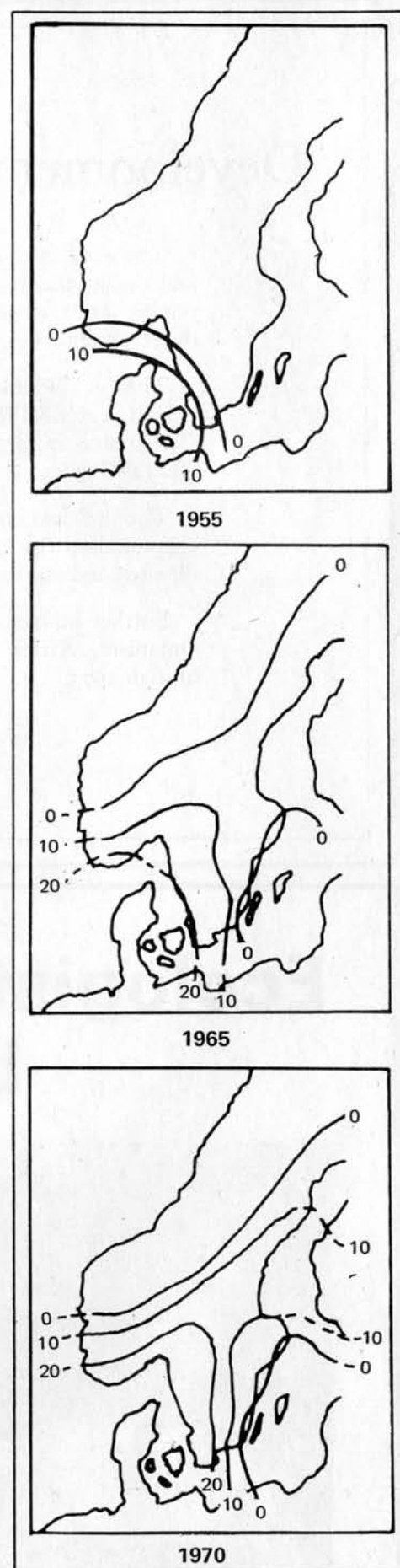


Figure 1
Deposition of excess acid through precipitation during one year, expressed in mg hydrogen ions/m² (3). The figures are average values taken from linear fits to the data.

Dr. Arild Holt-Jensen is a geographer concerned with resources. He works at the Geografisk Institutt, Bergen, Norway, and is a senior lecturer at the University of Bergen.

amounts of SO_2 .

Based on 24-hourly samples of air and precipitation from stations in Sweden and Norway, acid precipitation and/or large amounts of sulphate in the aerosol fraction have been analysed. In each case the material has been traced back to the heavily industrialised areas in Europe. Since November 1971, a meteorological 36-hours' forecasting service has been in daily operation for aircraft sampling. Using forecasted wind trajectories at the 850 mb level, all incidents of acid precipitation in Scandinavia during the last four months have been successfully forecast.

Measurements show that the largest amounts of acidity in precipitation are obtained in a particular type of meteorological situation. First a high pressure situation with ground inversion and low winds causes an accumulation of pollutants in the source area. Later, as the high pressure moves eastwards, the general circulation around the high pressure will start to move the accumulated pollutants. Frequently a low pressure west of the area will speed up this transport. When the air masses hit the Scandinavian area, precipitation will bring down the pollutants. The result is precipitation with a high content of sulphuric acid, and the snow takes on a greyish colour due to soot and fly ash.⁴ Very often, the air masses may pick up their first charge in one area, and then receive a second charge as they pass over another.

The observations indicate that the yearly deposition of sulphuric acid in the Scandinavian area amounts to a 1–2 g concentrated sulphuric acid, $\text{H}_2\text{SO}_4/\text{m}^2$. An analysis of the meteorological situations giving rise to precipitation with high acidity, indicates that this situation occurs 10 to 20 times a year.

A survey of the effects of acid precipitation with special reference to Swedish conditions is given in the United Nation's Conference in 1972, chapter 5.

Soil effects

As pointed out in the Swedish report³, the composition of the soil is the result of a dynamic balance between different processes. Salts and plant nutrients are continuously leached out of the top layer of the soil by precipitation. Part of this material will be absorbed by the roots of the plants and returned to the surface by the litter. The produc-

tion of acids by litter and the extraction of bases by the vegetation leads to a natural acidification of the top soil. These processes, which in the long run would exhaust the supply of nutrients in the soil, are counteracted by other processes; the extraction of bases from the sub-soil and the weathering of rocks, which bring new materials into the system. The result of these processes depends on the type of raw material available for the formation of the soil and the age of the soil. Human activities, the use of fertilisers, forestry harvesting methods, as well as the acidity in precipitation, also result in changes in the dynamic balance of the soil.

Within large parts of central Europe, the lime content of the soils can be as high as 20 per cent, and the thickness

of these soils may range from less than one metre up to several metres. In these areas, the present acidification, according to the report, will be of no importance for at least a century.

The soils in the northern and western part of Europe were formed after the last glacial period and thus are much younger. In this area, the transport of soil materials by ice and water has resulted in soils poor in calcareous materials. Soils in the most extreme acid conditions (podsoils) are common, particularly in the forest areas of Scandinavia. Under these circumstances, the acidity of the precipitation will reduce further the amounts of bases available in the soil.

The Swedish report³ points out that the more sensitive forest soils mainly occur in the southern part of Scandi-

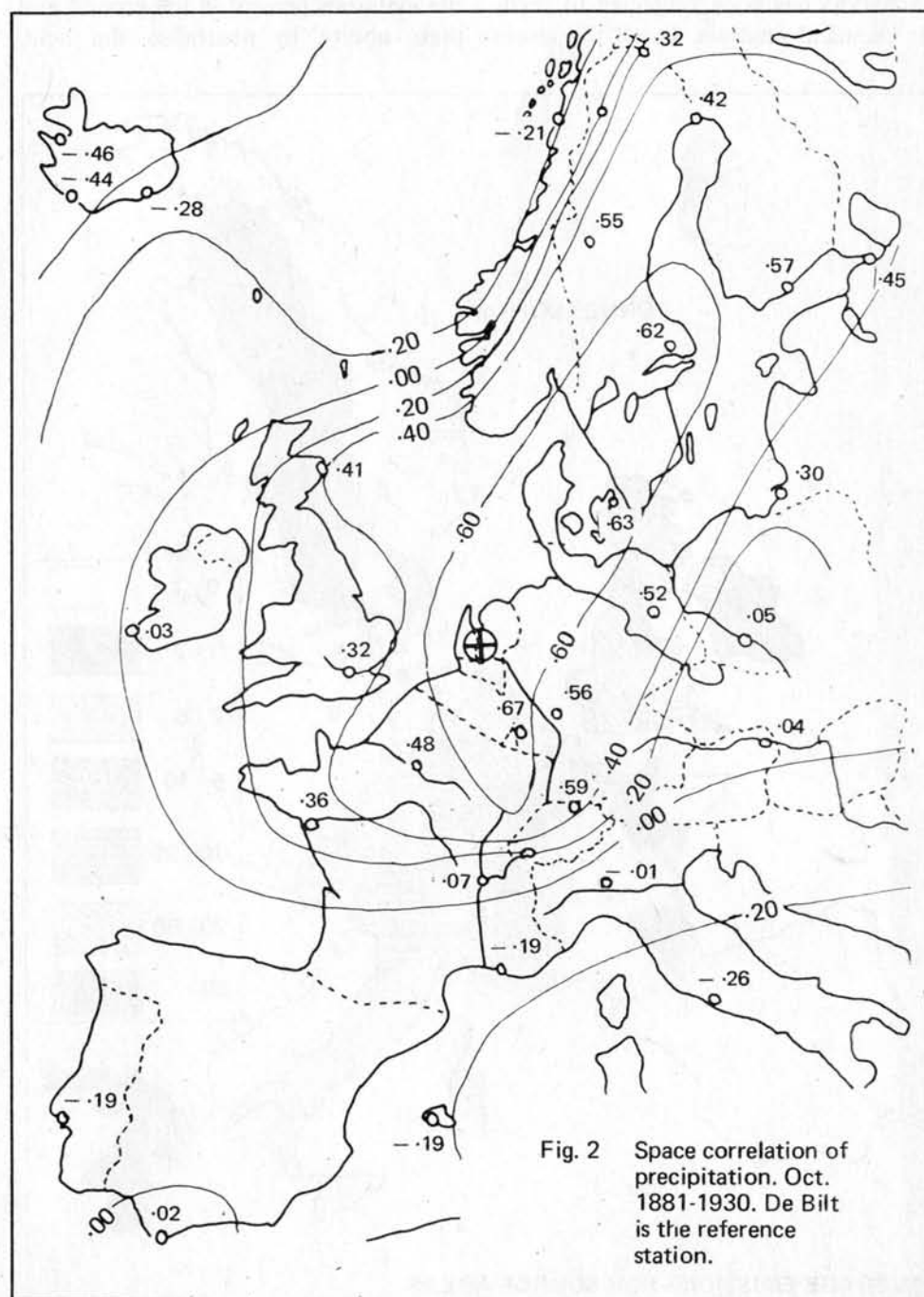


Fig. 2 Space correlation of precipitation, Oct. 1881-1930. De Bilt is the reference station.

navia, the area which receives the largest amount of acid fallout. It is considered very likely that this will cause a reduction of the forest productivity in this region.

In the case of cultivated land the excess acid contributed by the precipitation seems, however, to be of little consequence, and can easily be compensated for by slight changes in fertiliser composition (it should be noted that sulphate as such is a necessary plant nutrient, added to many fertilisers).

Effects on lakes and rivers

The Swedish report³ has reviewed measurements of acidity in a large number of Swedish lakes and rivers during the last 10 to 40 years. About one third of the total run-off in Sweden since 1965 has been subjected to regular chemical analysis. In all the rivers

a negative trend is found for the pH value and the drop over a five year period varies from 0.1 to 0.4 pH units.

Similar observations have been made in Norway^{5, 6}. In all the major rivers in the southern part of Norway, where the soil has a low buffer capacity, a significant lowering of the average pH value has been observed during recent years.

According to the Swedish study, the average reduction in non-polluted rivers is 0.15 pH unit over five years, while the value in rivers polluted by industry or sewage is twice as high. In the rivers of south Norway, the largest changes in pH values are, however, found in the upper part of the rivers which are not polluted.

The effect of precipitation acidity on rivers and lakes depends primarily on the materials present in the ground and their ability to neutralise the acid,

mainly sulphuric acid with minor additions of nitric acid in some cases. This has been clearly demonstrated by investigations of precipitation basins in Norway 1970/1971⁷. The results show that when the ground contains sufficient amounts of carbonate minerals, the variations in precipitation acidity are not reflected in the drainage water, whereas the reverse is the case in areas with low concentrations of carbonate.

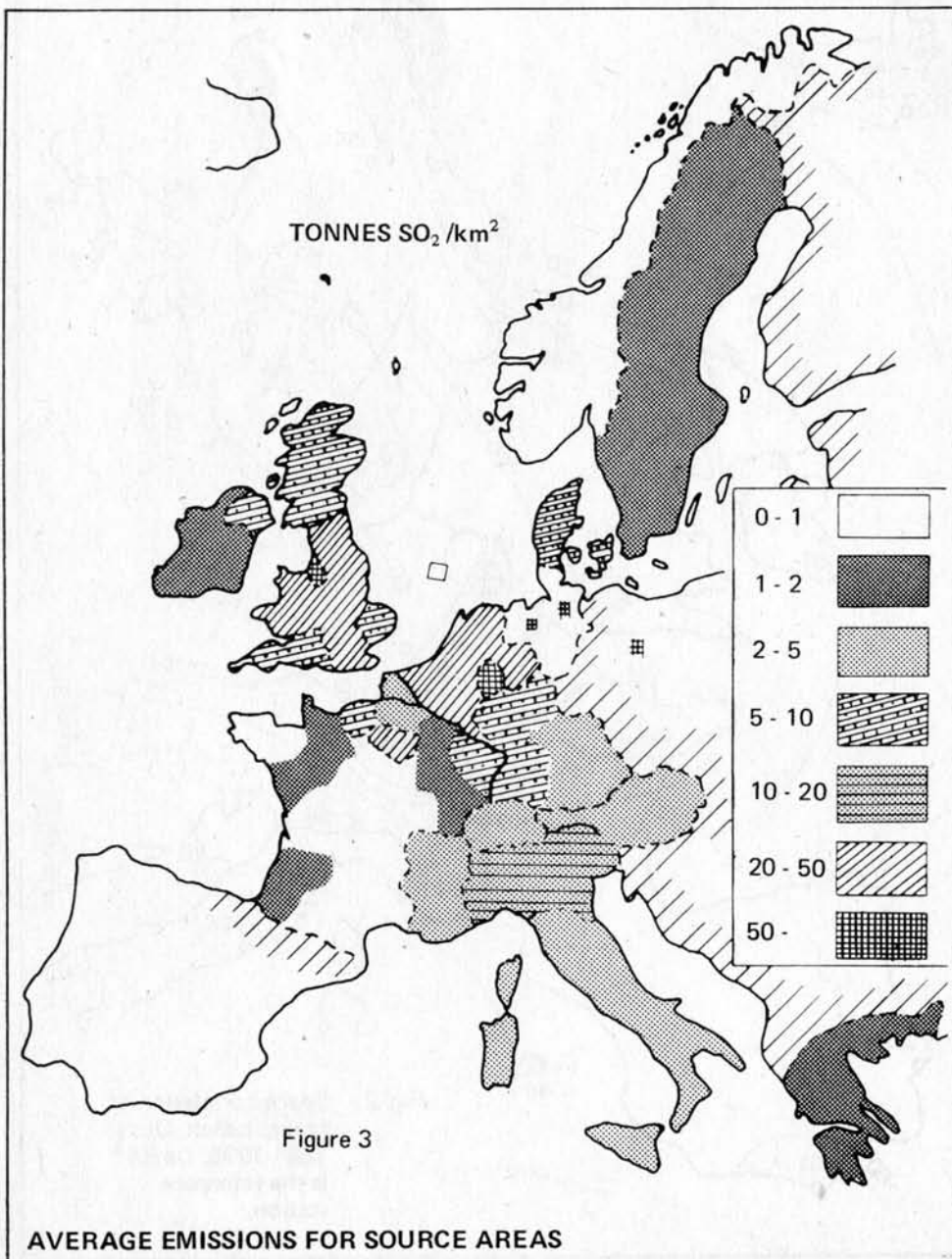
This general result is complicated by climatological conditions. In the Scandinavian area, the acidity in precipitation during the winter is accumulated in the snow cover and brought into the rivers and lakes in the spring. Some of this water will enter directly into the rivers and lakes. This gives rise to a well known acidity peak in the spring. The situation is further complicated by the fact that considerable variations in the acidity of the rivers were observed at the beginning of this century. Occasionally, the acidity has been sufficient to kill the fish in some parts of a river.

These early cases are supposed to have been caused by the oxidation of sulphide minerals or humus in the ground during periods of dry weather in the summer. When such a period is followed by heavy rainfall in the autumn, the acidity of the river and lake water increases due to sulphuric and humic acids. This effect is also observed today, but it is easily separated from the pollution effects when the precipitation samples are analysed. A detailed study of these effects has been published by Odelian.⁸

In the Swedish report,³ an estimate has been made of the time needed to reach a critical pH value in 15 different Swedish rivers. The time ranges from 20 to 80 years. The possibility of liming lakes and rivers is discussed. This has been practised to some degree in Norway and Sweden. However, it is estimated that some 250 thousand tons of lime each year would be needed for Sweden alone, and the environmental effects of such large scale operations are not sufficiently known at present.

Effects on fresh water fisheries

Information collected by the Inspectorate of the Fresh Water Fisheries in Norway have shown that the catch of salmon in the rivers of the Southern part of Norway has been seriously reduced during the last 20 years, and in



many rivers first the salmon, then the trout, has disappeared.⁵ Some of these rivers are completely unaffected by pollution from industries or population centres. Reports from numerous angling clubs in Norway indicate that the trout has become extinct in a few thousand lakes in south Norway, and that attempts to re-stock with new fish have been unsuccessful. In such cases, measurements nearly always show that the acidity has increased. The large number of such results indicate that acid precipitation is the cause.

Similar results have been obtained in Swedish waters. In some cases, lime has been added to the lake water and new fish put out with good results. However, in most cases, very large amounts of lime are needed and continuous treatment is impracticable.

The first report that precipitation could be sufficiently acid to kill the trout was given by Dannevig.⁹ In a fish breeding installation at Tovdal in south Norway, where the water from a small mountain stream was used directly, it was observed that, in a situation with heavy precipitation, the fish started to die. Hurriedly, limestone was thrown into the pond, and the fish took up positions with their noses close to the limestone and so survived. The pH value measured at the Flodevigen Biological Station at the same time, showed that the precipitation was much too acid for fish to live in.

Studies at fish hatcheries in south Norway have shown that when the pH value goes below five, the salmon does not breed. At pH 4.7-4.8, the trout also stops breeding. Such fish as pike and perch may live in waters with somewhat higher acidity. Correspondence has always been found between these limits and the pH values in rivers and lakes at the time the fish in question becomes extinct.

In some of the rivers in south Norway, until some years ago, the river water was used directly in fish hatcheries. This practice has been abandoned and today the river water is always passed through a limestone bed.

Recently, more comprehensive studies have been made of the acid precipitation on the biological life in non-polluted rivers and lakes. It has been observed that snails and various crustacea cannot live when the pH value is reduced towards five. This has a definite effect on the quality of the

fish meat, as these animals constitute an important part of the diet for the fish.

Effects on forest growth

As stated in the Swedish report,³ it is very difficult to prove that the acid precipitation so far has had any effect on forest growth in Scandinavia. Theoretical evaluation shows clearly that such an effect is to be expected; the question is how long it will be before this becomes of practical importance, taking into account that the average age of a tree when felled is about 60 years.

It is possible to relate a certain reduction of the calcium content of the soil with a possible reduction of forest growth in a quantitative manner.^{10, 11} The second question, how much the calcium content in soil is reduced for a given addition of acid precipitation, is much more difficult to evaluate. The maximum effect is naturally obtained if it is assumed that any acid will remove an equivalent amount of cations from the soil. It was assumed that the cations were used in the ratio present in the soil. On these bases, a reduction of the forest growth amounting to about 1 per cent a year as a mean for the southern part of Scandinavia was obtained.

Over the last 10 years, this should give a reduction of 5 to 10 per cent, a value much too high not to have been discovered. We would expect this estimate to be too high, as the washout of calcium by acid precipitation could hardly be as effective as this. For one thing, in spring much of the acidity will be brought directly into lakes and rivers as the snow melts. Also, the acidity in the precipitation may increase the weathering of the minerals in the ground and in this manner bring new material into biological circulation.

In an attempt to obtain more information about the growth of pine and spruce trees, Brandt measured the width of the yearly rings of about 200 trees from a morain area North of Oslo.¹² No apparent reduction of the forest growth could be observed for the last 10 years. However, experiments in Sweden with liming of forest stands have not resulted in the expected growth increase over the last 10 years. It is pointed out in the report³ that this may be due to a delayed action, which would mean that when a change in growth is observed, it would be too

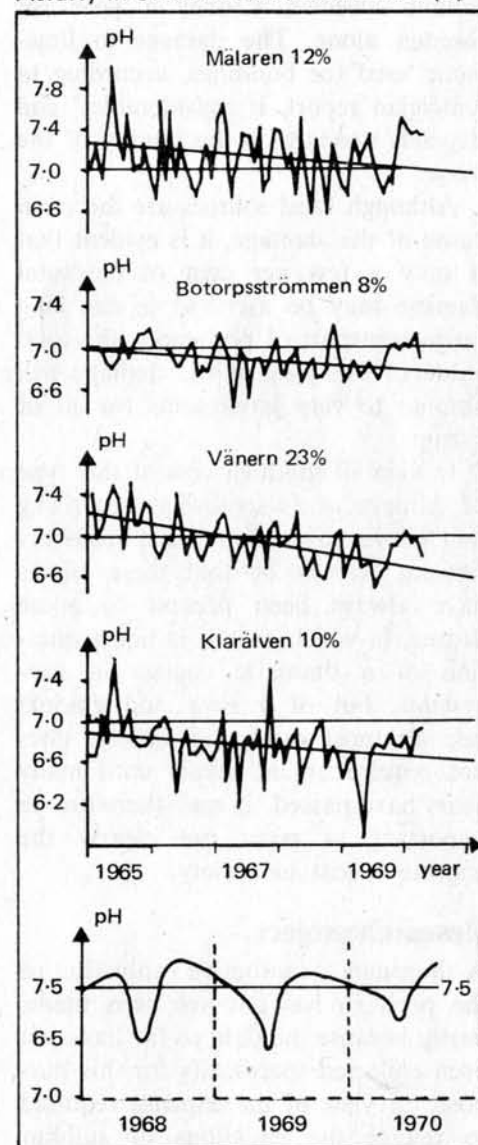
late to do anything about it.

In the report,³ the annual growth of forest has been related to the calcium in the ground for natural stands. One the bases of these data and estimates of the acidity brought down by precipitation, it is expected by the year 2000 or earlier in many parts of Sweden.

It now seems quite clear that theoretically a reduction of the forest growth rate must be expected over a long period of time. In view of the average

Fig. 4:

Acidity in Swedish Lakes and Rivers (3)



The four upper curves illustrate the pH changes from month to month during 5 years in rivers and lake outlets in Southern Sweden (14). All of them show a negative trend varying from 8 to 23% per year, with respect to hydrogen ion concentrations.

The lowest curve (data for the river Ljusnan in Central Sweden (15)), illustrates the effect of the washout of acid melting water every spring. The rapid pH-drop within a short time may be hazardous to the water life.

age of 60-70 years for a cultivated forest it is therefore urgent to find the solution to this problem at an early stage.

Corrosion and deterioration of materials due to air pollution

A survey of corrosion and effects on materials in Sweden is given by the Swedish report to the United Nations.³ The conditions described there apply to all cities in Europe, and the main cause is local sources of, among other pollutants, sulphur dioxide. The economic value of this damage amounts to very large sums, a few hundred million Swedish Kroner a year for Sweden alone. The damage to limestone used for buildings, according to a Belgian report, is considerable¹³ and depends strongly on the quality of the stone.

Although local sources are the main cause of this damage, it is evident that if only a few per cent of the total damage may be ascribed to the long range transport of pollutants, the total value of this part of the damage will amount to very large sums for all of Europe.

In view of the high cost of this type of damage, it is somewhat surprising that efforts to combat it are relatively limited. It may be that these effects have always been present to some degree, in which case it is not a question of a dramatic change in ecosystems, but of a slow and gradual one. In most cases, the damage does not require urgent repair until many years have passed. It may therefore be important to point out clearly the enormous cost to society.

Research project

A thorough, quantitative evaluation of the problem has not yet been made, partly because the data so far have not been collected specifically for this purpose. In view of the expense required to reduce the emissions of sulphur dioxide either by cleaning stack gases or by purification of the flues, reliable estimates of the magnitude of present and future damages are strongly needed.¹⁴

The use of fuel oil containing a high percentage of sulphur is steadily increasing in Europe, and the important question is how far this development can continue uncontrolled before the various effects will reach a level which makes a change of policy necessary.

The purpose of research today must be to determine what the possibilities and alternatives are, before deterioration is beyond repair.

To go some way to meet this requirement, the western European countries have since 1968 been planning a co-operative research project within the OECD to determine the quantitative relations between sources of SO₂, dispersion in the atmosphere and acidity in the precipitation. The planning of this project was completed in June 1971⁵.

In the autumn of 1971, the plan was approved by the OECD Environment Committee. The economic part of the plan and the formal agreement was further elaborated by the OECD Secretariat, and finally, on 14 April 1972, it was accepted by the OECD Council. For practical reasons the project started on the first of July 1972, with participation from the following countries: Austria, Denmark, Finland, France, Germany, the Netherlands, Norway, Sweden, Switzerland and the United Kingdom. France joined the project from 1 January 1973. Canada participates as an observer. Italy does not participate in the project, but an arrangement had been made whereby the project will receive data from the Italian stations.

While the planning work was proceeding technical preparations were made in a number of countries on a voluntary basis. Extensive studies have been made in the Scandinavian countries, organised through Nordforsk. Also several of the other OECD countries have participated in the preparatory work. The Norwegian Institute for Air Research (NILU), has been responsible for the co-ordination of these preparations on behalf of Nordforsk and OECD.

It should be pointed out that the described project is limited to a study of the long range transport of air pollutants, in particular the sulphur compounds. Any effects which these air pollutants may have in the participating countries must be studied on a national basis. In the Scandinavian countries, comprehensive studies of the acidification of rivers and lakes and the possibility of future damage to forestry is being investigated, but so far rather little interest has been shown by the other OECD countries. A greater public interest in these matters might get things started.

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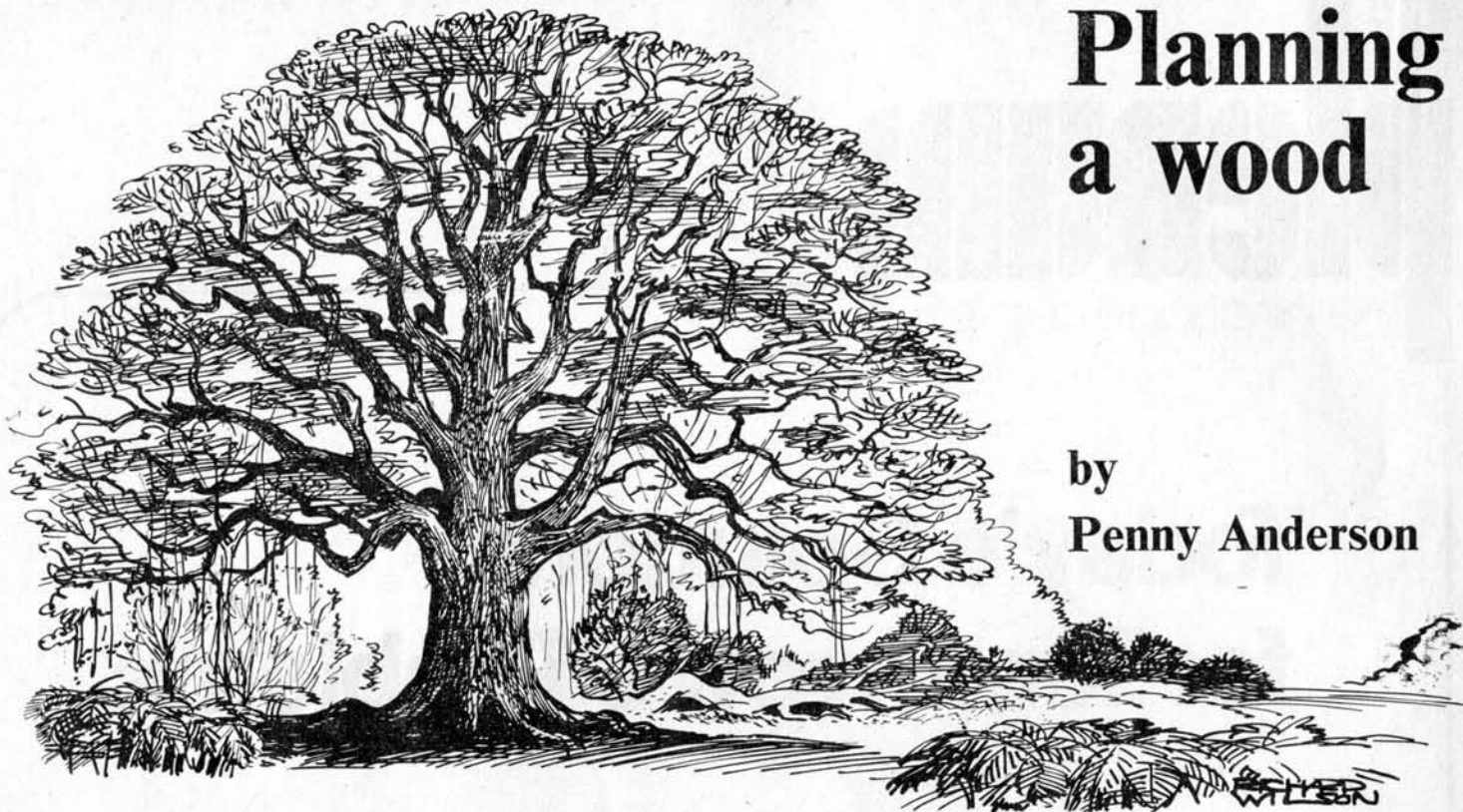
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Planning a wood

by
Penny Anderson

When old woodlands are cut down it is not just the wood which disappears leaving a gaping hole in the landscape but a myriad of other plant and animal species. While the Department of the Environment is promoting its "Plant a tree in 1973" scheme it has issued no directives about old woodlands which are fast disappearing from the British landscape.

In her article Penny Anderson makes a plea that when planning a new wood indigenous British species should be used rather than alien ones and that as good a mix should be achieved as possible.

While tree felling continues unabated throughout the country it is hard to be anything but sceptical of the Department of the Environment's 1973 tree planting campaign. Nevertheless, the programme has considerable intrinsic merit. The broad aim is to plant suitable trees in town or country in order to make the British Isles "more beautiful and pleasanter to live in" (Circular 99/72 DoE, and 219/72 Welsh Office). In particular, trees are to be planted where there are none at present, to

soften stark backgrounds, improve the environment, shield eyesores and ameliorate derelict land. They can be used for softening new road schemes, camouflaging car parks and caravan sites, to enhance Country Parks and brighten old and new housing development. A variety of Acts of Parliament provide grants of 50 per cent to 85 per cent for such projects as these.

Yet, while the programme to "prettify" the country is highly commendable, it has failed to grasp an opportunity to contribute significantly to wildlife conservation. If considerations of both amenity and conservation could be incorporated into plans for tree planting, new wildlife habitats would be created and some compensation made for past woodland destruction.

Before man began to clear the land for agriculture and settlement, primeval England was covered in trees with a matching flora and fauna that had evolved for life in a woodland environment, and mainly a deciduous one at that. Since the indiscriminate, still subsidised, tearing out of hedgerows and woodland the animals and plants living in such habitats have become sadly depleted. The tree-planting campaign could be a marvellous opportunity for safeguarding and building up again this significant part of our national heritage.

Even in urban areas, a multitude of

creatures can colonise subsequent upon new tree planting. Many invertebrates benefit from such planting, and are not intimidated by the frequent presence of humans. The concomitant increase of insectivorous species, such as certain warblers at the expense of the scavenging sparrows and starlings, would be welcomed.

A woodland is sterile unless it harbours, supports and nourishes the myriad of dependent and interdependent plants and animals that can be associated with it. Although we seldom recognise the dynamic qualities of a woodland and the interrelationships between the plants and animals, they are significant factors in producing some of the characteristics we unconsciously look for, such as the carpets of bluebells or primroses in spring, and the autumn blackberries. As a consequence, in order to plan a woodland which incorporates some of these essential features, we have first to understand some of the basic ecological principles underlying a wood's structure and functioning. And such principles are usually totally overlooked or discontinued when old well-established woodlands are destroyed. In part by condoning the chopping down of such woodlands on one hand, and promoting its tree-planting campaign on the other the DoE has failed to see that it takes decades, if left undisturbed, before a woodland returns to its mature state.

Diversity of vegetation structure

Except, perhaps, in dense young conifer plantations, a woodland composed solely of trees is relatively unknown. Usually, there is a ground flora of bluebells, grasses or bracken, or other low-growing herbs. These lower layers in a woodland can be the richest in the number of plants and animals they contain. Most small mammals, particularly voles and shrews, live or feed in them, many birds also feed there, and some like the chiffchaff and garden warbler are dependent on them for their nesting sites.

Another important part of the woodland apart from the essential upper tree canopy, is the understory. This is usually composed of larger shrubs or small trees such as yew or wayfaring in a beech wood, and hazel or holly in a lowland oakwood. They also contribute significantly to the diversity of a woodland's structure, providing cover and food for a variety of invertebrates and birds.

Each layer of this stratification is unlikely to be continuous. A mature tree canopy of about 75 per cent allows suffusion of adequate light for the development of a mosaic of the lower layers. In general, the greater the natural diversity of the vegetative structure, the larger the number of "structural niches" there are for a wide variety of animals and other plants to exploit. These would include opportunities of shelter and cover from predators, and for food searching, as well as tree-top, scrub and ground nesting sites.

The number and kind of species in a woodland depends on the kind of trees and shrubs. A well stratified sycamore and rhododendron wood has less invertebrate life and therefore less birds than an oak and grass habitat. In fact it is the woods composed of native species that have more species rather than those aliens introduced into the British Isles during the last one and a half millennia. Into this last group fall such frequently planted species as sycamore (from Central and Southern Europe in 15th or 16th century), horse chestnut (from Greece and Albania), rhododendron (from Southern Mediterranean countries in 1760), and all the conifers except scots pine, yew and juniper.

Of the native species, the English oaks (*Quercus petraea* and *Q. robur*)

harbour the highest variety of insect species. In their translation the alien oaks, for example the Turkey and Cork Oaks, did not carry their concomitant fauna into this country. Indeed, more recent introductions are stringently quarantined to preclude the possible spread of any new pest. As a consequence, any non-indigenous species must play only a minor role in the functioning of the woodland ecosystem, and therefore should be planted preferentially.

In 1961 T. R. E. Southwood showed that apart from the native oaks, the rose family (which includes hawthorn, whitebeam, rowan and bramble) is the richest for associated invertebrate life. There are also some trees and shrubs which are specially valuable for butterflies and moths. Oak, birch, the willow and rose families are of particular importance, whilst ash, rowan, lime, honeysuckle and gorse are also useful and should be planted in suitable sites.

The importance of these invertebrate populations lies in their specificity to one or a few related food plants. Some can feed on a number of different plant species, whilst many (mostly insects) can feed on one or two species only. Because the close relationship has taken hundreds of years to evolve, the native trees and shrubs have a far greater number of insects dependent on them than on those which have recently been introduced. In addition, within the range of native species, certain of them, as indicated above, have more dependent insects than others, and therefore must play a more important role in the functioning of the ecosystem. It is noticeable that many of the trees preferred by invertebrates are also berry producers. Two different food sources can therefore be exploited by different birds and mammals on the same trees.

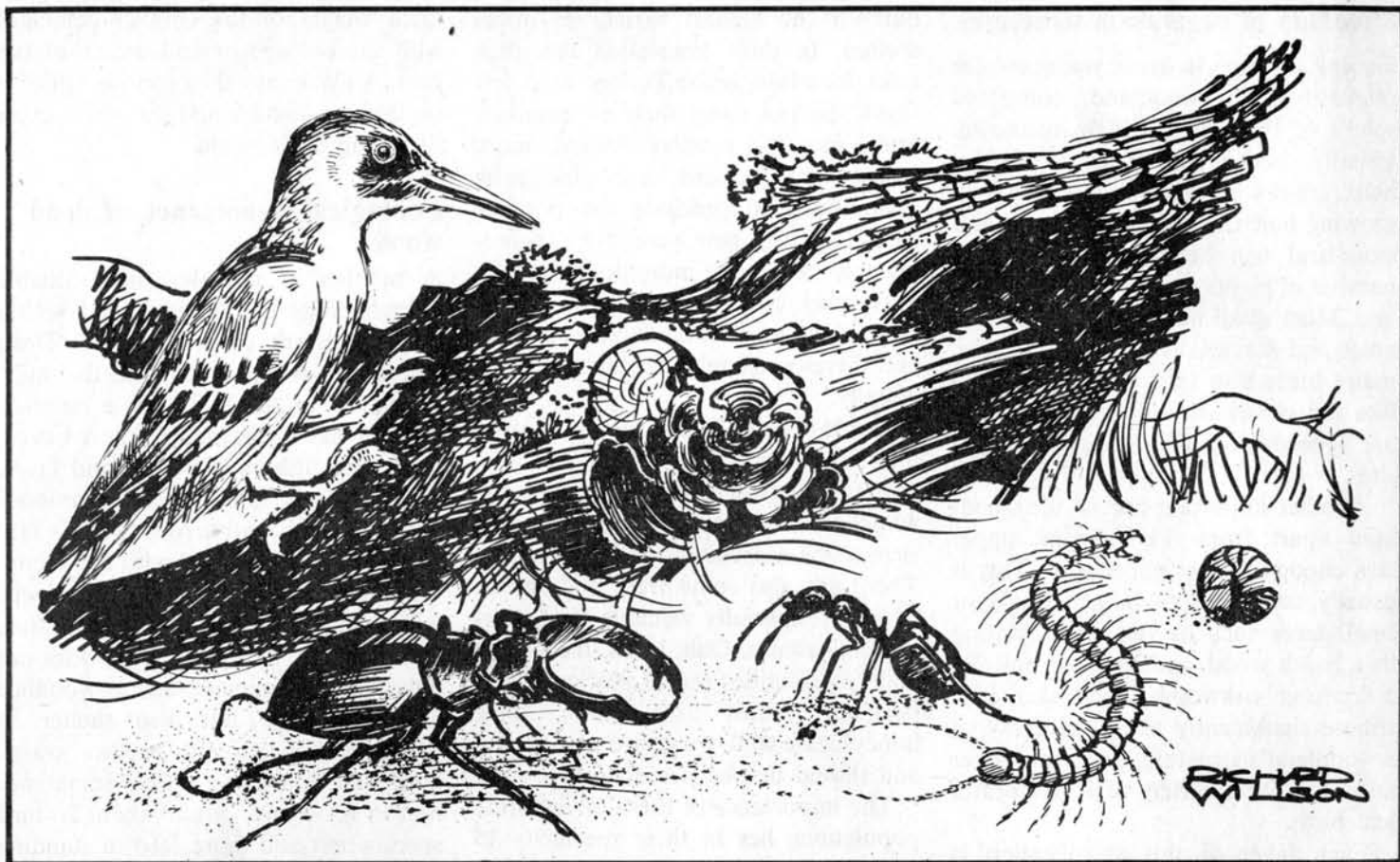
It is not only wood species which contribute to the faunal diversity of a woodland, nettles are the food plant of about 40 species of butterflies and moths, including the peacock and red admiral. Ivy also provides valuable cover for nests, and the berries are important as they ripen in spring when the other fruits are unavailable. Contrary to popular belief, ivy does not parasitise or deprive its tree-support of life. The relationship is purely mechanical, although there may be some competition for water and nutrients. The tree falls only when the

great weight of the climber coincides with the old age or bad health of the host. A glade may then form in which a sapling can mature and the whole cycle of ageing begin again.

Ecological importance of dead wood

A number of complex and valuable microhabitats can be identified within the framework of a woodland. Dead and dying wood is one of the most prominent of these. R. Steele reported in 1970 that if this material is removed, up to one fifth of the woodland fauna is lost. Nearly 1,000 species of animals together with numerous fungi, are known to be associated with the decaying wood. Some mosses, liverworts, lichens and ferns also thrive on such material. The dying wood provides not only food for animals such as woodlice and centipedes, but also shelter in which certain ground beetles, wasps and bees hibernate. Ants sometimes nest in rotten wood, and about 20 bird species nest and more feed in standing dead wood (woodpeckers, nut-hatches and pied flycatchers in particular).





Dead wood, therefore, should never be removed unless for reasons of pest control (or fire risk in plantations). Only a small proportion of the species involved in the cycle of decay attack healthy wood. Many are specific to only one or two closely related species of dying wood, and few feed on both deciduous and coniferous species. The completion of the cycle in order to release nutrients for the woodland plants is one of the key elements in the ecosystem.

Large, old trees, both living and dead, have a particularly rich association of invertebrate and bird life. Large dead trees are renowned for their beetle and fly populations, whilst live specimens are frequently noted for their epiphytic lichen communities. Their role as nesting and perching sites for birds, especially birds of prey, is also important.

A stream, pond or wet patch, provided that it is relatively unpolluted, may be edged or colonised by the native alder or willows together with other water-loving plants. If of sufficient extent an area of water may attract such species as dragonflies, fish, moorhens, or the harmless grass-snake. Running and stagnant water provide distinct habitat conditions which are exploited by different communities.

Paths, glades and rides within the

woodland provide for the more sun-loving plants and animals. A grassy path merging into tall herbs flanked by shrubs and trees is a particularly suitable environment for many woodland butterflies and birds such as the spotted fly catcher. The woodcock nests in similar cover in large glades such as those derived from a rotational coppicing cycle.

Adequate food and cover must be available in order that animals can colonise an area. A well stratified woodland composed of a mixture of native species and encompassing a wide variety of microhabitats provides the optimum conditions for a broad range of animal life. By exploiting the different "structural niches", animals can avoid intense competition with neighbours; moreover food webs are complex, the diversity of invertebrates and plants ensures stable diets; and cover is in abundance. The intricate interrelationships engendered within the flora and fauna by environmental conditions such as these, afford a basis for a dynamic equilibrium in the woodland. This would tend to buffer changes such as sudden, rapid increases in populations. The structural diversity, then, is instrumental in ensuring the stable functioning of the ecosystem.

Wherever a planting is planned certain "criteria" should be followed.

Whatever the size of the site, the specific environmental features should be analysed, including the identification of surface geology; soil type, acidity and water relations; site aspect, slope and altitude, and local pollution problems of air, water and soil.

Planning the wood

The beneficial features already on the site should be retained and incorporated into the plan, for example, wet areas, any trees, shrubs and banks.

Then find out what species are most suitable for the area, consult the relevant literature and find a local "natural" woodland similar in its position and conditions to use as a guide. Collect some seeds and cuttings of suitable field and ground layer plants for transplantation.

Analyse the structure and diversity of the local woodland. Remember the local wood may have been planted. Look out for alien trees in it. From your researches into the local wood and literature, decide how to space and group the different trees and shrubs and relate this to the environmental conditions. Plant more trees than are eventually required as some will inevitably die. Use understory species and shrubs as nurse trees in which canopy species can be raised. Plan rides, glades and paths which can be



Hawthorn

maintained by mowing or be left undisturbed to mature.

The importance of diversity must not be taken to the extreme. It is not necessary to plant examples of every tree species in one area, or to create ponds on a site naturally devoid of water (on chalkland areas for example). Nevertheless, it is important to capitalise on any opportunity present and plant accordingly, for instance alder and willows on wet sites.

If the plan is for a restricted area—a field corner, garden, a road-side—omit the canopy or use smaller trees, but remember to attempt to maintain the horizontal layering of tree, shrub and field layer. This will provide greater opportunity for wildlife than the planting of one or two isolated trees.

Next go to a local site where woodland has been destroyed. There must be some saplings, shrubs and ground flora species which can be saved and moved to a new site. Try contacting the local council and amenity societies.

The ecological complexity of natural woodlands is such that few may feel adequate to attempt their reconstruction on any scale. Guidance in selecting suitable species and in the preparation of an ecological plan can be sought from either the appropriate Regional Office of the Nature Conservancy, or from the County Conservation Trusts. Alternatively suitable academic experts from colleges or University may be willing to offer advice and expertise. The S.P.N.R. (Society for the Promotion of Nature Reserves) has provided a leaflet giving details of trees suitable to wildlife, and the DoE circular provides

a comprehensive list of tree species, their potential size and site preferences. The latter, however, does not indicate whether the trees are indigenous or not.

Planting a woodland has enormous potential educational value. There is no reason why school and college students could not undertake the evaluation of environmental conditions, and plan their own woodland on an adopted site. A school plant nursery using collected seeds and cuttings, supplemented by specimens from the Local Authority or other agency, could provide the necessary materials.

Many school fields are barren, grassy areas where peripheral planting could easily be arranged. Even a small acreage, for instance boundary planting 5—10 feet deep, could encompass some mature specimens, a few shrubs and smaller trees, and patches of ground flora. Such planting would be particularly valuable in urban schools where suitable field sites for ecological work are often difficult to find. The monitoring of the development and invasion by other plants and animal populations, together with the results from management projects and the initial growing in the nursery, would provide informa-



Whitebeam

tive work which could be incorporated into various curricula. Hopefully, the on-site nature of the project might also prevent vandalism.

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Reports

Hampshire's growth pains

Confronted with a growing problem of waste disposal, South Hampshire finds itself almost literally between the devil and the deep blue sea. The devil is how to treat the effluent well enough for it to be returned to the freshwater system so that the water can be used again, the deep blue sea is the Solent, where South Hampshire wants to discharge all its treated sewage.

Besides cooling water from the Marchwood and Fawley power stations, and industrial wastes like those of Esso's Fawley refinery, the Solent area receives 48 million gallons of sewage a day, half of which is untreated. A Working Party made up of the engineers from South Hampshire's fourteen drainage authorities and representatives of the Hampshire and Isle of Wight River Authorities considers that about a quarter of the area's sewage treatment capacity is incapable of receiving any further increase at all, and another sixth requires immediate replacement. It concludes that the existing foul drainage systems are incapable of coping with expected growth, and even if South Hampshire were not a designated growth area they would have to be replaced.

According to the Working Party the streams and rivers should be pure enough to support the salmon and trout fisheries for which they are famous and to supply water. Of the only two rivers of any size, the Itchen could possibly cope with double the present discharge of effluent, provided the outflow were well up river, and the Test could safely accept even more. The other streams, the Hamble, Meon, and Wallington are too small to deal with any but very minor increases. The expected increase therefore far exceeds what the rivers can accept.

Also, even if effluent quality were significantly improved, there would be a danger of altering the character of the rivers, promoting weed, especially

flannel weed, thereby rendering the water unfit for public supply and impossible to store in reservoirs. These fears refer basically to the presence of nitrates and phosphates, which would be expensive to remove.

On the other hand, Southampton Water and especially the Solent have ample capacity to accept anticipated discharges.

On the basis of these assumptions, the South Hampshire Main Drainage Board has proposed a trunk sewerage scheme serving the whole area except Southampton, Portsmouth, and possibly Gosport. At the proposed Peel Common site (40 acres for works and another 40 for landscaping), the sewage will be fully treated before being discharged at the five fathom line off Browdown on the East Solent. The £30+ million project promises to be a controversial one and will be the subject of a public inquiry beginning 9 October.

The South Hampshire Main Drainage Board has built a £100,000 computer model of the Solent to find out the probable movement and dispersal of effluent discharged to it. The Engineer to the Board, Mr Ian Kirkaldy, is confident that the Solent will be shown to be capable of safely accepting 60 million gallons of fully treated sewage a day—the amount the discharges are expected to grow to by 2010. To describe such water as "fully treated"—meaning a BOD of 20mg and a suspended solids measurement of 30 mg—is to put far too nice a word on it.

Ambitious though it is, the model excludes a number of potentially critical variables, such as the Isle of Wight's proposed Gurnard outfall which is to discharge 4.5 million gallons a day and the waste heat from a second power station proposed at Fawley. Such omissions—reflecting the lack of a single water authority for the Solent area—are rather disturbing, since semi-

enclosed water bodies like the Solent are vulnerable to the additive effects of series of changes.

The evidence that the Solent has ample capacity to cope with anticipated discharges is therefore not only inadequate, but one should also ask why the Drainage Board is prepared to spend so much money on one study without looking as seriously at the alternative—discharge into the freshwater system. It is undoubtedly the case that if the character of rivers like the Test and Itchen is to be conserved, effluent discharged to them must be of an exceptionally high standard, and even double the accepted standard is unlikely to be enough. Nutrient levels must be kept very low, and it is possible that relatively new and expensive treatment methods such as reverse osmosis or the activated carbon process may be necessary. The truth is that nobody, not the Hampshire River Authority nor the South Hampshire Main Drainage Board, knows. Both bodies appear simply to have assumed that whatever the method, it will be so much more costly than discharging a 20/30 effluent to the Solent as not to merit investigation.

However, there are other considerations to be borne in mind. First, it may be to improve the discharge to the Solent to a standard of 10/15 or better. The extra cost (estimated at £3 million) might make an alternative scheme more attractive.

Second, South Hampshire's demand for water is growing rapidly. Its population is projected to increase by 300,000 over the next 20 years and to reach 1.4 million by 2001. Daily consumption of water per head is expected to rise from 63 gallons in 1968 to 100 gallons by 2001. However confident the Hampshire River Authority claims to be that it can meet this demand without recourse to upstream boreholes or to desalination, it is plainly foolish to consign potentially reusable water to the sea. Much of the demand is to be met by abstraction from the Test and the Itchen. But flow reduction can be as damaging to such rivers as the addition of excess nutrients. Accordingly, as much water as possible should be adequately treated and returned either well upstream, or to aquifers (this may not be desirable but should be looked into), or both, to compensate for the increasing quanti-

ties extracted. The Hampshire River Authority argues that the rivers are not long enough to do this without endangering water supplies, but does not explain why Portsmouth's supply point at Gaters Mill is sited on the Itchen just below the outfall from Eastleigh's Chickenhall sewage treatment plant.

Third, there is growing recognition that this country cannot long afford the loss of nutrients to rivers and the sea when they should be returned to the land. Minimising the nutrient content of effluent is not the extravagance some people suppose.

Because of the desirability of maintaining soil fertility and particularly because of the clear need to conserve water, an alternative to the Peel Common proposal should be thoroughly investigated. The existing decentralised sewerage system could be improved in such a way as to safeguard the biological quality of both the Solent and the rivers draining into it. It may be expensive, but then for growth areas like South Hampshire the cheap and easy choices are over.

There is tremendous pressure to go ahead with an improved sewerage system without delay to accommodate housing demand, but it would be irresponsible to do so without knowing the real costs, ecological as well as economic, of the available alternatives. The Secretary of State for the Environment is no doubt well aware of this. At the public inquiry, the South Hampshire Main Drainage Board will have to give his inspector much better comparative data, if they are to convince him, and the public, that they are not about to throw Prudence out with the bath water.

Robert Allen

Organic farming in New Zealand

The mineral deficiency of many New Zealand soils means that the organic farmer here has to adopt a very different approach from his European counterpart. In Europe, generally speaking, the soils are old and inherently fertile, and produce good results provided that sufficient organic material is returned to them. Experience has shown, however, that the straightforward methods of the "compost" school are not in themselves effective here. The soils are

young, often thin and woefully deficient in available phosphate and other plant nutrients. The orthodox answer is to pour huge quantities of super-phosphate and other artificials on to the land—with the usual attendant problems of run-off and eutrophication of lakes and streams. Compost made from plant material grown on such deficient soils is not an answer in itself, because, of course, the plants lack the minerals which it is desired to supply.

The organic movement here has, however, a highly developed technique for correcting deficiencies by the application of crushed rock, principally dolomite and rock phosphate. One of the foremost exponents of this method is Mr Peter Bennett, an Australian, who has spent some years in his own country fighting a most vigorous battle against artificial fertilisers. Peter Bennett is not well-known in Britain. He deserves to be, because he is a redoubtable campaigner. At one time he had his own television programme in South Australia, which he was able to use as a medium for his ideas—ideas which did not go down at all well with big business. He has persuaded many farmers to give up artificials and apply crushed rock, and as a result many lush green pastures are growing where little would grow before. The fight continues.

Recently Mr Bennett went on an extensive lecture tour of New Zealand, and was the keynote speaker at the New Zealand Soil Association's annual conference in Tauranga, the theme of which was "Ecology or Extinction". The conference, which attracted several hundred people, was notable in that it was organized by the local branch committee and not the national officers—surely there is an ecological lesson there somewhere.

Another impressive speaker was Sir Dove-Myer Robinson, the Mayor of Auckland, New Zealand's largest city. His contribution was impressive perhaps not so much for what he said—which represented the now commonplace credo of the environmental movement—but for the fact that a man in this influential position held these beliefs with such evident fervour. (The mayor of a New Zealand city is a much more important figure than his British counterpart, being chosen by popular vote and regarded in a real sense as the city's spokesman).

New Zealanders like to believe that

theirs is a clean, unpolluted environment. But vast quantities of pesticides and herbicides (to take one example) are poured on to the land every year—probably more per cultivated acre than in Britain because the climate favours pests and weeds. After getting off to a slow start, there are signs that protesters against this kind of thing will soon make themselves heard loud and clear.

Roger James

US Highway Trust Fund to be used for public transport

A conference committee of Senators and Congressmen has made a hairpin turn in US transportation policy by allowing part of a multi-billion dollar special revenue fund to be used for the purchase of mass transportation.

The breakup of the "Highway Trust Fund" (the revenue comes from a four cent federal tax on petrol) was an important and hard-won breakthrough for environmentalists in America who have been fighting highway construction and the "highway lobby" for years. No longer is US transportation policy to be dominated by the trucking industry, road builders, the oil industry, the automobile companies and their congressional allies, all of whom have played a major role in assuring that the US government would direct more and more financial aid to the building of roads.

Two years ago, a coalition of national organisations including environmentalists, conservationists, freeway fighting groups, several trades unions including the United Auto Workers, and professional groups joined with John Volpe—then Nixon's Secretary of Transportation—to begin a concerted effort to break the highway lobbies' control of the five billion dollar fund. The coalition succeeded two years in a row in the Senate, but failed in the House.

As the negotiations continued, many of the states began to run out of funds to continue construction on existing projects, and their representatives in the House had no choice but to agree to allow use of the Highway Trust Fund for mass transportation, or watch every programme across the country come gradually to a halt.

Rafe Pomerance

Notebook

Contradictions

"Outstanding in the US scene at the present is the emphasis upon ecology and improvement of the environment—the topic which has ousted Vietnam from the TV and press headlines, and where typically too much is happening as a result. Volunteer groups are collecting scrap for which there is no market, dealers are now re-named 'Environmental Re-cycling Centres', whilst cardboard-making capacity has been significantly reduced due to water and air pollution strictures at a time when the increased usage of waste paper is being encouraged. (One board-maker is concurrently being awarded for increasing secondary fibre use, and being prosecuted for environmental pollution.)"

"Re-cycling", a paper presented by Mr P. L. Whiting, of Thames Board and Paper Mills Ltd, at the 1973 Spring Meeting of the Institute of Public Cleansing.

Remedies?

Garrett Hardin, the eminent American ecologist, has attacked the reasoning that lies behind many of our endeavours to resolve difficult and complex problems.

"It is quite understandable if the mind of a well-to-do and well-meaning person, after a visit to the slums, generates a simplistic argument: 1. Poverty is found in slums; 2. Therefore, let us destroy the slums, and thus; 3. We will destroy poverty."

Slum clearance

Alfred Sherman, in *Council Housing: Crumbling Foundations*, describes slum clearance as not only an expensive failure but a counter-productive folly based on ludicrously false premises. "In place of every council home now built several existing dwellings in which families have been living for five, ten, even twenty years, can be modernised for letting at economic rents... local politicians, too often aping their big brothers in Whitehall, are more interested in spectacular housing statistics which show a high percentage increase in new houses, particularly council houses... as for

the borough architects, they can gain architectural awards and other satisfactions by spectacular housing schemes, which they could not get by ensuring that thousands of homes had decent plastering, plumbing and baths."

Atoms for prosperity

"Energy provides the power to progress... With a sufficiency of energy properly applied a people can rise from subsistence level to the highest standard of living." P. J. Searby, writing in the United Kingdom Atomic Energy Authority periodical *Atom*, November 1971.

Prosperity for what?

Siegfried Gideon, in *The Eternal Present*, takes the idea a stage further: "The one-way street of logic has landed us in the slum of materialism."

Rain stealing

As resources become scarcer, "environmental aggression" is likely to set off serious political crises in the next decade, according to Maurice Strong, Executive Director of the United Nations Environment Programme. Since rain-making is now a possibility, he foresees "rain stealing", where one country sets out purposefully to steal another's rainfall, thereby causing drought. There have already been disputes between countries over claims of pollution damage to waterways and the atmosphere. Such disputes are likely to increase with the further development of large-scale technology. Countries may well attempt to melt the polar ice-cap in search of minerals, create artificial earthquakes and tidal waves. "We are only beginning to realise the potential area for conflict," said Strong.

America's sacred cars

"What's good for General Motors is good for the United States". If we consider that the survival of industrial society in America is a good thing, then these oft-quoted words are almost certainly true.

The petrol crisis is very likely to lead in the near future to a reduction in traffic on the roads, which in turn must lead to a reduction in car purchases. The effect of this might be quite dramatic. Let us consider a few figures. There are about 100 million passenger cars in use in the US, rep-

resenting an investment of some \$95 billion. They travel a trillion miles a year. Each car uses more than 700 gallons of petrol per annum. \$20 billion a year are spent on improvements and repairs and additions to a road system which extends 3.7 million miles.

More than 80 per cent of Americans who own cars and have a steady job use them for commuting to their work. The motor car business represents 13 per cent of the US Gross National Product, 24 per cent of retail sales, and provides one job out of every six.

It appears that American car users have actually paid no more than 1 per cent of the value of the cars they own. Their purchase is financed by the dealers. They are largely owned by large motor car companies like General Motors, as are the finance companies through which the credit is arranged. The whole structure is thus about as unstable as it can be and should General Motors experience financial difficulties, then it could collapse completely, with a devastating effect on the US and hence on the world economy.

Tree spirits

Our view of the natural world as a piece of real estate, given to us for development by a God who had no time, opportunity or skill to perfect it, is not shared by the majority of human societies. The belief that trees possess spirits that must be treated with respect is common and indicates an understanding of man's place in the order of things we would do well to acquire. Among the Maoris, for example, no tree may be felled unless the spirits have received a formal apology and explanation for the need to disturb them and time to evacuate. The story is told of a village idiot who ignored this requirement and simply went ahead and felled a tree. The next morning, to his horror, the tree was standing again, balanced on its stump. He went to the elders of his tribe for an explanation of this weird phenomenon, and learning that he had omitted the most elementary observances of their religion he was told to return to the tree, to apologise for his discourtesy and to ask the tree's forgiveness. This he did, explaining that the wood was needed for making a canoe. The following morning, not only was the tree once more horizontal, but the spirits had hollowed it into a canoe for him.



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Friends of the Earth

Coming the FOE Campaigners' Manual

For those people who have in the past condemned the environmental lobby for its middle-class outlook and concern with issues considered peripheral to the social ills in the UK, the time has come to rejoice. Largely due to the consistency of the lobby's arguments there has undoubtedly been a steady rise in the level of awareness throughout the strata of our social hierarchy. At last the trade unions are stirring. Working people everywhere are grouping and forming cells of resistance to combat the onslaught of the wreckers and the spoilers. People everywhere are beginning to question proposals and demand a say in their future and the future of their particular neck of the woods. The arguments used by the environmentalists three years or more ago still hold good today. Precedents have been established and the power of the individual has been asserted.

Despite this laudable situation the defensive front remains in pockets of resistance throughout the country and only a minority of these groups have the *savoir-faire* to adopt offensive tactics. The sheer size of the invading machine generates a feeling of impotence, albeit a feeling of *collective* impotence. People know *why* they should undertake action but all too often they don't know *how*. Friends of the Earth do not profess to be the be-all and end-all as far as campaigning techniques go; but we feel our two years of work in this field has given us a certain amount of experience from which other groups and individuals can learn. Working as we do in a field which daily produces a sizeable crop of letters requesting help and guidance on specific issues, we felt that we should do our best to provide a service to such people which would not only give them practical help and advice but which would also attempt to capitalise on the growing indignation which can be felt throughout the country. To bring about meaningful change there must be a strong and consistent application of pressure in the right spot by a well-informed and serious

body of people. We hope that the guidance we can provide will help to indicate where to get that information, how to generate credibility and where to apply the pressure.

The FOE guide to environmental action to be published soon must necessarily be just that—a guide. All we can hope to do is to provide a pointer which will indicate that the answer to a particular question may possibly lie in direction *x*. The complexity of the subject obviously precludes first-hand detailed answers; the manual can't attempt to tell how to turn a nut; it merely indicates where the nut is.

At the time of writing, the manual is roughly half-completed. The original idea of a simple guide rapidly grew into something which was impossible to condense. Attention to one topic gave rise to a dozen facets of the problem, all of which demanded detailed discussion. The compilation of such a document obviously has to be able to facilitate the inclusion of new information and data as it comes to light; the guide will therefore be produced in loose-leaf form, additional material and amendments being available perhaps twice yearly depending on desirability. We hope that purchasers of the manual will agree to pay a fee for this updating service, which will be operated from a subscribers mailing list.

The manual will fall into three sections. Section One will be a collection of essays on the whole spectrum of environmental abuses, each of which will be dealt with by outlining the fundamental problems pertaining to that topic. Appended to each essay will be a guide for the individual as to how the problems manifest themselves, what to look for and through which channels action can be initiated: i.e. whom to phone and whom to write to. This section would have been impossible to write without the help of those organisations who have the necessary expertise in their own particular fields of activity. May I here propose a vote of thanks to those people, albeit slightly prematurely!

Section Two concerns itself with the generation and organisation of support. It deals in depth with the way in which

a group should be structured, how to use professional help and perhaps most importantly how to use the potential power of a few sincere, dedicated people to bring about change. This section will be biased towards practical steps to take, the philosophy behind the action, and will draw extensively from the experience FOE has gained in terms of dealing with and attracting attention to its campaigns. This is the real "nuts and bolts" part of the manual. To many environmentalists the level of information will necessarily be too low; but it is essential to bear in mind that the manual is designed to help those who have as yet limited experience of eco-action. The lower the "pitch" the wider the scope. The more we can reach the less motivated section of the community the more we hope activity will follow.

The third and final section is perhaps the most difficult to compile. This will be a dossier of case-histories of past and present campaigns. Prerequisites for these case-histories will be a minimum of philosophy and maximisation of factual accounting. We've requested from our FOE groups write-ups of their own campaigns; but this section will willingly accommodate accounts of non-FOE action. It is designed to illustrate the successes and failures of tactics employed by eco-groups and won't attempt to understate the pitfalls that we have encountered. The desire is for others to learn by our mistakes and to copy proven successful plans of action. Contributions to this section will be warmly welcome from any quarter.

Trying to keep this article as far removed as possible from an overt advertisement for the manual is a difficult task. Suffice it to say that we think the project is essential. We hope you do too.

Pete Wilkinson

PS. Arthur Puffett (56 Pondfield Crescent, Marshalswick, St. Albans, Herts) collects stamps of any description (even regular 2½ or 3p ones) which he sells as a source of income for environmental groups. Please write to him for particulars.

The GPO sells 5,600,000,000 stamps per year, which represents a colossal potential revenue for groups who can sell collections to stamp buyers.

FOE, 9 Poland St., London W1V 3DG.

Down to earth

Thalidomide tomatoes

Ted Barton of Bocking, Essex, is a grower. He grows lettuce, runner beans, self-blanching celery, chrysanthemums and some of the last English greenhouse peaches still sent to Covent Garden, but tomatoes are the mainstay of his business. In the last week of February he planted his new greenhouse which cost £6,500, complete with automatic ventilation and watering and propane gas burners providing extra carbon-dioxide for speeding growth. His tomatoes should therefore enjoy an atmosphere like that when England was growing her coal seams.

On March 13th he found some plants showing the first signs of hormone damage and sent specimens to the ADAS (Agricultural Development and Advisory Service) Research Station at Cheshunt. By the next day the damage showed on tomatoes in pots standing on polythene in other greenhouses for sale and further plantings. So he called in the NFU and the Essex River Authority, the last because for 35 years he has pumped the water for all his crops from the river Blackwater at a cost of about 5p a thousand gallons instead of 65p on the mains.

On the 16th, the ADAS advisers from Chelmsford and Cheshunt, a Scientific Officer from Cambridge and the Horticultural Secretary of the Essex NFU met on the nursery and surveyed the damage. The glittering new aluminium greenhouse had every plant with twisted slender leaves above the first fruit bunch, squirming and distorted like lawn weeds poisoned by a selective killer. This greenhouse alone should have produced ten tons of perfect fruit this summer, but now, with luck, perhaps two. Even if tomato plants recover from hormone damage, their fruit, though wholesome, is plum shaped, late, and earns only prices that hardly pay for picking.

The experts confirmed that the disaster was caused by water-borne hormones, from a selective weedkiller in the river, of which *one part in 10 million* would have been more than enough to have blasted Ted Barton's crop. General opinion was that some-

one had thrown an empty weedkiller drum in the river, since the only spray in use on farms at that time was a pre-emergence one for oats, and with no rains even this could not have washed off the land.

The waiting plants in pots had deteriorated so badly by 19 March that 1,500 of them were thrown away and £67 spent on fresh stock from distant nurseries. But by 28 March the bought plants were showing damage and by 11 April it was certain that the killer had struck again, with over 4,000 plants twisting into uselessness. One weedkiller drum in the river is gross carelessness, two of the *same* hormone in a month is rather unlikely.

Ted Barton wrote to *The Grower*, a trade weekly that circulates all over Britain, which drew letters from nine other nurserymen, all lower down the river Blackwater, but all on the mains, and all served by the Mid Essex Water Authority.

One of these, Mr F. Ashford of Mayland, put his losses on a larger nursery at £5,000. He wrote to the Secretary of State for the Environment, his M.P. and the Ministry of Agriculture, and stirred the other growers to do the same.

Because of the long drought, water from the Great Ouse catchment area, which extends as far as Denver Sluice in Norfolk, is being pumped across into the Blackwater to supply thirsty Essex. Could the problem be arising in Norfolk?

Through the long dry spring and summer more and more growers were struck, with a July total of 40, mainly in the Mayland area, and the estimated damage grew to £100,000, in the opinion of the Grower's Action Group at Mayland, who employed a freelance pollution expert, Mr David Gowan, at a fee of £500. The NFU offered £1,000 reward for information leading to the successful prosecution of the person or firm responsible, and local papers carried headlines on "Baffled Boffins".

Though Authority continued to suggest reassuringly simple solutions like discarded drums, or even farmers washing their sprayers in the river like modern versions of Constable's "Hay-

wain", no grower would believe them. Helicopter sprays, clearing waterside weeds with hormones, or even Mr Eldon Griffiths's suggestion of drums falling off lorries, all became impossible.

Mr Barton's little pump built up 0.3 ppm of hormone in his soil, despite the fact that soil bacteria were breaking it down all the time, from 30 million gallons a day from Denver Sluice alone. In June it was estimated that 100 gallons of hormone had gone down the river, and as this is sold diluted to a third strength, this means 60 five-gallon drums worth about £10 each falling off lorries between March and June, week after week, each one rolling into the river and spilling its poison. Cabinet Ministers may believe this, but no policeman will.

There were three possible causes. The first was that, despite official denials, the River Authorities were using the officially recommended hormone weedkillers to destroy water-weeds in drainage channels. These are 2-4-D, Dalapon, Malic Hydrazide, Diquat, Chlorpropham, Dichlobenil, Chlorthiamin, and Paraquat. The water bacteria that break these down are rare and less effective.

The second was the theory that there was a dump of industrial waste somewhere along the relevant rivers, and some of these, especially plasticisers, PCBs and methylene chloride, were combining to produce plant hormone effects. The Deposit of Poisons Act 1972 lays down that the dumpers must notify the Local Authorities where and what they dump, so if this was the case, the Act was being disregarded. There is no guarantee that a spontaneously produced chemical hormone will not also be poisonous to human beings.

Finally there was leakage from one of the very few factories in rural Norfolk, and on July 20th it was officially announced that the cause of the deformities was washings from Fison's factory at Harston, discharged with permission into the Cam and flowing down to Denver Sluice through fields rather than tomato nurseries. Now the NFU will fight a case or settle it out of Court. But the public are entitled to an inquiry why Authority explained away the damage, instead of going straight for the factory effluents which are the major cause of pollution.

Lawrence D. Hills

Failures of planning

PERSONAL MOBILITY AND TRANSPORT POLICY by Mayer Hillman with Irwin Henderson and Anne Whalley. Political and Economic Planning, 1973. £2.00.

THE SACK OF BATH by Adam Fergusson. Compton Russell, 1973. 95p.

THE URBAN EXPLOSION by T. H. Elkins. Macmillan, 1973. 75p.

THE CHANGING LIFE OF LONDON by George Gardiner. Tom Stacey, 1973. £3.50.

THE POVERTY OF PLANNING by Thomas L. Blair. Macdonald, 1973. £3.00.

Of these five contributions to the debate on urban planning by far the most significant is the PEP publication *Personal Mobility and Transport Policy*. Dr Hillman and his colleagues have lit a slow burning fire right down among the foundations of transport planning. And since for most planners the planning process revolves round the provision of transport facilities, the effects of this destruction of the fundamental assumptions of transport planning will be profound indeed.

From Buchanan on a myth has taken hold. It is that most people have a car or if they haven't they soon will. The problem is "to devise an urban structure which... needs to be extendible to accommodate almost universal car ownership". The point is that only 25 per cent of the population owns cars and even in the unlikely event of "saturation" car ownership there would be no more than 40 per cent.

Dr Hillman analyses what this means. To my knowledge he is the first to do it so thoroughly and systematically. His indictment of those who plan for the car is devastating. There are 10 million school children who need mobility: there is evidence that an inability to move reasonably freely in their environment and among friends can cause children to grow up socially retarded or anti-social. If opportunities for independent activities are not pro-

vided they may become socially alienated and delinquent. These are serious considerations with profound implications for the next generation. Not only are they ignored in current planning for "universal car ownership", the provision of facilities for the car causes public transport to run down. It also makes cycling—the main way of getting about for young people—dangerous or impossible.

The elderly, the disabled, the blind or otherwise handicapped are not part of the "universal" ownership of cars. But their needs for mobility are as real as anyone else's. There are eight million old age pensioners in the UK and there are three million disabled people over the age of 16 living in private households. It is this 11 million who perhaps suffer most waiting endlessly at bus-stops or harassed in subways and windy over-bridges, or in danger of their lives at crossings.

There are 29 million people of working age in the UK of whom most of the males are working full-time and over half the females. There are 12 million cars. The arithmetic is obvious.

There are the mothers of 4½ million children under school age who have their own special needs. They see public transport declining and becoming more inaccessible. They see their shops disappearing as shopping facilities become concentrated, their doctors developing group practices and becoming accessible only by car and so on.

This book just cannot be ignored. Orders (including 13p for postage) should be sent to Research Publications Services Ltd, Victoria Hall, Fingall Street, East Greenwich, London, SE1 0RF.

One final quote, however, cannot be resisted. Some economists, in trying to work out everything, including the value of human life lost in accidents, in terms of money, have got themselves into difficulties. A Road Research Laboratory publication points this out: "in the case of the elderly the discounted value of future consumption was greater than the discounted value of future production. This implies that in resource terms the community would gain from their deaths..."

The Sack of Bath is an angry monograph about the destruction, the wilful vandalism, of one of the most perfect towns in the world in terms of its architectural harmony and beauty. Photograph after photograph shows

the dust and smoke rising from the shattered remnants of streets and groups of houses. The destruction of Bath is almost unbelievable. It would be unbelievable if the evidence were not before us. And it is going on still. Worst of all its perpetrators are such people as the City Architect who has had a major role in the blitzing of the town and the replacement of grace and harmony with lumpish ugliness. It is given to few to have so much destruction as their abiding monument.

Of course Bath cannot become a mausoleum. It has its problems like any other city. There is no hint that the present destruction is going any way to solving these problems. It is high time the care of Bath be taken out of the careless hands in which it has rested in recent years.

The Changing Face of London is one of those books the writing of which is justified only by its revelation of attitudes all too commonly held. Superficial and journalistic, it reads like a GLC handout of a couple of years ago when the shaky edifice of the Greater London Development Plan was beginning to totter before its final collapse under the probing of the Layfield Inquiry.

George Gardiner believes "there must be comprehensive development", that "any loss of nerve by the GLC in the face of protests from a small section of London's populace" about the (now largely rejected) Covent Garden plans will be a "black day in London's history". He believes the housing problem is a question of houses and that it will be solved in 1978. He does not believe the allegations of what he calls "the anti-roads lobby" that there is an irreconcilable conflict between homes and roads. He thinks traffic is an overwhelming force of nature; "If it is banned someplace it will pop up somewhere else" (one always thought traffic was people trying to go somewhere not something like water squeezing up through the floorboards of a flooded house—as though people banned from taking their car to work would go for a visit to their granny in Slough instead).

His advocacy of the Ringways has fortunately dated this book completely. The last GLC elections were fought on a pledge to abolish them. Perhaps the minority with cars will agree with him but it is doubtful if this bold decision to fight the vested interests of

the motor lobby (a rich, well organised and staffed one at that) will cause "the next generation of Londoners... to look back on our timid age with scorn."

Profesor Elkins is obviously a sympathetic, erudite and urbane man. He knows Europe and its great cities. In this slight volume he talks briefly about all of them. There are some useful facts for those who would like to know a little more about these cities. But they do not add up to much. One wonders why he bothered.

Finally there is Thomas Blair's book. He is a sociologist and he knows the problems of cities are in their people. The "vulgar physicalism" of architects and planners is part of the deep-rooted materialism of our time. But it is obvious that even if you can get the traffic flowing and the people in clean, dry and aesthetically pleasing (to the architect) dwellings the problems are still there. The poor are still with us. The blacks and others we have brought in to do our dirty work are placed among wealth and privilege that was beyond the dreams of many of them—and are firmly denied a share.

The first half of this book is an attempt to open a dialogue between those involved in physical planning and those immersed in the too often academic disciplines of sociology. Blair is getting somewhere. Mind you, the fiendishly irritating use of semantically barbaric coinage like "Privalord" for private landlord and "welfstaters" for people in public housing is a totally unnecessary handicap he imposes on himself. One feels he is beginning to find a way in which the insights of sociology can be applied in the analysis of the exceedingly intractable problems of urban renewal and development.

The second half of his book he devotes to an interesting survey of how people are trying to deal with the ghettos of America, notably Watts in Los Angeles. He also looks at the role of British planners in the perpetuation of oppressive situations in two towns: Belfast and Durban. A fair degree of "vulgar physicalism" is indeed required. Whether it solves anything is highly questionable. As a bonus we have a little chapter on the ecological impacts of Kariba and Aswan. Having got that off his chest we look forward to Blair's return to his main themes, the architecture of sociology or the sociology of architecture.

But in the end one goes back to the beginning. *Personal Mobility and Transport Policy* must be read.

Gerald Foley

Three worlds

OUR POLLUTED WORLD—CAN MAN SURVIVE? Revised edn. 1972, by John Perry. Franklin Watts Ltd., London, £1.95.

SCANDINAVIAN AEROBIOLOGY (Bulletin No. 18 from the Ecological Research Committee) ed. Siwert Nilsson. Swedish National Science Research Council, 25 Sw. Kr.

INDUSTRIAL POLLUTION CONTROL—THE PRACTICAL IMPLICATIONS, ed. Keith Tearle. Business Books Ltd., London, £5.50.

John Perry goes on tour in search of pollution and has no difficulty in finding it. His journalistic, personal, pseudo-scientific account of his findings, primarily in the United States, is rather rambling and unorganised. The moral is, of course, that man's activities have now reached a scale at which successive improvisations following epidemics or other disasters are not any longer going to be adequate to prevent the situation getting worse. He is to be congratulated on having an index which enables the reader to collect spicy tit-bits which are good conversational material, all in a good cause, but the reader must be warned that there is no substantial follow up of any topic, and many examples of pollution are exaggerated. An informed disputant could fault this book on very many details.

The conclusion, which the author cannot escape, is, of course, that pollution is not really the problem at all. As long as we have the resources to create it we have the resources to control it. The problem is that we are creating a growth-addicted consumer civilisation in a world already so thickly populated that only a minority can possibly live the way the US citizen does, who now, far from being the envy of the world for his riches, is becoming despised as a glutton, and an unsophisticated one at that.

The Swedish publication could scarcely be more different. It is a boring report of a conference at which the

papers, being very individual contributions, do not make a coherent whole. It is badly produced, with many of the diagrams far too minute to read, others too large for the style. It is not a good source book on anything, although if one has to read it one cannot help gleaning a few interesting tit-bits.

It illustrates above all the up-hill work that is being done to make biologists realise that the only real understanding we have of their subject is the result of reducing it to physics and mechanics. Chemists have always realised this about their subject. As John Perry points out, the ecological disasters caused by the Aswan Dam are understood through the physics and mechanics of the situation and however wise they may be after the event, ecologists are generally so ill-educated in physics and mechanics that they cannot visualise and predict the results in advance.

So it is good to see biologists taking the atmosphere seriously at last. They will soon be able to appreciate that the marvellous theory of evolution is

NATURE IN THE ROUND

A Guide to
Environmental Science

edited by
NIGEL CALDER

At last! a plain language statement of the expertise, principles and methods needed if we are to begin even to understand the environment.

Not yet another handwringing exercise about the state of the world: this book outlines, in an original way, the scientific approaches needed for the wise management of the environment. Dismay at the 'intellectual sloppiness' of many utterances on environmental issues, and at the way ecology has come to be regarded as a political movement rather than a science, has motivated Nigel Calder, the distinguished science writer and broadcaster, to marshal a coherent body of knowledge and methods for environmental science.

£3.25

Weidenfeld & Nicolson

intellectually compelling because the mechanics of it can be understood. It is a pity, however, to see them falling for some rather sophisticated systems analysis when their comprehension of the system is so very primitive.

When we look at engineers and administrators at work in *Industrial Pollution Control* we see the gulf between the practical man, working under known restraints of the law and economics with his very short term objectives (10 years, say), the man who is actually causing the physical upheaval of our environment, and the environmentalist whose instincts compel him to look for new motivations for society. Clearly the authors in this book think of themselves as good citizens, and in many cases good environmentalists. They represent an enormous advance from 50 years ago, but the traditional attitude remains: namely that they are doing what they have been asked to do, and are allowed resources to do no more.

Of the three volumes, the third is far more professional and useful, and it is a pity it has no index. It gives a much better picture of what is going on in our industrial society because its objectives are well defined. It cannot be criticised for not having objectives it does not pretend to have. Although some chapters are rather superficial (and one or two diagrams are quite horrible as to perspective) most are worth reading if they are about what

you want to know. For ecologists generally it can be highly recommended as giving insight into a world of short-sighted doers, who have no concern with long term issues or even with politics. Realists, I believe they call themselves. But let us be fair, people of this kind have done a wonderful cleaning-up job and it is not their fault that their efforts have been regarded mainly as making room for more industrial growth. One is almost tempted to say read it soon for it will be outdated by the advance of technology and quite new problems in a decade; but while it is relevant it is a good lesson in attention to detail which many propagandists need. One cannot help admiring, and wincing at, their simple minded view of the predicament of man.

R. S. Scorer

Song of Salomon

ONE MAN'S VIEW... ON MONEY, TAXES, GOVERNMENT, FREEDOM by Walter Salomon, Churchill Press 1973. 50p.

In this Year of Lonrho and Roche, Polwarth and Poulson, it is fun to read a right rabid tract from a freebooting free marketeer.

Born in 1906 of a Hamburg banking family, Salomon was a bank manager by the age of 21. He witnessed the fantastic German inflation of 1923-24,

which helped Hitler's rise, and thus his flight to Britain in 1937 with just his "wife and a few thousand pounds". Pounds were worth 5.3 times more then, so we have here the philosophy of one very rich man, a banker still.

That figure of 5.3 is probably well-known to him, for there are twin ongoing obsessions in this book, of which inflation, understandably, is one. Its cause—and hence simple cure—is a mere matter of money supply, we are assured: the excess cash and (Access?) credit created by promise-anything politicians.

The second obsession is freedom. Laudable say we all. But Mr. Salomon's is the individual's freedom to circumscribe that of others less fortunate, the freedom to charge usury, foist trivia and make a mint; preferably without any government interfering (i.e. "confiscating" taxes) "in the names of consensus, of participation, of social justice and of many other high-sounding or emollient euphemisms for retreat" from the laissez-faire ideal.

Blind to our present gulf between needs and wants, to the gross inequities in society for which growth is the placebo, to the material and spiritual limits to that growth, Salomon's song is straight Economic Darwinism: survival of the fittest. He is the archetype Heathen Man, c. 1970. But these are dog-eat-dog days, Mr Salomon.

Philip Brachi

Coming events

2-4 October—Environmental Health Exhibition 1973 to be held at Devonshire Park, Eastbourne. Further details from Exhibition Manager, Environmental Health Exhibition, Brintex Exhibitions Ltd., 178-202 Great Portland Street, London W1N 6NH.

8-14 October—The British Sub-Aqua Club is staging the Third World Congress of Underwater Activities at Grosvenor House, London, on "The Threat to Marine Life". For further details write to Oceans 2000, Conference Office, Grosvenor House, Park Lane, London, W1.

9-10 October—2-day course of lectures to be held at the Water Pollution Research Laboratory on Advanced Waste Treatment, Instrumentation in Water Pollution Control and Developments in Sedimentation and Sludge Technology. Further details from The Director, Water Pollution Research Laboratory, Elder Way, Stevenage, Herts, SG1 1TH.

16-18 October—Seventh Symposium on The Future of Conurbation Transport at Holly Royde College Manchester. Further details from Mrs Lynn Palethorpe, Department of Extra-Mural Studies, The University, Manchester, M13 9PL.

20 October—One day conference on Environmental Problems to be held at the Brighton Polytechnic. Further details from Peter J Bates, 21 Lower Faircox, Henfield, Sussex, BN5 9UT. Tel. Henfield 3172.

27 October—The Farm and Food Society are holding a conference on Farming Now and Tomorrow at Friends House, Euston Road, London NW1. Further details from Miss Angela Smith, Woolpits, Saling, Braintree, Essex.

29 October—Communicating Survival—A one day seminar in central London. For further

information contact David French, National Council of Social Service, 26 Bedford Square, London, WC1B 3HU. Tel. 01-636 4066.

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

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

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

Future of the car

BEYOND THE CAR: RECREATION TRAFFIC IN NATIONAL PARKS. Cambridge University Conservation Society. 25p.

BRITISH LEYLAND: THE BEGINNING OF THE END? Counter Information Services, 5 Shaftesbury Ave., London W1. 60p.

WHEELS OF PROGRESS? Ed. by Dr J. Rose. Motor Transport, Pollution and the Environment. Gordon and Breach. London, 1973. £1.25.

Here are three publications with the common theme of the car and its impact on society and the environment in which we live. The first two come from outside the established groups and disciplines which owe their existence to the fact of the car's predominance in our economic and social life. The third is a collection of papers published by planners, academics, engineers and economists in the *International Journal of Environmental Studies*.

Perhaps the most startling difference between the two attitudes represented is that those outside the establishment put the future of the car itself in question. For the others no such doubt is hinted at; there is "no reason to expect other than a doubling of traffic flows during the next twenty years". Their preoccupations are firmly encompassed within this assumption.

The Cambridge Conservation Society's pamphlet points to the steadily accumulating evidence that we are approaching a profound change in the level of availability of petrol for private motoring. Present official plans for National Parks are too often oriented towards the requirements of the "leisure motorist". This is someone to whom a park is a place in which to drive and enjoy the scenery. According to a Lake District Survey as much as 39 per cent of car-borne visitors stay less than one hour at a parking space during which time they move, if at all, only a short distance from the vehicle. The Conservation Society argues that the very beauties which people come to see should not be destroyed to cater for this kind of visitor, particularly as there is evidence that petroleum restrictions will make the whole concept of leisure motoring

out of date within a couple of decades.

Instead there should be provision of widely available public transport facilities which will make the National Parks accessible to those who can enjoy them, whether they own cars or not. There is information on what has been done elsewhere on these lines—particularly in Yosemite in California from which planners and public here might learn a lot.

Counter Information Services have a high reputation for digging out the facts behind the bland faces of some of our larger corporations and institutions. Here they turn their attention to British Leyland, which has steadily lost ground in competition with other major manufacturers in the world. The story of its emergence into its present form under Lord Stokes through a series of mergers and take-overs during the 1950's and 1960's is told. But, the authors contend, it has not eliminated the basic structural and managerial weaknesses which were built into the old idiosyncratically run individual motor companies. Now we have a large proportion of our economic well-being dependent upon a huge, under capitalised and disjointed organisation increasingly vulnerable to competition and changing circumstances.

In its efforts to survive, British Leyland is leaning increasingly heavily on its labour force who, because they have nowhere else to turn, will be the greatest sufferers if it collapses. Their jobs are threatened by the deployment of resources to areas such as Spain and South Africa where labour is more amenable. The descriptions of actual working conditions here should dispel for ever the notion of the car worker as the pampered ingrate who petulantly bites the hand that feeds him.

Looking towards the future the CIS authors see British Leyland's difficulties becoming worse. They also see energy restrictions beginning to bite on sales of private cars thereby reducing the market. The better run and better equipped Americans, Japanese, Germans, and Italians will be competing even more fiercely for customers. In these new circumstances "only the strongest will survive—albeit in a radically different form. On all the known facts BLMC can hardly be counted as one of these".

One turns from this to the bland certainties of *Wheels of Progress?* Here the line into the future remains smooth

and unending. Of course there are problems associated with our progress but it is the job of these people to solve them—or at least quantify them. One essay says: "Jacobs and Wilson report that the overall risk to pedestrians crossing the road was found to increase with vehicle flow. A graph was produced relating vehicle flows to pedestrian risk and the following formula represents the regression line.

$$r = \frac{F}{10,000} - 0.03."$$

Such activities have been known to confuse people about the difference between woods and trees.

Throughout, also, one finds a harking back to Buchanan and his *Traffic in Towns*, that bible of the traffic optimists who believe in a future of motorways and cities rebuilt around them. Professor Percy Johnson Marshall nostalgically calls the book a "civilised and intelligent approach to the problem of transport" which among other things advocated a maximum use of public transport. He must be joking.

Here then we have the two views, the unorthodox and the orthodox. The unorthodox view is that the car's role is going to change, that if nothing else we will within the foreseeable future find ourselves without the fuel to keep even today's traffic levels running, let alone much higher ones. From this the conclusion is drawn that we should begin to prepare ourselves to deal with the unpleasant and inevitable. The orthodox view is that there will be no interruption of our steady upward movement along the curve of progress. Our task will be to deal only with the snags that come with the good life; to produce vehicles which are safer and less polluting, refine our planning methodologies and cope with the difficulties of putting a cash value on visual intrusion.

The question of which view is the right one is important to all of us.

Gerald Foley

Corrections

In "Progress to Poverty" (September issue, page 342) the year of publication of Richard G. Wilkinson's book was given as 1927. It should be 1972. We apologise to Mr. Wilkinson and to his publisher, Methuen, for our error.

In "Adam and Eve Revisited", section 8, p. 350, "neocracies" should read "neocracies".

Letters

Limits to Growth?

Sir,

In your August issue you carried a long summary of the Council of Europe meeting 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. It is valuable to have these replies, but they do confirm yet again the carelessness with which environmentalists often treat facts and sources.

In the Club's replies there are three quotes, all in the section on food. Two of them are ascribed to Dr Norman Borlaug, awarded the Nobel Prize for his part in launching the "green revolution", and one to Professor Georg Borgstrom. In fact all three quotes were made by Professor Borgstrom in an article in the *Observer* of 5 March 1972 which launched a three-part series called "The Great Doom Debate" (subsequently reprinted as an *Observer* Pamphlet). If the Club of Rome wishes to base its testimony so heavily on the views of one man, that is its affair. But at least it should get the man's name right.

Gerald Leach,
3 Tanza Road,
London NW3.

How many can we feed?

Sir,

The last paragraph of Malcolm Slesser's article in the June *Ecologist* would be comic if it did not underline the essential tragedy of our times—that man's enormous intellectual and technological powers are in the hands of a creature whose actions, motivated as they must be by the basic instinct to survive, are cast into specific forms of unthinking prejudice and habit. Except in certain dangerously segregated areas of activity, man is still a rationalising rather than a reasoning animal; his survival depends on turning the searchlight of reason on to his own behaviour patterns and, beginning with the individual thinker, using his intellectual powers to alter them according to the challenge of the times.

After a most useful article leading

to the conclusion that, for strong economical and ecological reasons, man should learn to depend on plant foods not animal foods as the population pressure on scarce world resources grows ever greater, Mr Slesser ends with the sweeping assumption that "good eating" means the eating of animal flesh. This is of course a rationalisation of the fact that he, as most in the affluent West, is addicted to certain habitual satisfactions of the palate. Such habits are typical of only certain sections of the human species through comparatively short periods of evolutionary time, and were probably adopted in the first place in response to the environmental challenge of the Ice Ages. Unfortunately they are now spreading through the prestige-conscious elite of the developing world together with other forms of Western violent technology. For example the higher yields of the Green Revolution are making possible the setting up of factory farms in traditionally vegetarian India.

Fortunately another trend is gaining momentum: growing awareness and sensitivity and acceptance of the importance of the emotional life are making flesh foods repugnant to a growing number of forward looking people: growing knowledge of the essentials of healthy nutrition and of the connection between modern killer disorders and Western feeding habits are leading to diets based on the enormously varied and delightful fruit and vegetable foods. This trend is not unconnected with the fact that environmental factors, unlike those of the Ice Ages, now challenge man to give up his wasteful and cruel habit of passing his food through animals before he eats it.

Yours faithfully,

K Jannaway,
Secretary of the Vegan Society,
47 Highlands Road,
Leatherhead, Surrey.

Human inventions?

Sir,

It really is time the ecological (or any) movement stopped using the blanket term "man" as in this passage in Michael Allaby's article on the Geneva meetings of scientists and theologians:

"Since he abandoned his hunter-gatherer way of life man has modi-

fied his natural environment to make it sustain larger human populations ... He has created social and economic systems within which he has invented injustice, oppression, exploitation and poverty."

Surely we need hardly worship Marx and Engels to know that civilisation and its class societies were a response to *scarcity and insecurity* caused not simply by "larger human populations" (was Medieval Europe overpopulated?) but by inadequate technology, in most environments, for meeting human material—and spiritual—needs? Implicitly at least, this appears in most of the relevant accounts by modern scholars.

Of course, exploitation, originally benign in compelling a social surplus, was perpetuated by ruling classes—but not by some abstract "man". The reasons again are pretty clear, as also why they had to have war and conquest. But to say that *man* "invented" injustice, etc. leaves the door wide open for the crudest Social Darwinism and a plenary pessimism about inborn human nature, relieved only by the hope that some rare and saintly elite (theologians and ecologists perhaps?) are born miraculously free of those inventive depravities.

Moreover, anthropologists and others have long since discovered a significant number of societies where a rare but sufficient bounty of nature enabled them to keep in rein any inborn aggression in human nature. The invaluable collation in Irenaus Eibl-Eibesfeldt's book *Love and Hate* should be compulsory reading for any ecologist (or theologian) who thinks "man" *as such* "invents" injustices, etc. out of a genetic bloodymindedness.

Yours faithfully,
Basil Druitt,
47 Barrack Road,
Christchurch, Hants.

I was reporting views expressed at the Geneva "consultation" rather than expressing a personal opinion, but Mr Druitt makes my point for me: the existence of societies which avoid social injustice, oppression and poverty suggests these characteristics of modern societies are not inevitable, but have been introduced at some point in the past. If they were not "invented" by man, by whom were they "invented"? It suggests, too, that since our societies

have been created by us, they may be changed by us—the point made in Geneva. No ecologist would dream of talking of “genetic bloodmindedness”—that is Mr Druitt’s “invention”!

Michael Allaby

Scottish oil

Sir,

Your correspondent Walt Patterson writing on the Scottish Oil Bonanza in your August issue is a bit astray. In fact the Scottish Liberal Party was the first to draw attention to the possibilities and dangers inherent in the discovery of oil off the Scottish Coast and has always advocated slowing down the exploitation of the oil. Our pamphlet “Oil—the key to Scotland’s future”, published in early 1972 is the first political publication on this subject; this quotes from speeches by Russell Johnston, MP, in the House of Commons on 3 February 1971 and at the Scottish Liberal Party Conference on 11 June 1971, raising many points connected with the oil question. Other parties have since taken up the issue with various degrees of zeal.

Our pamphlet covers all the points mentioned in the statement from the meeting in Dundee of various conservation groups. Since then Scottish Liberals have developed their policy on oil, to call for a National Energy

Policy, the restriction of the extraction rate to cover only our essential needs and a ban on exports to the USA. Other points in our policy, agreed at this year’s Conference may be of interest to your readers. They include a Scottish Oil Development Corporation with powers to negotiate with oil companies, to lay down social and environmental responsibilities for them and to apply 50 per cent of the (greatly increased) royalties to help fund appropriate industrial and commercial enterprise in Scotland; compelling oil-based companies to involve a high percentage of local capital and trained local labour; slowing exploitation to allow local firms time to learn to compete for contracts; government finance for educating and training local people to man the oil industry and for research into deep sea oil exploitation; a compulsory insurance fund to cover restoring sites to their former condition and deal with pollution. Another resolution called for a National Energy Commission to study the possibility of an escalating energy tax on consumption and ways in which we could adjust our national “life style” to a GNP which could be achieved within a framework of the future rationing of fuel supplies.

As with our resolution in 1971 on a Population Policy, we would claim this as a political breakthrough—the first British party to consider the possibility

of dethroning the great god “growth”. Some politicians do think ahead at least some of the time.

Yours faithfully,
Donald Gorrie,
Administrative Director,
Scottish Liberal Party,
2 Atholl Place,
Edinburgh, EH3 8HP.

Celtic identity

Sir,

It was a pity that Nicholas Gould, in his review of the Celtic League Annual was so fatalistic about the loss of Celtic identity. As in the case of the overall consumer, apathy is the result of generations of conditioning.

Cornwall, victim of the greatest degree of assimilation, will evidently follow in the wake of the Scots and Welsh rather than set its own pace. In the meantime, the matter in which the three Westminster parties have contrived to freeze out Plaid Cymru and the Scottish National Party from radio and television is evidence that they consider it foolhardy to rely on Celtic apathy as a foregone conclusion.

Yours faithfully,
Pádraig Ó Conchúir,
(Chairman, London Branch,
Celtic League),
84 Pulleyns Avenue,
East Ham,
London E6 3LZ.

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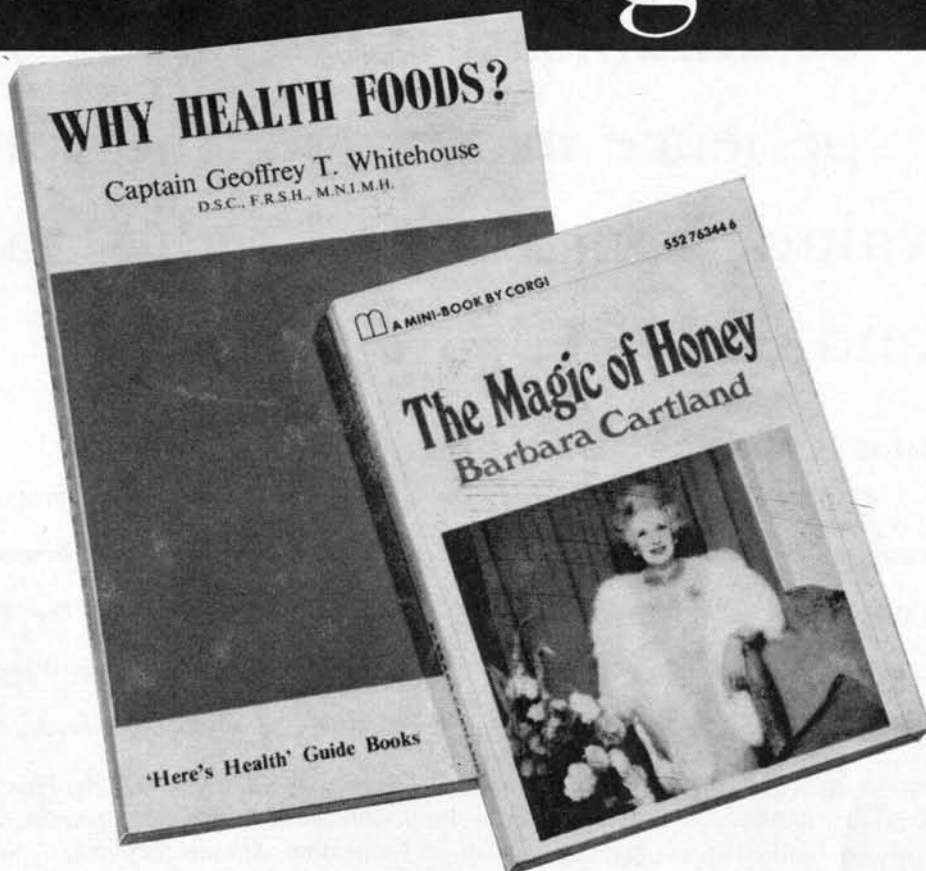
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