

The

Ecologist

Man and the environment ■ The Quality of life ■ Pollution ■ Conservation

Vol. 1. No. 3

September 1970

Saving the Severn ■ Should Britain be a federation?

The green revolution ■ Supersonic second thoughts



The
ailing
air



It's good to get out for a breath of fresh air.

But some people have to go a long way for it, because, as everybody knows, Britain's 'smokeless zone' programme is by no means yet complete.

There are quite a few areas where this kind of picture can still be taken. On the other hand the programme of conversion to

Natural Gas, Britain's cleanest fuel, is going ahead at high speed - with great benefit to all.

In a few years' time it will not be so easy to take photographs as grim as this one. The sooner the better.

Use Natural Gas - the smokeless fuel.

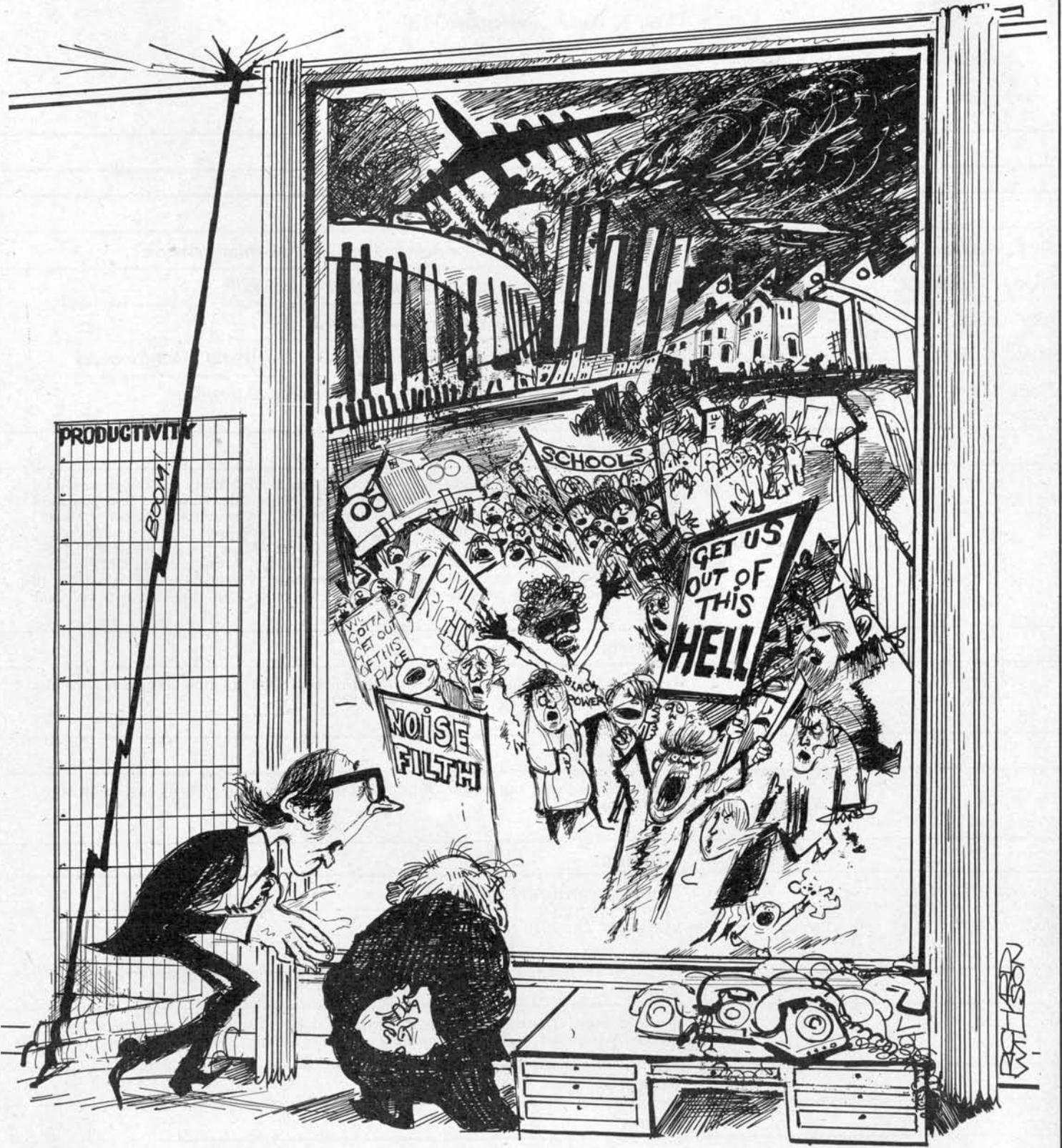
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"I can't understand it. Productivity has never been higher."

Editorial

The cult of 'productivity'

"Productivity" is a cult. Its aim is to achieve maximum output for minimum input. This sounds innocent enough, even desirable, as it is in this way that wealth can be maximized.

Closer scrutiny, however, reveals that this wealth is mainly illusory and that it is achieved at vast social cost.

The goal of behavioural processes in a stable system is to achieve an optimum output—*never a maximum one*.

There is no way of increasing the output of any part of a system beyond the optimum with total impunity. This is a basic ecological principle from which no-one is exempt—not even the most brilliant scientists in the world.

Take the example of "Productivity" in agriculture. In 1935 wheat yield per acre was 19 cwt. By 1968 it had surged to 29. How has this been achieved? The answer is by "intensification", i.e. by increasing the input of various technologies. In this way wheat output per unit of land has risen dramatically. But is it the same wheat? Also is it the same land? The answer, in both cases, is no.

Among other things, we have increased the use of nitrogen fertilizers and introduced chemical pesticides. As a result today's wheat is different. For instance, it has a higher water content and may contain traces of dangerous poisons such as DDT.

But the land has also been affected. The structure of the soil has been destroyed. Its moisture retaining capacity has been impaired which makes it far more vulnerable to drought, as farmers in East Anglia are finding to their cost. In addition pesticides have exterminated countless living organisms that previously controlled pest-populations. This makes food production that much more vulnerable to epidemics—think of the swarms of green-flies and caterpillars that farmers are now complaining of.

We have also had to introduce expensive farm machinery—and to make this

viable 5000 miles of hedgerows are mercilessly cut down annually. Partly as a result each year the fens lose an inch of topsoil which has taken between 300 and 1000 years to produce. These factors combine to reduce the land's capacity to produce food for the future.

It must be clear by now that the "productivity" we are referring to is not just output divided by input. It is *short-term output divided by long-term input*. Thus to increase today's output we are using resources required for tomorrow.

But this is not all. We are supposing that land is the only input. It is not. There are countless others, and some of them, rather than fall or remain constant, have risen dramatically. Thus, whereas in 1939 farmers used 60 elements of nitrogen fertilizer, in 1968 they were using 748. In fact, "productivity", if nitrogen is taken as the input, has fallen by 88%. It has also fallen if we take chemical pesticides as the input, as it has if we take agricultural machinery. On the other hand it may appear that productivity per unit of labour has increased since there are less than half as many people on the land as there were after the war. But this too is an illusion—as many of the people who once tilled the soil are now simply producing the fertilizers, pesticides and agricultural machinery in urban factories. Indeed, if agriculture is defined as the production of food, then they are as much involved in it as they were before.

But this is not all. To manufacture fertilizers, pesticides and machinery, we must build factories, to transport them we must build roads—and all this, as does their daily use, involves the consumption of non-renewable natural resources—metals of different sorts—and above all fossil fuels of which the earth has a limited stock and one that is fast running out.

It is recognized accounting practice to 'write off' or 'amortize' fixed plant. Yet

though the importance to technological processes of such renewable manufactured resources is trivial compared to that of land and non-renewable minerals and fuels, *the latter are totally left out of our accounts*. Why? The answer is that if they were included it would become plainly evident that modern agriculture, rather than having increased productivity, has drastically reduced it.

But this is not all. Growing food is not man's only occupation. A social system is very complex. It is made up of many parts, and many of these have been affected by those processes that have permitted the spectacular rise in "productivity" of which we are so proud. For instance, pesticides have decimated bird and insect species. Nitrates, added to the soil, have run off into rivers, leading to eutrophication and the extermination of fish-life. Cutting down hedgerows has transformed once beautiful countryside into monotonous prairies. Unemployment has destroyed rural life and the cities have become chaotic and overcrowded as more and more have sought factory employment.

In many of the so-called developing countries this process is proceeding at such a rate and on such a scale that cities are menaced with social breakdown. Indeed at the present rate, it is only a matter of time before the alienated and unemployed refugees in mushrooming shantytowns revolt and destroy any semblance of law and order.

Thus the cult of productivity is leading to a reduction in the quality of our food and in the land's long-term food-producing capacity, and also causing such serious perturbations in the complex social and ecological systems of which we are part that it may menace the very survival of civilized life.

Clearly we must scrap this absurd cult, and in devising a substitute goal-structure let us remember that it is the *optimum* that we must aim for—*never the maximum*.

The ailing air

Do we know what we are doing to our most essential resource?

by Dr Eric S. Albone

Research Associate, Centre for the Biology of Natural Systems, Washington University, Saint Louis, Missouri.

"Pollution panic" is today's fad. But it is far too serious to be so devalued. In the midst of our current clamour, facts are few and informed discussion is deafeningly silent. Attitudes of environmental hypochondria jostle those of "balanced" complacency. In this article Dr. Eric S. Albone puts the problems of air pollution into perspective.

A year ago a man walked on the moon. Here was a measure of our time, inspiring and futile, cut out by cash and courage for the television sets of the world. But it was a crucial event, for here man first stood outside his world and knew his oneness with a precious, living lump of rock set in a bleak infinity. Here was an experience different from that of generations of explorers struggling over the earth's hostile hide in search of new lands and new fortunes. Here was a world grown small and fragile in the shadow of man's power.

From a relentless arrogance towards a world we still seem to believe was created for our benefit and from a determination to exploit all we find with uncompromising thoroughness has flowed the stream of achievements of which we are justly proud. Such attitudes, which Lynn White sees rooted in our half-forgotten theological past, are now by their very success and power threatening us with destruction. Their value has passed. Man must learn to replace harmony for aggression, or die. René Dubos has put it this way. "In order to survive, mankind will have to develop what might be called a steady state." The transition implies momentous consequences for all aspects of our life and thought. But unless there is transition, our tenancy of this planet is limited.

Man's capacity today to kill and to communicate, to reproduce and to foul with his biological and technological excreta is global and therefore of dimensions critical to his survival. The problem is one of the scale of man's power, and pollution presents one facet of that impending problem, one manifestation of man's mindless might.

Let us here look at one kind of pollution, the physical and biological aspects of the pollution of the air, remembering that in reality our environment is an integrated whole and that a consideration of the air environment in isolation is not strictly valid. And if we wish to look to the future, let us mainly look to the present rather than lose ourselves in fantasy, for the present is where the future is born.

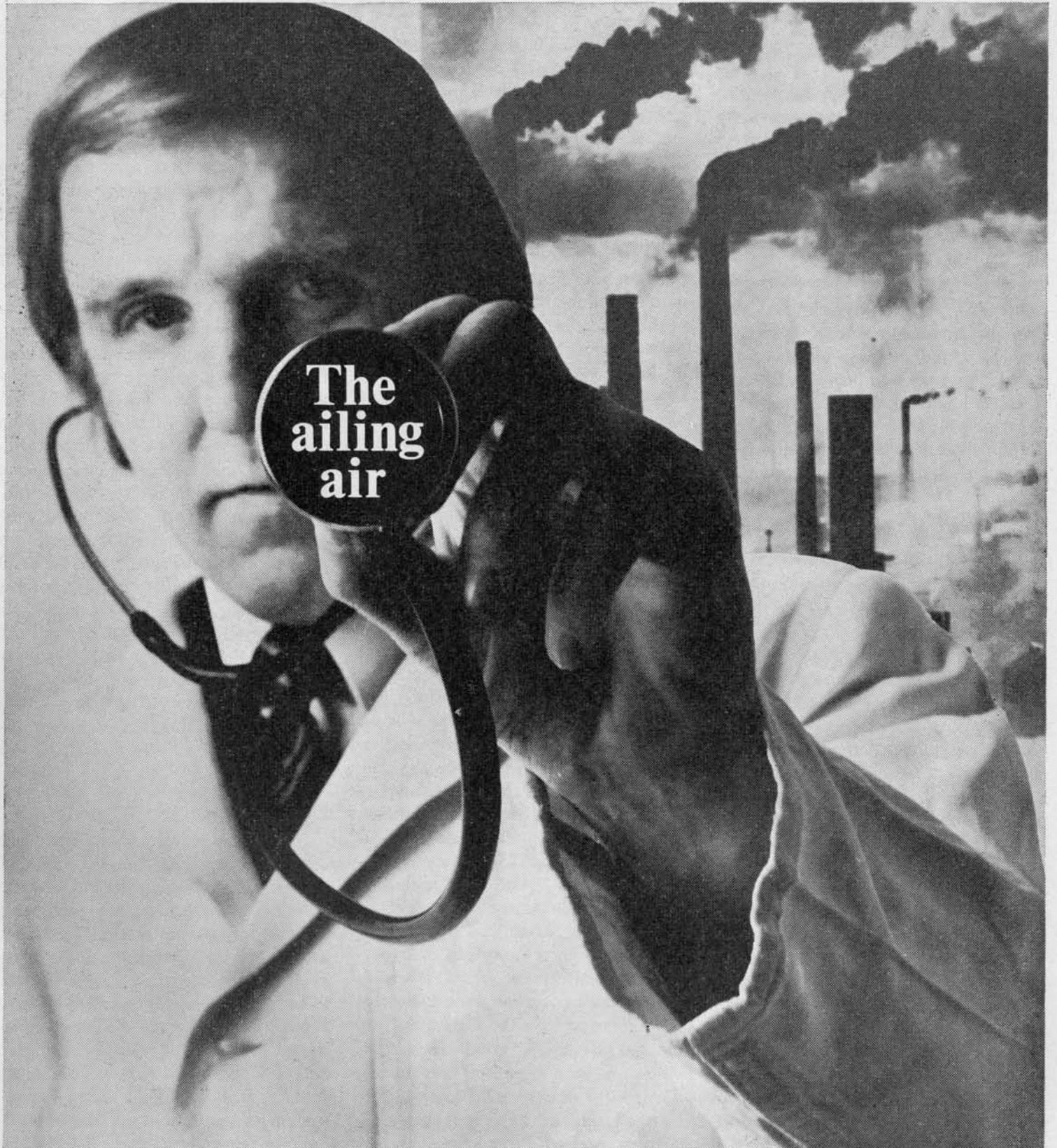
"Pollution" is not a scientific term, implying as it does a value judgement. It presents a convenient label but not a convenient starting point. Rather it is necessary first to develop understandings of the nature of the many complex processes occurring in the environment. Judgements follow, for although on some occasions pollution will be evident to all, at others it will be illusory and at still others it may be hidden to casual examination.

Envelope of air

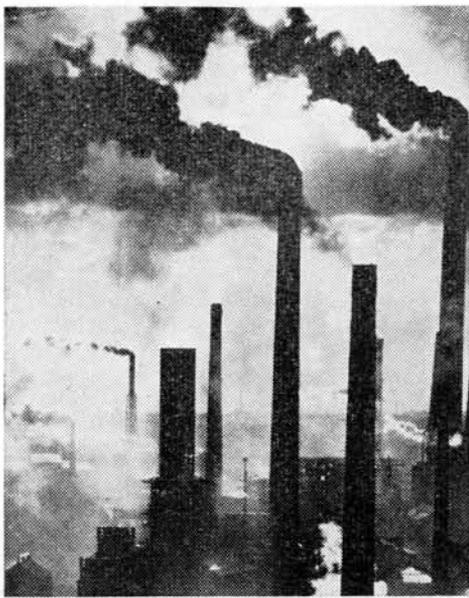
So, what of the air environment? Each day each of us breathes his way through about 3000 gallons of air composed, if dry and clean, of 78.09 per cent by volume of nitrogen and 20.94 per cent oxygen. The remainder is mainly argon and carbon dioxide. In practice, water vapour is also present to an extent varying from 1 to 3 per cent. Approximately one half the weight of the atmosphere lies below an altitude of 18,000 feet and 1 per cent above 100,000 feet. The composition and dominant chemical processes of the atmosphere differ from the troposphere, which extends from the ground to 39,000 feet at mid-latitudes, in

the abundance of shorter wavelength radiation leading to a chemistry based on the photolysis of oxygen molecules to atomic oxygen. One consequence is the maintenance of an ozone layer which serves to shield the earth's surface from dangerous radiation. But even these remote heights feel man's impact. It is said that by flying for one hour at these altitudes, a supersonic transport consumes 66 tons of fuel and casts out 83 tons of water, 72 tons of carbon dioxide and 4 tons each of carbon monoxide and nitric oxide. If such flights become common, the consequences are unclear. Anxiety has been voiced that the water vapour produced at elevations where natural water concentrations are low could have significant effects on the energy balance of the entire planet, and also that the vital ozone layer could be disrupted. But lacking sufficient background knowledge we can only advance an informed guess.

Into this thin envelope of air we pour our gaseous wastes. Carbon dioxide is produced in massive quantities, but this is not usually considered a pollutant. With water, it is the ultimate product of combustion. Of the major gases considered pollutants, the US in 1965 released an estimated 72 million tons of carbon monoxide, 26 million tons of sulphur oxides, 19 million tons of hydrocarbons, 13 million tons of nitrogen oxides and 12 million tons of "particles", together with a plethora of other materials, lesser in quantity but not necessarily in significance. Future trends are uncertain, but if one recalls the astonishingly rapid and violent explosion in technology which this century has seen, one could be very pessimistic. On this point, the Spilhaus Report in America projected with regard to sulphur dioxide emissions that on the basis of "severe but realistic controls... a 75 per cent increase by 1980 and a further 75 per cent increase by 2000" will occur, and John Middleton, US National Air Pollution Control Administration Commis-



**The
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“By 1990 our potential to emit sulphur oxides could hit 95 million tons—and again our calculations may well prove on the conservative side.”

sioner, has written this year that “by 1990 our potential to emit sulphur oxides could hit 95 million tons—and again our calculations may well prove on the conservative side”. What happens in America will surely be paralleled here. Certainly the problem will continue to grow under the fragmentary yet relentless impulse of our dangerously narrow economic concern.

Understanding pollution

To put meaning into these numbers, various understandings are required. Firstly we need to know something about the diffusion, transformation and fate of the substances we add to air. This requires a knowledge of the location, nature and extent of emission sources and understandings derived from meteorology and atmospheric chemistry together with the support derived from an extensive monitoring programme of the ambient air. In all these areas we are weak. A second kind of understanding we require concerns the effects of materials added to the air at the concentrations and in the mixtures actually encountered. We may expect effects on man's health, on his possessions (through corrosion and soiling), on the plants he grows for food and decoration, and on the total web of life of which he is part. Effects on a global scale are to be expected and the less easily quantified consequences such as personal discomfort caused by odour and the psychological

weight of dismal surroundings also have a place.

Only when such understandings are being developed can we hope to discuss pollution rationally. Then we shall begin to be aware of the real costs of our comforts in the modern world, and we shall become impatient with such statements as “The Generating Board has been searching for years for a way of removing sulphur dioxide formed by the burning of fossil fuels without increasing the cost of electricity” (*Daily Telegraph*). We shall realize the real cost of dirty electricity.

The environment is a dynamic system and our gaseous wastes are unlikely to remain unchanged in it. If they were to, global air pollutant levels would slowly and inevitably rise. In fact, with the dearth of information we have, we probably wouldn't notice the early stages of this process anyway. We also have rather little information on the nature and extent of the various processes removing pollutants from the atmosphere, the natural pollutant sinks. We are unsure of the atmospheric fate of carbon monoxide (although we can guess) and of methane, although the possibility of oxidation in the stratosphere has been discussed. Usually we have not worried about such problems and have trusted that pollutants will be diluted by the winds and then forgotten.

Killer smogs

But we cannot always trust the weather to be our friend. The December 1952 killer smog of London depended for its ferocity on the weather. It impelled Londoners to light fires to keep warm and then trapped the smoke in the damp atmosphere. Last summer (1969), the American mid-west experienced smog for several days and smog alerts were announced in Chicago and St Louis as stagnant air settled over the region and populations suffocated in their own fumes. In fact US government meteorologists (ESSA) regularly examine meteorological charts and issue high pollution warnings as such atmospheric conditions develop over a region. Los Angeles provides a notorious example of unfavourable climate. Pollutants from this heavily populated area concentrate in a stagnant atmosphere and, in the California sun, undergo photochemical transformations which are even now not fully understood. Most significant in Los Angeles are the oxides of nitrogen and hydrocarbons derived from Los Angeles

One estimate of the total agricultural damage in the US resulting from air pollution has put the cost at \$500 million per year.

County's 4 million cars. This accumulates in an atmosphere in which low winds and the surrounding mountains limit horizontal dispersion, and thermal inversion (which lies over the area some 320 days of the year) limits vertical dispersion. The outcome is a whole range of new pollutants, the oxidants, formed in the atmosphere itself. Best known are ozone and peroxyacetyl nitrate (PAN). An average oxidant level of 0.15 ppm or more for an hour is considered evidence of serious photochemical smog. Los Angeles experienced such smog on 29 per cent of the 714 days of 1964 and 1965 for which good records exist. This phenomenon, unknown before 1945, is now extending to other major cities of the world. It exacts a severe toll, the total cost of which has not been computed. Here are some elements of the cost. Oxidants produce severe eye and respiratory irritation and one study has revealed a general relationship between oxidant levels and the athletic performance of schoolchildren in Los Angeles. Materials are attacked, especially rubber, and plants are damaged. In 1954 the damage to crops from Los Angeles air pollution was even then estimated at \$3 million per year. One estimate of the total agricultural damage in the US resulting from air pollution has put the cost at \$500 million per year. It is possibly greater. Nobody really knows. Today we have reports of smog killing nearly a million trees in a National Forest on the mountains 60 miles from Los Angeles.

British scene

But that is America, not Britain, we confidently say. Such things do not happen here. And certainly the British scene differs from the American. Sometimes it is better, sometimes worse. Conditions are not nearly so conducive to the formation of photochemical smog in Britain as in Los Angeles. But recall that there is neither extensive nor systematic monitoring of the air for oxidants in Britain, so our optimism has little base apart from supposition, albeit seemingly reasonable supposition in the case of oxidants. In this context, it is interesting to

recall recent reports from Porton concerning an unexpected bactericidal component of ordinary air. It is conjectured that this component has an origin similar to Los Angeles smog, but this time "made in Britain".

Apart from some measurements in London, we do not examine the composition of our atmosphere very thoroughly. The Ministry of Technology through its Warren Spring Laboratory has been conducting a very extensive National Survey of Smoke and Sulphur Dioxide for some years. By September 1969, 1189 daily sampling instruments were in use. This excellent study has resulted in the publication of a listing of geographical "black areas" in Britain. It has also detected a very encouraging downward trend in ground-level sulphur dioxide and smoke levels in the country as a whole in recent years, especially following the Clean Air Act of 1956. But this limited success is grounds for more action rather than less, especially in the face of the bureaucratic farce in which shortages of smokeless fuel have now dictated a policy of *suspension* of smokeless zones.

Unknown pollutants

But the Ministry of Technology survey

As a result of the "vast geophysical experiment" man is unwittingly conducting, "by the year 2000 the increase in atmospheric carbon dioxide will be close to 25 per cent".

measures *only* smoke and sulphur dioxide. This is not adequate. Nitrogen oxides and oxidants should be added to the list, especially in view of the Porton reports. And a much more general approach to assessing air quality should be initiated. A report of the 1967 WHO symposium on the health effects of air pollution contains these remarkable statements: "In the concentrations found in the air, none of the known pollutants would be expected to have any serious effects on health... some *unknown* substance is therefore responsible for the correlation between airway resistance and air pollution during the winter". That is how much we understand our environment.

We need to be on the lookout for unusual or unexpected pollutants which can cause serious damage even following brief exposure at low concentrations.

This form of pollution is most easily overlooked. An example is the damage observed to cut its way through the centre of St Louis last year following the chance release of quite a small quantity of defoliant. Defoliant is manufactured in the area. The effect on plant life could be mapped, but it required a trained scientist with an interest in the community to draw the observations together, and such persons are not often available.

Acid rain

But sometimes quite ordinary pollutants fox us. Consider the fact that Sweden's rain has become more acidic recently. One theory is that the sulphur dioxide emissions from Britain and other European countries are to blame. Are they? We don't know. Since 1957, the pH (a measure of acidity, the acidity increasing the lower the pH) of rain over Britain has averaged pH 5.0. But, in Sweden, median values have been slowly dropping from pH 4.8 in the period 1957-61 to pH 4.5 in the years 1962-6. Isolated reports of rain of astonishing acidity exist. This phenomenon is not confined to Sweden. In 1958, precipitation of pH less than 5.0 was limited to parts of the Netherlands. By 1962, rain of that acidity extended over areas of

Sydney harbour





“Britain has the highest death rate in the world for chronic lung disease in middle-aged men.”

central Europe and in the Netherlands rain of acidity below pH 4.0 was encountered. It is pointless to debate who or what is to blame. We do not have any conclusive evidence. For example, we do not have much information how much pollution we “export” on the winds. An airborne spectroscopic technique developed in America would be valuable here, but it is unlikely to be applied. So far our one ground-level directional smoke and sulphur dioxide pollutant monitoring station on the Norfolk coast indicates that we “export” just a little more than we “import”. But one station is not enough to begin to assess the situation. And still people debate Sweden’s rain. It seems that we are determined to fight the “Fight Against Pollution” over unknown terrain. There is the frightening-amusing quotation of one of our lost leaders, Austin N. Heller, Commissioner of Air Resources, New York, that “by reducing sharply the ambient sulphur dioxide levels, we could be increasing photochemical reactions... or smog”. I don’t suppose anyone knows enough about any particular atmosphere to say whether or not this is so. But we do know the fight is world-wide. The Swedish rain situation indicates that. We know it too from the detection of pesticide residues (DDT, dieldrin, BHC, heptachlor epoxide) in the tissues of the animals of Antarctica, even if the concentrations are low. Pesticides have never been used in that entire continent. We know it too from the carbon dioxide affair.

Carbon dioxide build-up

Carbon dioxide with water is the ultimate major product of combustion. It is non-toxic and a natural constituent of the air. It appears quite harmless. But *global* carbon dioxide levels are rising. They have risen from 296 ppm in 1900 to 318 ppm today. The US President’s Science Advisory Committee Report of 1965 entitled “Restoring the Quality of Our Environment” states that, as a result of the “vast geophysical experiment” man is unwittingly conducting, “by the year 2000 the increase in atmospheric carbon dioxide will be close to 25 per cent. This may be sufficient to produce measurable and perhaps marked changes in climate, and will almost certainly cause significant changes in the temperature and other properties of the stratosphere”. The root of the matter is that the carbon dioxide build-up, which through man’s agency has been too rapid for the slow acting natural sinks such as the ocean to respond, may perturb the globe’s energy balance, for carbon dioxide, while allowing the sun’s radiation to reach the earth in its usual way, has the property of trapping the longer wavelength radiation the earth re-irradiates back into space, thus tending to an overall global temperature rise. This might even eventually cause some melting of the polar ice-caps with an accompanying change in sea level. It seems however that this may not happen. The total situation is much more complicated. Not only carbon dioxide, but also atmospheric water and dust levels (the dust level itself being partly the result of man’s activity) together with factors depending on the sun’s own activity, determine the earth’s temperature. In fact, global temperatures which had been rising, have, since 1940, been declining a little. The crucial point in all this is that *man is now acting in ignorance on a scale of global consequence*. Further it seems practically impossible that he would be able to regulate his production of carbon dioxide anyway.

Even with smogs and smoke and sulphuric acid droplets in urban air, to see pollution in perspective, it must be recognized that man is not alone in pouring chemicals into the air. Estimates are that 80 per cent of the sulphur dioxide in the air of the whole world at any time derives from the natural sulphur cycle in which hydrogen sulphide is evolved by decaying organic matter. There is too a natural region rich in sulphate particles

Man is unique in the rapidity and extent to which he is conducting his blind environmental experiments.

extending round the globe at altitudes just above the tropopause. Large expanses of vegetation evolve considerable quantities of organic materials. Even the reactive hydrocarbon isoprene has been thus identified. But man is unique in the rapidity and extent to which he is conducting his blind environmental experiments. A medley of pollutants marks his crowded communities. An American study shows that the level of lead in rain in a given locality is well correlated with the sales of leaded petrol in that location. In two cities, the level of lead in rain was twice the maximum allowed by US Public Health Service standards for drinking water. In this context, it is cheering to read in the 1968 Rothamsted Report that “in most industrial countries, burning (sulphur containing) fuels puts enough sulphur in the air and rain to provide for crops”.

Pollution by metals

Pollution of the environment by small quantities of metals is a vast subject, not fully explored. Metals can pollute the environment in various ways and can have serious effects on health. Lead has been much discussed, but it possibly also exerts indirect effects. Very low lead levels occur in our cities as the result of using leaded petrol. Certain experiments also reveal that the lung’s resistance to infection may also be lowered by exposure to small quantities of lead. Cadmium is linked with hypertension and a whole spectrum of other metals also exert their effects. NAPCA Behavioural Toxicology Unit at Cincinnati is looking at the way pollutants affect brain function. Carbon monoxide, lead and ozone are under investigation, for although it has been said that carbon monoxide in the environment seldom results in blood carboxyhaemoglobin levels much in excess of those experienced by smokers, these levels could be of significance on our roads where any reduction in driver performance and perception could be critical. Metals in the environment might also play an important part in the chemical transformations of other pollutants. Thus manganese and iron speed the production of sulphuric acid from sulphur dioxide. Again

more needs to be known concerning the full range of such catalysis.

Air pollution and health

In this sea of uncertainty, it is difficult to know where we stand with regard to the consequences of air pollution for our health. The 1970 Report for the Royal College of Physicians "Air Pollution and Health" does state that "Britain has the highest death rate in the world for chronic lung disease in middle-aged men" and that "men working in London had worse bronchitis and poorer function of the lung than those in either Bergen (Norway) or the cities of the eastern seaboard of the United States" taking men of similar age and smoking habits. It remains difficult to assess the precise impact of pollution on health because of the variability of susceptibility and exposure among the population and because of the importance of synergistic effects, that is, of combinations of effects acting together to create an enhanced total effect. The private (and therefore of less public concern) "pollution" of tobacco smoking adds a further complication. As Lambert and Reid recently stated in the *Lancet*, "The dominant influence of smoking on chronic lung disease is now well recognized", yet air pollution effects are documented. Most dramatic was the London smog of December 5 to 9, 1952, responsible for an estimated 3,500 to 4,000 deaths. In-

creased deaths were notable among lung (especially bronchitis) and heart diseases especially in old people. Under less dramatic circumstances, Carnow has documented an increase in acute morbidity from respiratory disease in patients with chronic bronchopulmonary disease in association with increased ambient sulphur dioxide levels in Chicago. Another survey published in 1969, comparing human lung tissue obtained at post-mortem from long-time residents of heavily polluted St Louis with similar tissue from Winnipeg where high pollution and stagnant atmospheric conditions are far less common, revealed a marked deterioration of the lung in the more polluted city. This effect was not accounted for on the basis of smoking history alone. For example, "of the smokers, there were four times as many cases of severe emphysema in St Louis residents as was observed in Winnipeg". This assessment was made on the basis of lung tissue examination.

Time to act

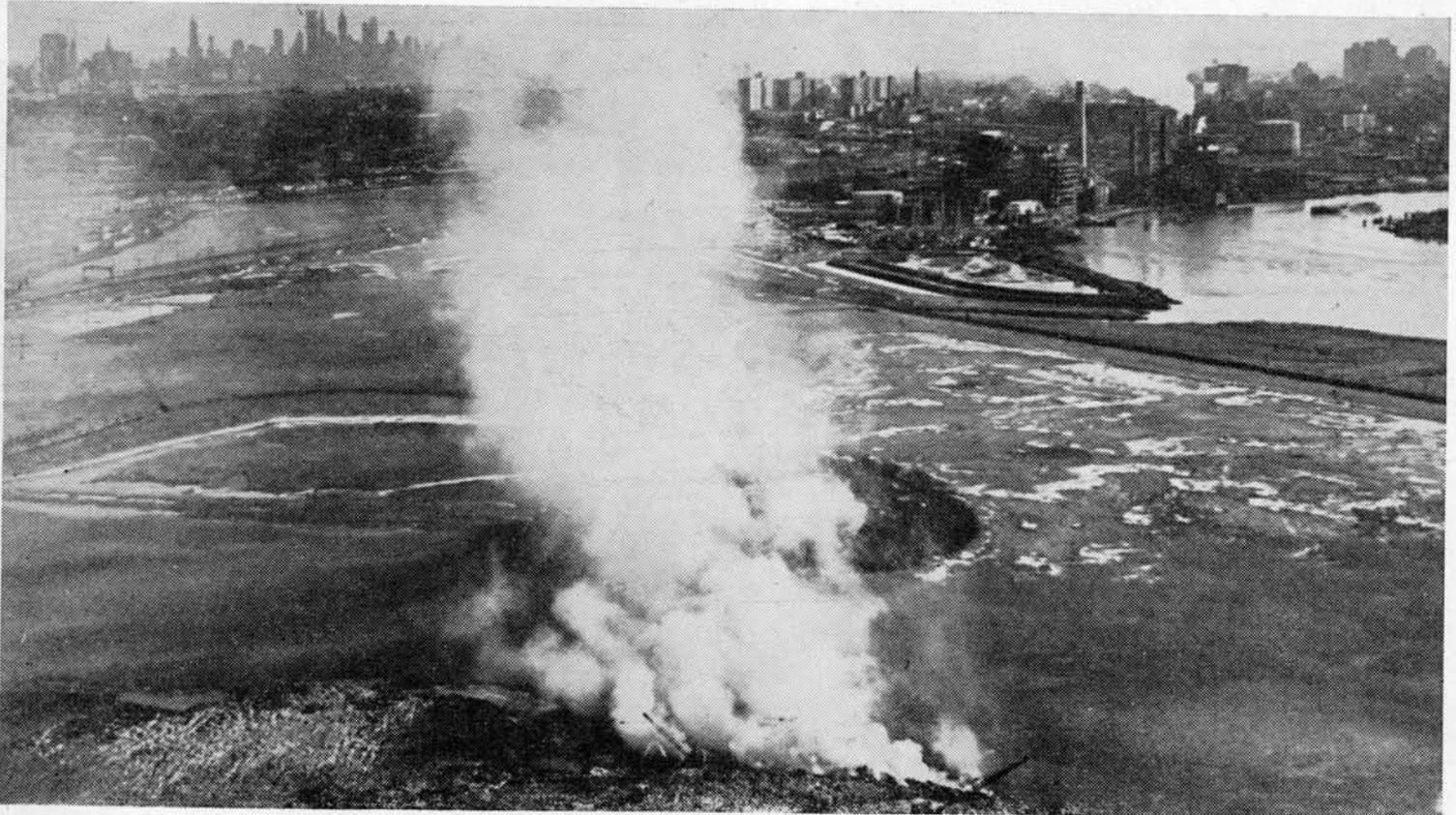
This brief discussion of air pollution has touched lightly on only some of many aspects of the subject. Corrosion of metals and stonework, the discoloration of paints, the soiling and disintegration of fabrics, the effects on crops of pollutants where "hidden" effects are sometimes as important as visible damage to foliage (hidden effects include re-

duction in growth rate of the plant), none of these have been discussed. Nor has the role of pollution in contributing to haze and mist nor the implications of pollution for ecology. As the 1969 American Chemical Society Report states, "the relationship of air contaminants to the ecology, the aggregate of living things as they exist together in nature, is very nearly a total mystery". We are increasingly learning the importance of odour in determining behaviour patterns of animals and the study of pheromones is in its infancy. The range of the implications of pollution is further suggested by one report suggesting that certain air pollutants possibly stimulate the growth of *Haemophilus influenzae*, a bacterium significant in relation to chronic bronchial disease.

But in all things, it is apparent that we are only beginning to understand what we are doing to our environment. Knowledge is scarce and the situation is serious. There is so much we need to know before we can begin to live in our world intelligently. The pressures are on. It is time to act now.

"The relationship of air contaminants to the ecology, the aggregate of living things as they exist together in nature, is very nearly a total mystery."

New York



Save Sabrina

An ecological research project is menaced by lack of funds

by Francis Arnold

The Sabrina Project is an ambitious and constructive response to critical conditions caused by pollution. An extremely competent interdisciplinary team of scientists is attempting a detailed study of the Severn Estuary in order to predict the likely effects of development planning there. This important project is suffering from lack of funds and support. We consider it essential it be allowed to accomplish its vital aims.

The area around the Severn river was once among the loveliest and most fertile in Britain. Its cities grew rich on agriculture and foreign trade. On the Welsh

bank the original inhabitants of this land blended into the countryside, and lived in it harmoniously.

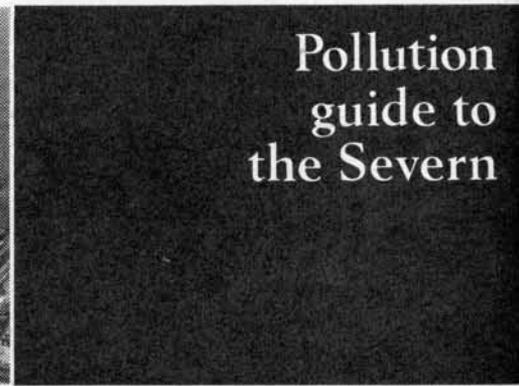
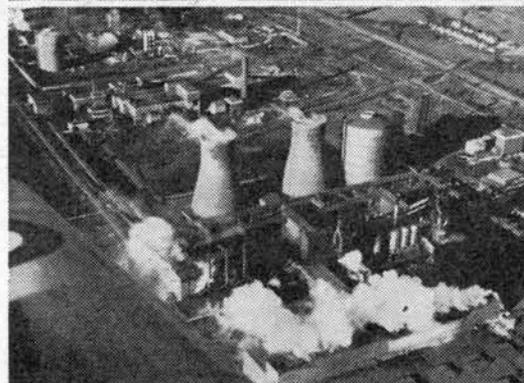
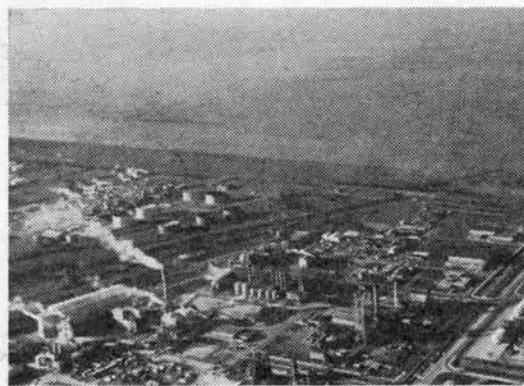
Today all of this is gone. Great expanses of the coastline, from Gloucester to Bridgwater, have been effectively destroyed. The air is foul with the fumes of power stations and steel works. Chemical plants pour their effluent into the river, and even the land is becoming poisoned. Trout in the tributaries of the river and birds on its surrounding mudflats are dying out.

The Severn is not unique in this respect. Almost every river in England shares its fate. Until recently, this destruction of one of our most valuable resources has provoked little protest, other than from conservationists, who have been ridiculed as "doom-cryers" by the hard-headed men of government and industry.

Cries of doom are unfortunately not out of place. The sewage, slag and fumes which have caused these changes are a

major threat to the welfare, and eventually survival, of hundreds of thousands of people in this region alone.

This is not idle speculation. There are, for example, three nuclear power stations, including the largest in the country, on the banks of the Severn. It should be noted that this river has one of the highest tides on earth, and is prone to flooding. It is hideous to contemplate the effect of a wave of water rushing through such a plant, to emerge heavily laden with radioactive isotopes. But even barring such a catastrophe, the prospects are poor. In at least three cases, nuclear plants have failed disastrously, spreading large amounts of radiation—and this is only in the last 20 years. Furthermore, the wastes have to be disposed of somewhere; the containers so far designed have a shorter half-life than some of their more toxic contents. Finally, there are no guarantees that low doses of radiation are as harmless as they were



Pollution
guide to
the Severn

believed to be. If anything, all the evidence points the other way.

Region with a future

But the government wants to “develop” the region. A recent report (*The Southwest: a region with a future*, GPO, 1967) suggests siting at least another 150,000 people, and a lot of power-consuming industry near Bristol alone. This will require the services of the two additional atomic plants already planned, and several more besides.

That is, needless to say, only the beginning. The Avonmouth complex is probably the largest industrial source of pollution outside the Midlands, with its enormous ICI fertilizer plant, and smokestacks which emit carbon dioxide, sulphur dioxide, and in one case neat nitrogen dioxide and arsenic. The latter is particularly poisonous. In addition, organofluorine compounds—not noted for their beneficial effects on plant, animal, or human life—flow into the river.

There have been substantial oil leaks

near the Gloucester canal; the steel works at Port Talbot have killed off the surrounding forest; Monsanto Chemicals pours its chlorinated biphenyl residues into the Severn. Several cement works pump out dust and sulphurdioxide on its banks. Stray fluoride from the slag heaps—“inevitable” by-products of the construction of the M5—has caused fluorosis in cows. In the latter case, it has got so bad that several farmers have found their milk refused by the marketing board for this reason. But there is no redress available to them.

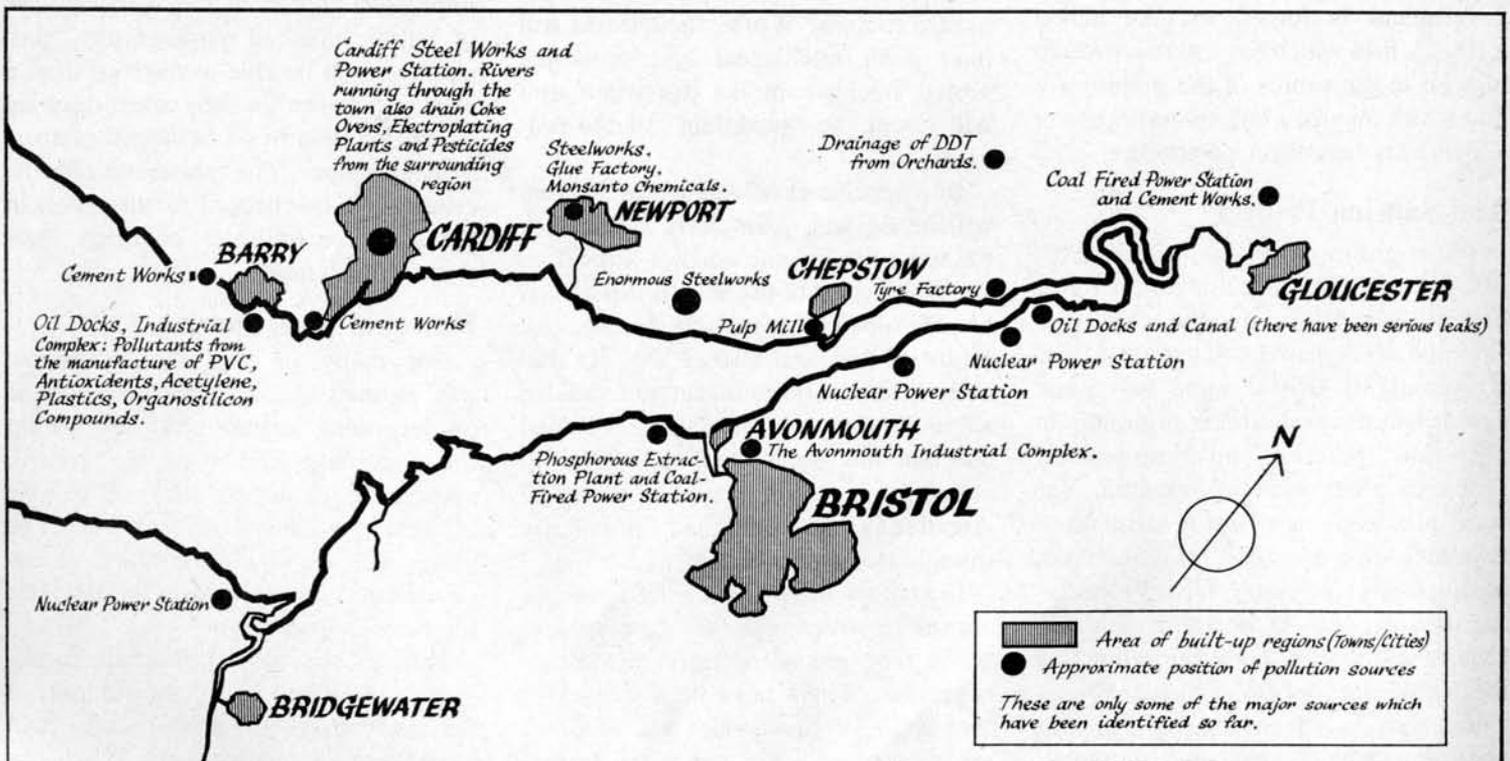
These are just some of the consequences of industrial expansion in the area. But the report quoted above goes on to say: “. . . schemes to inject new population into various parts of the region, notably Severnside, would call for a planned introduction of new industry; such a combination of indigenous manufacturing expansion and new industry could lead to an even more rapid rate of growth than was experienced in the decade 1954-1964.” The authors appear

to think that this is unquestionably a Good Thing.

Planning amok

What of this *planned* introduction of new industry? I called the Ministry of Housing and Local Government in Bristol and tried to find out what safeguards were proposed against the introduction of pollution hazards. The reply did little to reduce my concern for the people of the region. Basically, it is unlikely that any plant which wished to site itself in areas planned for industry would be objected to. Of course, some factories are referred to the River Authority, the Alkali Inspectorate, and other specific agencies. But how is the County Planning Office to know that a certain chemical plant will produce waste materials, and that these will interfere with various aspects of human metabolism, perhaps in a lethal way? This is not the sort of thing a prospective industry would be likely to advertise.

A central pollution control board,



Sewage, slag and fumes are a major threat to the welfare, and eventually survival, of hundreds of thousands of people in this region.

with powers to vet all future development, and to call in any experts required, is urgently needed. It should see all development plans *before* they are referred to the County Planning Office. The current bureaucracy, however well-meaning, is simply unable to deal with these problems.

To return to the Southwest Report. It defines derelict land as: "... land so damaged by industrial and other development that it is incapable of beneficial use without treatment." The Southwest comes high in the tables of those regions afflicted with derelict land, much of which is beyond redemption. Not surprisingly, its spread—and the more subtle degradation of land still used for farming—is reflected in a reduction in the efficiency of local agriculture.

The detection of specific pollutants, and the identification of environmental disorders is an extremely tricky business. Usually it is carried out—in a few cases where comprehensive studies have been done—by survey techniques. Where one finds high levels of both smoke particles and lung cancer, the *hypothesis* that the former causes the latter appears justified. But to *prove* the point is difficult. To provide proof so conclusive that the government is forced to take action against a firm which has a massive vested interest in the source of the pollution—and which may be a substantial exporter—demands herculean persistence.

The Sabrina Project

But a group called the Sabrina Project, after the Roman name for the River Severn, has taken up the challenge. Initiated by a pair of scientists at the University of Bristol some two years ago, it has planned, and is beginning to put into practice, an impressively thorough programme of research. The team now consists of more than thirty extremely able scientists from disciplines as diverse as Chemistry, Civil Engineering, Botany, and Architecture, who will require less than £70,000 per annum for the whole programme. When one considers that two heart transplants cost about the same amount, or that the pol-

lution damage in the region of study comes to millions every year, this is a trifling sum.

So far, they have had trouble obtaining this money, though their normal source, the National Environmental Research Council (NERC) has footed some of the bill. The NERC has its own problems. After studentships and research traineeships have been taken care of, they have only a little more than a million pounds a year for the whole of Britain, and some projects outside this country. This is pitiful. Still, one would have hoped that they might have been a little more generous with Sabrina, which is the first of its kind.

What are the aims of Sabrina? "The Sabrina Project will contribute an increasing quantity of vital scientific knowledge to planners and communities around the Severn Estuary. It will also help to break down some of the barriers to interdepartmental communication in the University and pave the way for the teaching of science as a study of the environment as a whole rather than as a study of individual facets." These are ambitious goals, but the founders of the project and their more recent converts are a thorough and highly competent group.

Interdisciplinary approach

The interdisciplinary concept is a vital one. What is the use of an organic chemist devising a new pesticide if, several years later, after massive investment and widespread use, a biologist discovers that the chemical is a major hazard to man? Worse, the chemist will have both intellectual and economic vested interests in his discovery, and will resent the "meddling" of the biologist.

In a specific case with which Sabrina will be dealing, plans have been afoot for some time to site a major airport on the Welsh coast of the Severn. An official of the meteorology section became aware of this, and also of the fact that there is almost no information available about weather conditions there. It turned out that the winds may be such as to constitute a major hazard to aviation. Apparently no one had previously thought this worth consideration.

In another sub-project, three researchers will be studying the fate of pesticides when they are acted upon by micro-organisms. There have been suspicions that some of the breakdown products are even more toxic and more persist-

A central pollution control board, with powers to vet all future development, and to call in any experts required, is urgently needed.

ent than the original pollutants. Not only will this process be observed in the test-tube, but another group will be checking on the actual types of bacteria and other fauna and flora in the river. It is this kind of combined attack that is almost unique to Sabrina. The vast majority of previous work has been virtually useless simply because it was impossible to relate theoretical to practical considerations.

Yet another study will be dealing with heavy metals, and may have alarming implications. It has been suggested in recent years that trace elements, such as copper, zinc and lead may have serious effects on metabolism, and hence general well-being. Excesses of these substances have been linked to heart disease, cancer, and dental problems, to name just a few. Maps of high concentration of these and other disorders, and of toxic metals will be drawn up. Computer analysis is expected to show areas of overlap, and to suggest linkages between chemicals and diseases. Needless to say, the main ways in which they attack the body are through the air and water pollution caused by industrial processes.

There are many other exciting and impressive aspects of this work. By use of aerial infra-red photography, geographers will be able to distinguish at a glance between healthy and diseased vegetation, and to plot currents of thermal pollution. The sediments of the estuary will be checked for their role in the sequence of water pollution. And there is much more...

Practical participation

But many of the greater benefits will be invisible. They lie in the areas of improved communications within the university and with the control agencies in the district who will be able to refer problems to Sabrina. The group will act as a major fund of environmental information in the Estuary, the best in Britain.

Perhaps the most important consequence of all will be for the students at the University of Bristol, who will participate as fieldworkers. This has

two results: it reduces the cost and provides the first worthwhile course of practical science in any university.

For years now, lecturers have wondered what to do with practicals, those interminable hours of repetition which are both so cursory as to be useless, and so time-consuming as to interfere with essential reading and seminars. At the same time, the demand of industry and basic research has not expanded as fast as the output of young scientists. In some fields, geology and physics, for example, graduates are becoming a glut on the market.

Allowing students to participate shows how these twin problems can be solved, while harnessing large amounts of youthful enthusiasm to a good cause. Those who go on to basic research will be the more competent for it, and the future industrialists who form a large part of the current crop of science students will become aware, before they go out to work, of the consequences of what they will be doing. Perhaps then, the indiscriminate rape of the land and fouling of the air in the name of progress will be subject to scrutiny within industry itself.

And there is a need of a new class of scientist, a sort of monitor, who follows the consequences of industrial actions. The researchers of Sabrina are his prototypes. He will need to be able to relate his speciality to the entire range of scientific disciplines. This is precisely the kind of attitude which will be inculcated by Sabrina, and the projects which follow it all over the country.

Action versus inaction

There is only one problem. Will the data be acted upon once they have been found? The history of foot-dragging over public safety, mania for "progress" at whatever the cost, and pandering to industry by local and national governments makes one less than optimistic about this. One of the things which the group must do if it is to achieve its goals is to discover the ways in which their findings can be converted into effective legal and social action. This is something which scientists heretofore have been wary of getting involved with.

Not surprisingly, the response of local industry to Sabrina has been less than jubilant. In fact only one firm has so far offered to co-operate with them, and none has advanced any money.

... there is a need for a new class of scientist, a sort of monitor who follows the consequences of industrial actions . . . He will need to be able to relate his speciality to the entire range of scientific disciplines.

The co-ordinator of the project puts it this way: "Many industrialists take the view that we may be polluting the environment. We'd like to know about it. But if you come back with evidence that we are poisoning the water and destroying the land, and publicize it, we'll have to do something about it. That would put us at an economic disadvantage with respect to competitors who have not been investigated."

In the highly competitive business-world in which success is only measured in terms of immediate results, there is little hope of survival for the socially-responsible industrialist over-concerned with wider long-term issues. That is why it is essential that Government should pass the necessary legisla-

tion to set out the precise conditions within which industry can operate.

With accurate assessments of the distribution and severity of individual hazards, it will be possible to determine the cost to the country of pollution from a given source. A simple tax, equal to this amount should be a sufficient incentive to "clean up". Once this has been applied to a single industry in a field, it will be in the interests of that industry to determine the damage caused by its competitors. It will be happy to subsidize research about them, which will help to place the burden where it belongs.

Of course this is only one possible scheme. It is to be hoped that somewhere, a group as thorough and as well conceived as Sabrina, is designing ways of transforming our painfully expanding knowledge of pollution into real improvements in the quality of life.

It is really no longer a question of "the quality of life", but of "the expectancy of life" for us, and particularly for our children. For if the "progress" planned for the Severn region—and for the rest of the country—is allowed to proceed, England in the year 2000 may be virtually incapable of supporting human life.



The supersonic albatross

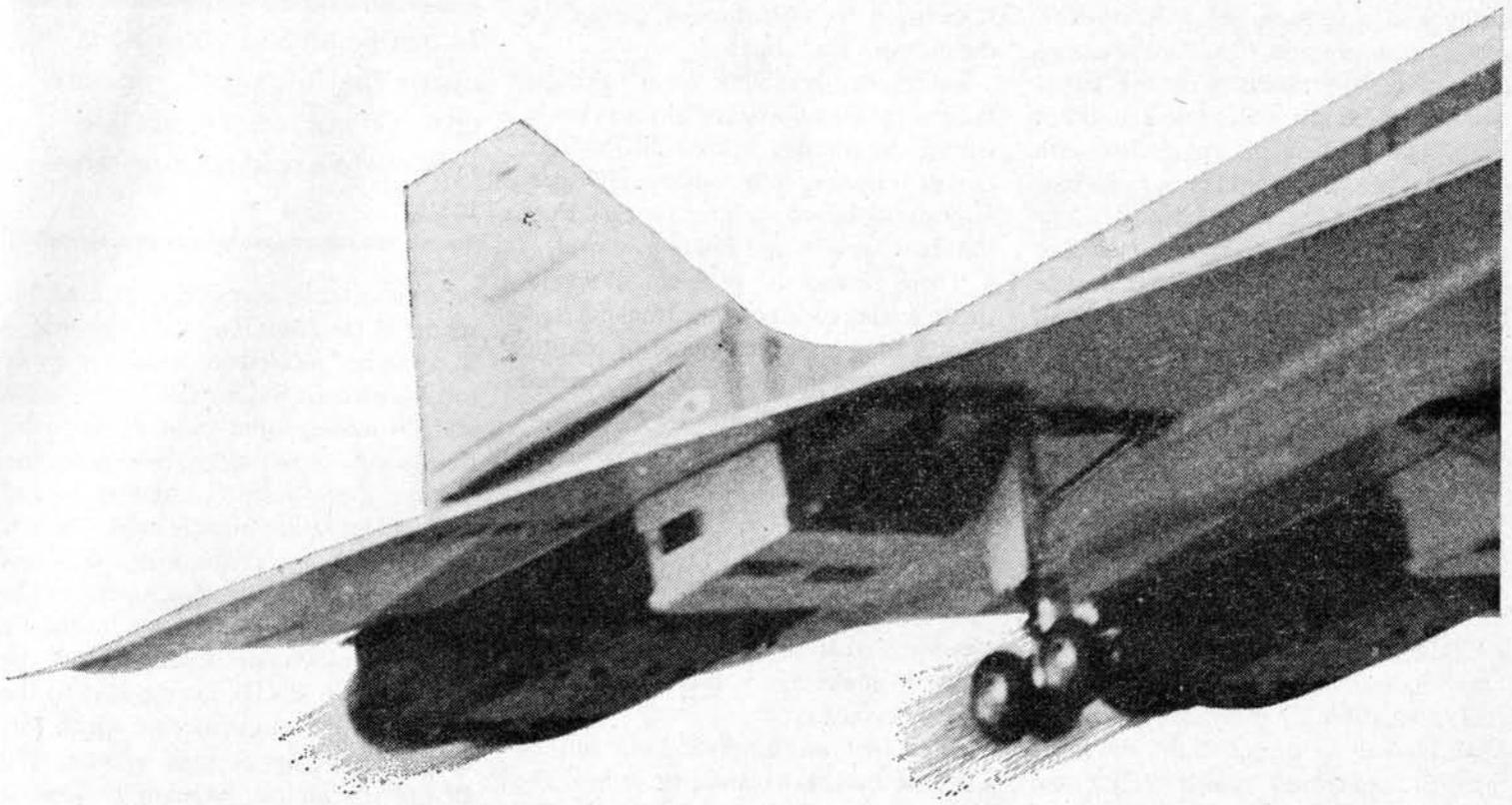
more Concorde discord

by Jean Liedloff

In April 1970 the Nixon administration revealed that it proposed to ban all civilian flights at supersonic speeds over the whole of the United States. A month later the Labour government of this country produced a White Paper, "The Protection of the Environment", which suggested that the Concorde and other SSTs be banned from flying supersonically over Britain. Whether the Conservatives will accept the proposals of the White Paper remains to be seen, but it seems likely that they will, for the damage and distress caused by that explosive trail



of sound, the sonic boom, left by aircraft flying faster than the speed of sound, vastly outweigh any possible benefits of speed and convenience. But although the banning of overland booms is more or less assured, it has drawn the sting of public outcry, and now other equally hazardous aspects of SST are in danger of being seriously neglected. These may be divided into two categories: threats to the environment and the large majority of people who will never have any use for supersonic transport, and threats to those who will actually fly in a Concorde, a Boeing B2707-3000SST or a Russian TU-144SST.



"Good morning, this is your captain speaking. Welcome aboard Flight 96, the maiden supersonic transport flight, New York to London.

"You are presently enclosed in the finest airframe ever built, capable of speeds in excess of mach 3, more than 1800 miles per hour at altitudes over 65,000 feet above sea level. Your purchase of tickets for this flight has put you in the technological forefront of air travel.

"Uh, because this is a technologically advanced aircraft, there are a few points I would like to cover with you before take-off that may have escaped your attention during the screening process at our ticket office.

"During take-off and in flight you will experience various forms of acceleration loads. This is a perfectly natural phenomenon and nothing to be unduly concerned about. America's astronauts have been subjected to it for years. But knowledge is comfort, so let me just say this: Acceleration loads between 3 and 4 g cause visual disturbances and at 5 g loss of consciousness occurs. At cruising altitude turbulent flight conditions could cause linear accelerations of 10 to 12 g which may cause fractures in unrestrained persons. It is highly unlikely that such high g-forces will be encountered, but let's keep those seat belts fastened, just in case. Passengers who

do not feel in tip-top physical condition may wish to debark through the front loading ramp at this time.

"At cruising speed the exterior skin temperature of this aircraft will be approximately 260 degrees Centigrade. For that reason we have installed a superb refrigeration system guaranteed to keep you and your dinner wine at room temperature. As some wag has said, should there be a malfunction in this system, instead of freezing to death like on an older jet, we'll fry. Passengers unaccustomed to rapid changes in temperature may wish to debark through the front loading ramp at this time.

"When we reach the higher altitudes you may begin smelling a sweetish odour in the cabin. This is nothing to be alarmed about. It is simply ozone, a colourless sweet-smelling gas caused by the reaction of oxygen with ultra violet rays from the sun. Ozone is perfectly safe to breathe except that it irritates the mucous lining of the throat, nose and eyes and there are indications that repeated exposure can cause extensive damage to the lungs. Passengers with chronic respiratory ailments and allergies associated with the breathing process may wish to debark through the front loading ramp at this time.

"By doubling the present flight altitude of older jets there is a reduction of ambient air pressure from one-fifth to

one-thirtieth that of sea level. That sounds pretty technical but what it means basically, is that if we should lose air pressure while in flight, everybody on board will lose consciousness in 15 seconds. However, we are equipped with oxygen masks conveniently located over each seat for just such an emergency. Passengers incapable of holding their breath for extended periods of time or whose reflexes are somewhat slow may wish to debark through the front loading ramp at this time.

"We now have clearance for taxiing out to the runway for take-off, and I would just like to say to those passengers remaining on board, be of good cheer. You are embarking on a new age in air transport, and although you have chosen to personally inaugurate this flight, you are not alone. Every person we pass over between here and London will feel that they also are part of this new age."

This little scenario appeared in the Sierra Club Bulletin.

Radiation hazards

It may be added to this that the radiation levels inside the cabins of SSTs at cruising altitudes are of the order of 100 times what they are at sea level. The usual limit on dose allowed to the public is 500 millirems per year and a maximum of 2 millirems per hour. In the

absence of a possible solar flare which might produce up to 20 *rems*, the actual level of cosmic radiation in the cabin will usually be just under this 2 millirem limit. US government regulations are such that passengers and crews who had been in an SST receiving a dose of 15 or more rems would be advised not to run the risk entailed by additional dosage for a year. This, of course, means that, among others who would have to refrain from participating in supersonic flight there would also be pilots, whose training costs in the area of £25,000. It has been suggested that in any case all crew members be classed as radiation workers and that air hostesses be over child-bearing age. Dr. S. R. Mohler, Chief of the United States' Federal Aviation Administration Aeromedical Applications Division, indicates that for the crews of SSTs, radiation "... may shorten the life span by 5 to 10 per cent and the gross signs of ageing may appear earlier than would otherwise have been anticipated." Other possibilities from radiation exposure, says Dr. Mohler, are damage to sperm cells, bone marrow, lung tissues, kidney tissues and the lymphatic system, as well as leukemia.

Emergency landing

Because an SST uses about half a ton of fuel per minute, it cannot circle near a crowded airport for hours if necessary, as subsonic planes can, or fly to some other airport 500 to 1,000 miles distant as they can in an emergency such as a storm or an accident. The Concorde's fuel reserve, for example, is guaranteed by the manufacturer, for a flight from Paris to New York, to be "thirty minutes over alternate", a figure noted as un-

realistic in consideration of congestion during peak load times.

Emergency landing is further gravely limited by the number of airports in existence which can accept SSTs since they require very long runways and specially strengthened surfaces to stand their immense weight and landing impact.

There is also the problem of inadequate testing of supersonic transports. A pilot testing a normal plane of reasonable price can try out not only prescribed flight conditions but also possible stress situations. He can fly through bad storms, dive steeply, stall, land crosswind or try an especially hard landing. But in testing an SST the pilot is aware that the prototype may cost £100,000,000 and that to build a replacement may require a year or two. He is therefore likely to make every effort to avoid all such stress tests.

Most people, however, will not be affected by the hazards, or indeed the questionable advantages, of flying SST. They will be more concerned with the harm done to the environment and the unwarranted disruption of their lives. For them the wistful, apologetic look on the face of the Concorde is not enough.

Big noise

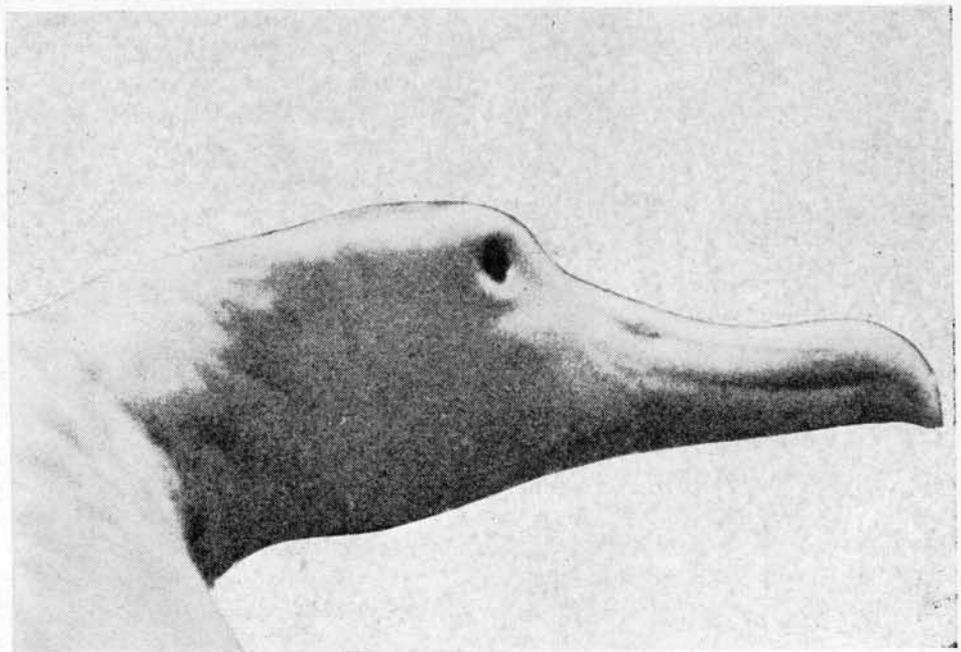
The problem of noise does not end with the banning of the boom. During take-off lateral noise from the SST will

It has been suggested that all SST crew members be classed as radiation workers and that air hostesses be over child-bearing age.

In testing an SST the pilot is aware that the prototype may cost 100 million pounds and is likely to avoid making stress tests.

be considerable. According to a recent report in the *Guardian*, the Concorde is likely to be "more than twice as noisy as today's aircraft in terms of lateral noise and, to make matters worse, the lower frequencies of its engines will penetrate indoors more easily." Landing at 180 mph will also be extremely loud. According to *Aerospace Technology*, "the Concorde may show a rather startling 124 PNdB figure during approach, primarily because its engine inlets cannot be choked." (90 PNdB corresponds to the noise beside a motorway on which lorries are passing at high speed: 120 PNdB is "almost unbearably loud".) Proposed ceilings on airport noise (Federal Aviation Administration) are 80 EPNdB except for the very heavy subsonic planes which would be allowed 108 EPNdB. (EPNdB is only very slightly different from PNdB.) To have an idea of what 124 PNdB means, the noise of one Concorde approaching would be equivalent to 40 planes of 108 EPNdB-rating taking off simultaneously or 25,000 of those with the ideal rating of 80 EPNdB!

If SSTs are forbidden to land at airports close to cities where this intolerable noise would be inflicted on the already ear-weary dwellers near airports, travellers would have to land so far out in the country that they may well prefer



subsonic transport which could take them to the more convenient airports.

Pollution around airports and elsewhere

At take-off time the Boeing SST would burn more than one ton of fuel per minute. Toxic pollutants will be showered upon the nearby communities in enormously greater concentrations even than the now seriously disturbing amounts.

In a letter sent to the chairman of President Nixon's Supersonic Transport Review Committee, one of the appointed committee members, Under-Secretary of the Interior Russell Train wrote: "... Operation (of the SST) at subsonic speeds, including speeds necessary for take-off and landing, results in inefficient fuel combustion with a resulting heavy discharge of pollutants into the atmosphere. Both atmospheric pollution and ground contamination seem likely to result." He, in accord with most of the expert committeemen, concluded that justification for proceeding with the programme is not now apparent.

Lost in the shuffle over the sonic boom aspect is the—perhaps even more menacing—matter of stratospheric pollution. In the words of the environmental and sociological panel of the President's Committee: "The wide-

The noise of one Concorde approaching would be equivalent to 25 thousand planes with the ideal rating of 80 EPNdB's taking off simultaneously.

A fleet of SST's, discharging about 150 thousand tons of water per day into the upper atmosphere may cause a pall of "global gloom" to hang over the earth.

spread use of supersonic transports will introduce large quantities of water vapour into the stratosphere. The introduction of this additional water vapour can produce two effects which may be important: (1) Persistent contrails might form to such an extent that there would be significant increase in cirrus clouds; (2) There could be a significant increase in the relative humidity of the stratosphere even if there were no significant increase in the extent of cirrus cloudiness. Both effects would alter the radiation balance and thereby possibly affect the general circulation of atmospheric components." What this might mean for us—in less technical language, has been spelt out by Dr V. J. Schaefer, Director of Atmospheric Sciences Research Center at Albany, New York. As reported in *This Week*, August 11, 1968, he is concerned lest a fleet of SSTs, discharging about 150,000 tons of water per day into the upper atmosphere cause a pall of "global gloom" to hang over the Earth. The weight of water vapour released is about 40 per cent greater than the weight of fuel consumed.

Secret anti-SST report

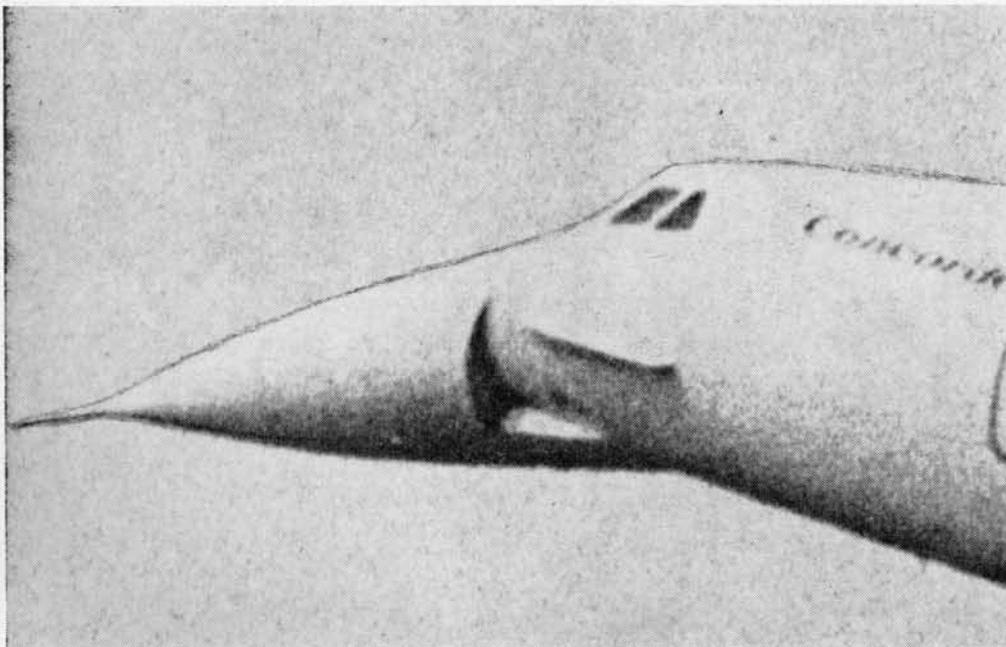
More recently reporter Henry Reuss for the *Washington Sunday Star* dug

up four Department of Transportation reports showing adverse affects of the SST on the environment, which he claimed were being kept secret. He found another such report by a top Boeing scientist. This assumes that 500 SSTs will be operating regularly, and also that pollutants will not accumulate but will be washed out in 1½ to 2 year periods. On this basis it predicts that SSTs will destroy some ozone in the upper atmosphere, which could decrease the capacity to shield the earth from ultraviolet rays; will increase nitrogen oxides in the stratosphere by 7½ per cent and carbon dioxide by 1 per cent; and cause a "noticeable decrease" in solar energy reaching the earth because of dust.

In spite of this report the Department of Transportation told Congress on May 21st 1970 that there was no scientific support for suggestions that SST would pollute the upper atmosphere. In addition, Boeing asserted in a pamphlet to all Congressmen on May 19th that "there is no known technical basis or available data to support the concern that SST fleet operation will have an adverse affect on the weather."

One might ask, what "technical basis" and what sort of "data" are required before that man-made monster the Supersonic Albatross is justly relegated to the status of an extinct species?

The main considerations likely to be taken into account in the improbable event of SST being shelved are economic ones.



Green revolution: social boomerang

by Michael Allaby

Experts from all over the world met at the Second World Food Congress to discuss the progress of the FAO (Food and Agriculture Organisation) plan to prevent world famine. Is the so-called Green Revolution likely to cause more serious problems than those it solves?

A young man almost ran down the aisle of the large conference hall and seized the microphone which stood below the platform. He spoke in rapid, passionate Spanish about the corruption in his country, about the foreign aid which found its way into the pockets of an already rich minority, about repressive measures which made it difficult to improve the lot of the poor.

His name is Manuel G. Arejola and he comes from the Philippines. Two days later news reached the conference that friends of his had been arrested. He knew the risk he took. His aim was to draw the attention of the world to the problems of the developing nations receiving aid as part of FAO's programme of industrialisation and intensification of agriculture. Foremost amongst these critical problems is the socially explosive question of rural unemployment. Population growth and the unconsidered introduction of agricultural machinery are forcing peasants off the land. Uprooted, their stable traditional value-systems discredited, these confused millions migrate to cities which are already hopelessly congested. They soon learn there is no work for them there either. The result is alienation, despair and mounting social chaos.

Manuel Arejola was criticising a report issued during the FAO's Second World Food Congress at The Hague

(16-30 June). He said the report, on people in rural development, lacked courage and was not relevant to the needs of his country. He was supported by others, particularly from Latin America, who said the report would be ignored by totalitarian regimes.

The aim of the Congress was to point the way to decisions and actions which are necessary if hunger and malnutrition are to be abolished in the Third World. In the view of many of the delegates and even more of the press, the Congress was a non-event.

The FAO had taken as its starting point what has come to be known as "The Green Revolution". This, in a nutshell, is the promotion of agriculture in developing countries, largely through the introduction of new hybrid cereals which are highly responsive to fertilisers and to irrigation. It may seem obvious to talk of increasing output by increasing input, but the agricultural production of much of the world has been held back for years because traditional cereal varieties are long-stemmed. If inputs of fertiliser and water are increased they fall, or lodge, under the weight of the ear. Usually this means they cannot be harvested and are lost. Temperate countries have solved this problem by developing short-stemmed varieties, but until recently no such plants were available which would grow well in the tropics. A programme backed by the Rockefeller Foundation produced them some years ago. This is America's answer to the world food problem.

The weakness of the Congress, and the feeling of hopelessness which it generated, was probably due to the widespread acceptance by delegates of the validity of the "Green Revolution" concept and an unwillingness to face up to the problems it generates.

For there are problems. The first of these has been the social one of adjust-

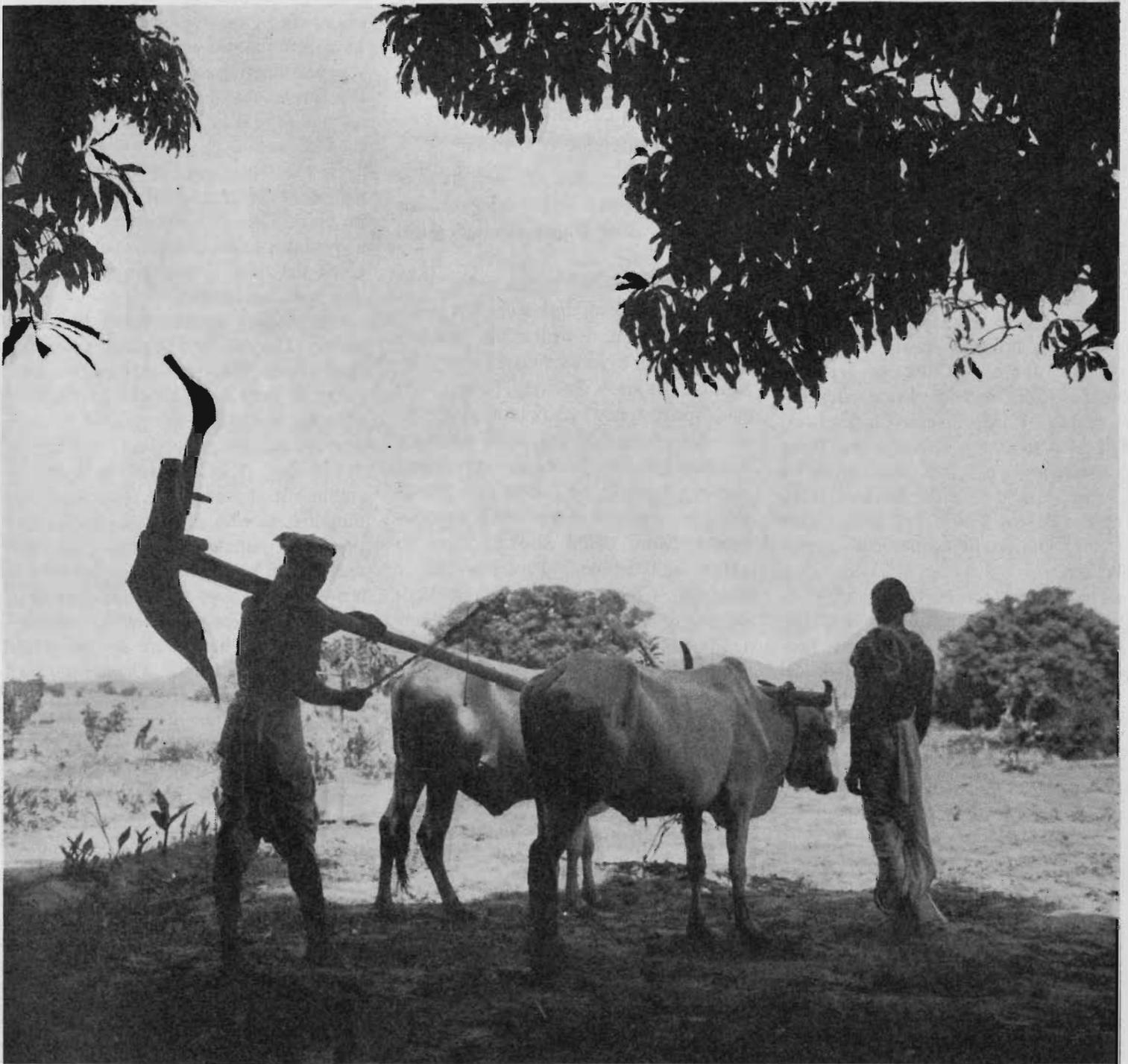
ing local situations so as to ensure that all sections of the community benefit from the increased income the new cereals may produce. A society may be stable and secure but exist nevertheless at a low economic level which could be improved. If outside factors are introduced, however, the effect must be to create imbalances. Unless these are allowed for the end result may be a situation worse than that which prevailed at the start.

There have been riots in India, which resulted in the death of a number of agricultural workers, sparked off by the introduction of blackleg labour by a landlord unwilling to pay higher wages for the harvesting of an increased yield of one of the new hybrids.

The extent to which these social problems are real depends on how far the Green Revolution has spread. The new hybrids require relatively high inputs of fertiliser, they are susceptible to pests and diseases and therefore require pesticides, and they are very thirsty. It is the policy of FAO to urge the governments of the developed countries to make these inputs available. It has not happened. Asked whether he could name the countries which were not co-operating with the fertiliser and pesticide programme, FAO's Director-General, Mr A. H. Boerma, said this included all the developed countries. He was not optimistic, he said, about FAO's ability to achieve its aims in the present climate of world political opinion.

This is a serious admission. The aim of FAO is to feed the population of the major part of the world up to 1985, a mere fifteen years from now.

Unemployment and under-employment in the rural areas of "developing" countries has produced mass immigration to the towns. The unskilled peasants find no jobs there either and sink into degradation and despair. Unable to rent a place to live, there are thousands of people who sleep on pavements, railway stations and bus terminals, as here in Bombay. The other half of the mat here is used by the boy's elder brother.



If it fails, as Mr Boerma suggested it may, the immediate effect will be a general increase in food prices. It is the poor who will go hungry, the oppressed who will be even more severely repressed. We may expect to see increasing social unrest, revolution and localised warfare, possibly leading to widespread famine.

What if the Green Revolution should "succeed"? Then, other problems are likely to appear. The increase in cropping on land in a low state of fertility may accelerate erosion unless the soil structure is built up slowly and painstakingly. Increasing use of fertiliser and pesticides will aggravate pollution problems. Lord Ritchie-Calder said that in a monsoon country like India the fertiliser, pesticides and herbicides will be washed into the River Ganges and the Bay of Bengal, where they may cause pollution of unpredictable proportions.

The sober fact is that the Green Revolution is in trouble. It has run into local political and social problems, it is hindered by wider political

If FAO fails, it is the poor who will go hungry, the oppressed who will be even more severely repressed.

and economic difficulties, and its success could create ecological problems the severity of which we can only guess at.

It seems that the outlook for 1985 is gloomy indeed, but it is not quite pitch-dark. A great deal could be done, for example, to reduce waste after harvesting. Major A. Ramsay Tainsh, who has spent many years studying this question, suggested that food waste be measured during every pre-investment survey. It might be found that its reduction would reduce total requirements. More could also be done to arrest soil erosion. Professor Pieter Buringh, from the Agricultural University of Wageningen, in the Netherlands, pointed out that twelve acres of cultivable land are lost through erosion every minute, five to seven acres are lost to construction, two and a half are ruined by salinity and alkalinity, and a further two and a half are lost through general degradation of the soil.

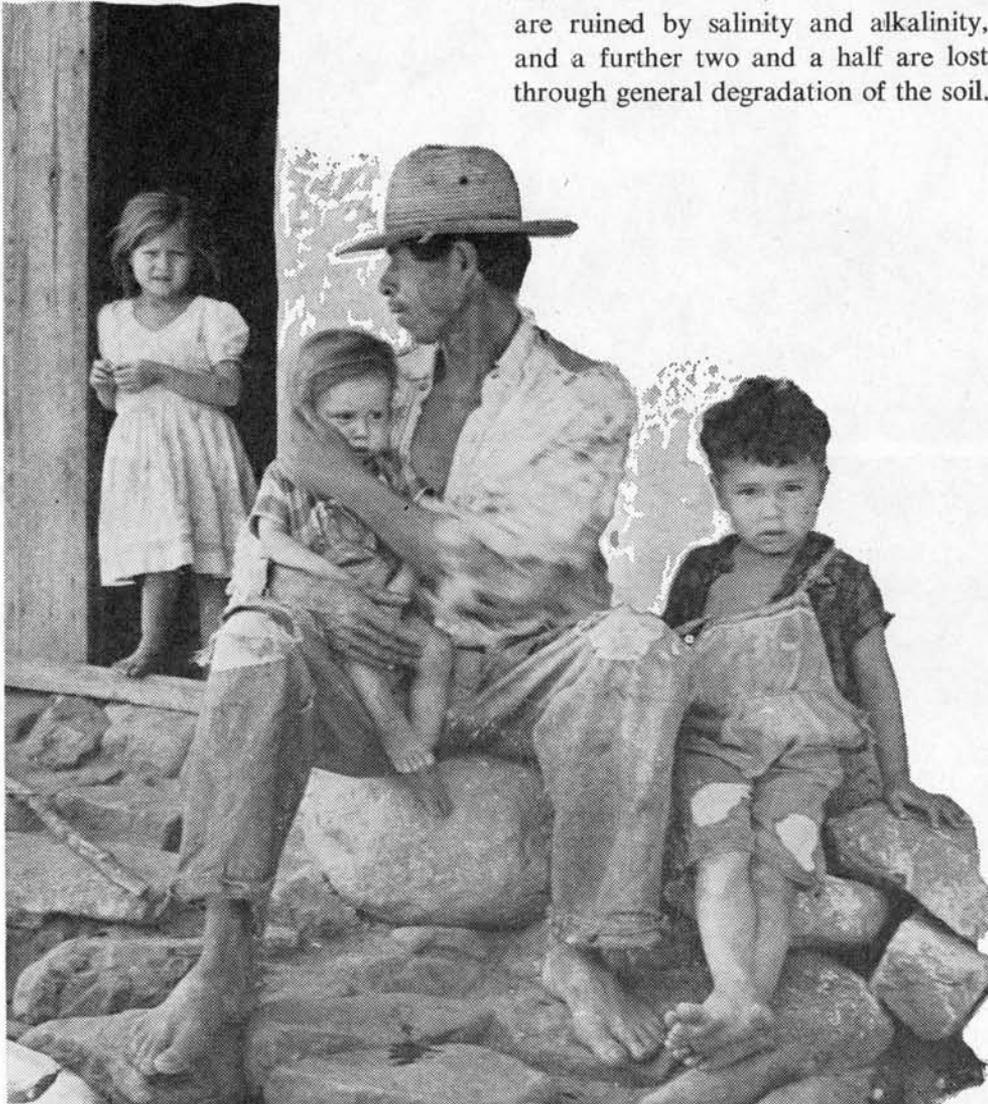
Local traditional agriculture might be improved by quite minor modifications to the tools and implements used. It was encouraging to see the literature of the Intermediate Technology Development Group Ltd much in evidence at the Congress.

It was, perhaps, in the Commissions that the Congress was to be seen at its worst. The platitudes rolled forth and a grinding of axes was heard as delegates given the floor to ask questions made long speeches instead.

The plenary sessions were a little less boring. The one held to discuss population growth was particularly relevant. After all, even if we accept that it is possible for the planet to continue to support its present population, and this is debatable, it is clearly necessary to stabilise it at some level. There are demographers who point out that an exponential population increase in any species will lead to its collapse and there is no reason to suppose homo sapiens has procured the repeal of a well-known biological law. There were no neo-Malthusians at The Hague. The session was presided over by Miss Mercedes Concepción, Chairman of the UN Population Commission. Delegates heard an eloquent statement from Dr S. Chandrasekhar, Minister of State for Health, Family Planning and Urban Development, Government of India. He pointed out that India's annual population increase of 13 million is equivalent to a nation the size of Holland. In spite of all India's efforts to increase food production, the situation continues to deteriorate. "Man must realize that he is just one member, albeit the most important, of Nature's large and interdependent fellowship of all living organisms, and that only by learning to live in humility and harmony with all else that lives can he ensure his own survival." Dr Chandrasekhar argued that family planning should be regarded as a rewarding investment for the development of human resources. India is one country which accepts the need for population control and seeks to introduce it. So far its success has been small and Indians I spoke to were not optimistic.

We may expect to see increasing social unrest, revolution, and localised warfare, possibly leading to widespread famine.

UNICEF/Ling



Miss Concepción placed the Green Revolution in its proper perspective. At best it can only buy time, she said, and there may be an employment-population crisis in the seventies to take the place of the food-population crisis of the sixties.

The session proceeded quietly, members of the panel making moderate appeals for a solution to what they saw as man's most pressing problem. Several questions were asked from the floor, and answered. Then Professor J. de Castro, author of *The Geography of Hunger*, exploded into a microphone. There is too much talk of the population explosion, he said. Riches and technology are exploding, under their symbol, the atom bomb. The population explosion is an exaggeration and not so dangerous as nuclear weapons. If there are hungry people it is because of the H bomb, which costs America 200 million dollars a year. No one has shown that hunger is caused by over-population. African populations are lower than those of Europe. Malthus believed that population growth was a constant, but it is governed by many factors. Had he been right the world would have 123 thousand million people today, instead of 3½ thousand million. Therefore Malthus was unscientific. We must feed mankind, not crush it by genocide.

This violent outburst was cheered warmly and Prof de Castro left shortly afterwards. FAO had reached the centre of the problem and it seems there is no answer. Although many believe there can be no long-term solution to any of the environmental problems facing us unless populations are stabilised, this view is unfortunately not accepted by a large number of developing countries.

The following morning was given over to environmental conservation. The most forthright speaker was Dr Makoto Numata, Professor of Botany and Ecology at Chiba University, Japan. He warned of the mutagenic effects of certain common pollutants and foresaw the annihilation of man if the degradation of the environment continues. Even this session, dealing with a vital and, one would have thought, uncontroversial, issue, was inconclusive and the general atmosphere suggested a disturbing degree of complacency. The best hope for developing countries was that they should learn from the experience of the developed countries and try not to repeat their mistakes. It would have been

Twelve acres of cultivable land are lost through erosion every minute, five to seven are lost to construction, two and a half by salinity and alkalinity.

difficult in that place and at that time to suggest a second look at the direction in which the Third World is being encouraged to move and that the developed countries might profit from a reconsideration of the bases of their own civilisation.

Perhaps if the Congress had been more controversial, if those who care deeply about the future of mankind had spoken out, more would have been achieved. As it was the panels were polite, moderate and ignored.

Outside the meetings there was another mood. It was particularly evident at the New Earth Village, a converted army camp on the other side of the city, where several hundred young people from all over the world had gathered at the invitation of Mr. Boerma. They came as citizens, delegates in their own right, with full status. In the Village, and among some of the delegates who said little in the meetings, the view was that the problems of the world are too profound to be solved by technological tricks. The young people accepted the need for a far more radical approach. Disillusioned with the Congress, they held their own meetings and invited speakers, including Lord Ritchie-Calder and Mr. Boerma, to meet them. The future of the world will soon be in the hands of these young men and women. In their village there was hope, an eagerness to discuss all the issues and a willingness to hear all points of view.

The world food problem is still with us. The Congress may have failed, but this does not invalidate the work which FAO is doing. It cannot be held responsible for the views of individual delegates and it is fortunate to be led by a Director-General who has the remarkable ability of inspiring respect and confidence among delegates, journalists and young people alike.

I am left with a few vivid memories. There was a student from Nepal, desperately trying to collect information which he could use to warn his government of the ecological hazards which might arise from its development pro-



Harvested rice being spread out evenly in the sun to dry. Rice provides as much as one third of human energy throughout the world.

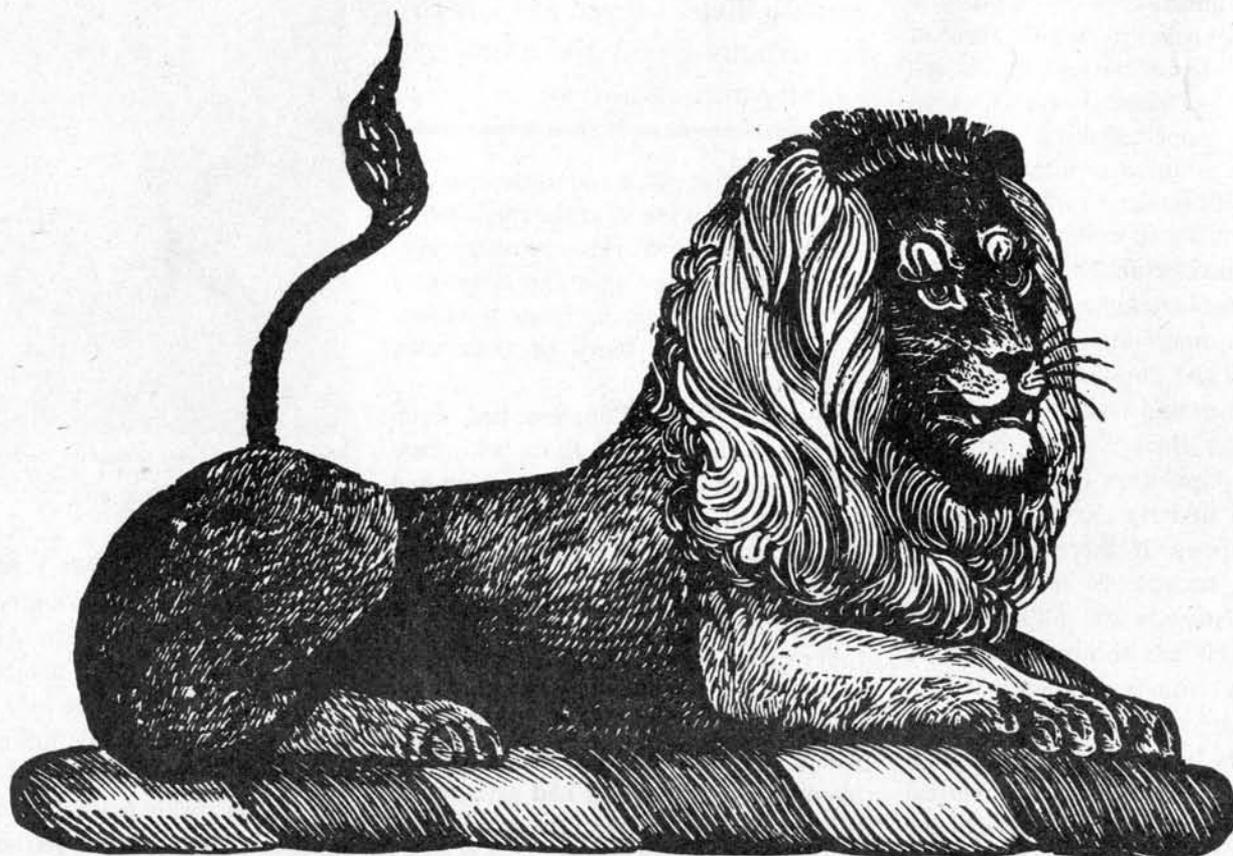
UNICEF/Ling

gramme. There was Mr I. Mann, from Kenya, who said his country had been developing a sound system of mixed husbandry combined with a local industry producing pyrethrum, a safe insecticide which does not cause pollution. The programme had been destroyed by aggressive salesmanship from the agrochemical industry. There was the Indian who proposed a moratorium on the use of resources by developed countries, and the Dutch Professor E. de Vries who drew attention to ways in which food production can be improved by soil conservation without harming the environment. None of these suggestions is "economic": that is to say, they offer no profit to European or American industry, nor do they contribute to increasing the "standard of living" judged by the accumulation of goods and services, nor do they provide jobs to the unemployed.

There was, too, a Sudanese businessman who told me he had seen a fellow countryman drinking from a river. His camel was beside him, drinking from the same water. Around the camel's neck hung a transistor radio. The man was listening to The Voice of America. "What will happen to this man?" my friend asked. What indeed? Truly, it may be the transistor radio that announces the crack of doom.

The Green Revolution can, at best, only buy time. There may be an employment-population crisis in the 70's, replacing the food population crisis of the 60's.

Should Britain be a Federation



a plan for the decentralization of government in Britain

by David Evans

Spokesman for the Liberal Party on Local Government

It has taken modern man quite a time to recover from the ingenuous delusion that Biggest is Best. Our daily experience, however, confirms that once an optimum size is surpassed the efficiency, in whose name centralization took place, is reduced and the individual citizen is completely alienated from the processes which govern his life. David Evans presents the Liberal Party's plan for a dynamic regionalism.

Within the lifetime of the new Conservative administration Parliament will be called upon to consider far-reaching changes in the structure of British government.

The Crowther Commission is currently examining the Constitution including the working of Parliament and

the position of Scotland, Wales and Northern Ireland.

The Maud Commission has already recommended major changes in local government and their proposals, accepted in principle by Mr. Wilson, are now under review by the Conservative Cabinet.

It would be a brave man who would forecast with any certainty how British democracy will order its affairs in the future. But one thing is certain. There must be no further centralization of government and no further invasion of community initiative, effort and responsibility. If there is, then the way will be wide open for ritual dictatorship from Whitehall over every aspect of our daily lives.

The past twenty five years have already seen a steady and increasing transfer of power and decision-making from local communities to the central government. And this rapidly accelerating decline in the ability of the average person to affect the decisions of his allegedly democratic government is one of the greatest threats we face today.

In the immediate post-war years the running of hospitals, electricity and gas supplies was transferred from local authorities to nationalised boards. None of these were elected. All were appointed by the government. All operate in private away from public scrutiny and under only the most general controls of Parliament. In recent years the process has been taken much further. We have seen the setting up of Regional Road Construction Units, Regional Sports Councils, Regional Passenger Transport Authorities and the compulsory amalgamation of police forces under ad-hoc committees. None of these bodies are elected. Most of their members are appointed nominees operating in a vacuum and free from any effective democratic control.

A widening range of local activities previously within the purview of local councils are now subject to the detailed scrutiny of civil servants in government departments. No pedestrian crossing can be sited, or set of traffic lights erected, without the sanction of the Ministry of Transport. Any scheme for the regu-

Further centralization of government will open the way for virtual dictatorship from Whitehall over every aspect of our daily lives.

lation and control of traffic has to be submitted to the same central authority. No council house can be built before its design and cost has been investigated by the Ministry of Housing. No plan for town redevelopment can be implemented unless it has received the blessing of the appropriate Minister advised by officials lacking any real knowledge of local conditions.

Nevertheless in spite of the welter of regulations, it has been possible until now for dedicated local councillors to represent the wishes of their constituents and to undertake certain projects designed to benefit the communities that they are elected to serve. This is now threatened by a new series of proposals the dangers of which are not yet fully appreciated.

The Maud Commission

At present the interests of the ordinary person are represented and safeguarded by some 1200 local councils. Their precise powers and responsibilities vary but they all provide an avenue, reasonably close to home, through which the man in the street can press a grievance or promote an idea. But the proposals of the Maud Commission, on which the Conservatives have till now carefully refrained from committing themselves, would sweep away all these local councils. In their place, to provide "local" government for the whole of England, will be put a mere fifty-eight "unitary authorities". These will cover enormous areas. People wishing to reach their "local" council office may find themselves involved in round journeys of fifty miles or more. And each "unitary" authority will comprise only 75 elected councillors. This will mean in the majority of areas that one councillor will be expected to represent anything up to 15,000 electors. What chance will there be for any but the most vociferous to make their voice heard in either protest or suggestion?

At present it is possible for a wide range of men and women from all classes to offer themselves for election to local councils, ensuring a wide cross section

of opinion and a close check on local officials. The size and extent of the proposed new "unitary authorities" will ensure that the officials will be paramount. And as they will be working in close co-operation with their opposite numbers in the central government the opportunity for control by the administrators will be vastly increased.

Already a majority of people are cynical and distrustful of government, and there is real evidence of a growing gap between the government and the governed. If the new proposals are put into effect then the gap will quickly become unbridgeable, and democracy, as we have come to know it, be supplanted.

The arguments put forward to support the new proposals have been heard before at other times in other places.

Local government today is inefficient we are told, because there is a large number of small units. Create bigger units, say the pundits, and efficiency will be ensured.

But are larger units necessarily more effective? Industrial experience indicates that larger units experience more labour unrest. Huge government departments frequently become ossified and resources are wasted or misapplied. In the police force statistical records suggest that the rate of crime detection declines as the size of the individual constabulary increases. And what of humanity? It is significant that alongside the proposals for changing the local government structure we find provision for an ombudsman in every new "unitary authority" to deal with public complaints and grievances. They are therefore anticipated in large numbers. And no wonder.

The Swiss system

Those in this country who are busily propagating the inevitability of large units in local administration would do well to examine the system which operates in Switzerland. There can hardly be another country where government is so genuinely local and local feeling is so steadfast.

Switzerland is divided into 25 cantons—the equivalent of the present English county. Much of the authority vested in the British Home Office, Board of Trade, Ministry of Agriculture, Ministry of Housing and the Department of Employment and Productivity is vested in the canton. Under delegated powers a canton has more say in the running of the Swiss army than an English county has

People wishing to reach their "local" council office may find themselves involved in round journeys of fifty miles or more.

in the administration of its police.

In Education, the Swiss central Government has no right to interfere with a canton as long as the canton provides a system of free, compulsory education without denominational bias. All the Swiss universities are cantonal institutions although they are co-ordinated by the central government.

It is the cantons which bear the brunt of governmental expenditure and they therefore have a major tax-raising function. They have almost total freedom to raise revenue. Consequently only about one tenth of their income is in grants from central government compared with 40 per cent in this country.

There are a very large number of communes within each canton—few with populations in excess of 10,000. These are responsible for primary and secondary education, "national assistance", minor highways, water supply and sewage, law and order and town and country planning. Every commune largely determines for itself which services it provides independently, which require co-operation with other communes, and which should be left to the canton.

The most remarkable feature of all is the degree of direct democracy which prevails. Every resolution of importance requires ratification by the people in what we would call a parish or town meeting. In the larger towns a referendum must be held. There are also facilities for groups of electors to put forward proposals for consideration. Efficiency? Switzerland is ahead even of Sweden in gross national product per head. Perhaps regional and community pride plays a greater part in the economic well-being of a country than we would allow.

Liberal concern

It was with the example of Switzerland amongst others before it that the Liberal Party in 1967 set up a committee to consider "the creation of a democratic system of regional government for Britain". We were concerned at the increasing tendency to treat people as a mass. At their failure to comprehend that effective national effort results from individual action. If individuals have their incentives removed and initiatives

discouraged, then the legislation that Parliament produces will be so much hot air.

Once, we know, people could get things done within their community. Local councils were responsible for important services and enjoyed considerable freedom of action. Now the area free of central government sanctions has narrowed so much that men and women of calibre have opted out. The electorate, quick to sense the situation have become disinterested in the electoral process. Witness the voting percentages in this year's local government elections! A similar malady affects Parliament. Once the great forum of our land, where major issues were debated and decided, it has been progressively denuded of power. While the real decisions are made by a few men and women in the Cabinet, M.P.'s seem increasingly to be acting out a play with a script bearing little relation to real life.

Peaceful revolution

In 1968 the Liberals published a report, *Power to the Provinces*. It called for a complete reversal of the process by which major decisions are taken by the central government. It called for a vast transfer of power away from Whitehall and back to the people. It called for a peaceful revolution in Britain.

We proposed that Britain should adopt a federal structure comparable to the systems already operating effectively in many other parts of the world including Australia, Canada and Germany. There is no other way in which clearly defined areas of a country can retain their individuality and purpose and the people there exercise a high measure of control over their own affairs.

Scotland and Wales, each with their own language, history and culture are clearly separate nations. It is remarkable that the English have for so long resisted their claim to have separate Parliaments exercising control over their own separate affairs.

Total separation would be ridiculous, but in a world where mass pop culture threatens to engulf us all, there is an unanswerable argument for the granting of self-government to Scotland and Wales, within a Federal Britain. Why should these two countries be denied something which the Northern Irish, despite all their unique problems, have had for fifty years?

Power to the provinces

To restore a feeling of purpose, re-

A majority of people are cynical and distrustful of government.

There is real evidence of a growing gap between the government and the governed.

sponsibility and participation to the people of England we advocated a provincial framework. The nation would be divided into these areas to which geography and the pattern of industrial and social development had given separate, recognisable identities. We defined them as Northumbria, Lancashire, York, Mercia, Trent, Severnside, Thames Valley, Anglia, Westcountry, Solent, Greater London and the Weald.

Each province would have an elected assembly of paid representatives, its own administrative personnel and revenues adequate to administer the welfare and progress of its inhabitants in all areas of activity not specifically reserved to Westminster.

Varying in population from 1.6 to 7.9 millions they would be large enough to handle most major services and undertake overall provincial planning and strategy.

Concurrent with this provincial structure there should be a rationalisation of existing local authorities. The aim should be to create one major tier of local government based on community of interest and formed, where necessary, by the amalgamation of existing local councils. To combat the danger of excessive size and consequent remoteness no local council (outside of the major cities like Manchester and Birmingham, which would remain as single, cohesive units of local government), should cover a population in excess of 300,000. In rural areas this figure might go down to 60,000. The intention would be to create new local authorities strong enough to accept back a great deal of the responsibility which has been filched from them over the years.

To foster local "grass roots" participation neighbourhood councils should be set up wherever a clearly established community group proved the need for one. The district councils would respond to public opinion in this respect. The neighbourhood councils would be watchdogs, offering a channel for protest and suggestion and providing everyone with a medium for gathering support and affecting decisions. In many respects they would be an official extension of

the many ratepayers and residents associations that already exist.

Reallocation of responsibility

In considering any new governmental structure, there are three important principles. First, as many functions and responsibilities as possible should be taken away from the central government. Second, all the "personal" services like health, welfare and housing should remain under the control of the district councils. Third, wherever possible the district councils should act in respect of the major services as agents for the province and administer the service within their own area.

The Westminster Parliament would consequently retain responsibility only for agricultural and fishery policy, customs and excise, defence, economic and social planning, education policy, national taxation, foreign affairs, home office affairs, nationalised industries and power supply. A Minister for the Provinces would co-ordinate and hand down central government policy. Where necessary, he would see that agreed standards were being maintained. The provincial governments would, with the central Ministry of Economic Planning, prepare a strategic national plan.

It would not, of course, be possible for each province to go its own way and enjoy total economic independence. But once a broad growth rate had been agreed for a province it could determine its own priorities and exercise considerable autonomy and control over detailed economic development. Provinces could be given responsibility for town and country planning, transport co-ordination, docks, inland waterways, power and water distribution, education, hospitals, the police, fire and ambulance services and the construction and maintenance of all roads except those forming part of the national motorway grid.

Such reforms would be meaningless unless the present system of revenue raising and distribution were changed. As the Inland Revenue already conducts its affairs on a regional basis this would not be difficult.

Provincial governments could retain the PAYE income tax collected in their areas.

A provincial payroll tax could be levied on all companies based upon payments made under Schedule E.

A provincial sales tax could be collected in a similar manner to the present purchase tax.

Provincial governments would also have the right to levy additional taxes and to make a charge for services (i.e. toll roads).

The district councils' main source of finance would continue to be rates, but these would be levied on land values and not buildings.

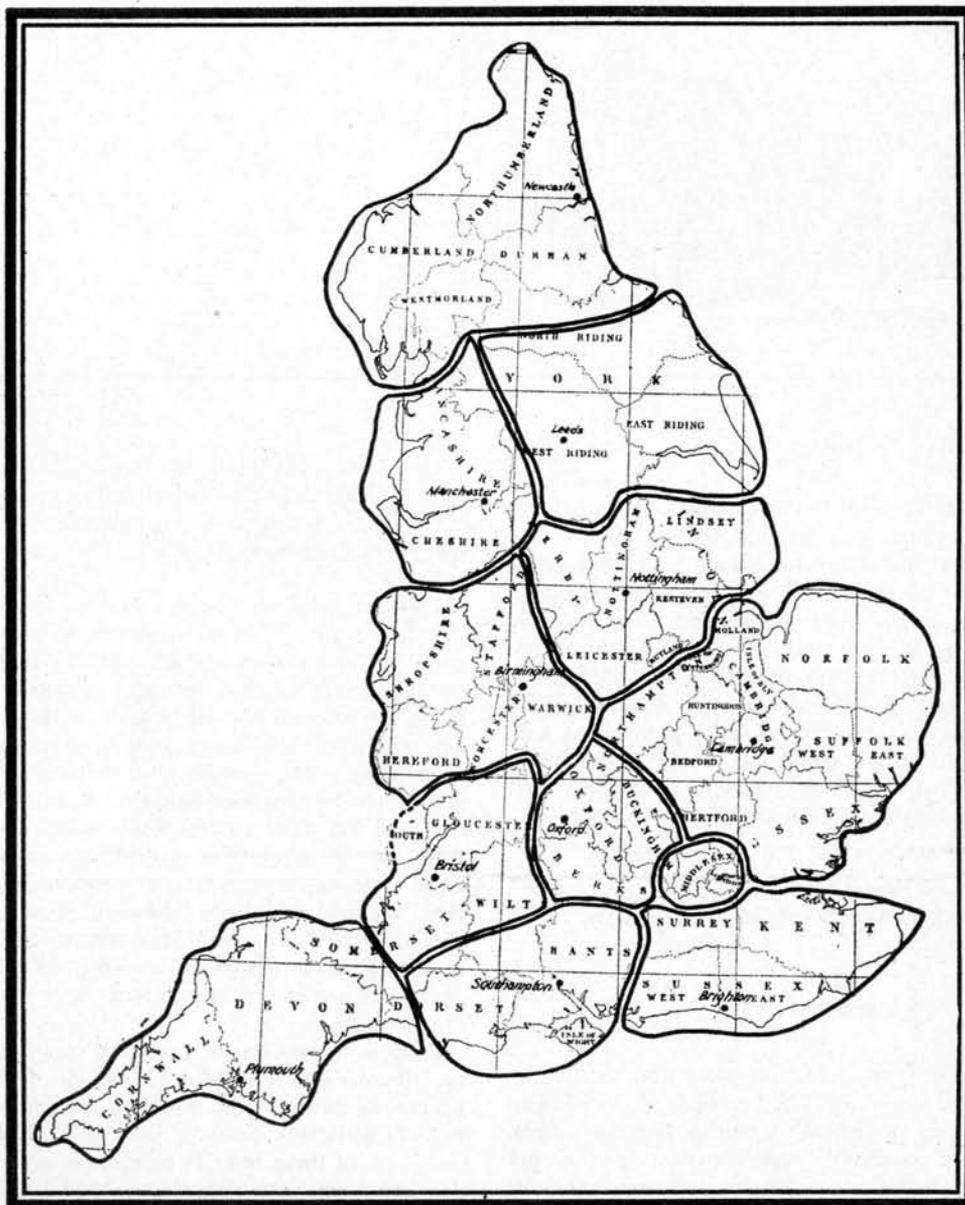
Radical proposals

These proposals would restore a large measure of power to the people and greatly improve the efficiency of Parliament. Freed of the responsibility for so much domestic administration, M.P.'s would find more time to investigate deeply (through expert committees of parliament) some of our major social and economic problems. It would be possible to reduce the membership of the House of Commons by a third, and increase the public stature of those that remained.

There would be an immediate strengthening of regional pride. Freed from Whitehall restrictions, the provinces could get on with their own development in their own way. There would be competition between them providing a stimulus to action. Considerable reductions in central government taxation would be possible. With more money raised and spent in the provinces, closer to the people, it would be spent more wisely.

Because it would be possible once again to exercise a decisive influence upon the planning and development of their area the interest of the electorate would be quickened. More people would be ready to give their time and effort to serve on the district councils where there would once again be a positive job to do.

The proposals put forward by the Liberals are radical. People are not going to find them easy to accept because they call for a reversal of much current thinking. But I am confident that the salvation of this country is to be found in something closely akin to them.



The twelve semi-autonomous regions proposed for England by the Liberal Party plan

Statement

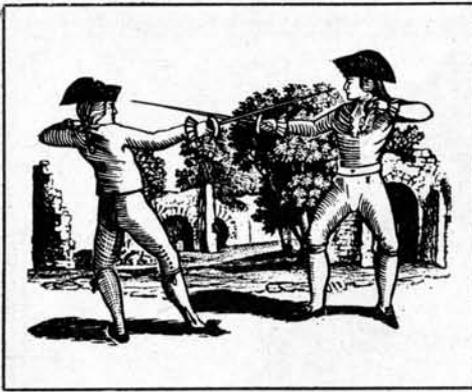
I live in a man-warren
Where tunnels of sound
Lead all around.

Car doors
Slam,
And like pistol shots
Reverberate down brick-lined canyons.
Starters
Kick
Your eyes from their sockets,
Your thoughts from their dreams,
And all the while idling,
Engine cauldrons bubbling.

I live in a man-warren
Where tunnels of sound
Explode all around.

Christine Francis





Praise indeed

Sir,

I have read the first issue of *The Ecologist* with pleasure and intellectual profit. The journal should be a success if you can maintain the standard. Popularization is becoming respectable, possibly because scholarship at large is now aware that popularization is not easy, but a responsible discipline in itself.

May I wish you and your journal the success you deserve for your courage as well as for the good contents of your first number.

Needless to say, I have posted my first year's subscription to the right quarter.

Yours sincerely,

Frank Fraser Darling.

Shefford-Woodlands House, Newbury,
Berkshire.

Ecological allies

Sir,

Congratulations on your new and badly needed venture. The *Ecologist* fills a huge gap in our periodical literature; so many people, even ostensibly well-educated people, are hopelessly out of touch with the real facts of our situation today, and the terrible dangers such ignorance is helping to create.

All good wishes for the success you deserve.

Yours sincerely,

John Papworth.

Editor, *Resurgence*, 24 Abercorn Place,
London, N.W.8.

Readers' suggestions

Sir,

I assume *The Ecologist* is a new publication, as it is the first time I have seen an issue.

It is certainly welcome to see in print such rational and sensible thinking in this modern age which, not surprisingly, depresses and confuses the young, and produces despair in both young and old.

Whilst I welcome your magazine, it is apparent to me, and probably to you also, that your greatest problem will be to provide material of a wide interest which will not reiterate too often the same facts. There is obviously great room for a diversity of topics, perhaps some sort of news sheet which exposes local or national erroneous decisions. Thank you.

Yours sincerely,

J. W. Hammond.

23 Brentham Way, Ealing, W.5.

Sir,

May I welcome the timely introduction of your monthly magazine and say how I appreciate its content and style of presentation, lively but fundamental rather than merely topical.

I should, however, like to make one point. The dire state of our environment is indisputable and remedies are urgently required, but it seems to me that the major problem is the nature of man himself both as an individual and as a social being. Individual habits of thought, social customs and political organizations all now seem in many ways obsolete and yet they continually demonstrate their inertia. Without a radical change in these areas we cannot succeed in solving our environmental problems, although presumably we have the technological means to do so. The physical aspects of our environment cannot therefore be dissociated from the sociological ones.

In view of this, might I make a plea that contributors to your journal include such people as Sociologists, Political Scientists, Psychologists, Planners, Economists and so on. Some of these have already come in for criticism from your contributors and I feel they ought to be able to air their difficulties.

As an example of what I mean I would instance the editorial where there is a reference under the sub-heading "Social Disorder" to the relationship between our present environment and social disintegration. One would like to have seen this intriguing point enlarged upon in a full article by a specialist in the Social Sciences.

I realise that there are other journals specializing in the various fields I mention but an integrated approach is needed. Your journal, which on the cover proclaims a concern with "Man and Environment" and "The Quality of Life" seems to be the one to make the attempt.

Yours sincerely,

E. N. Shapeero.

3 York Street, East Markham, Newark,
Notts.

Editor's note: We are, of course, very grateful for suggestions from readers and hope many more will be forthcoming.

Hippocrates unblinkered

Sir,

I, too, must add my congratulations to those of Pan Australian Unit Trust on the back cover of your first issue.

One comment I would like to make after

reading Prof Lindsay Robb's article. Granted things are moving slowly, possibly too slowly but such things as the emergence of Health Centres, the concept of the community physician and his function, the proposed factory doctor service and the establishment of a single ministry for health and social services suggest to me that there is a faint glimmer of hope that medicine is becoming aware of the Environment.

A further small point with regard to your book reviews is necessary. Though everything can't be covered in one issue I am surprised that no mention was made of Dr Mellanby's "Pests and Pesticides"—surely one of the most balanced books on the subject; but then, he was your first correspondent!

Yours sincerely,

F. G. Ward, MB, ChB.

111 Gravel Lane, Wilmslow, Cheshire.

Eco-action at Faversham

Sir,

Congratulations on producing a long overdue platform for those concerned with our environment. The only criticism I can offer of your journal is that the views expressed coincide so closely with my own that I can find no grounds for raising arguments. All power to your elbow in bringing home to the public the possible disaster which may be just around the corner.

I am particularly interested in Lawrence D. Hill's article on the disposal of PVC, as the pulverising equipment he mentions may be the answer to a problem being faced in Faversham at the moment. A public tip has been established in a gravel pit only yards from houses and a school. Failure to maintain proper covering has resulted in a nuisance being caused to the extent that local residents have formed a "Tip Action Committee", of which I am a member. The cry from the public now is for an incinerator, but I have not been happy with the suggestion from the start, and Mr Hills' article makes me even less so. The Compost Plant he mentions is a much more interesting proposition, and I would be very grateful for further information in the hope that we may find such a plant able to meet our needs. We would need to cater for a population of up to, say, 20,000.

A complication is that at present trade tipping of waste fruit is allowed on the public tip, and I believe this to be a possible source of insect infestation, needing special measures to deal with it. Mr Hills' com-

ments on this aspect would also be much appreciated.

Yours sincerely,

C. W. Haycock.

18 Everard Way, Faversham, Kent.

Menace of the milk bottles

Sir,

I was very interested to see the article in your July issue on the future of Milk Packaging. This Company supplies Pure-Pak cartons and machines to a number of the leading Dairy Companies in this country and we believe that this pack meets all the stipulations made by the author of your article.

It consists of board made from pure wood pulp sandwiched between two layers of polythene. There is thus no question of toxic fumes on disposal and with the mechanical strength of the board supporting the polythene there has never been any question of board being punctured by birds or of any other hazard of milk distribution.

On the question of size, a square carton uses space in storage, distribution and the domestic refrigerator much more efficiently than a round bottle and the pint and one half carton now coming into use will fit into the space of a pint bottle.

In the long run it is my personal view that the litre will be the main unit as the cost of a bigger package is proportionally less than a small pack. Our figures indicate a saving of approximately 30 per cent between packing in pints and packing in litres.

On the question of colour, the board is a natural filter for ultra-violet light so that we feel here too we meet your specification for an ideal container.

Obviously I am biased, but the fact that North America, Scandinavia, Australia use this pack to an overwhelming extent and that its use in the United Kingdom is expanding rapidly shows that it can be used without the problems enumerated for the alternative packs in your article.

Yours sincerely,

R. W. Mosse.

Managing Director, Liquid Packaging Ltd., Stevenage, Herts.

The Fight for the Tamar River

Sir,

Reading an English paper in Madrid, on holiday in April, there was a brief announcement to the effect that the Ministry of Technology had rejected the Central Electricity Generating Board's request to build an Atomic Power Station at Insworke Point on the Tamar in Cornwall, and that the C.E.G.B. would shortly apply for authority to construct an oil-fired station.

The C.E.G.B. intend to build their oil-fired station on this creek of the Tamar if they can get away with it. Their reasons are solely technical and their interests in this site affect solely the economic interests of the Board.

As well as the River and the famous haunt of Avocets where the Station is to go, this part of South East Cornwall is untouched and very beautiful. It includes a designated area of "outstanding natural beauty" where planning permission is difficult to get. The Power Station unbelievably, is to be built a mile from the centre of this area, but just out-

side its boundary. Within this area are the great headlands of Penlee and Rame and the fishing villages of Cawsand and Kingsand. These villages are to be designated Conservation Areas shortly. Also within this area, and again a mile from the Site is Mount Edgumbe House and Park, which have recently been bought jointly by the Cornwall County Council and Plymouth Corporation, for their citizens, forever. A mile to the North of the Power Station Site is the National Trust Property of Antony House, again with its grounds.

We are not sure exactly which way the pylon outlets from this Station will go, but they have to go North to join the Grid 15 miles away, and across the Gateway to Cornwall.

The Power Station itself will take over Insworke Point on the River, and the C.E.G.B. are acquiring 154 acres for Turbine House, Boiler House, Tank Farm, etc. The multiple flue chimney will be 650 feet high: but this is not much good as the centre of the area of "outstanding natural beauty" is a wooded ridge 400 feet high, a mile away. This Station is to consume 2 million tons of oil annually and so will be billowing out all around the bowl, raining down sulphuric acid.

The Station is to be cooled from the River, and will use and return 30 million gallons of water an hour, raising the temperature 10°F. The Estuary has a narrow funnel entrance and the heated water won't escape. We don't know the effect on Marine and Shore life, the C.E.G.B. certainly don't either and I am afraid don't care.

How the Station is to be supplied with Oil we are not certain. As far as we have been able to "dig out" this is to be either by a 40,000 ton tanker discharging in the River once a week, or discharging in Cawsand Bay, with a pipeline across our area of "outstanding natural beauty". 99.9 per cent efficiency in discharging, such as at Milford Haven would still mean 2,000 tons of oil floating around annually.

Our M.P. when he was approached was cynical about it all, he said he might get us an enquiry, but once the C.E.G.B. had "pointed a finger" we were wasting our time. I would hate to think he was right, although the sole official notification of any intentions was a group of notices displayed at points on the wayside in the immediate vicinity of the Power Station Site, as if people here were the only ones involved. It had its amusing side; tentative recruitment investigations were made in the neighbourhood before the notices were even down. The notices appeared and disappeared exactly to the day that they were obliged to be shown. They, of course, indicated certain protest rights that are open. We are asked to protest officially but given barest information.

As long as decisions of this magnitude are left to Statutory Boards to manoeuvre through, then willy nilly we will all suffer by default.

For us the fight still goes on.

Yours sincerely,

O. J. Prattent.

Tudor Cottage, Lower Anderton, Cremyll, Plymouth.

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Down to Earth



by Lawrence D. Hills

Mrs Butler's bill

The important difference between the weedkiller used by Dr Crippen the murderer and the paraquat that killed Britain's first unsuccessful lung transplant case—a boy who drank it by mistake—is in the labelling. Crippen's arsenical weedkiller had a skull and crossbones on it to warn even illiterates, and the nicotine used by gardeners in the past was also in fluted glass bottles to prevent mistakes in dark potting sheds. Today we have only brief warnings in small print and names, incomprehensible except to skilled chemists, on the poisons for sale in every gardening shop.

Mrs Butler's Bill began with a resolution passed at the A.G.M. of the Henry Doubleday Research Association, who circularized all the Allotment Societies and bodies such as the Soil Association and the Royal Society for the Protection of Birds and gathered 55,000 supporters. Then they secured the interest of Mrs Joyce Butler (Labour, Wood Green) who introduced a Bill under the Ten Minute Rule on June 2nd 1964. It was sponsored by two Labour M.P.s, two Conservative and one Liberal, making it entirely non-political.

Its object was to make it possible for the public who may not know D.D.T. from M.C.C. to choose garden chemicals that are entirely without risk to children, pets and wild life, by making it illegal to sell these substances without distinctive marks. One suggestion was for red rings round the bottles or packets of those that can kill or produce serious illness in adults or children, such as the organo-phosphorus compounds like malathion or metaldehyde slug baits; yellow round the cumulative poisons, especially the organo-chlorine compounds and others especially dangerous to wild life, and green for entirely safe substances such as derris and pyrethrum.

The first of the two recent Labour Governments fell before it could become law, but Mrs Butler fought on until her bill passed both Commons and Lords with all party support and finally re-

ceived royal assent as the Farm And Chemicals Act 1967. It "provides that Ministers may make regulations requiring the active ingredient to be named on the container and the label to bear a distinguishing mark indicating the extent of any hazard to human or other forms of life and words of explanation or warning". The important phrase is "may make" for it does not say that he must, but he can if he wishes.

In 1969, five years after the A.G.M. that began the story, the Ministry of Agriculture, Fisheries and Food issued five foolscap sheets, duplicated on both sides, entitled "Proposals for Regulations Under The Farm And Garden Chemicals Act 1967". These regulations insist in great detail that chemicals must be labelled with names in accordance with those agreed by the British Standards Institution, that these names must not be obscured by other matter on the labels, and how much there is of each ingredient by weight in the container must be shown. There is a five page list of substances beginning with Aldrin and ending with Ziram, and including everything from pyrethrum and quassia to manganese dimethyldithiocarbamate and orthohydroxyphenyl-mercurybenzene, with nothing to show what is safe for which or whom. They ignore the whole purpose of the act which was concerned with marks indicating "hazard to human or other forms of life".

The regulations would make it illegal to sell a bucket of tar without "TAR" in white letters on the bucket, and so long as the word "tetrachloroisophthalonitrile" can be got on to a label, there is no need to say what it poisons. It is pointless to insist that the weight in grammes contained in the packet should be printed on the label, unless it must say how much will kill a man.

When this mountain of effort produced not even a mouse—merely a little chewed up waste paper—Henry Doubleday Research Association Members and others wrote to their M.P.s and the Ministry of Agriculture and demanded an explanation of why the Civil Service had reduced a Law that had satisfied Parliament, the House of Lords and Her Majesty as a practical and valuable protection for the public, to nonsense. They received basically the same reply.

Firstly there was a totally irrelevant defence of chemicals and the existing safety regulations, useful only in showing the bias of the officials concerned. This

was irrelevant because the Act did not suggest that any substance should be banned, merely marked clearly so that the buyer could choose or reject it when the name on the label could not be understood without special training. D.D.T. is the only well known organo-chlorine compound, but chlordane, endrin and dieldrin are far more toxic, and the public are entitled to an easy warning system.

Then it was stated that any mark would have to be agreed with the Council For Europe, who had the subject under consideration and could not be hurried. Those who go on continental holidays should ask themselves how often they bring back pesticides rather than scent or cigarettes, and consider how likely it is that Frenchmen will flock to Britain to buy D.D.T. now that their Parliament has banned it after over 3,000 samples of fruit have been analysed and found to contain toxic traces (*Daily Telegraph* 20th July 1970).

This first example of the use of Europe to delay action and prevent press discussion, because this could involve criticizing the Common Market, has been entirely effective in suppressing the Act for the past three years. Nearly four months now remain of European Conservation Year, but though millions of well paid words have been spilt, Britain has done nothing to compare with pesticide bans of other countries. Yet we have this sensible and practical measure that is already Law, which would cost little yet be highly effective.

We now have a new Minister of Agriculture, who *may make* an entirely different set of proposals, that would give the public the right to choose "something green for aphides" without risking the birds they feed in winter by gambling on a name almost as long as a Parliamentary recess or a set of letters that would beat the Brain of Britain. If only sufficient readers of *The Ecologist* cared enough about pollution to write to their M.P.s and the Minister of Agriculture (c/o the House of Commons, Westminster, S.W.1.) demanding red rings for danger, yellow for long-term risks and green for safety, we could chalk up our first achievement. For pollution is far too important to be left to experts who sit on fences. Only YOU can stop it.

If only one in fifty of you would spend an hour each and some stamps for over a thousand letters, we could achieve something—we could shake the Civil Service and enforce Mrs Butler's Bill.

Gargoyle

by

Wayne Davis

Professor of Zoology
University of Kentucky



The fifth freedom

At last some important people are beginning to speak up about the serious population problem in the United States. Although Presidents Kennedy, Johnson and Nixon have all expressed alarm about world population, I know of no high public official who has brought it home to the American people, where the most urgent population crisis has developed.

Now a prominent member of the last Administration has taken a public stand at home. Roman Catholic Robert S. McNamara, one of the most influential and respected men in the Kennedy and Johnson cabinets, was the first name on an advertisement in *Time* saying, "Whatever your cause, it's a lost cause unless we control population."

Morris Udall, from a family of six and father of six, has written in the *Reader's Digest* of concern about the overpopulation of our nation. If Bobby Kennedy were alive, perhaps he would write; or maybe he would father another child. If all his descendants are as productive as he, the 11th generation will produce exactly 100 billion people, 27 times the number on earth today.

Udall's article is sound except for one point. He clings to the outmoded notion that everyone should be allowed to produce an unlimited number of children. This concept must change. People are the most serious form of pollution the world has ever known: no one has the right to add another litter to the Earth today. We must establish a new basic freedom—freedom from those who are destroying the Earth and its ability to support life by excessive production of their own offspring.

I'd now like to release my programme for population control. I introduce it as a starting point towards a rational approach to an extremely serious problem which is still being ignored by our political non-leaders. Suggestions and amendments are welcome. My programme is not original; it has been put together from the literature.

It should be official policy that no one has the inherent right to produce more than two children and we should pay a bonus in the form of increased social security payments for those who produce less. We should have a marketable licence for babies. Each girl, upon maturity would receive certificates allowing her to produce two children. She could have the children or sell her certificates to someone who wanted more than two. Not only would this control population but it would solve the poverty problem as well. Excessive numbers of children now assure the perpetuation of the poverty cycle. With the certificates for the rich to buy, they would have more children and become poorer while the poor would have fewer and become rich.

We should revise all our laws which favour the production of children. The cost of child raising is now more of a burden on society than upon those who produce them. We should eliminate tax deductions for children; the federal government has no business subsidizing procreation. The cost of producing a third child should involve an annual excess child tax, in addition to the free market cost of a certificate. School taxes should be levied in such a way that those who produce children pay the major cost of educating them.

We should phase out the Aid to Dependent Children programme. With our new programme anyone desiring to have a child not only must present a certificate but must post bond for insurance to provide for the welfare of the child should tragedy befall the parents.

Now for the poor and the welfare people. Before starting on them, I want to clear the air of some misconceptions. When I speak on population problems there are always those present who expect me to be a champion for those who want to kick the unwed mother with the large brood, or the prolific blacks, or both. I favour justice and equality of opportunity and will neither advocate nor support any programme which would pick on certain groups or classes of people.

Although the poor and the black have larger families than the average American, cutting the birth rates among these groups would not solve the population problem. By far the greatest portion of the population explosion in the United States is in the middle income group with their predominantly 3-5 child families. That's you, Whitey, and don't forget it. If you plan a population programme

for the poor and the black without taking care of your own excess procreation at the same time, you are looking for trouble and you will find it.

Recent studies (e.g., *Science* '65: 367, 1969) have shown that people desire the same number of children regardless of family income and that Negroes want no more children per family than whites. Why then, do the poor have larger families? Indifference and lack of adequate contraception are probably factors. But the natural response of rational beings to our economic system of financial rewards and punishment is also an important factor.

Few subjects create more emotional response among a middle income white audience than the subject of uncontrolled reproduction among unmarried women whose already large litters of children are being supported by public welfare. But I have no hard feelings against them for producing children, with the amount of payment being a function of the number produced. In Kentucky a woman may get about \$50 a month for one child, whereas with 10 she would get about \$300. Thus they seem to be cheaper by the dozen.

Surely society must want her to produce children. Why complain when she does? The fault here lies not with the welfare mothers but with the society which developed and tolerates such a system.

Aid to Dependent Children payments vary widely among states and in no case are they sufficient to provide a very high standard of living for the family. However, to a person who has nothing they look attractive and they encourage the production of children. I have seen social workers quoted in disbelief of the possibility that a woman would intentionally have another child in order to collect additional ADC payments. However, I know from personal experience during my days in the snake-pit bars of Minneapolis that such behaviour was commonplace. Perhaps it was influenced by the fact that at that time Minnesota had the highest ADC payments per child in the nation.

For the middle income couples, on the other hand, each child is an additional financial liability. Therefore, they rarely produce the large families so commonly found among welfare clients. But because of their affluence and a tax system which subsidizes their production of children, the vast middle class has been reproducing at a rate sufficient to have

caused the major part of our population problem.

For the poor people and those on welfare I suggest a positive approach to population control. First, we should pay them not to have children, just as we pay farmers not to raise corn, not to raise hogs, and as we should pay the U.S. Army Corps of Engineers not to build dams and the Soil Conservation Service not to denude and channelize our streams. Surely if we contract to pay women \$300 a month to produce 10 unwanted children, we should pay another woman at least this much not to have any. Remember that we do not solve any problems by raising her children. Surplus populations of unwanted children absorb resources, create crime in the streets, and reproduce themselves at near the biologically maximum rate.

Next we should pay substantial federal bonuses for sterilization. Vasectomy is a very simple operation which does not affect the sexual behaviour or desires of a man. Since it costs society about \$18,000 just to raise and educate one welfare child, let alone try to keep him out of trouble, we could well afford vast sums for this programme even without touching the sacred war chest.

Sterilization is not so easily performed on the female. It can best be done at the time of childbirth when the oviducts are most accessible to the surgeon. Therefore a federal population control programme should be established in the maternity wards of every hospital. It should involve a massive subsidy for sterilization or a smaller annual subsidy for successful use of contraceptives. It has also been suggested that a certificate of sterilization be required for a woman to get a new baby accepted for ADC payments.

Let me make it clear that fertility control is absolutely necessary for the welfare of the poor as well as for the rest of society. The idea of raising expectations for the disadvantaged minorities is a cruel joke foisted upon them by the Establishment. Whitey's system of payments according to the number of children produced assures that there can be no possible escape from poverty except through crime. Poverty programmes within this system are a farce.

If we control reproduction then there is hope for the poor. An uneducated man with a wife and two children can be trained to repair automobiles or electrical appliances and he can climb into the

middle income class. But if he has half a dozen children the outlook is bleak; we might as well write him off as "cannot be saved" so as to concentrate our resources on better prospects. And if he has 11 children we could educate him through the PhD, get him a job as an associate professor of Zoology at the University of Kentucky, and his family would still be below the President's official poverty line.

As I have pointed out in a previous writing (*Ecologist*, July 1970), the population problem in the United

States is the most serious in the world. In facing this problem we have a choice. We can limit the number of births by humans means: contraception, abortion, sterilization, social and economic rewards and penalties. Or we can do nothing and allow the nation to sink ever deeper into chaos as the population comes into balance due to increased death rates subsidized by wars, riots, murder, suicide, heroin overdose, and the battered baby syndrome, plus a birth rate depressed by drug addiction, prison confinement and mental derangement.

The Ecologist Environmental News Digest

The Ecologist has much pleasure in announcing the publication of a fortnightly environmental news digest. It will review the fortnight's news as it appears in the English-speaking Press under the following headings:

Conservationist Pressure & Litigation	Ecological Legislation
Pollution Control & Re-cycling technology	Agriculture & Forestry
Population Growth & Control	Natural Resources
Depletion of Mineral Resources	Power availability
Man-induced climatic changes	Health trends
Oceans: Resources, Pollution & Control	Wildlife
Rivers: Resources, Pollution & Control	Social structures
Air: Pollution & Control	Urban environment

This publication will have 30 pages and will be available by subscription only at £35 per annum. Subscribers will have at their disposal a comprehensive environmental news service. Date of publication: 1 January, 1971. If you are interested in this service and would like further information, please complete the form below and send it to The Managing Editor, The Ecologist, 73 Kew Green, Richmond, Surrey.

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Farewell guillemot and goodbye razorbill

Oil pollution and other unknown causes threaten two species of British seabirds with extinction. More than 100,000 guillemots and razorbills died in the Irish Sea this year and about 50,000 breeding guillemots and 14,000 razorbills disappeared from cliff edges in the area.

This loss follows a decline of 24 per cent in both species between 1967 and 1969 according to the Royal Society for the Protection of Birds.

Morning Star

Greetings PCBs

One of the previously unknown causes of last year's bird deaths around the British Isles has been traced to a group of persistent poisons, known as PCBs (polychlorinated biphenyls), which produce biological effects similar to DDT.

According to a study carried out at Monks Wood Experimental Station, PCBs also contribute to repeated breeding failures among already depleted species.

Controlling PCBs is going to be difficult, since they have a vast number of industrial uses and are let into the environment in countless different ways. But even if effective controls are brought in PCBs already exist in the environment in significant quantities and will persist for many years doing harm.

Dr Kenneth Mellanby, director of Monks Wood and editor of *Environmental Pollution* said that "If a pollutant is shown to have an adverse biological effect then it should be stopped. And we should always base our assessment on the most sensitive indicators."

The Guardian

Dirty sea dangers

Extraordinary pollution of the beaches around Genoa forced a city magistrate to seal them off and ban bathing. He

was overruled, however, by a higher official who said that the danger, which included the threat of an epidemic, was so great that it could only be dealt with by the national authorities.

The result is that the Genovese may continue to swim in water so dirty that they are advised to get inoculated for tetanus and typhoid before plunging in.

The Times

Oil on the rising sun

At least 20 per cent of the world's oil fleet are refusing to use the "load-on-top" anti-pollution system and continue to discharge 600,000 tons of oil—the equivalent of five Torrey Canyons—into the sea during tank cleaning.

Half of this amount, according to Mr John Kirby, vice-president of the UK Chamber of Shipping, is jettisoned by Japanese ships; but the Japanese government show no signs of passing legislation to enforce the anti-pollution requirements, which they recently accepted in principle at an international convention on oil pollution.

Financial Times

Pollution makes climate change

According to a government-sponsored study of the weather around St Louis and Chicago, the climate of North America is being altered by air pollution and is becoming steadily warmer and wetter.

Clouds seeded by common pollutants such as lead from car exhausts and sulphur dioxide from power plants produce the extra rain, while energy production, which doubles every 17 years or so, accounts for the warmer weather, especially in urban areas.

Dr Walter Roberts, president of the National Atmospheric Center Corporation, said that the study "will be the first major effort to identify particular sources of pollution that are significant in terms of health and adverse atmospheric effects."

St Louis Globe Democrat

Feedback

Smog cuts sunlight

Smog over Houston at times blotted out 31 per cent of sunlight necessary for plant growth according to a report by researcher Darryl Randerson presented at a recent air pollution conference. The overall loss of solar energy averaged at least 23 per cent. Randerson blamed the loss on ozone, created by hydrocarbon pollutants undergoing a photochemical reaction in sunlight.

The Houston Post

Bonds against pollution

The First National Bank of Miami has issued anti-pollution savings bonds as concern over the environment grows. The bonds can be bought for as little as \$25 each to allow as many people as possible into the fight against pollution. They carry an interest rate of 5½ per cent and can be redeemed at face value in two years.

Engineering

Black or white ecology?

At the first national Congress on Optimum Population and Environment held recently in Chicago representatives of the black caucus stated that present concern about the environment and population growth favoured white interests.

"The elimination of dangerous species such as rats, roaches and other vermin is of more immediate concern to the black people than the preservation of brook trout, buffalo and bald eagles", they said.

The blacks demanded that the congress be reorganized to reflect non-white views and to protect basic freedoms. They said that measures to stabilize population should not be allowed to become part of any national or local legislation policy.

Milwaukee Journal

Who pays the bill?

Robert P. Mayor, out-going Director of the Budget said at a meeting of investment bankers in Santa Barbara, Calif-

ornia that the cost of cleaning up after pollution over the next five years would be \$110 billion. The breakdown of this sum gave \$70 billion for water, \$12 billion for air, and \$27 billion for solid wastes.

Mayor said that "as the nation grows, pollution problems grow right along with it—perhaps even at a faster rate", and warned that although the government was determined to do its bit, it could not afford to pay the whole bill.

Los Angeles Times

Cigarettes = cancer = death

One in every eight deaths in the Glasgow area is caused by lung cancer. Dr C. R. Gillis, director of the Cancer Registration Bureau for Western Scotland said that whereas air pollution multiplied the risk of lung cancer by a factor of two, smoking multiplied the risk by a factor of 50. Dr Gillis said, "There is no doubt at all that cigarette smoking is an extremely important direct causal factor in lung cancer, and accounts for lung cancer deaths in about 85 per cent of cases."

The annual report of the Scottish Western Regional Cancer Committee said that it was scandalous that tobacco—"a dangerous drug of addiction"—should be a mainstay of the economy.

The Guardian

Smell pollution

Venice had a day of crisis recently when thousands of dead fish and rotting seaweed blocked its waterways and sent up a foul smell to heaven.

Biologists said that a violent storm, which uprooted the seaweed, and a heatwave which killed it and made it rot, were responsible. The decaying process changed the oxygen in the water into hydrogen sulphide gas, killing the fish and blackening any silver objects which the gas touched when it escaped from the water. The smell, identical to rotten eggs or stink bombs, was bad.

Chicago Daily News

Esso gets sulphur out

Esso's research centre at Abingdon, Berkshire has come up with a new process for reducing the sulphur content of emissions from boilers burning heavy fuel oils. The centre has received a £100,000 contract from the US government's National Air Pollution Control Administration to develop the process to the stage when it can prove its commercial viability. *Financial Times*

Jet pollution

Commercial aviation contributes massively to air pollution. The amount of pollutants pumped into the air each year at Heathrow airport runs at 10,000 tons of carbon monoxide, 4,000 tons of hydrocarbons, 300 to 400 tons of nitrogen oxides and 100 tons of fine solid particles. These amounts are emitted only by aircraft landing and taking off. An ordinary jet between landing and take-off gives out as much filth as a rush-hour traffic jam stretching from Marble Arch to Oxford Circus.

The Listener

The price of pumps

With the growing concern over pollution in Russia being expressed in the speeches of its political leaders, a Soviet conservationist, S. Trofimov, has spoken out against the adverse effect of the great Kuznetsk coal mines on the environment.

Trofimov also complained that officials in the area are so ignorant of land values that they think the price of one hectare (2.47 acres) "is no higher than two pairs of fashionable ladies shoes".

New York Times

Ad-ding to the horror

During the next ten years American advertising will become restricted and regulated by government controls "in a way that would have seemed unbelievable only a few years ago" according to Victor Bloede, speaking at a meeting of the Dentsu agency in Tokyo.

He said that control over advertising would be influenced by "the so-called consumerism movement and the increasing awareness of environmental and psychological problems that technology has created".

Although Bloede admitted the horrors of physical pollution were bad enough, he believed the "psychological ravages" created by the modern environment could be even worse.

Campaign

Norway's electric car

Taking heed of air pollution problems the Norwegian government is investing £80,000 over a 3 year period in the production of a practical electric automobile, which is the work of El-Bil A/A, of Förde Norway. If tests go right full-scale production may start in 1972. *Newsweek*

From plastic to dust

A team of scientists from Birmingham's university of Aston has produced a dye which could make plastic crumble into dust when it is exposed to sunlight.

Professor Gerald Scott, from the university's department of chemistry said, "It works rather like the action of sunlight on chemical dyes in curtains—they fade first and then they gradually crumble".

The dye which is sensitive to the ultra-violet rays in sunlight is impregnated into plastics. After three months exposure to bright sunlight the dye starts to break down the plastics. Containers made of the new material would change colour when about to disintegrate, giving the shopkeeper or housewife plenty of warning. They would not disintegrate when stored indoors away from sunlight.

With 250,000 tons of plastic being dumped in Britain alone this year, the dye could help solve one of the world's most pressing and difficult pollution problems.

Daily Mail

Mass mercury poisoning

Doctors in the US fear there may be thousands of unknown cases of mercury poisoning after contaminated fish and waters have been found in 14 states.

The mercury search began in April this year and is still incomplete. Some states have issued fishing bans but others, especially in the south, have not done so. Although the Food and Drug Administration has declared that anything more than 0.5 parts per million in fish is "dangerous contamination", no one knows if any level at all is really safe.

Mild and severe cases of mercury poisoning are being incorrectly diagnosed as encephalitis, senility or mysterious brain damage. Officials of the National Communicable Disease Center say that about 10 per cent of any mercury a person takes in goes to the brain. The results may only show up after years, when enough brain cells have gradually been destroyed. *The Washington Post*

Non-potable drinking water

Charles C. Johnson Jr, administrator of the US Environmental Health Service warned that industrial wastes from 12,000 toxic chemicals are getting into the nation's drinking water systems and threatening to make them unusable.

Addressing the American Water Works Association, Johnson said that water pollution had "greatly increased" over the past 25 years, partly due to the 500 new chemicals being developed each year. "We know very little about these chemicals", he said. "For the most part we don't know what they will do to our health, including genetic effects."

He added that the demand for water is rising so rapidly that by 1980 "major sections of the country" will be forced to drink reclaimed waste water, thereby complicating the problem still further.

Staton Island Advance

Better off in gaol

The State of Philadelphia has decided not to build a prison in southwest Philadelphia because air pollution and foul smells from the Schuylkill River would make it unfit for prisoners to live there. The residents of that part of Philadelphia are happy that they are not getting the prison; but Mrs Marie Jones had a good point when she asked, "If the pollution is too bad for the prisoners what about the people who live here?"

New York National Enquirer

Poor caviar

Russia's sturgeon, the source of 95 per cent of the world's caviar, are dying in rivers and the Caspian Sea, victims of pollution. Between 1961 and 1967 the sturgeon catch from the Caspian and the Volga dropped from 114,500 tons to 66,000 tons. Novelist Mikhail Sholokhov, in a warning about pollution, said that in one part of the Volga a count was taken of 842,000 dead sturgeon contaminated by factory residues. He estimated that this loss alone cost the Soviet Union four million pounds.

Milwaukee Journal

Warning light

Doing their bit for European Conservation Year the Swedes are having an "Earth Week" this month. The campaign for a cleaner environment, running alongside similar efforts in other Scandinavian countries, will be headed by over a million students, who will be given the week off from work.

Unlike the US Earth Day last April, Sweden's campaign is being organized by the State. There will be exhibitions, demonstrations, teach-ins and pollution tests, which "will cause every Swede to sit up with a jolt", according to the organizers.

Earth Week will end on September 6 with the lighting of 1,500 beacons

across the whole of Scandinavia. The beacons used 1000 years ago by the Vikings as warning signals against invasion are intended to warn of the threat to the environment.

Chicago Tribune

DDT did for Cannery Row

A biologist has blamed the death of California's sardine industry based at Monterey, the setting for Steinbeck's novel "Cannery Row", on DDT.

In 1945 the 16 plants on Cannery Row packed 469.3 million pounds. This same year DDT was first applied on a large scale to crops in California's Central Valley which drain into the Pacific Ocean. The next year the catch dropped to 284 million pounds and in 1947 to 54 million pounds.

By 1967 the catch had dropped so low that a moratorium was declared on sardine fishing. Walter Thomson, biologist, said that overfishing had played its part in the disappearance of the sardines but that DDT had provided the final coup de grace.

Chicago Daily News

Light haze kills too

A study of New York's mortality rate shows that death rates from heart and respiratory disease rise as much from small changes in ordinary everyday pollution as they do from massive smogs.

Dr Thomas Hodgson, who has conducted the research, said that "a unit change in the level of air pollution induces as great an increase in mortality at low levels of pollution as at higher levels". This means that an almost imperceptible increase in haze for instance, produces 13 more deaths each day in New York City, he says.

Long Island Press

Ear-service only

Ohio Water Pollution Control Board has authorized the building of a nuclear power plant on Lake Erie, which may have serious effects on fish life in that part of the lake.

Barton Holl, a member of the board, said "I think the welfare of mankind is just as important as ecology," and capped that with "I'm glad to listen to the ecologists, but I'm not influenced by what they say."

The Cleveland Press

Power rationing

The need to double the electric power

output in the US every eight to ten years is becoming a serious problem. Carl Bagge, Federal Power Commissioner, said that the strain on the environment of increasing power production calls for a major study on the effects of energy use.

"We may have to face up to rationing (electricity) as a matter of national policy", said Bagge.

But energy authorities say that environmentalists are trying to disrupt the picture of the country's energy situation. "Today's outcries about the environment will be nothing compared to the cries of angry citizens who find that power failures have plunged them into prolonged blackouts", said Glenn T. Seaborg, chairman of the Atomic Energy Commission.

Air conditioners are responsible for the problems of peak-demand in summer, which has forced utilities to build more generating capacity than is needed during the rest of the year. Ultimately utilities will have to actively encourage power conservation. But will Americans be prepared to turn off their air-conditioners to save the environment?

The Evening Bulletin

Freedom to breed?

At the First National Congress on Optimum Population and Environment Prof. Garrett Hardin took the hard line on the population issue.

"We won't make much progress unless some very big catastrophe takes place, simply because that's the way people are," went the gloomy prediction of Hardin, father of four.

Hardin also wrote in the recently published *Environmental Handbook*, "The only way we can preserve and nurture other and more precious freedoms is by relinquishing the freedom to breed and that very soon".

Chicago Daily News

Poverty before pollution

Efforts to link the growing consumer movement with the battle against pollution met with a poor response from African and Asian nations at a meeting of the International Organization of Consumers Unions in Baden, Austria.

"We are not concerned with pollution but with existence", said Dr Shankran Kristnamurthy, director of the Consumers Council in India. "The wealthy countries worry about car fumes. We worry about starvation."

Sayed Adam al-Jafri from Malaysia said "Some of us would rather see smoke coming out of a factory and men employed than no factory at all".

The New York Times

Alaska pipeline could close

Conservationists and Indians are raising legal obstacles which may cause the Alaska pipeline project to be shelved, and attention to be turned to alternative methods of getting oil and gas out of the deposits there.

A group of Indian tribes in the area obtained a court order temporarily forbidding Federal officials from granting a permit for the pipeline, since they said it would infringe on their land and could effect the movement of the caribou herds which they need for food.

A conservation group, called "The Wilderness Society", obtained a similar court order from a different court also forbidding construction of the pipeline before a route of the service road is laid out.

By the middle of next year the eight oil companies which have joined together to build the pipeline will have submitted their complete and detailed plans for the building of the line.

But even if government permission is then given, actual construction could not begin for two years. So there is time for hope. *The Guardian*

Evolution in our time

A new strain of hedgehog, which takes evasive action against cars by running to the nearest verge instead of curling up into a ball, has been noted in Lancashire.

The change in the roadcrossing habits of these northern hogs is taking place rapidly because "it is only the 'run-for-it' hedgehogs that are left to breed 'run-for-it' hedgehogs", according to the Lancashire Naturalist Trust.

Mr L. D. Hills, director of the Henry Doubleday Research Association, has a theory about why the hogs have changed tactics. Hedgehogs always run from fire and smoke, and he suggests that increased fumes from car exhausts lying close to the road surface pollute the hogs so that they associate cars with smoke.

But perhaps they just got tired of sitting around in balls waiting to be run over. Who knows?

The Guardian

Ecologue

On devouring a small roasted battery-reared milk-fed chicken

Unhinging now your little wishbone from its anchorage
I have a twinge at last of breaching someone's personality.
Even as I decarnate this unresisting box—
Pink and ochre—of your unconvincing flesh
It comes upon me with a shock that you were real:
A small puffed bird, beadily peering out beyond
Its machine of animality, the speck of pineal brain
Busy with the wants of birdhood and a fowl's entelechy.

Were you really something with a running spark
Igniting quick sensations to the brain, and actually
More than vegetable and mineral? . . . Oh, how few
Sensations did they give you in your cardboard life—
Poor little rich bird in your milk-fed battery!
No ovine memories of a mother to untag
Those early clockwork days in which you dared jerkily
Among the amœba of your peers: not once hungry,
Not once cold or wet—you little fluffy bag
Of fattening test-tube chemicals!

And now that I unpick these soft insipid shreds
I have to force myself to think that God infused in you
The thing that made you bird, despite your mealy prison
Underneath your ceiling without sky. You were
A person after all.

The Infinite be praised
That self in form of poultry and of chickenhood
Could still impose itself on so much plump sterility.
Like a bird you must have cocked that hatchet of your head
(Hallucinated) at a worm, listened, scratched and peered
Into the esepic useless chaff upon your chromium board;
You must have rustled through your feathers with your nib
Of opaque yellow bill, and with a crooked heel
Vibrated non-existent mites around your pinhole ears.

There is no proof of this, alas! Your present tasteless
Birdless form is more millenia away from me
Than monoliths of pterodactyls in Siberia.
I'd rather you had been a plastic vegetable
Mocking the greeny-eyed with waxy subterfuge.

Yes, vast deceit—the cheating of a life—
We need no consciousness to say what we miss:
Your neck and feet and eyes, your untried remex quill,
Your legs that never ran and had no space to jump,
Your mash-fed beak that never pecked on hard,
Even the proboscis of your little cushion-hidden sex,
Were themselves the consciousness of loss,
Something stunted, missed.
Therefore, with your half-formed wishbone in my hand
I flense these elements from you, your last,
And see you only as a thwarted dish—
Your wishbone in my fingers . . . yes, unconvincingly—
And wish.

PAUL ROCHE

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Reports

Factory farms v. Factory farms

It is the age of the knitted steak. Protein foods are now being synthesized in several countries. One by one they are appearing on the market. Already we have milk which has never been near a cow. Meat is next.

The basic processes have been known for many years. The first stage involves the reduction of a raw material to pure protein. This may be done either by extracting the protein from a vegetable rich in protein, such as soya, or by growing a protein-rich yeast on a nutrient. The nutrient may be of conventional, vegetable origin, or more bizarre. BP has two factories planned, one in Scotland, at Grangemouth, and one in France, which will produce protein from yeasts grown on petroleum. The range of products and processes not previously associated with food production has brought new sidelines to old industries. Cellulose material, such as grass or even wood, may also be used after chemical treatment to break down the cellulose into its component sugars. The yeast is grown in stainless steel tanks by a process of continuous fermentation, and harvested. It is then reduced to a free-flowing white powder.

When extruded through a mesh at a high temperature the powder acquired a fibrous texture. Now fibres can be spun, and this is where Courtaulds join the league. They, too, are now in the food business. Once woven the protein can be textured to simulate meat. It is then coloured and flavoured. The result is a knitted steak.

The latest firm to announce a new synthetic protein is Rank, Hovis, McDougall. They have always been in the food business and they are scornful of the new boys. At their research centre at High Wycombe they have spent 4½ years and £1½ million developing A3/5. The National Research and Development Corporation is to invest a further £500,000 in the work of Professor

Arnold Spicer and his team of 50 scientists who have brought A3/5 this far. The white powder can be added to soups, gravies and other foods to increase the protein content, or it can be made into sausages. Difficulties have arisen with the beef and chicken versions, but no doubt these will be overcome.

Food technology has come a long way since margarine became the first man-made food. Any natural flavour can now be simulated and if we are to believe the claims of the advertisers in the technical journals, the flavourings can taste more like the real thing than the real thing does. There is a wide range of laboratory products to control changes in foods during processing and for making subtle changes to improve colour, flavour or keeping quality. America now has something like 1,300 different food additives in general use.

The advantages of simulating food are obvious. The protein content of the new product is higher than that of "natural" meat and the cost is lower. The factories can be sited anywhere and are subject to none of the disadvantages of farming. They can be closed down at night, on Sundays, during the holidays, which makes them easier and more attractive to operate. Most important, however, they can produce protein in greater quantities, with less waste, than animals can, by streamlining a natural biological process.

There is much talk of the effect of the new foods on the world food problem. Professor Spicer has been quoted as saying of A3/5: "I do not exaggerate when I say this could change the lives of millions of people, save their lives." But will it? The factories are very expensive to build and it is unlikely that developing countries will be able to operate their own in the immediate future, although eventually it should be possible to export the necessary technology. The real reason for the excitement at High

Wycombe is that A3/5 could be a big earner of foreign exchange. This suggests that it will be sold to other industrial countries. In the short term it will be valuable to have on hand stocks of a high protein food which can be transported easily to disaster areas as relief, and supplies or on the spot production facilities may well be of great assistance to developing countries as a bridge while their problems of population and food production are brought under control. In the middle term it cannot help those countries which depend on their exports of primary produce if industrial countries, their customers, become major primary producers themselves. In the long term, a plentiful source of protein will not, in itself, solve the population problem. It may exacerbate it.

The biochemists tell us that the new foods contain all the essential amino acids and that the overall protein content is higher than that of meat. There appears to have been less consideration of vitamin or trace element content. There is much that we do not know about nutrition and the substances of nutritional significance, many of which occur in minute quantities and some of which have not yet been identified. If knitted steaks were to become a major part of a national diet the effect is unknowable. Once again man would be using himself as an experimental animal on a vast scale. It might be 20 years or even longer before the results of the experiment were known and by this time conventional farming of livestock might have suffered such a setback that it would take a long time to recover.

The first section of the community to feel the effect of synthetic proteins will be the farmers. British Soya, one of the producers of a simulated meat, sell their product at one shilling a pound. When this is launched on to the market in large quantities the housewife will be presented with a choice between beef at, shall we say, eight shillings a pound, and

simulated beef at, perhaps, three shillings. At first she will resist the new product, but for how long can she sustain this resistance in the face of her family's demand for meat every day? She will buy simulated meat, the family will like it, the television commercials will tell all of them how much more protein it contains and British Soya will have made another group of converts. The livestock farmer, with his animals in intensive units, with high costs and a narrow profit margin, will go under. For years farming has been moving further and further towards industry, so that we talk now of "factory farms". When the farmer meets competition from the real factory farms, which are genuinely industrial, he will be lucky to survive.

This will happen. The new products will be sold in the supermarkets. Industry does not invest millions of pounds in a new venture without anticipating large profits and large home sales. Nor is the motive pure altruism in the face of world food shortages. The new products will be sold at home.

There is one hope for the farmers. It may be that just as instant coffee created a large market for itself without ever being accepted as "real" by that section of the community which cares most about the quality of its food—the gourmets if you like—so simulated meats may increase overall meat consumption by expanding the existing market, but may leave untouched a smaller "quality" market of people who insist on "real" meat. This group may contain a few of us all the time and many of us part of the time. We may buy simulated meat on weekdays and "real" meat on Sundays.

Even so, this offers little comfort to today's intensive animal farmer. The



demand will be for high quality, naturally reared meat, not for the product of the barley beef lot. If we want factory meat we will go to the factory.

It is dangerous to prophesy, but it does seem that whatever the effect on

the world food problem and world health, the knitted steak league may present us with the spectacle of the factory farms closing down the factory farms.

Michael Allaby

A lot of rubbish



The subject of refuse is nobody's favourite but it can be a positive threat to the countryside if its disposal is not well managed. During the next fifteen to twenty years the total volume of refuse from domestic and industrial sources will double, according to most estimates. In the United Kingdom three hundred and eighty thousand tons of domestic rubbish are generated every week. Fourteen hundred local authorities tip most of it into holes in the ground and cover it over with some degree of adequacy. Industrial waste assumes about the same volume. Specialist waste disposal contractors and the industries themselves tip most of it into holes in the ground as well. About eighty million pounds a year are spent by local authorities for refuse collection and disposal, and industry may spend as much or more.

By 1980 domestic rubbish is expected to increase to four hundred and fifty thousand tons per week, but will also be a third more bulky in character due to an increased proportion of paper, glass, plastic and other packaging and the disappearance of ashes and cinders in most parts of the country.

Tipping places near towns and cities are already at a premium and competition is increasingly keen. To study this critical situation The Countryside in 1970 organization has set up an ad hoc group chaired by F. L. D. Flintoff former head of the refuse disposal branch of the Greater London Council Public Health Engineering Department. A report has been produced for discussion at The Countryside in 1970's third conference in October of this year under its president, HRH the Duke of Edinburgh. The conference will consummate British

participation in European Conservation Year and, hopefully, guide future policy in this and other fields.

The report recommends that the old tipping method with its advantages in economy and land reclamation should not be replaced by incineration, pulverization and composting despite recent technological advances in these methods, which can, however, be used complementarily. Standards, the report urges, should be stricter, and enforced by all acceptable methods. Most importantly, tips should be covered with soil or suitable material every day and to the prescribed depth of nine inches, even though this may increase cost. Deep pits should be used exclusively for controlled tipping of untreated refuse unless there is a natural protection from wind or the site is large enough to accommodate concentric wire fences to trap blowing litter.

The problem is not want of holes in the ground for tipping. Many of them, like the disused brick quarries in Bedfordshire, would never be reclaimed without it, but these sites are often at what has been considered unacceptable distances from towns with refuse disposal problems. Ideas of acceptable distances as well as feasible transport methods will have to be revised, the group submits. It is also pointed out that pulverized refuse takes about half to two thirds of the space of crude refuse. Pulverizers reduce refuse to pieces three inches or less in size, relatively fly free and unattractive to rats: it may or may not then be treated with a mechanized fermentation process to provide qualities that improve some kinds of soil.

Inadequate supplies of cover material could be overcome by well established pulverizing and composting techniques on some refuse material and using it in conjunction with industrial and agricultural wastes.

These projects are quite impossible of realization, says the report, unless it is recognized that refuse disposal can no longer be regarded as a local problem for the fourteen hundred individual local authorities acting on their own. A national advisory committee is recommended which would promote joint schemes with local authorities, national industries, contractors, agricultural interests and transport means. The committee would establish standards for the protection of the countryside during reclamation and produce land of good contours, and capable of cultivation.

Preferable to the idea of complete national control would be a flexible network of various local solutions by individual authorities, groups or consortia of local authorities for such projects as the building of large incinerators. Larger groups of refuse producers could co-operate in major land reclamation schemes which, because of importance or distance, rank for national subsidy.

An alarmingly passive attitude is taken by the group on the matter of non-biodegradable plastics which it recognizes as a kind of Frankenstein monster fast becoming a threat to its proud inventors by inundating the environment. The report points out that incineration of certain much-used plastics produces a quantity of toxic gases which cannot be permitted to increase, but offers no recommendation for the prevention of the galloping trend to worsen the problem by the introduction of plastic milk bottles, etc., before a solution, if any, can be found to the question of their satisfactory disposal.

It was our impression, too, that insufficient attention was given to the long term advantages of such techniques as recycling, especially of organic wastes for agricultural purposes as an alternative to artificial fertilisers.

Jean Liedloff



Not counting foreigners

On February 17th 1970, *The Times* reported the death of Mr Fred Hilton, aged 69, of Philadelphia, after using chlordane in his garden for three years. Dr I. Selig Epstein, who signed the death certificate, stated that the pesticide (one of the organo-chlorine compounds of which D.D.T. is best-known and least deadly) had accumulated in the patient's bone marrow over the period and led to the destruction of his red blood cells.

This is not an isolated case, for every year there are cases of chlordane poisoning in the United States where it is a popular worm-killer. It penetrates the skin easily, can be absorbed by breath-

ing and is, of course, deadly if drunk, but essentially it is a poison that adds up in the body, producing symptoms that are put down to something else. Carelessness or accident can make it a quick killer, and there is a recorded case in the US of a gardener who spilt a 25 per cent solution on his skin and died before medical help could arrive. Dr. Arnold Lehman of the US Food and Drug Administration described chlordane as "one of the most toxic of all insecticides—anyone handling it could be poisoned."

Chlordane is on sale in most garden shops with nothing to show that it is as dangerous as the arsenic used by Dr Crippen, if you drink it. The directions warn "Not to be used on food crops. Keep off skin. Keep away from fish and pets. Wash off spillings of concentrate. Wash after use. Store in a safe place away from children. Wash and dispose of container safely". There is nothing on this or any other bottle to warn of death in the potting shed.

The *Advisory Committee on Pesticides and other Toxic Chemicals* was quoted by the Minister of Agriculture on December 17th 1969 as stating that "although a number of persistent chemicals are present in the environment, there is no evidence that this has any adverse effects on man". The Committee refuses to condemn chlordane, insisting that when used against worms, cockroaches and ants it "appears to present no obvious risks to other wild life". But it took three years to kill Mr Fred Hilton, and the cumulative effects of partly poisoned worms adding up in the birds on every lawn from a pesticide that persists for twelve years in the soil, can never be obvious.

On May 18th 1970, a Ministry spokesman, answering a query on chlordane, produced the following example of "Spokesmanship"—the art of reassuring without actually lying. "We have no knowledge of any deaths occurring in this country resulting from the use of chlordane in agriculture, horticulture, home gardening etc. Similarly, the Poisons Reference Service have no knowledge of such deaths." The italics are not the Ministry's—they are merely a token of respect for the memory of Mr Fred Hilton, who suffered from the effects of this particular persistent chemical in his environment.

No MP has yet had the courage to ask the Minister what evidence there is

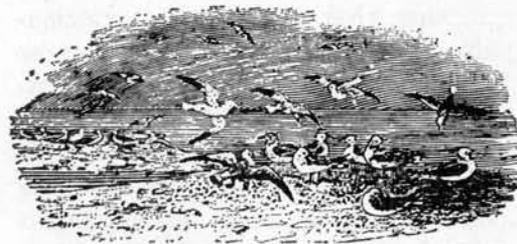
that British citizens are resistant to chlordane although Americans are not, but it should be realized that all statements on pesticide safety refer only to this country—foreigners like Mr Hilton and the 6,000 Japanese killed by organo-phosphorous compounds in the five years up to 1963, do not count.

There is no justification whatever for any amateur gardener killing the earthworms that are his friends, and then buying a spiked roller to aerate his lawn, doing laboriously and badly what the worms do perfectly without payment.

However remote the risk of spilling the concentrated liquid over his hands, knocking it off the shelf to smash and splash his socks, or of penetrating the bare skins of his children romping on the lawn, he has no need to take it.

The only place where worms should be destroyed is on golf or bowling greens because their casts can divert the bowls, and here a derris or mowrah meal worm killer is just as effective, rather cheaper, and entirely safe for birds and men.

Lawrence D. Hills



Seminar on Water Pollution by Oil, Aviemore, May 1970

At Aviemore in May, the first International Seminar on Oil Pollution was held under the auspices of the Institute for Water Pollution Control, The Institute of Petroleum and the World Health Organisation. About 400 delegates attended, representing water interests, oil industry, fire services, C.B.I., various wild life organisations, marine interests and many others. The first half of the week was devoted to discussing the growing problem of oil pollution of inland waters and the latter half to a discussion of coastal and estuarine pollution.

H. Jagger introduced the problem from the oil companies' aspect explaining how the use of oil has grown considerably over the past 20 years and that in the United Kingdom the oil consumption is doubling each decade. This ex-

plains the resulting growth in oil pollution although the volumes involved were such a minute proportion of the oil used that it showed great care was already being taken by the industry.

In putting the river authorities' case Ronald Toms presented the results of a survey of occurrences of oil pollution showing that during a recent period of 12 months, 483 cases of oil pollution were reported by river authorities in England and Wales. The main source of the oil pollution was not from the oil industry but the many commercial and other users of oil. Accidents due to overfilling of storage tanks, faulty pipework etc., often lead to large volumes of oil escaping and as a result much of river authorities' time was now devoted to trying to prevent oil reaching water undertakers' intakes. A great deal of this oil pollution could be prevented if the firms using and storing oil were under a legal responsibility to ensure that it did not escape when a foreseeable accident occurred. The safeguards are relatively simple and not expensive but at present if an accident occurs the owner of the oil is not responsible when the oil pollutes water resources.

Other river authorities' representatives reported similar problems and the rapid increase in oil pollution of the inland waters that was now taking place.

D. Buchanan of the Clyde River Purification Board described a number of the more serious incidents that his Board were faced with. One big problem in removing oil was the cost and where to dispose of it. Contractors who now have a big market in disposing of waste oil were peculiarly silent on this point. In inland waters it is not acceptable to use emulsifiers to remove the oil but it is much better to try to take off the oil at a boom. In the estuary the use of emulsifiers may be acceptable during an emergency but account must be taken of any toxic effect these emulsifiers might have on aquatic life.

The section dealing with fresh water pollution was almost unanimous in stressing the urgency of dealing with the growing problem of oil pollution. There was virtually no disagreement on the cause of the problem and it was obvious that it could be tackled by much better education of people using oil and by the introduction of improved legislation.

The section on coastal pollution was far more controversial with three sided arguments developing between the over-seeing officials, the oil industry and the

ecologists. Whether to sink oil at sea or leave it? Clarence M. Tarzell, Director of The National Marine Water Quality Laboratory of the U.S. was convinced that oil became toxic when dispersed in water because marine organisms tended to concentrate this oil. The lower forms of organism were eaten by higher forms and at each stage the concentration increased. He provided some striking micro-photographs to illustrate this point.

Dale Straughan in describing the Santa Barbara Oil Spill tended to support the argument against using detergents, as her evidence suggested that although large volumes of oil have been deposited on the coast in the neighbourhood of Santa Barbara for a number of years there is no evidence that any major changes in the fauna could be attributed to the oil pollution. However, J. Crudas of the Royal Society for the Protection of Birds stressed the danger that exists to the diving birds when oil is left floating on water. Large numbers of such birds were killed in the Torrey Canyon Spill and there was real danger of certain species of these birds being exterminated when oil contaminated their feeding grounds.

There has been a noticeable development over recent years in the production of relatively non-toxic detergents for use in oil spills. Unfortunately these tend to be more expensive but they are being used by various authorities. The detergent used at the time of the Torrey Canyon was extremely toxic and the large stocks remaining in the possession of the Ministry have been distributed amongst coastal authorities. One delegate suggested that these toxic supplies ought to be replaced by the newer non toxic materials.

The marine section finished with a real battle as to who should do what, when oil was seen. J. Wardley Smith explained that his Ministry had arranged demonstrations and instructions for authorities responsible for oil removal along various parts of the coast. However, the fire service, which was well represented throughout the seminar and only too anxious to help when an emergency occurred, said that they had not been consulted in this matter. If they could only be told what to do, they had the manpower and the equipment, and they would do it. There was also disagreement over the methods used between the various authorities involved when the Hamilton Trader Oil Spill oc-

curred in Liverpool Bay during April 1969.

Little was said as to how communication between these authorities could be improved, each side holding to the attitude that "I am doing my part, if anything extra is needed it's up to somebody else to provide the effort". This attitude of only doing precisely what your "terms of reference" say you will do is one that is so often hammered home by the legalistic outlook which frequently controls the activities of the various bodies concerned. This way of thinking produces managers who consider their job is to ensure that the body they manage does not get into trouble, rather than see that their work is properly done and that any obstacles are overcome. If only the various people concerned, the officer responsible for oil emergencies, the fire officer, the Ministry man and the ecologist, realized that they are trying to protect the same world and in fact each trying to solve the same small problem, this restrictive way of thinking could be overcome and when oil pollution of the sea occurred everybody could work together. The most obvious essential that was missing during the discussion was leadership and it is difficult to see how this hurdle could be overcome because the public service employs public servants and amongst servants, leadership is often regarded with suspicion.

To sum up, a most enterprising and revealing seminar that can only do good in overcoming the problems of oil pollution. The only person noticeably absent was the little boy with his bucket and spade. A pity because the pleasure seeker seems to be as badly hit by oil as anybody.

R. G. Toms

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Comments

Must cars take over our cities?

Roads for the Future; the new inter-urban plan for England sets out the ex-Labour Government's road building programme for the next 15 to 20 years. It assumes that by the late 1980s there will be a 70 per cent increase in traffic, and by doubling the inter-urban trunk system it aims at enabling an estimated 20 million motorists to "travel freely, safely, and without frustration or congestion". To achieve this lofty ideal, four thousand million pounds will have to be spent, something like half of which, it appears, on urban transport.

Needless to say, the white paper pays lip service to conservation ideals. Thus it states that "Full account will be taken of environmental and amenity questions, including the conservation of historic areas". However, the emptiness of this assurance becomes evident when we read in the next sentence: "New roads do improve the environment although, inevitably, amenity is reduced in some areas for some people".

This document is a perfect illustration of "tunnel" thinking. No one has bothered to work out how this proliferation of roads, dual carriageways and motor ways will affect all other aspects of our lives. All that has been taken into account is the apparently indispensable requirement that more and more motorists should "travel freely, safely, and without frustration and congestion". So long as this can be achieved, it appears, to hell with everything else.

Any change brought about to a city should be prompted by a desire to improve it. What, in fact, constitutes an improvement to a city? We can only answer this once we have decided what a city is for. Most people would agree that the object of a city is to provide a satisfactory environment for its citizens.

This point seems to have totally escaped Mr Desmond Plummer and the

GLC. It does not seem to have occurred to them that, by transforming London into a cobweb of motorways, it might cease to fulfil this essential function. Perhaps Mr Desmond Plummer has simply never asked himself what constitutes a suitable environment. He might for instance consider that stable citizens can be reared in vast monotonous urban conglomerations or metropolitan areas or whatever our cities are being turned into. If he does, it is time that he was disillusioned.

A vast amount of sociological literature is available to show how such environments favour the development of every type of socially undesirable behaviour. He has before him the example of Los Angeles, of which 60 per cent of the surface is made up of roads as against 25 per cent in the average European city. LA is a city built to measure for the automobile age, where it is said that, were a pedestrian to venture onto the street he would be arrested as a vagrant. There are drive-in shops, drive-in cinemas, drive-in banks, yet it is universally regarded as a veritable hell on earth.

Why this should be so is not difficult to understand: the car is not an intrinsic part of man, as a shell is of a tortoise. A man is a motorist for only a small fraction of his time—unless he is a taxi-driver. He has other activities and other preoccupations. He is, for instance, father, husband, lover, open-air enjoyer, footballer, bowls-player, amateur gardener, dog-walker, child-entertainer, to name a few of his roles. He also needs to be a citizen of a small cohesive community; and the environment that is ideal for the fulfilment of these human functions happens *not* to coincide with that which enables him to fulfil, in optimum conditions his far less essential function as a motorist.

For the former purposes, a citizen needs the company of people, not a life

dominated and congested by large metal containers. He needs to breathe fresh clean air and not air poisoned with carbon monoxide, lead, or asbestos particles. He needs a measure of quiet and peace, not ceaseless exposure to the noise and chaos of countless motor-cars driven by ever more neurotic drivers.

If the GLC planners were prepared to examine a city as a system, as does J. Forrester in his *Urban Dynamics*, they would realize that there must be an



optimum value for each one of its constituent parts. This means, among other things, that there must be an optimum number of cars, and hence of motorways.

What this figure is can only be calculated by taking into account all those aspects of human life that can be affected in some way by a change in the value of this variable. It is typical of the methodology made use of by today's decision-makers that in deciding to build Westway, etc., only one such aspect was apparently taken into account: how to favour rapid communications.

Of course we all want to be able to get to central London quickly, but this presupposes that there be a good reason for going there. I should have thought that the planners' chief concern would be to make London as attractive and as interesting a place as possible; to make it, in fact still worth going to. If they have their way it will not be like this for long.

Of Ants and Men

Human societies appear unique because of the elaborate and specialized forms they have evolved to adapt themselves to the many and varied environments to which they have been submitted.

However, a glance at the adaptive capacity of ant societies reveals that this uniqueness is illusory. The nomadic and pillaging hordes of the Eurasian Steppe, such as the Huns and the Mongols, find their counterpart in the soldier or driver ants organized in hordes of 100,000 to 150,000 strong, which march out in perfect formation from their temporary bivouacs leaving a trail of total destruction in their wake.

Pastoral societies such as the Masai and the Navaho have their counterparts in those of the yellow lawn ants who in underground galleries milk their herds of large aphid flies for the rich honey dew that they secrete.

The agricultural societies out of which our modern world has evolved have their counterparts in those of the famous grain-harvesting ants of the genus *Messor*, which meticulously collect millet or wheat. They lay it out in the sun to dry, the outer husk being split by the soldiers, which then store it in well-drained chambers; or the even more scientific ants, *Atta*, which cultivate (Rhozite) mushrooms that would normally grow to a gigantic size but which, by repeated cropping and replanting in carefully fertilized plantations, are never allowed to grow beyond the requisite height.

The hunting and food-gathering societies of the Australian Aborigines or the Bushmen have their counterpart in the carnivorous *Stigmatomma Pallipes*, who track down underground game which they kill with the aid of their powerful sting.

Militarist societies such as the Assyrians and the Spartans find their counterpart in the blood-red slave-making ant, *Formica sanguinea*, whose assaults on neighbouring nests for the purpose of seizing larvae to be brought up as slaves, involve veritable sieges with the despatch of reconnaissance parties, followed by a perfect blockade of all possible exits and a fierce direct onslaught via the most vulnerable approaches.

The decadent societies of the Ottoman Sultanate and the Abbasid Caliphate have their counterpart in those of the slavemaker, *Strogylanthus Huberi*, who is not only economically sustained by a

large slave population, but also uses slaves as soldiers to conduct his wars. This parasitical ant is as vulnerable as was his human counterpart, for, as the result of many millenia of disuse, the muscles of his proud mandibles have atrophied, rendering them useless save as symbols of past glories, with which this pathetic figure, as helpless as he is awesome, can still hope to intimidate his gullible victims.

Clearly we have to seek elsewhere—if we must—the material that might justify the illusion of human uniqueness.

Too Many

Any activity which is harmless, even beneficial when indulged in by few people becomes disastrous when the prerogative of too many. The motorcar is an obvious example. When there were only a few around, it must have seemed a godsend. Today in Britain we have nearly 12 million. In 30 years' time we are told to expect three times as many. The conditions it gives rise to are already intolerable. They will then be nightmarish to pedestrians who will be overcome by the noise and the fumes, and also quite useless to motorists caught up in endless traffic jams.



According to *Your Environment* the average speed of a horse and buggy in Manhattan in 1917 was 11 miles per hour, whereas today after man has reached the moon, that of a car is barely 7 miles per hour.

There is indeed no defence against sheer numbers. Or, to be more precise, a point must always be reached when a further increment will bring about diminishing and eventually negative returns. No activity, however praiseworthy, is exempt from this inexorable law. Take bird-watching: Mr Peter Conder, Director of the Royal Society for the Protection of Birds, writes, in a recent number of the Society's Journal *Birds*: "There is an excitement in seeing new bird species... There is no harm in wanting to widen our experience in this way. But we can go too far. When 600

people turn out to see a cream-coloured courser in Norfolk, disturbing the bird itself, causing some damage to crops (to be fair, only a little), tramping on private land without permission, bird-watching has started to become a harmful occupation."



A biting comment . . .

The London anti-fluoridation campaign has asked all MPs to help combat Whitehall's attempt to subject the nation to "compulsory mass medication".

The campaign has so far been reasonably successful as less than 2 million out of nearly 50 million people in England and Wales receive fluoridated water.

This success is apparently deplored by most doctors and dentists. Sir George Godber, Chief Medical Officer, Department of Health, in his last annual report referred to all opposition as "Misguided, quasi-scientific, and allegedly ethical".

If this is the position of science in this country, then I suggest that the term needs to be radically redefined. There are meant to be 17 million people with no teeth at all in Britain, almost one person out of three. This deplorable situation could be attributed to a number of genetic and environmental factors. What it cannot be attributed to, however, is a lack of fluoride in our drinking water. We have created a pathological situation, and rather than take the necessary measures to restore a healthy one—which would probably involve a radical modification in our diet—we prefer to make use of a gimmick that may, to a certain extent, render this pathological situation more tolerable. To do this, however, will only perpetuate it.



Poetry and knowledge

The Royal Society has not admitted a poet as a Fellow since Byron. From the 18th century onwards our culture became so dominated by science that the arts were slowly degraded to the status of entertainment, in the sense, at least, that they were no longer regarded as adding to our knowledge of reality. I recall being told of a colleague and admirer of Sir George Stapledon who, on reading that Sir George wrote poetry, was so painfully disillusioned that he lost his respect for him. From that time he no longer trusted his judgment and regarded him as possessed of a frivolous streak unworthy of a dedicated scientist. A scientist of this sort never diverts his attention from the strict and narrow path of experimental investigation. Science is the inheritor of our Puritan tradition and the pilgrim of science progresses along a path that bears a strange resemblance to Bunyan's. Intolerant towards any faith but his own, with a dogma about conclusive proof based on inductive reasoning that corresponds to religious salvation, the scientific intellectual represents a new individual who is shaping our society in his own image. The imagination of this type is compressed by his scientific training and the assumptions which he picks up from his teachers, often without being able to state what they are.

The proliferation of intellectuals of this kind represents science in decay: great creative scientists were never like this. Great cultural movements have tended to decay as they expanded and science is no exception. Contrary to appearances, the great age of creative science may be declining into an age of technocracy. Within itself science is experiencing a tension between divergent and convergent trends. The intellectuals are breaking down its fundamental creative unity into more and more separate sciences, while the imaginative are reaching out for links with the arts and religion in an attempt to understand the great stream of life as a unity. This is the convergent movement.

Stapledon once suggested that the Agricultural Research Council should propose a grant for research into the relationship between poetry and agriculture—the whimsy of a delightful eccentric who was a scientist in spite of his fits of unruly fancy. In fact, his freer imagination was trying to add new dimensions to biology at the time when

such an expansion was needed. But science has, unfortunately, not only created a wonderful corpus of new knowledge, but it has shaped the scientific intellectual who is so fused with this knowledge that he cannot perceive its limitations or the needs of a new age for new fields of understanding. Apt, for the most part, at sneering at everything that is not strictly rational, the scientific intellectual little realises that he represents a reaction himself.

Artists (using this word generically to represent an outlook on life) have a tendency to be passionate about beauty—which is also quality. Why is quality missing from our industrial products and our food? Because the artist is never consulted. The artist exists in every profession: he is not just a painter or poet. Doubtless there are some professors who have the temperament of artists, but the scientific culture (which is, in effect, a theory of truth) oppresses it and the academic is embarrassed by his own artistic impulses. In a society which judges values in terms of costs of production, the artist must be severely excluded from official bodies. His observations and comments are diversionist and unkind to sincere men dedicated to great social tasks. In scientific circles it is now tacitly agreed that poetry as an instrument of knowledge belongs to the pre-scientific age of magic and its place has been taken by the disciplined imagination of the scientist. The ancient claim of poets to add to our knowledge of the nature of things is no longer taken seriously. But if I mistake not, the whirligig of time is about to bring its revenge and the poet may return with a savage bang, as we are more and more sickened by our own sordid affluence.

The poet recognises that knowledge is limited by the nature of man himself—which implies that the more fully man develops his personality, the more he knows and the better he can act. A society organised by scientists and academics tends to become sterile because such men are not temperamentally accustomed to active planning and to creative social visions. The Buchanans are rare. A modern society should be integral, not overweighted by one type of intelligence. The Natural Environment Council is overweight with intellect.

The intellectual believes he can discipline his intellect to become an impersonal instrument for observing facts which add up to conclusive proof of

laws of nature. He therefore pays little regard to his own intuitions, feelings and impulses as a man in society. He appears unaware that the neglected side of his character influences his interpretation of the facts discovered by his instruments of research. The poet, on the other hand, accepts a discipline of the imagination and a very severe discipline. Not only does he accept the discipline of the material with which he works, but he accepts the discipline involved in entering imaginatively into personality. In this way he learns to interpret the springs of action within the contemporary arena in terms of the knowledge at the individual's disposal in relation to his character. This is knowledge: its disregard is imperilling our existence: for we do not see what we do not look for. What determines what we look for? It is not so much that we don't know what is missing from our planning of society, as that we wantonly shut one of our eyes, justifying our one-eyed attitude in terms of the need for conclusive proof of the necessity of beauty or quality. It is as if we were to reckon the quality of composers by the number of symphonies they produced annually and the amount they spent on their ink and manuscript paper. That is certainly the way we evaluate most of our agricultural products and we firmly deny that there is any other evaluation possible—since beauty is in the eye of the beholder, etc., etc.

And suppose beauty is in the eye of the beholder. Power is in the eye of the microscope. Do we therefore say that one microscope is not better than another for its particular work? Do we decide on a massive scale. This man, as accuse microscopes of being "subjective"? The artist is the judge of quality but we reckon his judgment as less than a machine's.

I have amused myself trying to write some verses embodying this concept of the role of the poet in society.

The verses that follow are a monologue in which an imaginary official of a Ministry of Agriculture—it could be any official of this kind in Western Europe—is ruminating with his staff around him in a relaxed and intimate moment before a press conference in which the Ministry have, let us say, to explain their decision to subsidise the use of pesticides so often the case, comes from a farming background and is, in part, a traditional countryman. Possibly he was not

in line to inherit any of the family property, so he has chosen a university career and followed the familiar path through academic distinction to a government appointment. Skilfully adapting himself to the needs of every situation through which he passes, his inner being is conditioned by contradic-

tory forces. As he never develops self-knowledge by training his feelings through art and philosophy, he remains strictly scientific and administrative in his interests. This results in a split self. His separated individualities are bridged by his ambitions. His views and decisions would seem cynical in the extreme

except that most of his colleagues and the people in society among whom he mixes are rather feebler versions of himself. Some of them lack his country background so are wholly unaware of the tension which his monologues, and unexpected moments of candour, relieve.

Scabby Apples

Uncle Harry munched a scabby apple,
(He stores them in his office drawer) then winked:
"Tastes better," he said, "than those unblemished orbs
Townspople buy—naïve perfectionists."
Uncle Harry likes his monologues,
Archly exposing to his city staff
The archaic countryman who underlies the senior bureaucrat.

"Remember Fred—afterwards Lord Fred?—
(Salesman and politician in subtle blend)
We owe to him the cosmetic treatment of food,
Rouge on the meat, peroxide in the flour,
The butter dyed a cornfield's golden yellow—
The chemistry of a coquette's dressing table
Used to create images of palatability.
Thanks to Fred's foresight, we are now assured
The worse food is, the better it appears.

"Embalmed Egyptians have a long shelf life
And gay exterior wrappings. The work, admit,
Of antique technocrats. Roman emperors
When they debased the coinage with an alloy
Used technology. To make the second rate
Look like the best—that's technology's job.
When all are equal how could we feed the people
Unless we had that art? Fred was shrewd,
Aware all classes must seem to eat the same.
So Fred sent for the chemists. 'Find out,' he said,
'How to maintain the show of quality
Without the nutrients that engender it,
So margarine, let's say, resembles butter.'
You doubt if this is honest? So did I.
But everything new technology does is progress
And that annuls existing moral codes.
Now there's a tip to help you to the top."

As Uncle Harry mused on his scabby apple,
A canny schoolboy gleam in chummy, ironic eyes,
We waited to be briefed. A conference
Was pending, when government ambiguities
Would have to be defended. But Harry lingered,
The man's two faces, so it seemed to us,
Needed to converse, as in a dream.

"The vital bloom soon fades from the plucked fruit
And fresh food stales before the cities' millions
See it on their plates—trace elements,
Rare vitamins, perhaps, disintegrate,
The appetising magic stolen away.
But science can't yet prove it—our research
Wisely diverted from enigmas of quality.
Once harvested, life starts to decompose
In the eternal cycle from seed to soil.
And so we've mummified the nation's larder,
Embalmed it, so to speak, with chemical skills
Extending consumer's choice through every season,
The failures of nature redeemed by the genius of man.

"Shops today *are* like the pyramids,
Food sealed in little coffins known as tins,
(A glittering mosaic of invisible contents)
Or dressed in virgin cellophane like bridesmaids
Or stuffed in cartons used as miniature hoardings—
Win a car by naming a crisp cornflake.
Thus progress leads us to the Supermarket—
The everlasting Eden of the High Street
With produce independent of the seasons
Displayed to every eye in glamorous toms
Of dyes and flavours and preservatives.

Food can be kept for the day of the resurrection
To greet the saints with a savour of baked beans.
But where, by then, will the tins have all been stacked?
Mountains of tins festooned with putrified labels,
Mighty plateaux moulded from kitchen waste,
Shoals of tins floating in the seas,
Pesticide cans of indestructible poisons
Killing the fish and drifting back to the rivers,
Sardines and ravioli, Russian salad,
Paws and Kattomeat—with that, thank God,
Let future Ministries cope, we can't prevent
Civilisation being engulfed by litter.
For, as the bishops say, we must take risks
To feed the spawning millions overseas.
(Nice of the Church to bless our work for humanity,
Though starving souls don't even nibble our produce.
Can bishops expect to master economics,
Know factory farms develop to keep *us* viable?)
But rise to your feet and applaud when ecclesiastics
Talk about ethics—look thoughtful and solemn:
Publicly abjure your real motives
And so disarm the sentimentalists
Whose dangerous passions threaten our industry's future."

He threw the core of his apple into a basket
Among the discarded memos and circulars,
Then opened the drawer of his desk and picked out another.
"Quality, taste and health are the weaknesses
Of factory farming methods. But why assume
Chemicals can't add to quality And why
Does no one say dieldrin's good for you?
Don't be defensive, go on the attack.
There isn't any proof to contradict you.
I'll make sure there isn't by the choice
Of scientists to sit on our committees:
Sticking to chemists and keeping ecologists out.
Taste, after all, is purely a personal matter.
I like this apple: I judge it by my palate:
But not the housewife. She has been conditioned
To make her choice by eye. And so—
These apples aren't a selling proposition.
We could, of course, test for nutritional factors,
Checking for vitamins and amino acids,
But then there'd be an uproar from the cabinet.
Food must be cheap: that's our traditional policy.
So be on the watch for questions on health and quality.
Treat them, like I do, as jocular, smoking room jokes.
Be alert, above all, for lean and cranky women—
Balfours, Carsons, Harrisons and their like—
You can tell them with practice before they open their mouths.
Call them, politely of course, hysterics and bigots,
Though praising on every occasion their great integrity.
You'll have the professions solidly behind you,
Except for the odd rebel who perhaps
Has read outside his field. But he's discounted.
Nature, my friends, is how science describes it:
The laws of science are not to be questioned—
Until it happens, unexpectedly,
Some genius shows they're wrong. But as for us,
We safely may assume conclusive proof
Of anything unorthodox discredited."

Uncle Harry rose and smiled at his apple.
"That's all today and thank you, gentlemen.
I know you'll see that Fred's great work's not hindered
And multitudes don't starve for a chimera."

Robert Waller

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Key book Every month a key book or books in the field will be described and analysed in this column.

Towards hope

THE SUBVERSIVE SCIENCE: Essays toward an Ecology of Man by Paul Shepard and Daniel McKinley (Eds.). Houghton Mifflin Company, Boston, 1969. U.K. price 58s.

"Is ecology a phase of science of limited interest and utility? Or, if taken seriously as an instrument for the long-run welfare of mankind, would it endanger the assumptions and practices accepted by modern societies, whatever their doctrinal commitments?" To these questions from Paul Sears, the editors Paul Shepard and Daniel McKinley answer No to the first, Yes to the second—hence the title: the Subversive Science.

To those accustomed to the modest, measured development of young disciplines, (the word *ecology* first appeared in the English language in 1873, and the truly holistic science of ecosystems ecology is very recent, the word *ecosystem* being coined in 1935), such questions may seem a little premature. Ecology has come a long way from being a mere branch of biology (the study of the relationships between organisms and their environment) to being the basis of a philosophy with the potential for changing world values.

That such values need to be changed we are left in no doubt. The very fact that we speak of Man and Nature (rather than man and the rest of nature), and of man and the animals (rather than man and the other animals), is sufficient indication that we have succumbed to *hubris*. "Nature is usually synonymous with either natural resources or scenery," writes Shepard, and only men are thought capable of "escape from predictability, determinism, environmental control, instincts and other mechanisms which 'imprison' other life." Shepard puts his finger on three important presumptions: "that nature is a power structure shaped after political hierarchies; that man has a monopoly of immortal souls; and omnipotence will come through technology."

Such concepts form an intellectual backcloth to those ill-defined but all-pervasive ones of Growth, Productivity and Progress. They are not new, as Lynn White demonstrates in a splendid essay on *The Historical Roots of Our Ecologic Crisis*. "Especially in its Western form," he writes, "Christianity is the most anthropocentric religion the world

has seen. . . . In absolute contrast to ancient paganism and Asia's religions (except, perhaps, Zoroastrianism), (it) not only established a dualism of man and nature but also insisted that it is God's will that man exploits nature for his proper ends." This view is today held by Christians and non-Christians alike, and "despite Copernicus, all the cosmos rotates around our little globe. Despite Darwin, we are not, in our hearts, part of the natural process. We are superior to nature . . . The fact that most people do not think of these attitudes as Christian is irrelevant. No new set of basic values has been accepted in our society to displace those of Christianity. Hence we shall continue to have a worsening ecologic crisis until we reject the Christian axiom that nature has no reason for existence save to serve man."

Our belief in the saving grace of technology, and the purely materialistic cast we have given to progress, are both expressed in the frenetic zeal with which we pursue more and better goods and services. And as we surround ourselves with improved versions of every possible mechanical aid and comfort, we feel betrayed when undiminished poverty, delinquency, crime, drug-addiction, and all the other indications of social misery are brought to our attention. Sometimes we manage to comfort ourselves by concentrating our observations on the large numbers of decent honest citizens who express social dislocation in more acceptable ways like ulcers, cardiovascular disease, a penchant for pep pills or tranquillisers and the regular employment of a psychiatrist. Nevertheless phrases like "sick society" no longer sound strange or inapplicable; and the ludicrous pity of it all is that we remain obsessively convinced that a cure will be found in a more equitable distribution of artefacts, and in a yet more vigorous bending of the world about us to the immediate demands of technological man. We prescribe, in the words of Shepard, "Culture, Security and Escape," and this so nearly reflects our needs that we are easily taken in. Instead of an organic culture grown from a dialogue between man and land, we accept art museums and annual folk-song competitions; rather than the security of the small human group as the functional unit of society, we ask for an all-embracing welfare service and cheaper insurance rates; as for escape—television and the motor car have taken the place of the wilderness, of leisure integrated with natural encounter.

Thus we apply engineering solutions to fundamental biological problems. Man is changing his environment at a speed at which

he cannot possibly adapt, and the biosphere is being rendered so instable by man's activities as to bring about the disappearance of many of his fellow species and even to threaten his own survival. Our dependence on the engineering process is leading us up a cul-de-sac; many accept this, but believe that right at the very last moment technology will magic a door and key out of thin air. The ecologists represented in the *Subversive Science* would probably prefer to liken the process to walking the plank and using rocket propulsion to speed the journey. No doubt some engineers might agree with them, but undeterred would argue that it is only a matter of time before the sea is fashioned into a perfectly acceptable environment for man.

The more we allow our environment to deteriorate, the more dependent must we become on technical systems. Fond as we may be of looking down on primitive man and describing his life as one of "wresting a precarious living from the soil," we must never forget how much more vulnerable we are rendering ourselves. 200,000 people left stranded by a power failure in the London Underground this July may not be the Awful Warning the doom merchants are looking for, but it does illustrate how silly we would be to rely on a handful of mass-produced components for our food, air and water.

This should help explain why ecosystems ecologists (those ecologists who try to understand wholes rather than parts, who see the world as a set of interrelated systems—and hence the limitations of studying it in terms of isolated units sanctified by the laboratory), "challenge the public or private right to pollute the environment, to systematically destroy predatory animals, to spread chemical pesticides indiscriminately, to meddle chemically with food and water, to appropriate without hindrance space and surface for technical and military ends; (why) they oppose the uninhibited growth of human populations, some forms of 'aid' to 'underdeveloped' peoples, the needless addition of radioactivity to the landscape, the extinction of species of plants and animals, the domestication of all wild places, large-scale manipulation of the atmosphere or the sea, and most other purely engineering solutions to the problems of and intrusions into the organic world." (Paul Shepard.)

For a fuller understanding of these and other issues which preoccupy ecologists, there is no better guide than the *Subversive Science*, the nearest thing we have so far to a primer of ecological thought. It is impossible to give an adequate impression of the many excellent

essay which Shepard and McKinley have brought together, but a brief look at three of the most illuminating should indicate their depth and breadth.

Frank E. Egler in *Pesticides—in Our Ecosystem*, written in 1964 two years after *Silent Spring* was published, examines the concept of the ecosystem and the role of the scientific community in helping the rest of society make its decisions. He writes with reference to the proliferation of persistent biocides, and his words are still warm with anger at the many scientists who received Rachel Carson's book in a timid silence tinctured with unreasoned hostility. He renews Professor Loren Eiseley's call for "an enlightened campaign not only against apathy but—what is worse—an apparently organized stupidity in areas where that attitude is most unbecoming." Egler also reminds us of the plethora of scientists who believe that "once they have published their research in a professional journal, all the world will know of it". Widespread public ignorance of ecology, the darker side of medicine, the bleak future of nuclear engineering, and so on, has been largely perpetuated by scientists reluctant to raise a hornet's nest of alarmism and hysteria. No one could quarrel with their reluctance, but a proper understanding of many vital issues will be denied to all but a few, unless scientists learn to share their doubts and fears with their fellows. Part of the blame, of course, must be shared by the Press, who seem to have a pathological abhorrence of ifs, buts and other qualifiers. But there are still too many scientists who put their consciences into mothballs and retreat to the no-man's land of academic detachment.

Egler by no means belabours scientists, nor would his doing so be of any value. But he does point out how alien ecosystems ecology is to western scientific method: the scientist today is "taught to take apart, and study the parts. He is taught to factor, to analyse. He has methods to study the relationship of two factors (cause and effect); and there are mathematical methods for studying the effects of several interacting factors. Quite simply, however, the study of ecosystems is the study of wholes first, and parts later. The study of those wholes cannot start, cannot proceed, by methods traditionally acceptable to chemists, physicists, and mathematicians, who, in turn, are likely to belittle concepts and methods which in their own fields might be 'inexact', 'subjective' and not amenable to statistical treatment. Even worse these wholes are intrinsically changed by factorial analysis. They are no longer wholes when so studied. Would you study the parts of an automobile in order to comprehend the functioning of the complete car on the highway and in traffic?"

For his part, Paul B. Sears in *The Steady State: Physical Law and Moral Choice* asks that the application of science "be guided, managed, controlled, according to ethical and aesthetic principles and in the light of our most profound understanding." To date we have been highly selective in our application of scientific knowledge but by no means have we been guided by principles as noble as Sears would like: for "science has been applied in spectacular fashion to the elaboration of consumers' goods, the reduction of mortality rates, and the tapping of fossil

energy." Among the unlooked for consequences of this selection have been a quite unprecedented population explosion, "dissipation of non-renewable resources, . . . disruption of natural cycles in the landscape, . . . signs of increasing tension upon the individual and the disintegration of value systems, which, whatever their limitations, have always exerted a stabilizing effect on human societies." Sears wonders at our "belief in the possibility of and necessity for a perpetually expanding economy," at the failure of economists to look to the long-term, and at the absurd attempts by various planners to estimate "the maximum number of human beings that could possibly be kept alive on earth, such estimates ranging from three to ten more times than the present population." Yet only a very few bold prophets like Orwell, Huxley, and Sir Charles Darwin the physicist, have troubled themselves over the quality of life under such conditions. He continues by contrasting the uninhibited development of weapons and other means of human destruction with our almost superstitious refusal to engage in population control or to entertain the notion that "human happiness might well be possible under a far less wasteful and consumptive economy." Sears concludes that "modern society seems incalculably rich in means, impoverished in ends."

Both Sears and George Macinko (in *Land Use and Urban Development*) reject the assumptions that we cannot and should not control our numbers. Macinko begins by examining Doxiadis' concept of Ecumenopolis—the idea of a city spanning the entire habitable portion of the earth. Doxiadis places the achievement of Ecumenopolis at the earliest by the mid-21st century, at the latest by the beginning of the 22nd century when he expects the total world population to stabilize at between 12 and 100 billion, with 30 billion considered most probable. The limiting factor will be resource availability, though Doxiadis does not explain why our grandchildren should dutifully stop multiplying once they have reached the limits of their resources, nor by what miracle such non-renewable resources will remain available thereafter. Macinko is justifiably scornful of Doxiadis' assumptions that current growth rates express an economic norm, that they are desirable and that they cannot and should not be modified. "Current growth rates," says Macinko, "have no precedent in the past, and more importantly, they are incapable of extension into any but the most immediate future". Macinko has no difficulty in demonstrating the naivety of Doxiadis' thesis, for "a population living at the limit of resource availability is vulnerable to all perturbations in the resource system. Any downward fluctuation in available resources would cause untold hardship." The most optimistic predictions of available fossil fuels and high-grade minerals are hardly reassuring, and even though there are plenty of minerals in a ton of granite or a cubic mile of sea water, Sears warns us that "the energy cost of reclamation" will be prohibitive. Finally, writes Macinko, "and perhaps most important to a society with any pretensions to civilization, it is necessary to add that man is not the only sentient being on earth and his ever-increasing numbers pose the very real threat that he will become, in

the words of Charles Elton, 'an all sterilizing force' obliterating all other life forms in his relentless and uncontrolled expansion into their living space."

As the only alternative to this needless and problematic growth, Sears proposes the "steady state", one of the basic concepts of both the physical scientist and the ecologist—namely that "systems tend toward conditions of minimum stress and least unbalance—that is, toward equilibrium." Thus "as a physical goal we must seek to attain . . . an efficient dynamic equilibrium between man and his environment". To do so both Sears and Macinko agree with Shepard, White, and many of the other writers represented in this volume, that our entire system of values must be changed. Macinko suggests we begin by first engaging in a conscious and continuous dialogue with each other on where we are going and where we wish to go, and then "so arrange (our) institutions as to make possible the latter". Secondly, we can only tackle unplanned expansion by accepting that "we cannot long afford to indulge ecologically unrealistic economics" and that the basic problem we face today is "the survival of the species in a humane environment for the longest period possible". Thirdly, each generation should "adopt as its goal the halving of the growth rate experienced by its predecessor. In order that this end might be accomplished a vast educational job will be required". Fourthly, we must effect a "marked reduction of population growth rates" if we are to hope for John Stuart Mill's "stationary state, with endless time to contemplate and devise a steady, costless improvement in the quality of life". (Harold Barnett and Chandler Morse.)

Such are the immediate aims of the ecosystems ecologist, the subversive scientist. He asks for intelligent action, but cannot see it occurring in today's ethical vacuum. Hope will return with new values, with a considered response to Aldo Leopold's question, when he wrote: "We of the industrial age boast of our control over nature. Plant or animal, star or atom, wind or river—there is no force in earth or sky which we will not shortly harness to build 'the good life' for ourselves. But what is the good life? Is all this glut of power to be used for only bread-and-butter ends? Man cannot live by bread, or Fords, alone. Are we too poor in purse or spirit to apply some of it to keep the land pleasant to see, and good to live in?"

Robert Allen

Massed Doom

THE ENVIRONMENTAL CRISIS, edited by Harold W. Helfrich Jr. Yale University Press. \$1.95.

Ecologists tend to view the world with alarm. You might almost say this is their main distinguishing feature. There is a danger that the public will react against their predictions of doom by dismissing them as unduly alarmist. In individual cases they may be right. It may be that the pollution of inland water will not bring the world to an end, nor DDT topple our civilization. Perhaps the air

will remain breathable for a while longer and the ice age may be averted. Even the oceans may survive and if they do not, perhaps we will be able to learn to live without them. In each case an ecological prediction may have been overstated by projecting forwards an established trend. It is not so much the individual predictions that are alarming as the total effect of so many predictions coming from so many quarters. If one ecologist talks doom, ten ecologists talk Massed Doom, and it is terrifying.

Even then, there are a number of Massed Doom books these days, going back to *Silent Spring*, the Doom Mother of them all. The advertising industry works on the doctrine of saying the same thing over and over again until it becomes accepted. The theory has a distinguished history and advertising may work. My fear is that it may work best for those things we want to believe and that there may be a quite different effect for unpleasant truths. Is it possible that the repetition of unpalatable facts generates a resistance, causes people to build walls to keep them out? May the doom books be preaching only to the converted and may their effect on them be subject to diminishing returns? With a bit of work I think I could make my own doom prediction out of that.

The prophet who goes unheard may do one of three things: he can shut up and go home; he can shout louder and, inevitably, more hysterically; or he can muster his arguments with greater care, assemble more and better facts and examples to back them, and try to speak more convincingly. The latest recruit to the Massed Doom series opts for the third alternative and the result is powerful, measured, and impressive.

The Environmental Crisis is based on a series of lectures organized by the Yale School of Forestry with funds from the Ford Foundation. It contains twelve essays which cover more aspects of the problem than it is usual to find in such books.

If I have a criticism it is that I would have changed the order of the essays to provide a more obvious pattern. Kenneth E. Boulding appears eleventh. I would place him first, not because of the quality of his contribution, although it is witty and informed, but because he deals with economics and the fallacies inherent in the concept of the Gross National Product. It seems to me that the economic assumptions on which our society is based are one of the root causes of the trouble and that a satisfactory solution will necessitate a radical revision of them. Professor Boulding confirms this view. Second I would place Charles R. Ross, who takes the story a stage further, into politics. Mr Ross is a lawyer who has served under Presidents Kennedy and Johnson on the Federal Power Commission. He recalls instances in which environmental damage has been avoided by accident as a result of federal government intervention in disputes over power sources. However, the motives were political and Mr Ross regards the federal government as an inadvertent advocate of environmental degradation. The third essay in this section would be Emilio Q. Daddario's on the allocation of research funds. Mr Daddario calls for more effort on the part of scientists and technologists to show the relevance of their

work and for more information which would help avoid useless research.

Having defined the underlying causes, we might then examine the problem itself. Clarence J. Glacken writes on the outdated concept of man against nature. He takes a broad view of the religious and philosophical history of the concept, from Genesis to Marx, handling a wealth of material lightly, elegantly and with force. It is ominous that the Chinese are now revising their traditional attitude to the environment, probably the stablest and sanest in the history of any civilization. The effect on China itself and the world of the adoption of the Marxist idea of struggle and mastery of nature will be considerable. Ian L. McHarg also criticises the western monotheistic religions which, in his view, justify the "bulldozer" mentality which regards nature as a threat to Jehovah. William A. Niering considers the plight of the coastal wetlands which are threatened with development. They are of great value ecologically and often economically as well. Based on the potential harvest of shellfish and bait worms, one acre in a managed estuary off the coast of Maine has been valued at 33,563 dollars, compared with 2,000 dollars for a good acre in upland Maine. Unmanaged, the estuarine acre would be worth about half as much. The coastal areas are subjected to heavy pressures since sixty percent of Americans live in a band 250 miles wide along the Atlantic, Pacific and Gulf shorelines. Last in this section I would place LaMont C. Cole's summary of the ecological effects of man's activities. He calls it "Playing Russian Roulette with Biogeochemical Cycles" and points out that man has degraded his environment since the dawn of civilization. It is modern industry and growing population which have accelerated an historical process.

What is likely to be the result? Paul R. Ehrlich is well known for his lectures, speeches, preaching and writing on the population problem. Always witty, lively and provocative, occasionally he can become a little shrill and his contribution to this book jars just a little. He considers the possibility of famine by 1975 and concludes that although we may argue about the precise date, famine there will be. In contrast, James G. Horsfall describes, one might almost say eulogizes about, the green revolution which has made it possible for five percent of the American population to feed the rest. This reduction in the agricultural labour force is necessary in developing countries to release resources and manpower for industrial development. He describes some of the mistakes that have been made in aid programmes but places, in my view, too much faith in the highly responsive new cereal hybrids. In America itself there is the alarming possibility that food production will not be able to keep up with population growth and that in its efforts to do so it will cause further environmental deterioration. He concludes that the developing world needs a green revolution but that if our descendants are to be bequeathed a full measure of life, "we should remember John Muir's words: 'Everybody needs beauty as well as bread, places to play and pray in which nature may heal and cheer and give strength to body and soul alike.'"

David Gates considers the possibilities of modifications of weather, for good or bad, and Georg Borgstrom writes on "The Harvest of the Seas", showing that at present huge catches of fish contribute nothing to the world food problem because they are sold in the developed countries. It is doubtful whether fishing on this scale can continue for long without exhausting stocks.

There is room for a section on solutions, but the only article I would place in this category is Joseph L. Sax's "The Search for Environmental Quality: The Role of the Courts". Professor Sax is a lawyer with an ecological outlook and he shows how, without changing the existing legislation, the help of the courts may be enlisted in the protection of the environment.

The symposium was conceived and planned by Professors F. Herbert Bormann and Garth K. Voigt, whose aims were to bring new vigour into the debate on the goals of society, to promote new studies and teaching on the interrelatedness of life and to bridge the information gap between those concerned with the quality of life and those who manage the environment. The quality of the contributions is very high and provided the book is read the Professors will succeed in their aims. No doubt it will be read by the scientists, engineers and politicians to whom it is directed. Yet it deserves a wider readership. At no point is it too technical for the general reader who is not yet aware of the extent of the trouble we are in. It is serious, thoughtful and, on the whole, unemotional. It does not overstate the case.

When the prophet is heard, what then? Prophecies may be self-fulfilling or self-cancelling. If enough people are kept sufficiently well informed of the dangers which threaten, they may be averted. If the ecologists, the prophets of doom, can be made to utter self-cancelling forecasts, their work will not have been in vain. It is our best hope.

Michael Allaby

From Prehistory to Preservation

THE VANISHING WILD LIFE OF BRITAIN by Brian Vesey-FitzGerald. MacGibbon & Kee. 160 pp. 36s.

WILDLIFE PRESERVATION by Philip Street. MacGibbon & Kee. 150 pp. 30s.

Brian Vesey-FitzGerald in *The Vanishing Wild Life in Britain* has written a well documented history of our wildlife, which began vanishing when Bronze Age man exterminated the mighty auroch, a big horned wild ox that survived as late as 1627 in Poland. The Romans brought sow thistles, cow parsley, and ground elder, the last regrettable introduction as a cure for gout, and exported our brown bears for gladiatorial shows as monkeys are exported from India for medical research and vaccine production. Their roads and their villas altered our ecology more than their introduction of the pheasant but when England's 500 years as their colony ended (the longest period of colonialism suffered by any nation in history) the wolf, bear, beaver and lynx population began to build up.

We lost the beaver in the 16th Century,

when they were being trapped in Loch Ness, though by then they were rare, and our clearest account of a thriving colony dates from 1188, on the river Teifi in Wales, while there were none in England, for they are missing from the Domesday Book which would have included them because of the value of their fur. The wolf vanished in England with the wild boar in the 16th Century, when crossbows became really efficient, but the last in Scotland was killed by a Macqueen in 1743.

The Enclosure Acts, of which about 4,000 were passed between 1760 and 1844, brought us the hedges that gave us our patchwork of fields. They produced a vast increase in bird life, and by providing shelter and good burrowing spread both the rabbit, which was introduced in the reign of Henry II, and the brown rat, to pest proportions. The black rat came with the returning Crusaders, bringing the Black Death on its fleas, but the brown one arrived about 1730. The scavenger of the cities was the kite and in 1540, William Turner who was our first "Peter Scott" described it as "wont to snatch the food out of childrens' hands in our cities and towns".

The slow and tiring reloading kept game bags low, and in 1845 Squire Osbaldston shot 44 grouse in a single day and boasted of it for the rest of his life. When the central fire cartridge arrived it was possible to shoot driven game, and on August 30th 1888, Lord Walsingham shot 1,070 with a well drilled loader and skilled beaters. Mr Vesey-Fitz-Gerald a one time editor of *The Field* brings his story up to the even greater slaughter

from organo-chlorine compounds when over 5,000 birds were picked up dead on one farm alone in the spring of 1960, and 1,300 foxes were poisoned in East Anglia in the winter of 1959-60. He looks ahead to a not always gloomy future, with both foxes and hedgehogs thriving in suburban life and an increase of polecats, pine martins, badgers and wildcats in Forestry Commission plantations.

It is unforgivable that a book of such quality should be without an index which reduces its value as a work of reference. Today, books not only cost more for fewer pages than ever in publishing history, their publishers refuse to spend the few pages of extra type on the indexes we have enjoyed since the 17th Century.

Wildlife Preservation has an index which is extremely useful in a book that surveys the species that are in danger, and gives some graphic accounts of recent exploits of preservation. "Operation Oryx" is discussed in detail and the problems and methods of game conservation in Africa, including the recent idea that the best meat producers are the native grazing animals, are described. Very much more detail would be desirable, not of the obvious which is familiar on film and TV but of the ecology of the animal sanctuary and the practical solutions that have been found to the many difficulties of re-balancing Nature.

For hundreds of years there was a balance between the caribou herds, and Indians and Eskimos and the wolves and their food supplies, with lichen the limiting factor, for if

too many caribou come through the winter they overgraze the lichen which cannot recover in time. The arrival of the rifle brought stocks down to a mere 200,000 but they are rising again, because of the change over to motor vehicles doing away with the need to shoot caribou for dog feeding. The musk-ox too was nearly exterminated, but it is making a come-back as the most suitable stock for Arctic pastures. There is now a "musk-ox bank" in Alaska where Professor Teal of Vermont University is ready to send out breeding stocks. The future may see an expansion not of factory farming, but of game cropping by those who know, understand, and respect the wild life of the world.

Mr Street raises hopes that Steller's giant sea cow may be still surviving, for a Russian whaler reported six of them off a part of unexplored Siberian coast. The Australian dibbler, a tiny opossum that feeds on nectar was rediscovered in 1967, and another, the Burramys known only as a fossil was found in 1966, and the Queensland marsupial tiger, like the Tasmanian thiacine of marsupial wolf may yet survive. "On balance" says Mr Street, "I think we must accept that there may well be quite a number of animal species, some of considerable size, still to be discovered and made known to science". Let us hope that the Loch Ness Monsters will be treated better than our last beavers, for it is better to have a still living and breeding mystery than yet one more dodo or passenger pigeon on the conscience of mankind.

Lawrence D. Hills

What the Canary told the Miner

We all know how the canary served man honourably in the bad old days of coal mining. Many of us will also recall that it was a relatively sudden and disastrous decline in breeding success among peregrine falcons that warned us, back in the 1950's, about the build-up of the chlorinated hydrocarbon pesticides in the food-chain.

A study of wildlife is perhaps the best early warning system we've got about impending pollution dangers. Professor Wynne-Edwards made this very point at a recent Royal Society symposium.

Any reader of *The Ecologist*, therefore, should also read *ANIMALS*, the international wildlife magazine. (In fact, the editor of *The Ecologist* has himself been reading it since 1963.) We are seriously concerned with all aspects of animal life—from conservation to ecology to animal behaviour; from bird-watching to butterfly-collecting (though we don't encourage the latter these days).

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THE SHAPE OF THINGS TO COME

What are the problems confronting mankind as we approach the year 2000? What are the threats to our survival, and what can we do to avert them? **your environment** magazine seeks to bring some of the world's keenest minds to bear on these crucial questions. It is appropriate that we begin this series with an essay by Sir Julian Huxley, whose prophetic voice foretold our growing predicament long before it caught the attention of today's media. Future contributors will include: Peter Scott, C.B.E., D.S.C., Chairman of the World Wildlife Fund; Professor Jean Dorst of the International Union for the Conservation of Nature, author of 'Before Nature Dies'; Desmond King-Hele, F.R.S., leading authority on earth satellites, author of 'The End of the Twentieth Century?'; Dr. E. B. Worthington, Scientific Director of the International Biological Programme; and other leaders of thought and action.

THE SHAPE OF THINGS TO COME begins in the Autumn 1970 issue of **your environment** (Volume 1, No. 4), mailed to subscribers on 15 September. Also in this issue: Ruth Harrison writes on factory farming; there is a special feature on water resources, one of Britain's most urgent problems; and articles on waste reclamation, defoliants, and supersonic transport. Regular features include Who'll Kill King Car?, What Happened . . . , Environmental Who's Who, book reviews, readers' letters, and Political Progress Report. Teachers and schools will find an announcement of particular interest to them. If you wish to become a subscriber to this active and informative quarterly magazine, please fill in and mail the order form below.



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Coming events

2-9 September—International water conservancy exhibition—"World, water and we". at Jonkoping, Sweden. This is part of Swedish "Earth week". Information from the Swedish Embassy, 29 Portland Place, London, W.1.

3-9 September—International Congress of Biochemistry at Interlaken, Lucerne, Montreux. Information from Mr. A. I. P. Henton, 7 Warwick Court, High Holborn, London, W.C.1.

5 September—Open day at Gromford Meadow nature reserve, Saxmundham, Suffolk. Information from the Suffolk Trust for Nature Conservation, Estates Department, County Hall, Ipswich, Suffolk.

11-12 September—Conference—"Conservation in the Development of Northern Ireland"—at Queen's University, Belfast. Information from Nature Reserves Committee, Room 341, Parliament Buildings, Belfast, BT4 3SS.

16 September-14 October—Photographic Exhibition—"Man and Nature"—at City Museum, Bristol. Information from the Nature Conservancy, 19 Belgrave Square, London, S.W.1.

18-21 September—Annual Conference—"The five threats to the countryside"—at Nottingham University. Charge £5.10.-£8.10. Information from the Council for the Protection of Rural England, 4 Hobart Place, London, S.W.1.

19 September—Focus—"Conservation of red deer"—at Torridon, Wester Ross. Information from the National Trust for Scotland, 5 Charlotte Square, Edinburgh, EH2 4DU.

21 September—Conference—"Conservation and you"—at St. Anne's College, Oxford. Information from Mrs. M. Stevens, Foxcombe End, Boars Hill, Oxford.

21 September—Meeting of Society of Foresters of Gt. Britain at the Forest of Dean, Wye Valley. Information from the County Secretary, C.P.R.E., Community House, College Green, Gloucester.

27 September—Photographic Exhibition from the entries for the wildfowl competition at the Wildfowl Trust, Slimbridge. Information from the Controller, Wildfowl Trust, Slimbridge, Gloucestershire.

29 September—Symposium—"The measurement of air pollutants in chimneys" at Leatherhead. Information from The Director, BCURA, Industrial Laboratories, Leatherhead, Surrey.

Classified Adverts

BRETON NEWS. A quarterly summary in English of the nationalist movement in Brittany issued by the Breton Information Bureau. 10/- per annum from 9, Br Cnoc Sion, Baile Atha Cliath 9, Ireland.

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30 September-1 October—Lecture—"Wildlife conservation and the veterinary profession"—at the Zoological Gardens, Regents' Park, N.W.1. Information from the British Small Animal Veterinary Association, 101 Sternhold Avenue, Streatham Hill, London, S.W.2.

30 September-2 October—National Conference of the Institute of Building at Gleneagles, Auchterarder, Perthshire. Information from this address.

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