

The

Ecologist

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

Vol. 1. No. 11

May 1971

Britain's environment and the Common Market ■ Trace elements

The victorious ticks ■ Preparing for Stockholm

The Swansong of the Clyde

by Peter Bunyard & Charlie McLean



You don't have to read ANIMALS.



But you ought to.

You owe it to yourself to read **ANIMALS** regularly. Men and animals are so thoroughly interlinked that their fates are interdependent. Ecologically-speaking, that is. Without animals, man would soon become extinct. But more than that, animals are economically valuable (through tourism, as in East Africa), and suppliers of much needed food (in many parts of the world the indigenous wildlife is much more efficient at converting sparse vegetation into protein than are domestic animals). Above all, we believe that animals are delightful creatures to study and observe—or simply to contemplate. Come with us and discover things about wildlife that you never knew before. Keep up to date on one of the most fascinating of all branches of modern science. We are authoritative (our editorial panel includes three Fellows of the Royal Society), and yet we aim for, and reach, a broad popular readership. Perhaps it's the stunningly beautiful colour photographs that attract our

subscribers. Or perhaps it's the penetrating, expert articles that examine the world of animals from every angle. As we said, you don't have to . . . but we think you ought to find out for yourself today.

To ANIMALS (E2), 21/22 Great Castle Street, London W.1.

Please send me a **FREE** introductory copy, and then enter my one-year subscription to **ANIMALS**, for which I enclose appropriate payment.

NAME

ADDRESS

.....

Subscription rates: UK & Ireland £3
North America \$9
Other O'seas £3.25

The Ecologist

Vol. 1, No. 11 May 1971

	Editorial <i>Basic principles of cultural ecology</i>	3
<hr/>		
Feature articles		
<i>Peter Bunyard and Charlie Maclean</i>	The Swansong of the Clyde <i>And how participation was sold down the river</i>	4
<i>Brian Johnson</i>	Common Market v. Environment <i>The environmental reasons for staying out</i>	10
<i>Henry A. Schroeder</i>	Trace elements in the human environment	15
<i>Michael Allaby</i>	How Boophilus tricked the tickicides <i>The victorious tick</i>	20
<hr/>		
Reports		
<i>Stanley Johnson</i>	Stockholm 1972	23
<i>Barbara MacDonald</i>	Hill-farming on Dartmoor: the writing on the wall	25
<i>K. Hempel</i>	The stony problem of Venice	25
<i>David L. Greenstock</i>	Biocontrol in agriculture: 3	26
<i>Nicholas Gould</i>	Gulliver in Automobilia, III: in which he encounters Astronauts	28
<i>Jeremy Bugler</i>	More on PCBs	28
<i>Allen Jones</i>	Very thin films	29
<hr/>		
Columns		
<i>Lawrence D. Hills</i>	Down to earth <i>Fly away home</i>	30
<i>Graham Searle</i>	Student action <i>Students and industry. General studies</i>	31
<i>Robert Allen</i>	Ecopolitics <i>A civilised act</i>	35
<i>Arthur J. Puffett</i>	Ecotechnics <i>Water from sewage. Industrial cooperation in USA</i>	36
<i>Edward Goldsmith</i>	Towards a unified science <i>The brain as a probability calculator</i>	37
	Feedback	32
	Books	38
	Letters	39
	This month's contributors	40
	Conservation Directory (additions to December issue)	40

Editor: E. R. D. Goldsmith; Deputy editor: Robert Allen; Associate editors: Michael Allaby, Francis Arnold, Peter Bunyard, Brian Johnson, Jean Liedloff, Charles Maclean. Production and design by The Soil Association. Editorial copy and enquiries should be sent to The Editor, The Ecologist, 73 Kew Green, Richmond, Surrey. Telephone: 01-948 0690. Advertising enquiries should be sent to Mrs Valerie A. E. Ingersoll, Hexagon Publishing Co. Ltd., 131 Praed Street, London W2. Telephone: 01-723 1456.

Published by Ecosystems Ltd., registered office 11 Mansfield Street, Portland Place, London W1M 0AH and distributed by the Hachette Group, Continental Publishers and Distributors Ltd., 4 Regent Place, London W1R 6BH; Telephone: 01-734 5259; Telegrams: Aglibrairi London W1; Telex: 25114. Subscriptions to: The Ecologist, 73 Kew Green, Richmond, Surrey. Printed by The Garden City Press Ltd., Pixmore Avenue, Letchworth, Hertfordshire, SG6 1JS.



SHOT-GUN WEDDING

"Whom God hath put asunder let no man join together"

Basic Principles of cultural ecology

The first principle of the growing new discipline of cultural ecology is that cultural patterns, like biological ones, are adaptive responses to specific environmental conditions. If this is not accepted there can be no cultural ecology, any more than there can be biological ecology if one does not accept the adaptiveness of behaviour at the biological level. Yet the implications of this principle are considerable. It means that human behaviour can be predicted like that of ants, and puts the dogma of man's intelligent and rational behaviour in their proper place, as anthropocentric myths.

The second principle is that ethnic groups will vary in their ability to adapt to similar environmental situations; in fact, no two groups are likely to display equal ability in filling the same ecological niche. This must be true if each one developed as an adaptive response to different environmental situations, i.e. to fill different ecological niches.

The third principle follows from the second. It is that two ethnic groups cannot fill the same ecological niche any more than can two animal species. If they try to do so, there must inevitably be a struggle, and the weakest will be ousted.

The implications of this principle are enormous. If it is true, then the whole basis of our policy throughout the world regarding the relations between different racial and cultural groups must be totally revised. But I shall come back to this later.

The fourth principle follows from the third. Ethnic groups must either be separated from each other territorially or else they must learn to fill different ecological niches, which means live in cultural symbiosis with each other. In Africa they have on the whole fol-

lowed the former course, in India the latter.

Most people would say that there is a third course, integration, and that this was the right one as it is alone compatible with a truly egalitarian society. In this way we subject everyone to the same education, force him to use the same language, adopt the same values, wear the same clothes, live in similar houses and eat the same dreary and monotonous diet. This is undesirable, not only on aesthetic grounds but also on scientific ones.

This brings us to the fifth principle of cultural ecology: cultural stability is achieved by the maintenance of cultural variety, just as biological stability is achieved by the maintenance of biological variety.

Thus in New Guinea, one of the last major areas in the world which has not been disrupted by "modern civilisation", there are 700 different languages still spoken, and a corresponding number of distinct cultures. This is highly adaptive, for if any one of these makes some terrible mistake, it can only affect a minute proportion of the population of the island, let alone that of the world. On the other hand, as Western industrial culture slowly engulfs all others, so its errors are likely to affect societies all over the world, which might lead to the annihilation of the human species as a whole.

This brings us to the sixth principle of cultural ecology. A cultural pattern will develop just as a species will to fill a vacant ecological niche. Since a vast modern society will present a rich variety of different ecological niches, so one must expect a correspondingly rich variety of cultures developing to fill them. To try to prevent this from happening by imposing a single cultural pattern on all the members of a society, is not only undesirable but also impossible.

It is interesting that increased mobility as well as the Government's con-

scious efforts to undermine the caste system in India are simply leading to the development of a new caste system mainly based on regional differences. Thus the Sikhs from the Punjab are taking over the automobile and air-conditioning business, and provide the country's mechanics, taxi-drivers and carpenters. The jewellery business is a virtual monopoly of the Jains. The Marwari from Rajasthan have become the toughest and most successful big businessmen, the Goas and the Baruas from Chittagong are the best cooks, while unskilled labour mainly comes from Bihar.

Why don't we face the fact that people are different, and always will be, and that there is nothing wicked about it?

On the contrary, it is the myth of cultural uniformity that is both false and pernicious and it should be eradicated as quickly as possible.

For example, the Catholics and the Protestants in Northern Ireland are not fighting over theological issues. They constitute two distinct ethnic groups, of different origin, with different manners and traditions and different motivations and capacities. They could occupy the same geographic area and form a single society if they were capable of living in cultural symbiosis with each other, which they have done to a certain extent up till now. The Catholics, however, are no longer willing to fill the lower echelons of the economic hierarchy, as the cultural pattern which previously enabled them to do so has largely broken down.

The only remaining solution is to separate them territorially. Ataturk separated Greeks and Turks very successfully, although there was a terrible outcry at the time and it undoubtedly caused considerable inconvenience to the people who were forced to migrate. But should we not be willing to accept a measure of inconvenience in order to establish a stable society?

The Swansong of the Clyde

by Peter Bunyard and Charlie Maclean

While getting worked up about the third London airport, Snowdonia and Rio Tinto Zinc, or tanker collisions at sea, few people in Britain have taken notice or even heard of a development scheme which will transform a beautiful part of the Scottish coastline into a major industrial complex.

The beauty of the area around Hunterston and Fairlie on the Clyde estuary is "outstanding", to quote one planning consultant, and yet the Secretary of State for Scotland, Gordon Campbell, recently took a decision, against the recommendations of a long and expensive public inquiry, which will bring to the area a deep-water port, a massive iron-ore terminal, possibly an oil terminal refinery, and perhaps even a steelworks.

A lot of people are dismayed at Gordon Campbell's decision; others, do not think he has gone far enough to help industrial depression in Scotland. But whatever is to be gained or lost by the Clyde Estuary Development, the circumstances leading up to the Secretary of State's decision have brought to the surface some illuminating facts from the obscure world of planning and decision making, and raised issues which are fundamental to all present and future development in this country.



Hunterston sands, with nuclear power stations in the background.

Once the river Clyde has shaken itself free of the rust-brown hulks of Greenock's shipbuilding yards and the effluent of Glasgow, and has spread itself thin in the open sea of the Firth, it sweeps southwards along a lovely stretch of coast. Here Largs, the site of a glorious victory against the Vikings in the 13th century and now a prosperous holiday resort, and a few miles further down, the village of Fairlie, look out upon Great and Little Cumbrae islands. Some way across the water the island of Arran rears its solid backbone of mist-enshrouded hills to shield the mainland from the full force of the south-westerly gales which blow hard in winter. The land along the coast is good agricultural land, and with the exception of the nuclear power plant at Hunterston, industry does not impinge upon the landscape until you come to Ardrossan some 12 miles to the south of Largs.

Apart from its natural beauty the Clyde estuary has something unique in

Britain, indeed in Europe. It has God-given sheltered deep water, ideal for passage and berthing of tomorrow's big ships, the 100,000 tonners and upwards.

With the exploitation of this asset in mind, the Clyde Estuary Development Group, set up in 1968, commissioned the industrial consultants, Metra Ltd., and a planning assessor from Sheffield University, Professor A. E. Weddle, to produce a report on the industrial potential of the Clyde Estuary and coast. It did not require much imagination to come up with the idea for a deep-water port, which would be the focal point of a massive industrial development in the area. The would-be developers saw a Clyde deep-water port as the mainspring of future progress in Scotland; without it, they claimed, Scotland would inevitably become the bankrupt partner in the UK.

People living along the north Ayrshire coast, however had no idea that the plans, which might radically affect their lives, were being quietly drawn

up behind their backs, until someone noticed a man taking borings on the beach at Fairlie. A few drinks in the pub and the man told them he was from the British Steel Corporation. Then the Ayr County Council, which was represented on the Clyde Estuary Development Board, let it be known that Chevron, an American oil company, had applied for planning permission to build an oil terminal and refinery at Portencross, just round the point from Hunterston. This came as a double shock since the site in question was in a "grey" area where development was restricted. At that time Chevron stood to gain £14 million industrial development grant from the government.

When the Metra-Weddle report appeared in the early spring of 1969 the cat finally slithered out of the bag. According to one critic the report was "nothing but industrial promotion of the worst kind". It assumed that the Estuary was destined for major devel-

opment, and barely paid lip-service to the question of amenity and the natural beauty of the coast.

The Metra half of the report proposed a South Scotland Electricity Board (SSEB) oil-fired power station at Inverkip, 5 miles south of Gourrock; an ore terminal and steelworks at Hunterston, "where there is no limit to the size of ship the natural deep water channels can accept . . .", and approved Chevron's application to build an oil refinery and terminal at Portencross.

Unlike Metra, Professor Weddle was not entirely without scruple, while admitting that Inverkip and Hunterston were "the most appropriate sites for deep-water berths", he did not consider Inverkip a suitable choice for a power station. "It is in a coastline of outstanding scenic quality," he said, "and one which should be protected from development." The SSEB, however, have chosen to ignore Professor Weddle, and already MacAlpines' gargantuan earthmoving equipment has torn, gouged and flattened the land at Inverkip. Because of "visual intrusion" Weddle also rejected Metra's suggestion for an oil tank farm and refinery at Portencross; but he conceded the steelworks could be built at Hunterston.

Faced with these proposals some of the residents of Largs, Fairlie and West Kilbride, mostly young, articulate and technically well qualified people, formed an opposition group, called the North Ayrshire Coastal Development Committee, which not only opposed the Metra-Weddle report but determined to put something constructive in its place. Tom Hutchison, the quiet-spoken chairman of the group, with the support of some 22,000 signatures of protest, mounted an all-out campaign and raised over £15,000, which enabled them to produce their own report and present their case at the public enquiry held last April.

Harbinger of squalor and depression

In it they suggested that there were better ways of developing the Clyde than by destroying its natural beauty. Its value as a tourist attraction, they pointed out, was far too great to throw up for large and inevitably dirty industries. They drew up an impressive plan of the area showing a marina, a fish farm, boat building and other light industries suited to the area. Indeed the committee's biggest contention was that

the development scheme was bringing the wrong sort of industry to Scotland. They saw it as the worst kind of up-graded 19th century thinking, which in time was likely to produce the squalor and depression of another Motherwell.

John Busby was one outspoken and dynamic member of the committee. Ten years ago he came up to Fairlie from Teesside where he was involved in the chemical construction business. He is now director of the Centre for Industrial Innovation at the University of Strathclyde. "Scotland has missed out on development for 20 years, and if it's sensible," he says, "it will take the hint from England where industry has made such a mess, and count itself lucky. Look what the steel and petrochemical industries did for Teesside in just a few years. It's an industrial nightmare. There may be economic growth—but one thing's for certain, you won't find the oil kings and steel magnates living in the places where they make their money."

John Busby in common with the other members of the committee believes that Scotland's greatest asset is its space and freedom from overall pollution. He is not against development, but believes that the emphasis should be on good planning and on providing jobs for a minimum of capital investment. "Steel and oil require large capital investments and they ruin the environment. Instead Scotland should be developing light industries and tourism, especially now that there is a premium on unspoilt countryside."

The committee has two hard-hitting adversaries in Robert Lambie and his son David, who is MP for Central Ayrshire. They have lived most of their lives in Saltcoats, the poor relation and neighbour of Ardrossan where 48p weekly rent for a council house is considered too much to pay. In Saltcoats as in many industrial parts of Scotland there is depression and unemployment. According to David Lambie the people want industry at any price and don't give a damn about pollution. "I've been to Billingham to see the ICI works down there, and if that's what pollution does to a place, then it's pollution that I want."

He scorns Busby's idea of sophisticated low capital investment labour-intensive industries. "We've been waiting 40 years for that kind of industry," he says, "and it's my feeling that those characters living in big houses in Fairlie

and Largs don't want any industry or people around the place at all. At the inquiry they talked about all the people coming down from Glasgow to see the wonderful view at Largs, but the local council has had a big yellow line on the road for years. Whenever we've wanted to go along the coast by Fairlie, we've been chased off the land."

David Lambie is almost as bitter about the Secretary of State's decision as the North Ayrshire Coastal Development Committee, though with less reason perhaps. If Gordon Campbell was serious about the areas being re-zoned for industrial development, he would not, Lambie feels, have delayed on Chevron's application to build an oil terminal and refinery.

"It is the only concrete proposal we have," he says, "and if Chevron comes the rest might follow." Lambie feels certain that BSC are pulling out of Scotland, and that it has no intention of building either an iron-ore terminal at Hunterston or a steelworks. He may be right about the steelworks. BSC's reaction to the Secretary of State's decision has certainly been cautious, and on being pressed it would only say that Hunterston was one of 12 greenfield sites likely to be considered. But the Steel Corporation is planning to spend £42 million on modernising Ravenscraig and will therefore definitely need a new terminal for the import of iron-ore.

It is possible too that Gordon Campbell will soon give the go-ahead to Chevron. In his letter of decision to the Ayrshire County Council he wrote of "new evidence on the questions of national oil refinery capacity and the balance of payment effects" which could influence his decision.

Sir Fitzroy Maclean, MP for the area, has no doubts at all that letting Chevron in would be a grave mistake. "Not only would the oil refinery spoil a beautiful section of the coast, but in return for providing jobs for some 200 to 300 people, mostly brought in from outside, the company would displace 30 or so families and deprive some 70 agricultural workers of their jobs."

Bill Adams, an ancient but lively potato farmer at Portencross, stands to lose 300 acres of his best arable land. "If Chevron comes here," he says, "it will more or less wipe out the whole place as a farming area. Agriculture and industry just don't mix."



Inverkip: proposed site of SSEB oil-fired power station

Sir Fitzroy is very critical of the Ayrshire County Council's behaviour in trying to rush into a deal with Chevron. "The Council made nothing like enough effort to ascertain the facts and examine the alternatives. How could they have done in a few weeks?"

Nuclear skulduggery

But the skulduggery did not stop with the Council. Hunterston is the site of two SSEB nuclear power stations, one already in operation for nearly 10 years, and the other likely to come into action in about two years' time. A third station is proposed for sometime in the future.

The older power plant—Hunterston A—is a Magnox reactor, which uses carbon dioxide gas under pressure to transfer heat from the nuclear core to water, which then turns the turbines of the generators. This type of reactor has a basic flaw in its design in that it is not completely self-contained. The steel core is surrounded by a concrete envelope—the "biological shield"—which has to be cooled by air drawn from the outside atmosphere. Should there be any leak of radioactive substances, this air is likely to become contaminated. Biological filters at the outlet of this cooling system are supposed to trap any contaminating particles.

Because this type of reactor was rela-

tively unproven when it was first constructed, it was only installed in isolated places such as Hunterston. Certain restrictions were then imposed by the Inspectorate of Nuclear Installations to prevent industrial or residential development in the area around the reactor.

Hunterston A has a good 20 years more to run. How then have these restrictions been suddenly raised so as to allow a major industrial development to take place in its immediate vicinity? Sir Fitzroy Maclean, on behalf of some anxious constituents, took up the matter with the Ministry of Power, who passed him on to the Scottish Office. But the Scottish Office, led by Lord Hughes, hedged, evidently not prepared to give him a straight answer, and weeks went by without his receiving a reply. Then, by a "revealing mishap" as Sir Fitzroy puts it, some departmental minutes, obviously not intended for him, were sent to him by mistake.

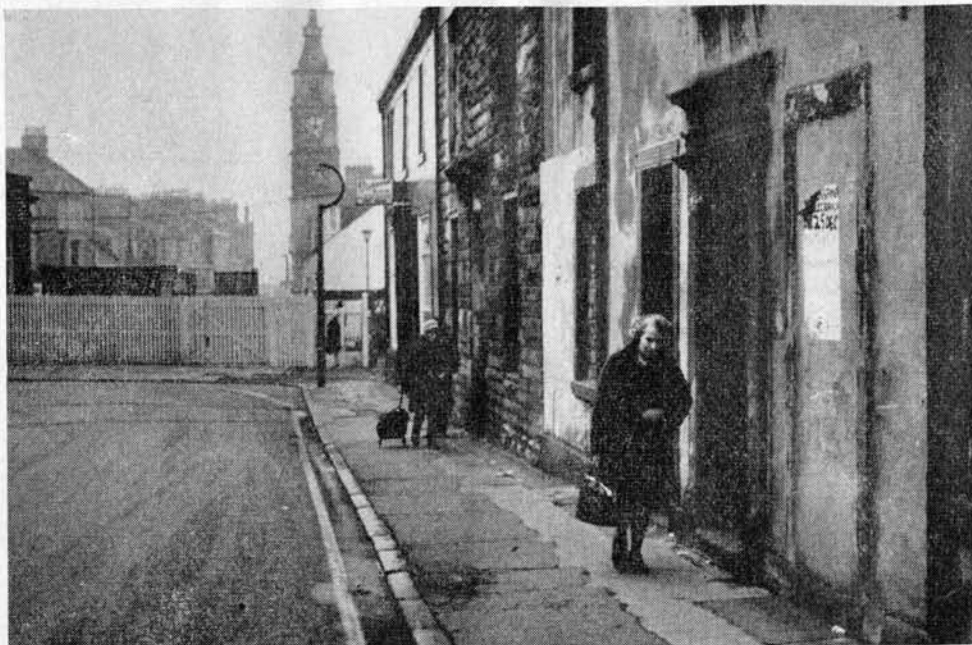
One note stated that there had been "no material change in policy" with regard to the restrictions on development in the area of Hunterston A, but that it was best to keep this information from Maclean. If anything, the note said, there had been a "shifting of opinion".

As the public are now beginning to

realise, a lot of information is withheld from them. When told that nearly 140 years of reactor safety has been clocked up in this country without any serious incident, not everyone believes this to be necessarily true. Certainly Hunterston A has not got the best reputation for safety amongst the local population.

Tom Hutchinson tells of one night during the public inquiry when a man, who could not give his name for fear of losing his job, rang him up and in great agitation told him that there had been a breakdown at the reactor. He said that some radioactive waste had got into the cooling air and had actually escaped into the environment. Workmen had discovered the leak when they went to check on the biological filters. They discovered that one of the filters had never been fitted. Particles of Cobalt-60 were subsequently found on the hills behind Hunterston.

In its "shifting of opinion" the Inspectorate of Nuclear Installations has said that, while it will not permit residential development in the Hunterston area, it will allow a certain amount of industrial development. A steelworks would employ several thousand workers at any one time and petrochemical works several thousand more. One wonders why these industries should



Saltcoats

be exempt from the restrictions, when in the case of emergency, shutting down the works in a matter of minutes would be a flatly impossible task. Neither the steel nor the petrochemical industry has a very good record of safety. Explosions in steelworks occur all too often, and Chevron, after being fined a million dollars for contaminating the Gulf of Mexico, recently had a disastrous explosion in its Dutch oil refinery. It also seems strange that the Inspectorate of Nuclear Installations should be prepared for the world's biggest tankers to pass within a hair's breadth of the reactors.

"The SSEB appears to be one of the biggest rogues in all this," claims John Busby. "Rumour has it that in return for supporting their case to build a refinery at Portencross, Chevron would indemnify the SSEB against any accident to the Hunterston reactors resulting in damage to property and people. And of course there was always the chance of cheap oil being piped from Portencross to their oil-fired power station at Inverkip. It's interesting that the pipeline should have already been dotted in on one of the development plans..."

At the public inquiry the Inspectorate of Nuclear Installations and the Nuclear Safety Advisory Committee

made a single statement to the effect that they had not yet decided whether or not the proposed developments could take place near the reactors. The Secretary of State, in his letter of decision, makes no comment whatever on the subject.

The objectors intend to raise the question of nuclear safety again should the enquiry be reopened (as it probably will be at their own instigation) if Chevron is given the go-ahead. As regards the other proposals for development, the Secretary's decision is final. There can be no appeal. The proposals for an ore terminal and a general deep-water port have been accepted. Land has been allocated for a steelworks in case the BSC should decide to make an application; and the whole area has been rezoned for industrial development.

Squandering public money

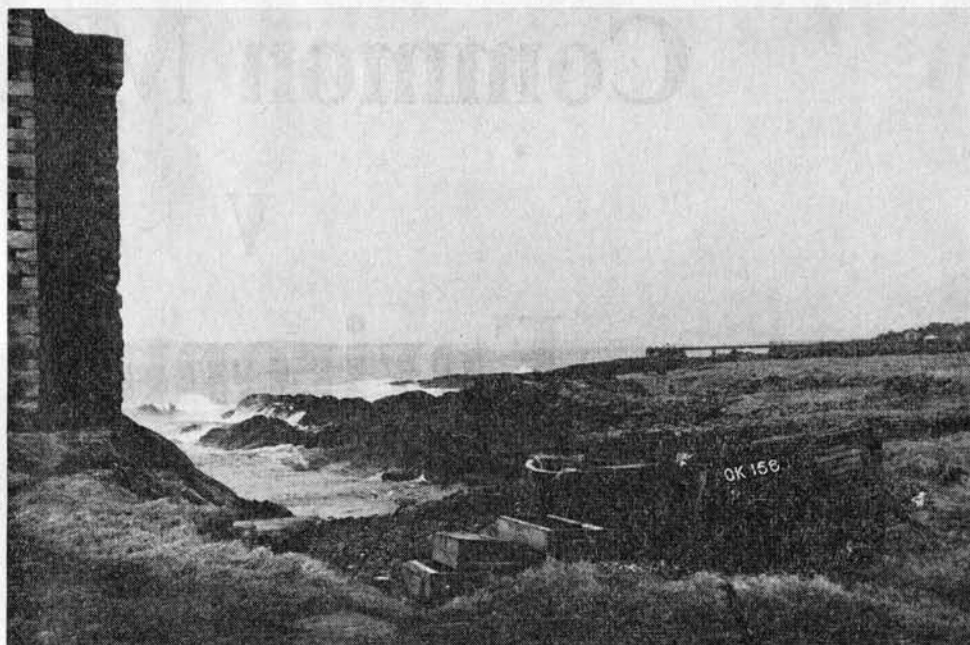
The North Ayrshire Coastal Development Committee and the other objectors are particularly depressed by Gordon Campbell's decision since the findings of the public inquiry in the main supported their views. As Tom Hutchison put it, "unfortunately we seem to have won the battle and lost the war. The report is a fair and serious piece of work, which makes it all the

more surprising that the Secretary of State should have paid so little attention to its evidence and so totally disregarded its recommendations."

Indeed the decision appears to have been made on undisclosed grounds, in which case to spend £100,000 of public money on an inquiry seems a little silly. It also seems unfair that people should be encouraged (at their own expense) to suffer under the delusion that they can really have a say in what happens to their environment.

It should be pointed out, however, that the initiative, efforts and high competence of the NACDC (which the developers had not bargained for) made it necessary for a deeper investigation and production of evidence at the enquiry than would otherwise have happened. This heightens the significance of both the NACDC's victory at the inquiry and their defeat by the decision. Although it avails them nothing, at least it shows up the incompetence of the planners, the underhand methods of the local authorities and the emptiness of the notion that decision-making in an advanced technological society can ever be democratic.

Ironically, it is probable that almost as many people welcome the Secretary of State's decision as oppose it. Those in favour of the development scheme



Portencross: site of proposed oil terminal and refinery.

are mostly to be found in the working-class areas of Saltcoats and Stevenston where David Lambie draws his argument. They want jobs whatever the cost to amenity, and naturally have the entire Labour movement in Scotland behind them. In such a situation the NACDC have a hard time trying to stay clear of politics, for although their members belong to all parties, their support is largely middle-class and the issue with which they are concerned is a middle-class one. The objectors evidently have something to lose or they would not be objecting. The "something" usually takes the material shape of a pleasant house with a pleasant view on the bonnie banks of the Clyde.

But this does not alter the fact that the NACDC are basically right. The environment does count for something, as we are all slowly being made to realise, and it matters that one should attempt to put the right development in the right place. It is probably a better bet trying to turn Scotland into another Switzerland rather than another Detroit.

The issue of amenity versus jobs is already becoming a key problem of the 70s all over the world and very often it has the effect of polarising different interest-groups and classes. But in this case the division is unclear. There are quite a lot of working-class people liv-

ing in North Ayrshire who are against the development, and equally there are some middle-class people who, for one reason or another, are for it. The Clyde, too, has always been the lung of Glasgow and the industrial belt. "Down the watter" from the centres of industry and population is where the working-class people have always gone for their holidays and they would be as badly hit by the development as anyone.

The real political significance of the Secretary of State's decision is that it has alienated the people most likely to support parliamentary government in this country. A similar situation has arisen over the siting of the third airport at Cublington, where a community is unanimously determined to make a stand against the inexorable advance of technological "progress". In a society blinded by the myth of economic growth and technological solutions, what choice is left to these people but to unfurl the black flag of anarchy, and continue their struggle without the law?

The following is an extract from a telegram sent by Tom Hutchison, as chairman of the NACDC, to the Rt. Hon. Edward Heath after hearing the Secretary of State's decision:

"We protest that the hunt for industrial sites under a cloak of secrecy, the acceptance of the developers' plans

by the local authority without criticism, the driving through of the planning decisions without prior consultation or even explanation, and finally the refusal of the Government to accept the results of an impartial inquiry has made a farce of the idea of public participation in planning.

"We ask the Prime Minister how citizens subjected to this bureaucratic tyranny over their interests and brusque contempt of their opinions are supposed to reconcile these things with continued belief in democratic processes which their Government treats with so little respect."

A reply was not forthcoming.

Environmental Pollution Science

Part-time Masters degree
Details from Professor G C Bond
Brunel University, Uxbridge,
Middlesex

Telephone 01-992 6661

Common Market

V

Environment

by **Brian Johnson**

In the great debate on the Common Market no mention has been made of the effects of entry on Britain's environment.

Since they are likely to be considerable, Brian Johnson's article is of unquestionable importance. He demonstrates the force of the environmental argument against entry, and concludes that we—and, incidentally, the undeveloped prime-producer countries—can only benefit from staying out.

How will the quality of life in Britain be affected by joining the Common Market? Judging by the lack of discussion, apparently everybody assumes that it will make little difference one way or another. Is this right?

It is widely accepted among the environmentally concerned that increased economic growth inevitably produces more and greater environmental hazards, swallows more countryside, widens and proliferates our roads, increases our air and water pollution, and so on. The European Economic Community was formed with the primary purpose of enhancing growth. Is joining that community the best environmental direction for Britain to take? Is there any other direction which would be practical politics, yet give Britain a wider choice as to the rate of her growth, the distribution of her wealth, the degree of regulation of her society,

the level and nature of her employment and the quality of her environment in the future?

Anti-marketeers have sought to avoid any suggestion that they are less keen on growth as a goal than their opponents. They have chosen to gather their forces under banners of "sovereignty" and protection of British institutions, like the monarchy and British socialism. But British sovereignty has no significance in itself. The question is, or should be, what is it to be preserved *for*? Surely, the real objective is to continue to exert British control over the social values and the physical character of the British Isles.

Any other way to go?

It is of course highly debatable whether any practicable course open to Britain will be capable of preserving these values and this character. But unfortu-

nately the concern of anti-Europeans appears to be less with British life-quality than with their anxiety over the price of entry into Europe, or being run by those sinister continentals with their Catholic politics, tough labour laws, and powerful Communist parties. Proof of the fact that anti-marketeers' fears are generally focused less upon appreciation of British values than fear of continental ones seems demonstrated by their general preference for a NAFTA (North Atlantic Free Trade Area) alternative. But how should NAFTA, a free trade area composed of the US, Canada, Britain, Scandinavia (and almost certainly Japan would be included) compare as an environmental alternative to the EEC? Pro-marketeers claim with some justification, that despite its lack of overt political ties, NAFTA's bonds of trade, and penetration of American capital and manage-



ment would rapidly lock Britain into a set of economic relationships with North America which would prove as resistant to environmental improvement as any marriage to the Growthmen of Europe.

Perhaps it is time for many people in the political centre, who by now are bemused or bored (or both) by repetition and refinement of the economic argument for and against joining the EEC, to reconsider the case from a wider than purely politico-economic viewpoint.

The debate on Market entry has so far been the purview of politicians, economists and businessmen all blinkered to the view that rapid economic growth must be our overwhelming first priority. This is why Britain's unique economic record as the world's slowest growing industrial economy (her GNP has shown an average increase of a shade

under 2.5 per cent over the last hundred years) is always presented as a sad and shameful one and a prime reason for applying the shock therapy of Market entry. But how ironic that at the very moment that Britain seems likely to opt for entry into Europe so as to gain economic stimulus, many Americans, including the US Government's Council on Environmental Quality and President Nixon's National Goals Research Staff should be calling for a shift of emphasis away from raw growth—with its implicit tendency to distribute rewards in direct proportion to what people already have, thus increasing social tensions—and towards specific welfare targets and a national accounting system which takes qualitative social costs into consideration.

Our British Growthmen point out that it is all a question of the level of affluence that a nation has achieved:

that the time for Britain to arrive at US-type concern over her social policies and environment is when she can afford that luxury. Such thinking springs from an extremely narrow view of what constitutes national well-being and indeed national "wealth". The concept "standard of living" was designed for a more primitive economic age. All it takes into account is the amount of disposable income attained by an individual. But as most of us are aware, America's standard of living—now double that of all but three or four other nations—has produced a level of pollution of air, food and water that has left Californians technically unfit for human consumption. Their poisoning, not restricted to the ingestion of sulphur, carbon, lead, pesticide chemicals, etc., includes a staggering intake of drugs of all kinds taken to face the stress and anxiety of crime-ridden urban life. In a society where welfare blight goes hand in hand with urban blight and where urban blight has run tentacles all over the land down every major highway, in a country where even outer-suburban drinking water is chlorinated to the point of undrinkability, while the bottom one-fifth of the population live in rotting slums and often go hungry, the affluence standard has become a mockery.

The astonishing flood of American applications for British academic, scientific and business posts confirms that many Americans have grasped the difference between "standard of living" and "quality of life". The British Embassy in Washington has recently had to double its staff dealing with work permit applications of Americans wanting to move to Britain. My own university is deluged by American applicants (the ratio of American to British applications for scientific appointments is running as high as 10:1) and many of these applicants hold astonishingly senior positions and are prepared to accept salary cuts of 50-60 per cent. But as one US Government official ruefully volunteered to me on a recent visit to Washington, public realisation that quality of life can deteriorate while "standard of living" is still rising may have occurred too late. The task of radically redirecting the political and institutional engines of business and state may be simply beyond our power. That this may be the epitaph of the "industrialised" world in the not too distant future now seems quite probable.

Prototype post-growth society?

What are the prospects for our tight little island managing to resist this dismal trend? Despite the growth-orientated superstructure of businessmen and politicians, and despite its great abundance of capital and technically skilled manpower, British policy-makers have, to a remarkable extent, opted for values other than economic growth over the last century of national development. Growth economists of the left have blamed British policy makers for favouring prestige over national prosperity, and the City's interests at the expense of industrial expansion. Growthmen on the right blame not only the scale of "non-productive" public spending on welfare and all types of feather-bedding, but also the fact that we—much more than the Europeans—finance our welfare state from direct progressive taxation, which (they claim) discourages private saving and business initiative (and incidentally transfers wealth from rich to poor).

Unfortunately, however, the hypnotic influence of the growth yardstick has so far prevented almost all economists from recognising the distinctive behaviour of the British as regards economic efficiency, productivity and growth. Rather than face the possibility of introducing such factors as marginal preferences for leisure over purchasing power (why not a comparative joke-cracking index, or an index of nervous-tension illness?) economists have generally assumed that non-growth preferences spring from moral deficiency, while a few more charitable ones add that they are a function of economic maturity. These more sanguine economists claim that other industrial

ments. It would suggest that uniting Europe could result in mutual hindrance among the mature rather than mutual stimulation.

What is needed now is a careful positive appraisal of Britain's remarkable low-growth record. No-one has yet explained (or even discussed) this phenomenon from a positive viewpoint. The endless analyses of Britain's "shameful" economic performance in this century have all been cast in terms of failure. Failure to achieve the growth that other countries seemed to manage with ease. Failure to work hard at boring, unpleasant and monotonous jobs. Failure to invest in British industry instead of conspicuous spending on imported "apes and peacocks", or failure to invest at home instead of exporting capital to the White Commonwealth. But in the light from the end of the industrial tunnel—the light that many Americans seem to have glimpsed—this "failure" may start to look rather less like failure and more like some sort of success. Quite contrary to the dogma that progressive distribution of wealth is only politically manageable under conditions of rapid growth, such distribution has occurred to a considerable, though still inadequate, extent in this country under conditions of perennial economic sluggishness.

A partial explanation of all this may be summed up in one word. Imperialism. In the decade prior to World War I, the volume of Britain's industrial exports had almost ceased to expand and more than half of British investment of new capital was being made abroad. At the same time emigration was absorbing one-third of our natural population increase. Small wonder that Harold Mackinder, an Oxford political economist writing in the 1900s, foresaw the evolution of British "finance capitalism" as a post-industrial return to financial feudalism. Britain's future, according to Mackinder, lay not in natural resources or industrial technology, but in her great accumulation of capital and the City's skill in exploiting it. British industry would continue to decline, or at least stagnate, while the fund of British overseas investment continued to accumulate. Most of the resulting unemployed would emigrate to the opportunities opened up in the Empire and elsewhere by British loans and venture capital. The remainder—a delightful *belle époque* touch this—would be absorbed into the domestic

service of the investing middle class and the new financial aristocracy.

Mackinder's analysis projected a future which, while drastically modified by two world wars, bore some relation to actual experience. Despite the wars which wiped out some three-quarters of Britain's overseas investment income and saw the dismantling of Empire, the installation of a welfare state and the unleashing of working class consumption, Mackinder's ghost still lingers. Britain retained her predilection to export capital and talent.

The raising of British food prices once we are in the Market will further intensify our agriculture while leaving Commonwealth producers in the lurch.

What would have been the national growth rate had this large and constant seepage of the fuel of growth been put to work at home? No meaningful guess can even be hazarded on this point partly because the social-economic mix of policies preferred by the economically slumbrous and self-satisfied mother country contributed not only to the flight of her men and money but also to the "under-utilisation" (in conventional short-view economic terms) of her resources.

Whether or not we accept the thesis that Britain exported her most thrusting and energetic sons and daughters, every management and manpower study in the voluminous "what's-wrong-with-Britain" bibliography ends up with puzzlement at the non-economic objectives of the British populace. Why has no-one so far studied the relationship between attitudes of our tea-break fancying unofficial strikers and our conservationists and countrysiders? Blue collars may have more in common with blue blood than we realise. If so far trade unionists and environmentalists have found no interest in common, it may be because so few of them realise the potential impact on the British environment—medical and aesthetic as well as social and political—of the juggernaut demands of continent-wide industrial markets.

Road transport policy provides one vivid example of the political power of

The hypnotic influence of the growth yardstick has so far prevented almost all economists from recognising the distinctive behaviour of the British as regards economic efficiency, productivity and growth.

countries will soon catch the English disease and sink into British ways of economic sloth. Unfortunately there is very little evidence to support this latter view, and much against it. Besides, acceptance of its implications would appear to refute pro-Market argu-

anti-economic interests in Britain and the threat they face. Back in 1965 a remarkable decision was made by the then Ministry of Transport regarding maximum weight limits for vehicles on British roads. The 32-ton limit that was then decided was a virtually unique decision in terms of its choice of environmental values over economic gains. The scale-economies of larger lorries have been demonstrated not only in the USA but on the continent (EEC countries have a 44-ton limit). Here was a bold decision to limit the drive for road and bridge "improvement" and the extent to which our historic towns and cities are shaken apart by noise and vibration. Since then however, the battle of the road monsters has been re-opened. Market entry by Britain will buttress the pressure of the British transport lobby with arguments for European standardisation. Despite a further "no" from the Department of the Environment, the fight is still very much on, the truckers confident of victory when Mercedes Benz and Magirus Deutz join forces with Scammel and British Leyland.

How will Britain's concept of town and country planning, already battered but as yet unbowed, fare against the onslaught of pressures in a unified industrial Europe? Our country, plentifully supplied over two centuries of industrialisation with dark satanic mills still astonishes visitors with the greenness and pleasantness of the land. Organised social and political pressure for the preservation of our rural character and urban quality is at a high level of sophistication when compared to the Continent. But it is still uncoordinated, in fact riven with internal dissension. Can British environmentalists and conservationists combine effectively to withstand the pressures that multinational companies will wield in a federal Europe? Those who have organised themselves to protect this country's character must ponder the implications of a steady, 4, 5 or even 6 per cent growth rate of Britain's GNP as a "successful" contributor to the super-power of United Europe.

Return to non-synthetics: "Environment-with-development"

But if economic integration with other industrial countries is shunned, what are the future prospects for a Britain which earns almost one-quarter of its

national income in foreign transactions? The fashionable thesis of the 60s was that the value of our trade with the Commonwealth was expanding at only 0.5 per cent a year, while our trade with the EEC countries, growing at 7 per cent was threatened by the common tariff wall of the community. It was a carrot and stick proposition. We had to get in or we would be left out in the ever-increasing cold. At the same time we would prosper if we could contribute to a general freeing of trade between ourselves, the community, its African associate states, and the Commonwealth. Now it increasingly appears that EEC entry will really hurt the Commonwealth as well as be expensive for Britain. Higher British production costs, resulting from higher food prices will, on British entry into Europe, reduce our competitiveness and foreign exchange earning power just at the moment when our heavy out-payments to subsidise French farming call for larger export income. Besides this, the very fate of the Community itself is in serious doubt. For the effects of economic union will unquestionably be to increase the economic depression of some areas while producing mushroom growth in others. Yet it will be some time before member nations yield up the vestiges of their sovereignty to the federal institutions that will be needed to redirect the continent's pattern of growth.

These are some of the basic reasons why, just as the French, worried by German predominance in the club, seem agreed on accepting British membership, the long frustrated applicant is now cool to the idea. Perhaps if we included the environmental dimension into our economic equations we might see cause, while de-emphasising growth as our primary objective, to pay new attention to the Commonwealth trading relationship. Let our anti-polluters, for example, consider the prospects—both for Britain and the prime-produce exporters of the Third World—of a return to the use of natural vegetable oil soaps, a move which would benefit both our hard-pressed sewage treatment plants and poor countries' economies. Let them also consider the fact that if we join Europe, the political "clout" of our agro-chemical business complex will be vastly amplified by those of the continent. The raising of British food prices once we are in the Market will further intensify our agriculture while

leaving Commonwealth producers in the lurch. (The case of Commonwealth sugar, and the prospective large-scale substitution of intensively cultivated British beet for extensively cultivated Caribbean cane, is especially relevant here.)

Reconversion to natural materials from synthetics—with its double benefit to poor nation economics and rich nation environments—may be a profitable area for study, both for development and environmental economists. Of course, the logic of this reversion to a natural product preference applies with equal force to all industrial countries concerned with their environment. But will the market imperatives of traditional economics permit the short-term costs of such a strategy to be offset against the long-term costs of rich nation environmental degradation and poor national indebtedness and stagnation? One is forced to the conclusion that the only type of industrial state liable to think in these terms is one with high environmental awareness, a leaning towards supra-economic values, with close traditional ties to pre-industrial economies, and above all, with the capability of restraining the force of continent-scale industries.

National governments, no less than international business, are today held in technology's political thrall.

Britain shows many signs of being such a state. She is markedly ahead of the major continental countries—and remarkably close to the United States—in concern over the total environment-resources-population equation. A major reason for this is clearly the growing awareness in almost every sphere of British life, of our island's overcrowding problem. Our efforts for a better quality of life are hampered at present by a daily excess of 800 births over deaths, a growth which is scarcely affected by a net emigration from Britain of 55,000 a year and which involves a massive diversion of resources away from better health, education and recreation facilities for our present population. So far, unfortunately, non-economists and non-business interests have been lulled into oblivion to all but the crudest calculations of entering Europe. Who, for example, beyond

unionists and economists, has contemplated the impact of the free movement of labour, guaranteed under the Rome Treaty, in bringing additional pressure onto our already scarce environmental resources? Protestant-Catholic politics could well ally here with the economic and environmental issues into a truly explosive mixture. In joining the Six, may we not suffer an environmental penalty in direct proportion to our ability to keep our environment more attractive than that of our federal fellows?

Technology—the last imperialist?

Economists sometimes jokingly suggest that British growth-phobia is misconceived. Don't you see, they say, that on entering the community, Britain will become the depressed area of Europe? Far from being a humming dynamo of development her capital and skilled manpower will desert her, while tourism—the economic payoff of environmental preservation—will sustain our balance of payments, encouraging us to turn our fair land into a fairground, as gasping workers from the Ruhr holiday in Birmingham to get away from it all.

Visions of Britain returning to a role as the seat of the arts and pastoral pleasures after her grimy industrial experience have been entertained since the early 1800s. And not only by poets. Our political and economic imperialism made it possible for this dream to linger to Mackinder's time and beyond. But the imperialism of today is not so much of individual nations or political ideologies but of technology itself, already past the control of man.

As the new master of the earth, our technology demands that the great multinational companies harness the potential of Europe's 300 million market, so as to make possible its ever more dramatic—yet more dehumanising—feats. National governments, no less than international business, are today held in technology's political thrall, propelled into decisions whose implications they cannot foresee, let alone control. The Concorde, Tristar and Roskill crises occur at a time when growing aircraft overcapacity is putting almost every commercial airline deep into the red. Each is a vivid demonstration of the way in which advanced technology has simply got beyond the control-capability of our basically 19th century

political institutions.

This is why it is vital that ecologists, conservationists and environmentalists generally, see control of techno-politics as the central problem, and divided science as the central threat. Otherwise

*We shall have to evolve
Problem-solvers galore,
For each problem they solve,
Creates ten problems more.*

Otherwise, too, we may succeed in giving the Osprey a further lease of life while allowing our total environment prospects to be bargained away in political-economic package deals like the federation of Europe.

Above all, we must be alive to the dangers, not only of poisoning and suffocation but also of monotony and inhumanity that the technology of continent-scale business must breed. Lincoln Steffans returned to the United States from the Soviet Union announcing, "I've seen the future and it works". I have recently returned from seven years in the United States with an equally strong conviction. I have seen the future of federal industrial Europe. It doesn't work.

Make your garden a bird sanctuary

THE BIRD GARDENER'S BOOK

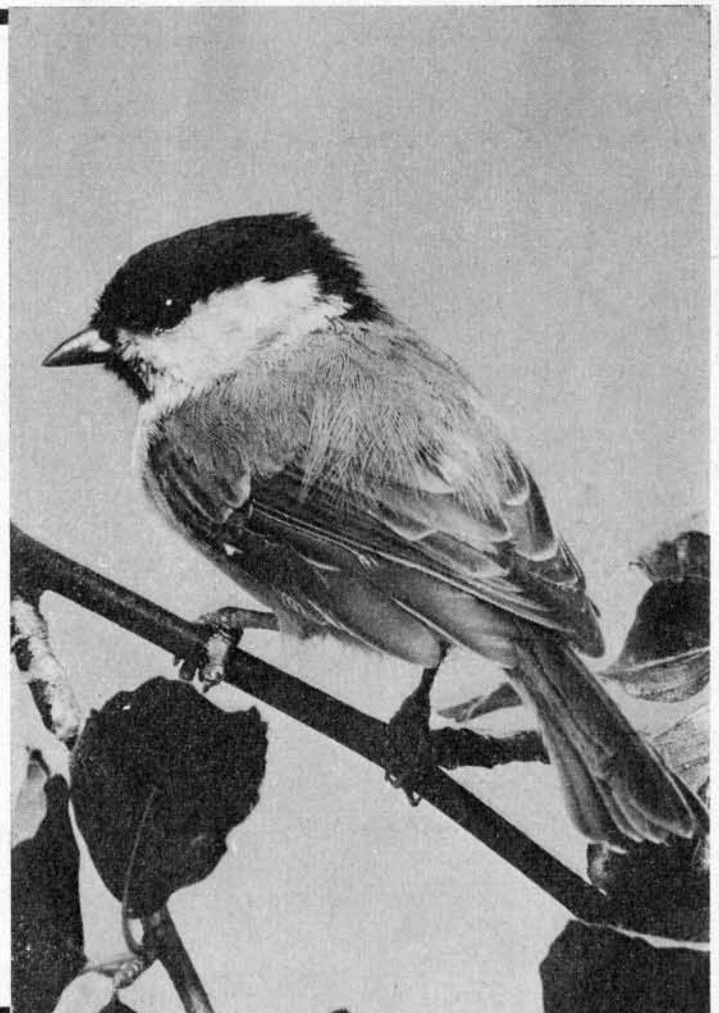
Rupert Barrington

Today, when the natural habitat of our wild birds is fast disappearing, this book is of vital importance. From his own experience the author shows how even a town garden can be planned to encourage a wide variety of wild birds to nest and feed there. Facts are given about trees and shrubs, artificial nesting sites, suitable food and protection from predators. This is a book for all who care about bird survival.

With drawings and diagrams

£1.50

**WOLFE PUBLISHING LTD.,
10 Earlam Street, London, WC2**



Trace elements in the human environment

by Henry A. Schroeder

Trace element pollution is more serious and insidious than pollution by pesticides or carbon monoxide. Here Professor Schroeder isolates the most dangerous metals in air and water and describes those that must be controlled immediately. He also examines trace element deficiency in modern refined food and shows this, too, is a cause for concern. Although the data used are American, they are no less valid in this country, and the Government should take steps urgently to reduce contamination by cadmium, lead, nickel carbonyl and mercury. Monitoring is no longer enough.

Living things have been exposed to trace elements since the beginning of life on this planet, and all living things contain them in their tissues and use some of them for basic chemical reactions. In fact, seven are necessary for the life of plants and eleven are essential for the life or health of birds and mammals, insofar as is presently known. In biological, and especially human terms, a trace element is one which is found in amounts less than 0.01 per cent of the body. All but three, iodine, fluorine, and selenium,

are metals: chromium, manganese, iron, cobalt, copper, zinc, molybdenum, and possibly strontium and nickel. Bulk elements such as sodium, potassium, calcium, magnesium, chlorine, phosphorus and the organic complexes of carbon, hydrogen, oxygen, nitrogen, sulphur, comprise most of the mammalian body.

Aside from these required elements, twenty-eight other trace elements have been found in modern American human tissues, most of them metals, and some of them in concentrations large enough to cause concern as to possible innate toxicity.

The vital questions are: Which elements have necessary biological effects? Which elements are inert biologically? Which have innate toxicity, perhaps to cause chronic disease?

Man has been unwittingly exposing himself to increased amounts of trace metals in food, water and air since he first learned to use metals—in fact, since he first used fire. Only for the past hundred years, however, has he been polluting his environment with metals in large amounts, from increasing industrialisation, smelting, refining and the burning of coal and petroleum for energy.

Pollution by metals and other elements must be considered in terms of the whole environment, air, water, food and in some cases, contact. What goes up in smoke must come down in soot, rain or snow, entering the soil and plants in the food chain, entering the waters to be taken up by plants

and fish, entering the human body by breathing contaminated air, drinking contaminated water, eating contaminated food. Certain metals are easily absorbed by the human lung or intestines; others are poorly absorbed, accumulating in lungs with age but not accumulating when taken in food or water. Others accumulate in the human body with age and continuous exposure and some of them can cause disease in older persons thus exposed. The important questions are: Which elements are absorbed from lungs? Which accumulate in human tissues? What are the signs of innate toxicity, if any?

Therefore, we must examine metallic pollution sensibly and in the light of knowledge as to the behaviour of each pollutant.

Fifteen years ago we set about answering these questions by duplicating the experiments which man has performed on himself, in small mammals, and observing life time effects, in an environment controlled as to contaminating trace elements in air, water and personnel. We can now provide part of the answers.

Air pollution by metals

There are at least twenty-seven trace elements found, or probably found in air. Five are natural pollutants from soil and dust—exposure is age-old. Four of these, titanium, aluminium, barium and strontium, accumulate to some extent in the human lung, but none is toxic, as far as is known. The fifth, iron, is both a natural and an in-

dustrial pollutant, is absorbed by the lung, is essential for life and seldom accumulates in the body. These five can be neglected at present levels of exposure.

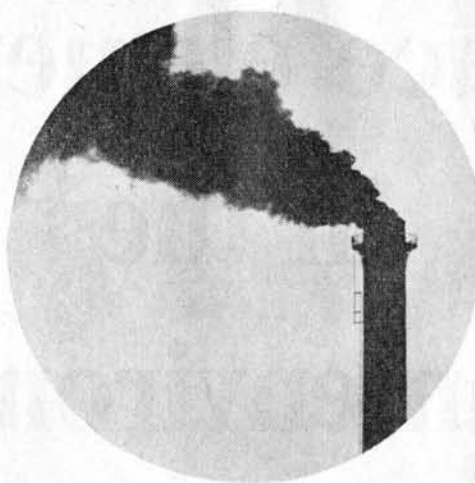
Six other metals in air are essential: chromium, manganese, cobalt, copper, zinc, molybdenum. Chromium is an industrial pollutant from coal, accumulating in insoluble particles in the lung; natural chromium occurs in food. The others do not accumulate, and merely add small increments to the needed amounts absorbed in food. They can be neglected at present levels of exposure.

The remaining sixteen are industrial contaminants. The burning of coal provides air polluted with nickel, titanium, beryllium, fluorine (essential as fluoride for health), boron, germanium, tin, arsenic, selenium, yttrium, and probably more. The burning of petroleum and its products (except gasoline) provides air polluted with nickel, arsenic, vanadium, niobium, zirconium, yttrium. Cadmium, tin, antimony and bismuth are also found in air from various industrial sources. Airborne lead is largely a result of anti-knock additives to gasoline, in the form of tetra-methyl lead. Mercury in paints and in seeds can volatilize into air.

Six of these elements can be hazards to human health. Of these, cadmium is a present and real hazard. Lead offers a potential and imminent hazard. Nickel, which is found in diesel oil, residual oil and coal has caused cancer of the lung in animals and exposed workers, and therefore presents a potential, if not a real hazard to the public health. These three require immediate control. Beryllium has appeared in the air of nine urban and four non-urban areas of the United States. It accumulates in the lung, and can cause cancer of the lung and serious disease; while probably a minor hazard at present, it could become a real one if not carefully controlled. Antimony in low doses shortens the life span and longevity of rats; it has appeared in the air of seven areas, and if not controlled, could become a hazard. Mercury in air is probably of little importance to health at present, unlike mercury in water, which is taken up by fish and concentrated.

Cadmium, lead and nickel

Cadmium is a constant contaminant of zinc, and where there is zinc (an



Nickel carbonyl must be specifically treated to decompose it in smelter and refinery stacks and in emissions from chimneys and diesel exhausts; no nickel additives should be allowed in gasoline. Beryllium and antimony in air can be controlled by reducing particulate emissions from coal smokes.

essential metal) in air, there is cadmium, in ratios from about 11:1 to about 48:1, depending on area. Cadmium interferes with zinc biologically, accumulates in blood vessels, kidney and liver, and causes high blood pressure in rats at tissue concentrations found in American adults. Death rates from cardiovascular disease by area are highly correlated with airborne cadmium and cadmium in milk. People dying of high blood pressure have abnormal amounts of cadmium in their kidneys. There is little doubt in my mind that cadmium pollution is a major factor in human high blood pressure, from which 23 million Americans suffer. Therefore, it should be rigidly controlled. Air, however, probably provides only a small increment of the total cadmium daily absorbed, the largest part coming from water and food.

Lead from motor vehicle exhausts enters the environment in amounts of two pounds per capita per year. We have found enough lead in vegetation growing beside a secondary highway (up to 200 parts per million, wet weight) to abort a cow subsisting on this vegetation; the concentration has trebled in six years. Fifteen of twenty

samples of melted snow from the same place had more lead than the allowable limit for potable water, and seven samples had more than five times that limit. Lead accumulates in human bone and other tissues with age in the United States but not in Oriental and African countries, according to our data.

Airborne lead is directly related to the consumption of leaded gasoline. Evidence of a biochemical abnormality in persons exposed to urban air concentrations of lead is beginning to appear. There is little doubt that at the present rate of pollution, diseases due to lead toxicity will emerge within a few years. There is urgent need at present to reduce and eventually eliminate lead additives to gasoline, before environmental lead, which has now contaminated the Northern Hemisphere, builds up much further.

Nickel carbonyl is formed when hot carbon monoxide passes over finely divided nickel. Coal, petroleum, diesel fuel and residual oil contain nickel, which is extruded in chimneys and exhaust pipes in an atmosphere of hot carbon monoxide. Methods are available to reconvert the resultant nickel carbonyl, which is retained in lung and is carcinogenic in the lungs, to nickel or nickel oxide, which is less toxic and is not retained in human lungs. Nickel salts in low doses may be essential for birds and possibly mammals. We have calculated that the annual global emission of nickel from fossil fuels into the air amounts to 70,000 tons or 14.5 per cent of annual world production, worth some \$110 million.

Vanadium, a component of Venezuelan and Iranian low sulphur petroleum (there is less or little in other known oils with higher sulphur contents) accumulates in human lungs with age. Vanadium in air occurs in a belt along the Atlantic seaboard and in Puerto Rico, where these oils are directly delivered, and in the North there is more in winter air than in summer. In low doses it had no effect on longevity of mice and rats, and probably presents no real and present hazard to health. Niobium also occurs in petroleum; it also showed little or no innate toxicity.

Arsenic occurs in coal and oil. In spite of its reputation as a poison, it has a low order of toxicity to mammals, and in small doses for life has no detectable biological effects. It is well tolerated, there are relatively large

amounts in seafood, and it is doubtful that arsenic is innately toxic at present levels of exposure. (In fact, it promoted longevity of rats).

Selenium is a constant contaminant of sulphur, and therefore occurs in the air probably as the dioxide, along with sulphur dioxide. It is carcinogenic in mice and rats; whether the low concentrations in polluted air cause prolonged ill effects is not known. Selenium in very small doses is essential for mammals. Human intakes from air have not been measured.

Germanium has little innate toxicity, and boron or borate probably has none, although boranes are toxic. Yttrium is carcinogenic in mice exposed to it for life; it has not been measured in air.

Therefore, there are five trace metals in urban (and non-urban) air which are of concern in respect to human health, and 22 which are of little concern at present levels of exposure. One has not been measured.

Water pollution by metals

US Geological Survey Water Supply Paper 1812 (1964) lists analyses of municipal water supplies of the 100 largest cities of the United States. Twenty-three trace elements were looked for, 16 were found in sizeable quantities. Of these 16, five are essential, 10 are biologically inert, and only one, lead, is toxic on life time exposures.

The maximum concentration of lead found was 62 parts per billion (ppb), which exceeds Federal Criteria of 50 ppb; the median concentration was 3.7 ppb. Lead in potable water has offered a hazard to health for over 2,000 years. Only about 10 per cent of the lead ingested in water, however, is absorbed by the body; nearly half the amount absorbed by urban dwellers comes from air. Lead from motor vehicle exhausts can contaminate water in reservoirs to a small extent. Lead in water mainly comes from lead pipes containing soft, acid water.

Cadmium was rarely detected in water because the method used was fairly insensitive. By using a sensitive method, we found that eight of 23 tap waters had cadmium exceeding allowable limits of 10 ppb, and demonstrated a pick-up of cadmium from water mains and pipes in houses, compared to water in reservoirs and streams.

This solution of cadmium from pipes



Lead from motor vehicle exhausts enters the environment in amounts of two pounds per capita per year. We have found enough lead in vegetation growing beside a secondary highway (up to 200 parts per million, wet weight) to abort a cow subsisting on this vegetation; the concentration has trebled in six years.

occurs only in areas with soft, acid waters, not in areas having hard waters. Because there is a direct relationship of cardiovascular death rates in the United States, Great Britain, Sweden, Canada and Japan with degree of softness of acidity of water, we strongly suspect cadmium, which can cause high blood pressure, as the offending agent.

Permissible criteria for limits of trace elements in water are mainly satisfactory, although from the standpoint of innate toxicity alone they could be raised in the cases of barium, boron, chromium, iron, manganese, and zinc and lowered for cadmium. No changes on this basis are recommended for arsenic, copper, fluoride, lead, selenium or silver. Whereas municipal water supplies of large cities are generally satisfactory, those for small towns may contain elements with possible toxicity in amounts exceeding drinking water standards.

Undoubtedly there are other trace elements dissolved in water which are not removed by treatment, but aside from lead and cadmium, none appear to be potentially hazardous to human health except under unusual circumstances and conditions. Analyses are needed, however, in the cases of pol-

luted rivers containing factory effluents which supply municipal waters or which contain toxic elements when these elements enter the food chain.

An example is mercury. Total maximal potential exposure to mercurial compounds used in agriculture, paint and dental fillings amounts to 1.85 grams per capita per year. If pharmaceuticals are included, the total is 2.6 grams. Undoubtedly only a small amount of this total represents real exposure. Unlike lead, inorganic mercury does not accumulate in the body but organic mercury is deposited in fat and nerve tissue, where it is less mobile. Alkyl mercuric compounds are especially toxic to the brain.

There probably has been mercury in fish ever since there were fish, for there is a background level in water. Mercury has been in air since the dry land appeared, for it is present in soils (up to 0.8 parts per million) and it is volatile. Mercury is found in all living things, but the increasing industrial use, from 2.7 million pounds in 1947 to 5.5 million pounds in 1966, has caused contamination of waters. As a result of methylation of inorganic mercury by bacteria in muck, fish have accumulated organic mercury. The amount of mercury used in agriculture and paper has decreased considerably, however, in ten years, while that in paint has tripled and that in drugs has doubled. Mercury as a source of water pollution should be controlled, in order to avoid possible toxic effects in human beings who eat much contaminated fish. The amount of mercury in water itself offers no direct hazard to human health when the water is drunk.

Metals in food

The relative amounts of essential trace elements absorbed from water are small compared to those absorbed from food. In respect to the toxic trace elements, nearly half of the total lead absorbed by urban dwellers come from air, and probably a sizeable increment of total cadmium comes from water. The potential hazards from lead, beryllium, nickel and antimony today are in polluted air; hazard from cadmium is in air and water. In respect of food, the situation is reversed.

Extensive analyses of foods and waters by us have revealed that, in general, most foods raised locally or bought in supermarkets or chain stores are relatively free of toxic metal con-

taminants. The food industry has kept their products quite clean in respect of contaminating trace elements, with individual exceptions. Canning introduces tin into foods, but it has a low order of toxicity.

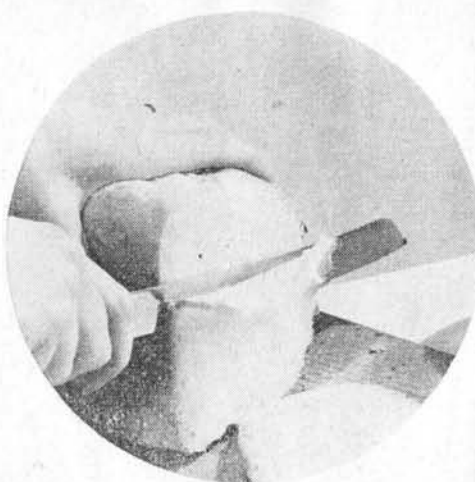
The hazard in foods occurs not from contamination but from refinement. Major sources of caloric energy are largely refined, and in refining, much or most of the trace metals essential for health are removed. Unfortunately, they are not restored to the food. Thus, at present, we have a situation in which domestic animals and pets receive more than adequate amounts of elemental micro-nutrients, whereas man can get only marginal amounts.

Thus, the milling of wheat into refined white flour removes 40 per cent of the chromium, 86 per cent of the manganese, 76 per cent of the iron, 89 per cent of the cobalt, 68 per cent of the copper, 78 per cent of the zinc and 48 per cent of the molybdenum, all trace elements essential for life or health. Only iron, and that in a form poorly absorbed, is later added to flour. The residue, or millfeeds, which is rich in trace elements, is fed to domestic animals. By the same process, most of eight vitamins are removed from wheat; three are added to make the flour enriched; millfeeds are rich in vitamins. Similar depletion of vitamins and essential trace elements occurs when rice is polished and corn meal is refined. Likewise, most of the bulk elements are removed from wheat: 60 per cent of the calcium, 71 per cent of the phosphorus, 85 per cent of the magnesium, 77 per cent of the potassium, 78 per cent of the sodium, which appear in the millfeeds.

Refining of raw cane sugar into white sugar removes most (83 per cent) of the ash, and with it go the trace elements necessary for metabolism of the sugar: 93 per cent of the chromium, 61 per cent of the manganese, 92 per cent of the cobalt, 76 per cent of the copper, 67 per cent of the zinc and 98 per cent of the magnesium. These essential elements are in the residue molasses, which is fed to cattle.

Refined fats contain little magnesium, cobalt or zinc but have adequate amounts of copper and manganese. They are generally low in chromium.

Therefore, most of the energy in the average American diet, which comes from white flour, white sugar and fat, is not supplied with the trace substances



The hazard in foods occurs not from contamination but from refinement. Thus, at present, we have a situation in which domestic animals and pets receive more than adequate amounts of elemental micronutrients, whereas man can get only marginal amounts.

needed to utilise that energy efficiently and properly.

Requirements of domestic and laboratory animals for essential trace elements are usually higher than are the amounts found in American diets. Whereas specific deficiency diseases are not generally recognised, there is evidence accumulating that dietary deficiency of zinc may be fairly common in older persons, in pregnant women and in patients with liver disease and chronic infections. It is possible, but not proven, that human beings subsist on marginal intakes of manganese, for animals given the same concentrations as are found in human diets show signs of deficiency.

Dietary deficiency of chromium is common in the United States but not in most foreign countries. Some 20-25 per cent of older adults show undetectable amounts of tissue chromium, whereas this lack was found in only 1.5 per cent of foreigners. Chromium is necessary for sugar and fat metabolism. In rats, the signs of chromium deficiency are elevated blood cholesterol. Mild diabetes and changes in the major arteries resembling the fatty deposits of arteriosclerosis is caused partly by chromium deficiency resulting from the

refining of sugar, flour and fat. Arteriosclerosis in the US accounts for more than half the deaths of middle aged and older persons. The disease can be prevented in rats; further study is needed.

Some abnormal trace elements cause cancer in animals when they are fed for a lifetime. Of 26 studies, we found only five: yttrium, rhodium, palladium (no problem of pollution from these metals, so far as is known), selenium and tellurium. There appears to be no contamination of foods or waters by these elements, and they occur in very small quantities.

Strict adherence to and broad interpretation of the Delaney Clause to the Food Additives Act of 1958 would require that beryllium and selenium be prevented from entering air and water, that environmental control of yttrium, rhodium and palladium be strict, and that no nickel carbonyl be emitted from diesel exhausts and in smokes from nickel refineries.

Interactions

Life has evolved in the presence of a balance of trace elements found in sea water. Toxic elements are there in small concentrations; necessary ones are readily available. Plants on land obtain their necessary trace elements from soil, and within certain limits, reflect the soils on which they are grown. Animals get their trace elements from plants.

Deficiency of an essential trace element causes disease in both plants and animals; high concentrations are toxic and lead to non-survival. Thus, when the balance is disturbed, from natural or man-made causes, the result can be serious.

Essential trace elements are very basic to life, to basic processes of energy transformation, growth and probably senescence. The action of each element in plants is quite similar, although there are examples of the utilisation of an element by a primitive species which is not used by other species. In mammals, it is probable that each essential trace element has similar actions in all species, including man.

Abnormal trace elements in larger than optimal amounts may enter living systems and interfere with the actions of essential trace elements. Similarity of atomic structures can lead to the interaction of one element with another in a system and cause biochemical alterations which lead to disease. This reac-

tion occurs when the balance of nature is upset, as it is now that man has added large concentrations of metals and other elements to his environment by mining them and literally spreading them over the face of the earth in air and water.

An example of such an interaction is that of cadmium, which mammals have no efficient mechanism to handle, because they have evolved in a low-cadmium environment. Cadmium, which is atomically similar to zinc, enters zinc dependent systems, and alters them. One result is high blood pressure, which has been produced by cadmium, but is more easily produced by cadmium in the presence of a low dietary intake of zinc.

Other environmental metals may cause deficiencies of essential metals by interfering with chemical reactions basic to life or health. They have been little studied from this viewpoint, and much more research is needed. The importance of this problem is illustrated by the fact that rats and mice spending their lives in an environment controlled as to metallic contamination live 20-25 per cent longer than do animals in the contaminated environment of the usual animal quarters. Furthermore, congenital abnormalities have been produced by exposing breeding mice and rats to cadmium, lead or selenium, for several generations, and the sex ratios of offspring have been altered by arsenic and molybdenum. There is a good correlation of certain qualities of municipal water supplies and deaths from congenital abnormalities in the United States, and the qualities involve trace elements. This phase of the whole problem is only beginning to be studied.

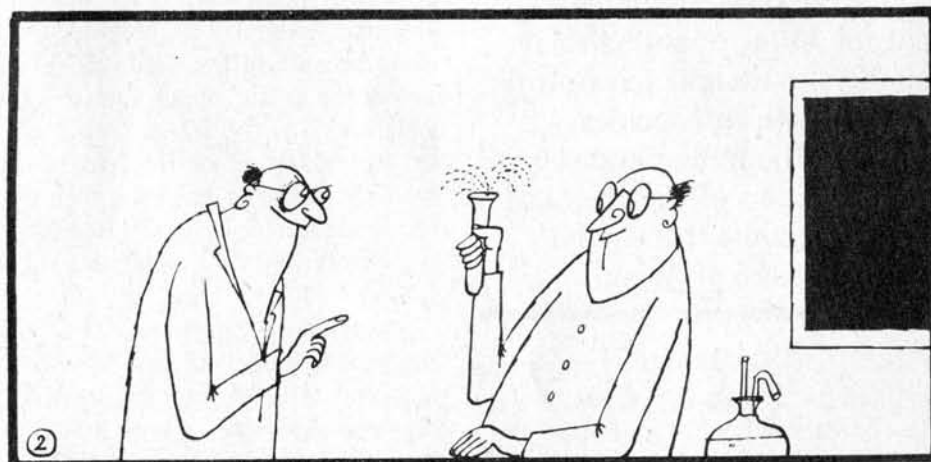
I must emphasize that environmental pollution by toxic metals is a much more serious and much more insidious problem than is pollution by organic substances such as pesticides, weed killers, sulphur dioxide, oxides of nitrogen, carbon monoxide and other gross contaminants of air and water. Most organic substances are degradable by natural processes; no metal is degradable. Elements in elemental form or as salts remain in the environment until they are leached by rains into rivers and into the sea. Some of them are slow to move; lead and arsenic, for example. Those metallic and elemental pollutants we have with us now are here to stay for a long time. Therefore, every effort

must be made to slow the environmental build-up of those elements which are toxic and can cause degenerative disease, neglecting those which are essential for living things and those which are biologically inert.

In order to maintain the present environmental balance of trace elements, we must control further pollution by those elements which give us concern. In the order of importance, cadmium in air can be minimised or virtually abolished by abatement of zinc, from which it comes. Lead in air can be virtually abolished by eliminating alkyl lead additives to gasoline. Nickel carbonyl must be specifically treated to decompose it in smelter and

refinery stacks and in emissions from chimneys and diesel exhausts; no nickel additives should be allowed in gasoline. Beryllium and antimony in air can be controlled by reducing particulate emissions from coal smokes. Mercury in water can be controlled by regulation of factory effluents and by finding less toxic fungicidal compounds for grains, paper and paint. If measures for abatement were directed at these six metals, particulate matter in air and pollution of water would inevitably diminish.

This discussion does not exclude the possibility that other trace elements insidiously toxic to man may be discovered in the environment on further intensive research.



How Boophilus tricked the tickicides

by Michael Allaby

One of the ecological effects of the use of pesticides may be the development of pests that are immune to the chemicals used. This is particularly true of insecticides. In parts of Australia parasitic cattle ticks were introduced without any of the natural controls that might have limited their numbers. Attempts to control the pest with insecticides appear to be failing and the intensification of the chemical warfare against them only aggravates the problem.

LOBE is a charged word. It may bring no blush to a maidenly cheek, but to those concerned with farm pest control it is shocking.

It means Loss Of Biological Efficiency. It is the term used to describe a situation in which a pesticide can be used no longer because the pests have become immune to it.

Australian farmers are reeling from a severe attack of LOBE at the moment. An area some 200 miles inland from the Pacific Ocean, stretching from the Queensland/New South Wales border, across the northern part of the Northern Territory, to the north of Western Australia, is suffering from cattle ticks.

The tick, *Boophilus annulatus microplus*, is widely distributed throughout the tropics and sub-tropics, as far south as the 34th parallel in Argentina but only down to the 29th parallel in Australia, to which it was introduced around 1872. By 1900 it had spread all over the north and the coastal part of Queensland. There are two main types of tick. *Boophilus* is one of the Ixodid, or shield, ticks, the kind which infest domestic animals. They earned their name because of the hard shield which covers the entire upper surface of the male and a small area on the front of the upper surface of the female. They are one-host ticks, spending their entire life cycle on one host, although not necessarily on the same part of the animal.

They have a short life. The female engorges herself with the blood of the host and falls off into the grass where she lays her eggs. These hatch into "seed ticks" which attach themselves to any animal brushing against the stalk or leaf on which they are waiting. The seed tick moults into a nymph which feeds for about 10 days before it becomes adult. After mating the female engorges herself and drops off into the grass to lay her eggs and the cycle begins again. Male ticks develop more quickly than females, the female cycle taking three to five weeks compared with two weeks for the male.

Ticks are vectors for a number of diseases, including babesiosis, gall sickness and spirochaetosis, collectively

known as tick fevers. The fevers can be treated but the cattle develop more slowly, suffer from a general debility and milk yields are lower. Tick wounds also provide sites for secondary infections. Cattle can develop an immunity to tick fevers but if fresh stock is introduced which is not immune animals are likely to suffer badly and may even die.

Boophilus can attack cattle, horses, sheep, goats, game animals and dogs, but the Australian strains appear to confine themselves to cattle. Ticks must be controlled to safeguard livestock production.

The standard treatment is dipping or spraying the animals with insecticides. In Australia dipping began about 50 years ago, using arsenite of soda. This was only partly successful and some immunity developed among the parasites. Then DDT was used, but about eight years ago DDT dips were banned because residues were remaining in the meat, which was no longer acceptable for export. Organophosphorus compounds were introduced. More toxic than the organochlorines, they leave no residues.

Five years ago the tick problem grew worse. Farmers found they were having to dip more regularly and ticks were encountered during the winter, when the cattle had always previously been tick-free. After two years, more definite resistant strains appeared. The Queensland Department of Primary Industries began a campaign to wipe out

the resistant ticks. Quarantine areas were designated and farmers in them were required by law to eliminate ticks by intensive dipping programmes. Stringent controls were imposed on the movement of cattle. The insecticide used in the quarantine areas was paid for by the government. The programme had some success. On some properties it was possible to go for quite long periods without dipping. The general condition of the cattle improved.

Trouble returned in December, 1968. One farmer, Peter Stephens, describes what happened:

"We were quarantined in December, 1968, and had already dipped three times before that. We had to dip every 17 days with the mixture at double strength until September, 1969, when the whole campaign was stopped and the government reported that the problem was under control. We suspect that the real reason was that the campaign was becoming too costly. When it was stopped in September, 1969, we carried on dipping every 21 days until December, 1969, when we stopped. Six weeks later we had an infestation, so we started again, and we are still dipping in April, and I don't think the ticks have ever been worse, and we have to dip at double strength to have any control."

Clearly, *Boophilus* was winning. Mr Stephens believes the intensive dipping may have aggravated the problem. At about this time a new insecticide appeared, called Prolate. It was supposed to kill resistant ticks but it is now virtually useless.

On 7 May an editorial in *Queensland Country Life*, a farming paper, called for the eradication of ticks. Headed "Get Rid Of Ticks", the article attacked opponents of tick eradication who were, it said, "about to reap the harvest of their unimaginative handling of Queensland's No. 1 pest problem". The editorial supported a plan to eradicate the tick completely from southern Queensland and to aim for a tick-free state. Just how the editor proposed to achieve this is a little vague. An article in the same paper reported that insecticides—they call them "tickicides"—at strengths which would kill cattle did not affect the ticks. Mr Michael Ahern, member of the Queensland State Parliament and an agricultural scientist, believed resistance had been spread by the widespread, indiscriminate use of tickicides, which

should have been employed more intensively but under greater control to free the state of ticks area by area. Mr L. G. Newton, of the Department of Primary Industries, is reported to have admitted that "strange things were happening with some of the chemicals".

Conflicting advice was being given to farmers. The normal procedure had always been to dip monthly between October and May. In 1968, when resistance was spreading, farmers were advised to dip five times at 21 day intervals before Christmas, and then two or three times in March and April. Then they were told to dip intensively in the autumn (our spring) to kill the ticks which otherwise would lay eggs for hatching in the spring and summer. This was changed again in favour of a programme of dipping every 10 days using stronger mixtures, up to double strength. This appeared to have some effect.

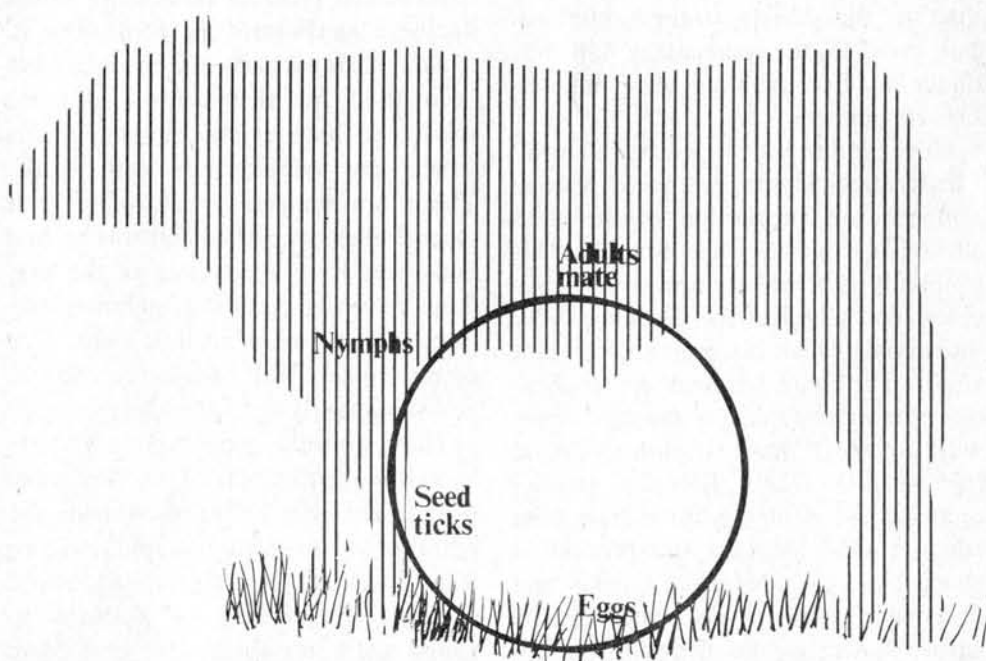
The tick was becoming expensive, both in terms of money and of labour, and it looked as though it might get worse. The insecticide is applied either by a plunge dip that the animals swim through, or by a spray race, an arrangement of sprays through which the animal walks, rather like an automatic car wash. Mr Stephens says that on his property it takes two men three days to dip all the stock. The cost is about 10 cents a head, or 60 dollars for the whole herd. Though he finds this cost acceptable, he fears it may become necessary to dip or spray on a continu-

ous weekly or fortnightly basis. Moreover, handling the animals reduces weight gain.

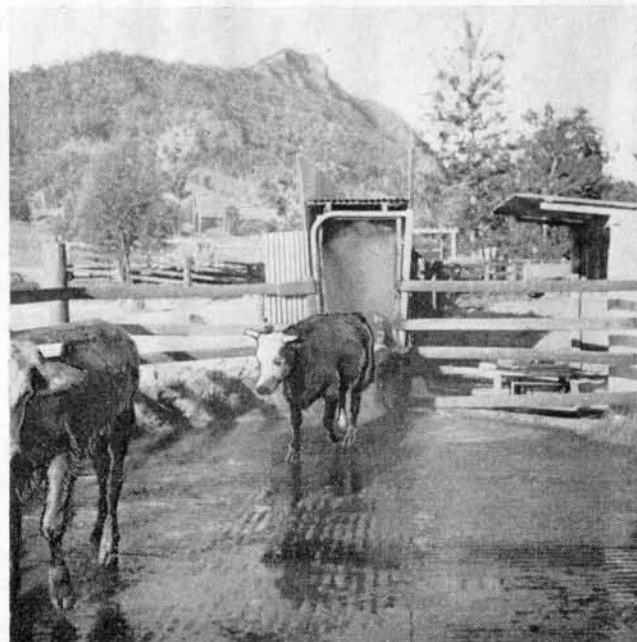
On 14 May the Queensland press reported that the Australian Agricultural Council had appointed a special advisory committee to examine tick control and that this committee would report later in the month. The Director-General of Primary Industries, Dr Harvey, said that tickicide resistance was not new. It had been observed first in the 1940s, when resistance to arsenical compounds began to appear and that the situation had been kept under constant watch. A substantial programme had been in operation. The latest tickicide to be introduced, Dursban, was already producing resistant strains, but Dr Harvey said this was not widespread and, in any case, the ticks were not resistant to Nexagan, another tickicide. There was some confusion over this because others claimed resistance to Nexagan had appeared. Cattlemen were beginning to talk of changing their cattle for tick-resistant breeds.

A few days later Mr J. A. Pope, Animal Health Product Manager for Dow Chemicals (Australia) Ltd., said there was strong evidence that a new strain of ticks had appeared which was resistant to all available dips. He warned that resistance could be increased by using dips which were under strength.

This, it seems, is what had happened in the case of Nexagan S. On 21 May, *Queensland Country Life* denied that



The Spray race: Animals walk through an arrangement of sprays rather like an automatic car wash



ticks were resistant to this compound. Some farmers, the paper said, had not been aware that they were supposed to be using it at double strength.

Then, at last, the problem was solved. A joint statement was issued by BASF Australia Ltd. and Monsanto Australia Ltd. which said that double strength dippings at 10 day intervals would prevent the ticks from getting out of hand next summer. The world was saved. Or was it?

By early June farmers were spraying and dipping intensively but the ticks were developing resistance to each new tickicide almost as fast as it could be introduced and the infestation was as bad as ever. One farmer has said that ticks appeared more susceptible to single strength Dursban and Nexagan than to the double strength mixtures but even so the percentage kill was under 40. For the time being it looks like stalemate.

How can the population be reduced? Clearly, tickicides do not work. At each application a proportion of the ticks survive because they are immune. This immunity is hereditary and so all pesticides tend to select for breeding those individuals which can found a resistant strain. The more frequent the application, the more rapidly a resistant strain will appear. Some South African farmers use sheep. Being a smaller animal than a cow, with a long coat which trails closer to the ground, a sheep picks up ticks more quickly and in greater numbers, so protecting the cattle. The sheep die of tick fevers but

the cattle, which are more valuable, are saved. This solution might not work in Queensland where a selective group of tick strains appears to have evolved which prefer cattle and where the dingo makes it necessary to fence land on which sheep are grazed. A second solution, also from South Africa, is to burn the grazing, field by field, under strict control. The fire destroys the ticks. As the grass recovers it forms a quarantine area into which cattle can be brought as soon as they are tick-free. The method is cheap and provided it is not repeated too often it probably does little harm to the land. Nevertheless good farmers are always reluctant to burn land and Mr Stephens is opposed to it.

Once the tick population has been reduced the problem remains of introducing a mechanism for controlling it. Mynah birds eat ticks and mynahs have been used for tick control in some places. So have egrets, the small birds which live symbiotically with cattle. There are dangers in introducing a second alien species to control the first and there have been cases of the predator reducing the pest population only to become a pest in its own right. This seems unlikely with insectivorous birds, and particularly unlikely with the egret.

There are other possibilities. The release of large numbers of sterilised male ticks might be effective in reducing the initial population, but it would not keep it in check in the absence of natural enemies. There may be diseases to which ticks are susceptible and there

are some oil-based insecticides which are highly selective and to which insects do not acquire immunity very readily.

Peter Stephens is a worried man, caught in a trap. He believes an alternative to the purely chemical solution must be found. "I do not believe in insecticides and I feel a hypocrite when we have to use them so intensively, but I just have to face the fact that at the moment we are dependent on their use. Insecticides for tick control are big business for the chemical companies, and I feel that perhaps there is too much emphasis on developing stronger chemicals and not enough on finding a permanent solution."

Any permanent solution must take account of the ecological imbalance which allowed the numbers of one species to grow to pest proportions. So far all attempts both to reduce the population and to control it have been wholly chemical. The situation has deteriorated so far that it is difficult to see any outcome satisfactory for the farmer. If there is one it must be based less on eradication of the pest and more on the stabilisation of the environment by the introduction of biological controls. It will be long, slow, and difficult and there will be little profit for the agrochemical industry, but the alternative may mean the removal of all cattle from the affected area and an acceptance of defeat: *Boophilus* has tricked the tickicides. Unless the strategy is changed it may have won the war.

Reports



Stockholm 1972

Stanley Johnson will be covering the forthcoming UN Conference on Man and the Environment. Here is the first of his reports.

There is little over a year to go now before the Stockholm Conference on the Human Environment. According to present plans the Inaugural Ceremony is scheduled to take place at 10 o'clock on Monday, 5 June 1972, at the Royal Opera in the centre of the city. The first plenary session will meet in the afternoon at the People's Hall, which is in the conference building of the Swedish Trade Unions. Seating will be provided on the floor of the hall for about 130 delegations consisting of five members each. Press will sit in the gallery, while the general public will be relegated to an underground theatre where they will watch the proceedings on video-tape.

Committee, as opposed to plenary, meetings will take place in the new Parliament Buildings and in the old Parliament. All premises, so the Swedes assure us, will be provided with restaurants, cafeterias and bar facilities. 2,000 first-class hotel rooms have already been reserved and delegations are advised to book as early as possible. Chauffeur-driven cars will be laid on (presumably the latest emission-free model), study-tours of sites of "special environmental interest" can be arranged and—the Swedes announce it almost coyly—"various social events are being planned".

1972 will undoubtedly be known as the Year of the Environment, and the Stockholm Conference will be the *pièce de résistance*, the bandwagon to end all bandwagons, a "talk-fest" of epic proportions. The delegates will jet in from

the round world's imagined corners. They will sit in plenary and in committees twiddling their earphones. They will make speeches, endless speeches which will be simultaneously translated, abbreviated, duplicated and re-issued in editions of several thousand. They will plot together in the corridors and bars and cafeterias, hatching out strange drafting compromises. They will agree to disagree and sometimes they may even agree to agree. At the end of it all, they will go back home and the tourists will return, like swallows, to the hotel rooms the delegates have vacated.

But what will it all add up to? What will Stockholm 1972 achieve? The answer to these questions very much depends on the nature and quality of the work which is undertaken in preparation for the conference and, above all, on the ability of the Secretary-General of the Conference, Mr Maurice Strong, to put together an agenda that forces delegates to concentrate on the issues.

So far the prospects look very good indeed. Late in January this year Mr Strong moved his office from New York to Geneva. With him went the small staff he had already assembled to help him run the conference. They installed themselves above Gate 2 of the Palais des Nations, in rooms looking out over the lake. By the beginning of February, the Secretariat was ready for what would be the most important meeting before the conference itself; the Second Session of the Preparatory Committee for the United Nations Conference on the Human Environment, known more familiarly as "Prep. Comm".

In some ways that fortnight of meetings from February 8-19 was already a miniature Stockholm. The Preparatory Committee was composed of government representatives, 27 nations in all being involved. (27 is one of the UN magic numbers.) It was fascinating to see the different ways in which *nationality* (for all the delegates were in Geneva as official spokesmen) interacted with *personality*. Excitable people sometimes made calm moderate statements, stupid people sometimes made clever statements. National viewpoints coloured national interpretations of

words whose definition was, at first sight, plain. There were other words, like the phrase "human environment" itself, where definition was not even attempted. Canny politicians and cautious bureaucrats do not enter willingly into minefields.

For most of the two weeks Prep. Comm. split into two sub-committees and worked its way steadily through the proposals Mr Strong and his secretariat had laid on the table. To understand these proposals, one must also understand the methodology that lies behind them. The physical arrangements for the conference with the delegates on the floor, the press in the gallery, and the public underground, will be in a sense matched by the conceptual arrangements. For here too it is envisaged that the Conference will work on three levels.

The *first* level will be concerned with establishing the intellectual and conceptual framework for the conference. This will be done, so the documents suggest, by calling on a "representative group of the world's intellectual community, including leaders in the physical and social sciences, for a comprehensive reading on the present state of knowledge and opinion on the principal aspects of the relationship between man and his environment". The deliberations of this group should lead to a "Report on the State of the Human Environment" which would identify "major areas of intellectual consensus and non-consensus" and major gaps in present knowledge, point out priority issues for consideration by political leaders and indicate the direction in which action should proceed.

In effect what is proposed at the first level is a State of the World report. Already shortlists are being prepared of possible "environmental wise men" and of consultants who might produce a final synthesis in each of the several official languages of the conference.

The *second* level will define the work programme in "the field of environment" (a phrase I find only slightly more attractive than the FAO's "field of fish") for the post-Stockholm period. It will, it is hoped, provide an agreed international basis for the establishment of priorities for environmental action and the allocation of resources to meet

Reports

those priorities.

The *third* level will concern that much smaller number of items on which action can be completed by the Conference. Inevitably it is on the third level that the bulk of the attention will be focused. This is where the action, in an "action-oriented" conference, will lie. The nature and effectiveness of this action will almost certainly be determined by the work governments undertake between now and June 1972. If they do their stuff, Stockholm will pay for itself a thousand times over. If they don't, the conference will resemble Sweden's own *aurora borealis*, a pale glimmer in the long northern light.

Major recommendations

By the time Prep. Comm. ended, on 19 February, agreement had been reached on the following major recommendations:

An intergovernmental working group should be established to prepare a draft *Declaration on the Human Environment* for adoption at Stockholm. There was a general consensus that the Declaration should be inspirational and concise; it should be readily understandable by the general public and should stimulate public awareness and community participation in action for the protection of the environment.

An intergovernmental working group should be established to review the question of *marine pollution*. The terms of reference of the Group should be broad enough to enable it to consider specific actions and to recommend them to the Stockholm conference if it found that agreement on these specific actions was feasible.

An intergovernmental working group should be established to prepare a report for the conference on the adequacy of "present regional or worldwide arrangements for the *monitoring or surveillance* of certain variables of the environment that relate to the proper balance of the biosphere and the health and well-being of man". The conference should take appropriate action in the light of this report.

The Secretariat of the conference should examine the feasibility of developing *international criteria for pollutant release limits*.

Preparations should be made to enable governments at Stockholm to establish, if they so decide, a *World Heritage Foundation* under which special recognition would be accorded to certain areas of natural, cultural, historical or scientific significance. UNESCO, in co-operation with other agencies was to develop a Constitution for the proposed Foundation.

Preparations should be made to enable governments at Stockholm to take positive action on a draft convention (being developed by IUCN in co-operation with FAO) to *regulate import, export and transit of threatened species of animals and plants*.

An intergovernmental working group should be established to prepare a Plan of Action, to be endorsed at Stockholm, aimed at strengthening and increasing the efficiency of *national programmes of soil preservation and wise land use*.

The Secretariat of the Conference should undertake a review of existing programmes for the *education and training of specialists* "in various fields of environmental problems". Possible action to be taken at Stockholm could include the establishment or development of regional training centres, which might be sponsored by the relevant bodies and agencies of the United Nations system.

The Secretariat of the Conference should review the adequacy of the present machinery for *interchange of information on environmental matters* between governments, and propose ways in which it might be improved.

Papers should be prepared before May, 1971 by member governments of the U.N. and interested agencies on the question of "genetic pools". Governments at Stockholm should be in a position to take additional measures for the *rational conservation of world genetic resources*, including the survey and collection of these resources. The Preparatory Committee was disturbed by the accelerating rate of plant and animal species extinction, largely because of the destruction of suitable habitats.

This then is the work programme between now and June 1972. Prep. Comm. will meet again in September this year to review progress. We must hope that the review is favourable. A great deal is at stake. Nothing concentrates the mind so much, apart from hanging, as an immovable deadline. The pressure for rapid effective action

between now and Stockholm, however artificial it may be, will not be easily recreated once the jamboree is over. This is an opportunity too important to be missed.

If the conference fails, it will not be the fault of the Secretariat but of governments. Even if governments do all or most of what is required of them, Stockholm could still be something less than a resounding success. The less-developed countries (LDC's) have yet to be convinced that this is their thing. Brazil, Costa Rica, Cyprus, Ghana, Guinea, India, Iran, Jamaica, Singapore, Togo, the UAR and Zambia are all serving on the Preparatory Committee and presumably they are a fairly representative sample of the third world. As Mr Strong put it in his opening remarks on the first day of Prep. Comm.: "If environment has acquired such political potency in the more industrialised countries, it is endowed with no such magic in much of the developing world. Although it is encouraging to note that here too interest and concern are growing, environment is still seen by many as a rich man's problem, a disease they would be prepared to risk if it is a necessary accompaniment to the economic growth they want and urgently need... They want to be sure before jumping enthusiastically on the environmental band-wagon about just how it is likely to affect their own interests and their own priorities".

Shortly after Prep. Comm. ended Mr Strong flew off to Delhi for the global meeting of the UNDP Resident Directors. They in turn will bear his greetings and exhortations back to the national governments to which they are accredited. Already the outline of a bargain between the rich and the poor, the polluters and the polluted is emerging. The LDC's are closing their ranks to form a kind of environmental UNCTAD. They know that their presence is necessary, even vital, at Stockholm in June 1972. Without the LDC's you can't have a World Conference and what would the UN do with all those hotel rooms? But, if they are to play ball, they will exact a price. Already there is talk of a special international fund to help LDC's pay for pollution-free technology which they would otherwise do without. We shall hear a great deal more of this and similar ideas before World Environment Year is over.

Stanley Johnson

Reports

Hill-farming on Dartmoor: the writing on the wall

No farmer expects to get through the year without losses in his herd, and no sheepman imagines that his flock will remain unscathed, no matter how good his husbandry. Lambs will die or fail to thrive and ewes will fall sick or die accidentally. These losses are bound to occur and are accepted as normal hazards of sheep-farming. Each loss is regretted and each one brings the questions, "could I have prevented this? could I have saved this animal?" How much more so, then, would the farmer question himself and his methods should he find that the normal pattern of losses was being reversed—that he was losing more ewes than lambs? He would know that somewhere along the line something had gone hopelessly wrong.

On Dartmoor, something went hopelessly wrong some 70 years ago, when greed dictated that the natural order of things must be challenged—that blood must be squeezed out of stone and that Dartmoor's summer grazings must carry stock throughout the year. The indigenous sheep could not withstand out-wintering and so the victim of this new policy had to be the hardy Scottish Blackface. Someone interpreted the word "hardy" as meaning that the breed could do without food in winter, thus enabling owners of common rights of grazing to put out animals for which many of them have no keep—no in-by-land to which stock can be brought in time of emergency for lambing. Here was a breed for which the ordinary rules need not apply!

The occasional winter of abnormal severity, bringing disaster on a massive scale, serves only to disguise the less dramatic but constant erosion of eaten-out pasture. Each such winter brings a flurry of ideas and schemes designed to cope with emergencies, each one inadequate and ill-conceived, while the writing on the wall is ignored and the stocking-rate on the impoverished grazings remains constant. No lowland farmer could treat his land with such contempt nor his stock with such foolish disregard and remain in business; nor can he hope to be cushioned against

his own fecklessness by charitable aid for his distressed stock.

For too long it has been accepted that there are only two grades of farming: good husbandry and bad luck—with bad luck prevailing on Dartmoor.

Now, as the result of a six-months survey of animal deaths, we can ask for the long-delayed admission that Dartmoor and its livestock are the victims of bad farming.

Over a large area records were kept from March to August 1970, and the results were professionally interpreted and correlated in the form of a histogram. From grid references noted down by recorders, a map was marked with each recorded carcass. Thus it is possible to study the monthly incidence and distribution of lamb and ewe losses, and from this study the unpalatable truth emerges that each month more ewes died than lambs. What we now have is a statistically reliable indication that ewes, starved in the latter part of pregnancy, either aborted and died in March, or succumbed to the stress of lambing during the following months. Who can argue that reduction and deterioration of quantity and quality of nourishment of the pregnant ewe, up to and after lambing, is anything but a reversal of every known rule?

Still further evidence came to light during the survey of wrong land-use, wrong stocking with the wrong breed, and failure to read the signs. There has been a steady build-up of tick infestation, as shown by the many 2-3 months-

old lambs found dead, dying or partially paralysed, suffering the usual symptoms of tick pyaemia. Maggot-ridden ewes bear witness to the absence of a regular dipping programme or of proper flock inspection. Ewes can be found dead or dying during lambing (a matter of shame to the lowland farmer), while others have died in boggy ground, too weak to save themselves.

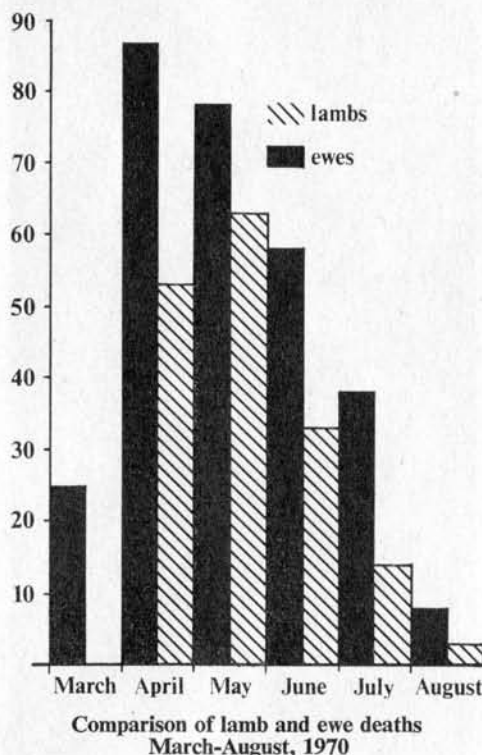
Ignorance of the art of swaling has led to the destruction of large tracts of moorland grazing and heather, which has either disappeared or become so stunted that only a moderate fall of snow submerges this invaluable emergency ration. It is with considerable alarm that one views the future of the Dartmoor commons and the hapless stock depastured on them. Under the Commons Registration Act 1965, claims to graze 500,000 beasts had been registered as early as November 1968, while there was still a year left for further registrations. It would seem most unlikely that objections have been lodged against all excessive claims, owing to the complexity and size of the task of checking the registers. The job of sorting out the reasonable from the ludicrous will have to be undertaken by Commons Commissioners, and only then can we hope to see a return to the old law which allowed a commoner to put out only that number of animals which could be kept on his in-by-land in winter.

The 1970 survey conducted by the Dartmoor Livestock Protection Society demonstrates that there can be no future for Dartmoor as a hill-farming area unless immediate steps are taken to protect its whole ecological structure. Existing hide-bound policies must be abandoned in favour of a return to the Moor's traditional role as a summer-grazing hill. Nature's inevitable backlash could have been foreseen many years ago. Soon it will be too late to save what is left.

Barbara MacDonald

The stony problem of Venice

If there is a classic case of excess density living, it is surely exemplified by Venice. This flower of North Italian Renaissance had blackened its petals long before the coming of modern pollution. Jammed together for safety and convenience, the populace must have created a fair amount of smoke with their countless cooking fires. But then,



Reports

the stones were new, now Venice is old, the stones of her palaces have lost their youth. They are tired from perhaps seven hundred years of stress, expanding and contracting under the hot summer sun and cold winter winds. Now into every minute crack and flaw, their enemies, old and new, rush in for the death. The soft pearly light which so often enhances the Venetian scene, beautifying and unifying that fabulous aspect of stone and water, is, sad to say, the tool, the scaffolding of the destroyers; that unholy trilogy, salt, sulphur dioxide and frost. As individuals, harmless, proven innocent, collectively of no great concern, but mixed with that moist air, that Turner veil of beauty, corrosive, insidious, irreversible.

So much controversy has existed on this subject, so many red herrings have been drawn across the trail, bacteria have been blamed, patent remedies suggested, that the Conservation Department of the Victoria and Albert Museum under the guidance of its Keeper, Norman Brommelle, felt justified in undertaking basic research to establish where the truth lay.

The polluted damp air of London needed but the addition of salt, to create the conditions relevant in Venice; in a mere ten months we achieved the destruction of new stone by the use of the trilogy. The story that emerges is this: the commonest stone of Venice is Istrian, wisely selected by the ancient builders on account of its durability and strength. It is a warm, putty coloured stone, so dense that no moisture can penetrate. Only at its surfaces is it vulnerable. It is a dolomitic stone, consisting for the most part of magnesium and calcium carbonate. The magnesium carbonate being more readily soluble than its associate is first leached away by the acid rain, leaving behind a rough, powdery surface which is further attacked by freezing water droplets expanding and contracting simultaneously or alternatively, depending on the location and the season—the crystallisation and dissolution of salt is a constant mechanism. Every time a crystal of salt forms, tiny but inexorable pressures are formed, slowly but inevitably, prising one particle of stone from another. Should it be

shielded from the rain and salt, its fate is no better, the sulphur dioxide in the polluted air corrodes its surfaces so that finally the encrustation falls away, leaving the stone with a scaly leprous appearance. The air pollution problem is twofold: From across the lagoon come the corrosive gases of Marghera and Mestre's great industrial sprawl. But Venice produces much of its own pollution. The so necessary central heating plants, and the fumes of the busy canal boats (vaporetti) all collaborate to attack the stone.

A little to the north stands Torcello, in marked contrast to blackened Venice. It does not suffer from the slip stream of Marghera nor owing to its poverty can it corrupt itself with central heating effluence. Here only lichen and algae present a minor hazard. But these problems of the Istrian stone pale before an even more appalling factor; seldom are the walls and facades of Venice built of solid stone, it is but a facing, a decoration to an internal building of bricks cemented together with sandy mortar, in direct contact with the damp ground, or even with the saline water of the canal, which may well lap against it. The examination of the lower parts of such a wall reveals that the whole mass of brick and mortar is in fact a concentrated salt sponge, and worse, the mortar has grown slightly with the salt, so that the

cementation is salt not mortar. Needless to say, remove the salt and there exists no adhesion amongst the bricks.

Such is the problem at the Church of Sta Maria dei Miracoli, here a damp course has been injected only to imprison a mass of salt. True, no new salt can make its way into the walls from the canal, but the problem remains how to remove the residual salt. Only its complete removal can ensure that the facing stone decoration is not doomed.

A brick 9"×4"×2½" can absorb something in the region of 370 millilitres of water, or well over half a pint; which gives say, three gallons of water per square yard of brickwork, which in turn can be replaced by salt accumulation. As the walls are often a yard thick, a cubic yard of wall could contain two hundredweight of salt and this estimate does not take into account the capacity of the mortar. A very sobering thought.

Agreed by most as an additional menace, are the pigeons. Known as disease bearers, they are still tolerated; how much damage they do has not been measured, nor has the actual nature of the damage been established—whether it is purely chemical or the result of a secondary organic activity. Work at the V & A it is hoped, will establish these facts soon.

From time to time wild statements appear in the most responsible journals stating that a cure is known, or that a certain commercial product will solve the stone problem. Close investigation often proves disappointing. Brief meetings of specialists in this field are seldom fruitful because the individuals are divided by languages and prejudice. Only the opportunity to work together in the same laboratory will bring about understanding and co-operation. That a solution exists or will shortly exist, I have no doubt.

K. Hempel



Biocontrol in agriculture: 3

The apple trees in the Asturias region of Spain are not sprayed heavily, yet they do not suffer badly from infestations of *Eriosoma lanigerum*. In parts of the central plain of Castille and southern Spain, on the other hand, *Eriosoma* is rife.

A study was carried out of two comparative areas in the Asturias and many common ecological factors were observed. The climate of each was simi-

Reports

lar; methods of cultivation and tree species were also similar and the population density of *Aphelinus mali* was relatively high in both areas. The general ecosystem was the same in each.

The climatic conditions of the north are not reproducible in Castille, with its very low summer rainfall, hot summers and cold winters, but irrigation systems could be improved and the late spring frosts, that did more harm than *Eriosoma*, could be avoided by planting late-flowering varieties and a fine-spray irrigation system. Further study revealed that *Aphelinus* hardly existed in Castille and there was a strong suspicion that it was the absence of this fly that was really responsible for increases in the pest population. But would *Aphelinus* be able to withstand the Castillian climate? This is still unknown, but even if it could be established apple production would not be economic unless the varieties were changed and the irrigation improved.

This kind of "combined operation" often applies in dealing with pests. Some predators and parasites will give effective control only when the numbers of the pest population are within certain limits. Others are more effective if they have to deal with large numbers, rather than small, isolated colonies.

Dr Simmonds of the Commonwealth Institute of Biological Control has described a case in which the Institute was asked to counter the winter moth that menaced trees in Nova Scotia. Two potentially effective parasites were introduced from Europe. The first, a wasp, seemed to produce no effect, but the second, a fly, reduced the pest population to a level at which the wasp took over. Thereafter pest numbers were controlled by the wasp and should there be a massive infestation the fly would deal with it.

It is important to know how many of its natural enemies are required to deal with a specific number of any pest. This will depend on a number of factors. Some insects are slow in searching for their prey, or careless in their methods (the ladybird is notorious for this), or incapable of dealing with large numbers at one time. Some have a lower fertility rate than the pests they

are to control while in other cases the beneficial insect may be so active as to put itself out of work, although this is exceptional. Sometimes one insect may need the help of another. This is the case with *Aphidus* for example, which cannot deal with a serious outbreak of black or greenfly by itself, but which can be highly effective when it works in collaboration with the *Syrphid* flies, ladybirds and *Chrysopa*.

Although it is often difficult to establish an accurate pest-enemy ratio it is important to try. The success of a project may well depend on it. Ratios have been worked out in recent programmes.

Ecology is a science based on field work and theories may have little or no foundation in fact. It has been said, for example, that the greater the abundance of a pest, the better the chance of finding a natural enemy to combat it. This sounds logical, but it is a theory unsupported by field experience. The Colorado beetle is far more widespread and has a greater population density than the Mediterranean fruit fly, yet there are more than fifteen known predators and parasites of the fly as against a dubious half dozen enemies of *Leptinotarsa*.

An insect or plant often becomes a pest because it has been imported without any of its natural enemies. If these enemies are introduced will they find new hosts to attack? Field trials are not altogether conclusive. It seems that an imported insect may control a pest it has never before met, provided certain conditions can be met. The imported predator or parasite should not be too specific. In the absence of its natural host it should be able to make do with other food. At the same time, however, it must not be too promiscuous. The ideal is an insect which limits its choice of food to a particular family, rather than to one species within that family. Thus it is wise to choose a parasite or predator that attacks a species closely related to the pest it is to be introduced to control.

The data provided by ecological surveys should include details of super-parasitism. This is often excluded on the ground that it is the concern of the entomologist rather than the ecologist, but it is an important factor in determining the host population density and gives a clearer picture of the pest-parasite relationship. Super-parasitism occurs when a host insect is parasitised by several insects of one insect simul-

taneously. If the parasites are of different species it is multiple parasitism.

Experiments with *Triptogramma evanescens* have demonstrated that some insects are able to distinguish hosts that have been parasitised from those that have not. The parasite may then prefer the latter, but this is not always so and there is no doubt that super-parasitism does occur.

Ecological studies of the natural enemies of pests and weeds should be as wide as possible. They should include animals, reptiles and birds as well as insects, giving at least a rough estimate of their numbers, species and distribution. It may sometimes be possible to encourage beneficial birds and scare off others. This is being done with some success in the pine forests and olive groves of Spain. The success might have been even greater had the area been protected from aerial insecticide spraying.

One of the aims of biocontrol, and of ecology, is to preserve wildlife. Thus it is advisable for the ecologist to keep in touch with local authorities and government departments to see whether there are future plans that conflict with this ideal. I mention this because the famous Spanish bird sanctuary lake at Laguna del Duero was destroyed unnecessarily when the area was drained for a housing project, and Castille was deprived of its only migrant-bird sanctuary. The sanctuary at Albufera in the south may suffer the same fate soon. In both cases rare migrant birds could have been preserved had ecologists been in contact with the authorities in order to warn them.

These are examples of technology gone mad. We will continue to suffer from them until ordinary people make their voices heard. It is impossible to estimate the changes that will take place in the ecosystems around Laguna Del Duero and Albufera. Neither project was necessary. We depend on nature for our survival and real progress will depend on the use we make of natural laws and raw materials. Just how far this will be possible will depend on the degree of co-operation that is achieved between the biocontrol expert, the ecologist and the keen amateur.

This is the first mention I have made of the amateur, but it will not be the last. The professional needs field workers, who do not need great technical knowledge, and the amateur needs the professional scientist to provide

Reports

guidance. There is no age limit. A child can be taught what to look for and where, and how to record what he sees. The retired person might find in this valuable work a fascinating hobby. There are many organisations dedicated to biocontrol and they can use all the help they can get. In a world in which too much time and money is spent on destruction, this other world, of nature, holds out visions of peace and tranquillity in which the enthusiastic amateur has his place.

David L. Greenstock

Gulliver in Automobilia, III: in which he encounters Astronauts.

The Sages of Automobilia long ago conceived that the Race of Mankind, being by the Will of God and by their own surpassing Virtues chosen to be supreme among all created Things, were destined at Length to subdue to their own Purposes not the Earth alone, but the entire celestial Universe. But until a few Years since, their Powers in no Wise matching their Ambitions, the Art of voyaging through the Firmament of Heaven, though a frequent Topic for idle Speculation and the pleasing Fancies of the Authors of Popular Tales, was not held to be in immediate Prospect of Realisation. That it came to be so, was the unforeseen Consequence of an Improvement in the Science of War.

Every General wishes if he can to slay the Enemy without Risk to his own Men; and it is to this humane End that the Nations of Christendom have devised Cannons, Mortars, Bombards, Grenades and such other Devices as kill at a Distance. The ingenious Strategists of Automobilia have perfected this Skill by the Use of Rockets, such as I have seen in England innocently employed at Shows and Illuminations, but of immeasurably greater Bulk and Velocity. These curious Engines at once suggested to the Imaginations of the Wise a Possibility of the Fulfilment of their ancient Dream: a Man, borne upon those fiery Wings, and encased in a Shell of Iron, might ascend to the Regions of Aether and discover all the Secrets of the Planets and the Stars.

To think, with this People, is to act: and it was at once proclaimed that

whatever the Difficulties, the Dangers, or the Cost, the Passage of a few Years should find the Flag of Automobilia planted in the Soil of our planetary Neighbour, the Moon. Some few Dissenters protested that the Advantages of Lunar Discovery were at best dubious and not a Whit commensurate with the Expense such a Project must needs incur: for the Moon is revealed by the Astronomer's Glass to be devoid of all Life, animal or vegetable, and he who desires a Desert may find it with greater Expediency upon Earth. But these Doubters were speedily laughed to Scorn: no great Enterprise, they were assured, could be carried to Fruition without Trouble to any Man, nor could a Cake be made, as the Saying goes, without breaking of Eggs.

Thereafter, for many Years, a large part of the Revenues of the State were directed to the Fashioning of Rockets impulsive enough to escape the Attraction of the Earth and ascend to the Lunar Sphere. Nor could the Needs of the Passengers be neglected: the perfect Vehicle must bear in its forward Parts a Cabin stout enough to withstand the cold and vacuous Wastes of that supermundane Zone. At last all was complete: and the prodigal and enthusiastic Temper of the Automobilians may be judged by this, that the total Cost of the Operation exceeded that of erecting and embellishing all the Churches and Cathedrals in Christendom. It is even alleged by some carping and pusillanimous critics (I use my Informants' Description of them), that a less Sum would have sufficed to house, clothe and feed all the Paupers in the Kingdom, and do much else besides: but the Majority of the People held the Glory of their Nation or more Account than the Welfare of a few Millions of poor Folk, and judged no Sacrifice too great that should speed Man's Exodus into the limitless Region of the Stars.

The Voyage, then, was undertaken: and the Astronauts (for thus were they designated) rose in their fiery Chariot like to many Phaethons, alighted at length upon the lunar Surface, and returned safe to relate their Adventures. The Total Tribute of this new Dominion amounted, it is true, to some few Handfulls of Dust, like the Gold the Fairies use to cheat poor Mortals withal; but the Sages and Philosophers esteemed this Dust so highly, and spoke so eloquently of the weighty Secrets it

would impart to them upon a fuller Inspection, that the common People too were fain to acclaim this Vessel with its insignificant Cargo as much as any Argosy that ever returned from the Indies freighted with Gold and Silks and Spices. If any objected, that no Quantity of Dust, whatever its unusual Virtues, could fairly recompense so many Years' Labour, and the expenditure of such an unconscionable Deal of Money, he was scorned as a vile Worldling incapable of subordinating his gross material Passions to the high Purposes of speculative Science. I cannot forbear to add that in another Breath the Advocates of lunar Exploration might be heard dilating upon the mineral Riches this new-found Land must in Time supply: though how such ponderous Commodities may be cheaply conveyed over the eighty thousand Leagues of intervening Void, they cannot yet describe.

Such, then, is the Project upon which, more than any other, the Automobilians have bestowed their intellectual Powers. It is their fixed Belief, that whatsoever *can* be done, *should* be done: if only an Invention be possible, they do not trouble their Heads to consider whether it be useful or no, but carry it into Effect without more ado. This Impetuosity is the Origin of many of the Ills which beset them: and he would do them great Service who could persuade them at all Times to look, before they Leap. In their lunar Adventure they have succeeded, where the Builders of Babel were frustrated: but the Sum of their Endeavours is this, that they have with immense Pains scaled a Ladder into the Loft or Attic of the World, only to find it full of naught but Dust.

Nicholas Gould

More on PCBs

There are disturbing signs that attempts to prevent the damaging industrial chemicals Polychlorinated Biphenyls (PCB) from entering the environment are not working. Monsanto Chemicals, the only manufacturer of PCBs in Britain, last year withdrew the chemicals from a number of applications such as their use in paints and varnishes. It also warned its customers of the dangers of letting the chemicals escape in liquid effluent and stopped supplying those customers it did not consider reliable enough to carry out the restrictions.

Reports

But recent analyses of the sewage sludge dumped by Glasgow Corporation in the Firth of Clyde showed that PCBs are present at the significant quantity of 0.5 parts per million. Monsanto Chemicals was surprised to be informed of these results; the company had hoped that the escape of PCBs would have been stopped. The analyses of the sludge were carried out in March by the Clyde River Purification Board. Its director, Mr Ian Waddington, told me that if PCB traces were still present in six months' time "you may take it that I shall be making representations at Government level".

Waddington is concerned especially because of the association of PCBs with harm to the natural life of the Clyde Estuary. PCBs are implicated in the massive mortality of seabirds that occurred in September 1969; many of the dead birds, containing high levels of PCB residues, were found washed up on the shores of the estuary. In addition the fish caught in the estuary have been found to have higher concentrations of PCBs than anywhere else in Scotland.

The PCBs end up in sewage sludge because they must be present in industrial effluents which are sent to sewage works for treatment. The escapes may be happening in two ways. They may be due to faults in Monsanto's policing of its customers. Or they may be caused by companies using PCBs which are not bought from Monsanto but from one of several Continental manufacturers. Maybe Continental chemical companies are less efficient and/or conscientious about protecting the British environment than Monsanto which has to live and work here.

It is understood that Monsanto has a tacit agreement with the Continental companies that if it bans a customer because it isn't satisfied with its control methods, then the Continental companies will refrain from picking up the business. This agreement may also not be working, or a Scottish industrialist may be finding a way round it.

There are only two points for comfort. First, samples taken by Glasgow Corporation itself indicate much lower concentrations of PCBs in the sludge than those taken by the Clyde River

Board. And anyway, the Board's samples reveal about half the quantities present in samples taken about six months ago by the Freshwater Fisheries Laboratory in Scotland. (*Nature*, 19 December 1970). The trouble here is that not enough samples have been taken to give grounds for optimism.

Secondly Monsanto Chemicals is continuing to show concern and has informed me that if PCBs are proved to be uncontrollable, it will withdraw them from the market. The evidence is that voluntary control is not working.

Jeremy Bugler

Very Thin Film

Every man, woman and child in the United Kingdom is responsible for the consumption of about two hundred-weight of paper per year. Spread out, it could amply cover urban England with plenty left over to decorate a few rural landscapes. In fact, it is not a particularly serious environmental hazard. Half a hundredweight gets returned to the mills for repulping and a fair proportion is privately disposed. The rest is lost in general refuse and becomes part of the overall problem facing local authorities. The disposal systems presently available are dumping and incineration. Paper is not too bad for dumping because it compresses and, in due course, rots down, nor for incineration because the fumes given off are comparatively harmless and do not eat too violently into furnace ironwork.

It is now evident, and admitted even by paper-makers, that conventional cellulose-based paper is about to suffer significant replacement by very thin plastics films. The technological revolution arrived when extruders were found capable of blowing film down to 0.01 mm and less. At this thickness, or thinness, the plastics film is cheaper than greaseproof paper and, if pulp prices continue to rise, will shortly become cheaper than kraft paper. Since the plastics film is grease-proof, odour-proof, gas-proof and water-proof it will obviously replace paper for wrapping any food with grease, anything with a detectable odour, anything which needs gas barrier protection, and anything which has to be kept dry. So far, nothing has been found to indicate any inhibition of sales development other than an inevitable shortage of the right kind of polythene.

The full story has already been documented in a study by Wolpert released

in February this year. There is no point in duplicating publication other than to mention that the machinery exists and is in production, that the very thin film does what it is claimed to do and is correctly low priced, that a lot of capital is being spent in full-scale commercial development. It could well become the largest outlet for plastics, particularly if the very thin film becomes known to those concerned with plastics in agriculture.

The problem is that, unlike clean waste paper, high density polyethylene is not easy to recover and reprocess. In fact the recovery fraction can probably be counted as almost nil because the cost of recovery is likely to be higher than the cost of virgin new material. A small fraction will certainly be re-used for household tasks but in long-life applications, not for lighting fires or any other avenue of instant disposal. Almost all will be passed to the local authority for attention.

It is not yet known how very thin film will compact and settle in dumping. Current theory is that "a reasonable proportion" in general rubbish should not offer too much trouble. Whether this applies if the general rubbish is denied the stabilising influence of wet paper, is not known. What is known is that the very thin film will take a long time to rot down and the film will be with us long before the plastics industry has produced commercial grades which will suffer normal biodeterioration.

With regard to incineration, the theory is that high density polyethylene is a fairly pure chemical and it should burn well without damage. Hence, the local authorities need not worry too much about chemical erosion inside their ovens—at least until PVC is also produced in very thin layers. (One company already has done). They do have to worry, however, about the increase in volume of rubbish for incineration, particularly if the very thin film restricts dumping sites.

In effect, the manufacturer is getting a superior and cheaper packaging material. Normal trade competition will ensure that part of the cost reduction will reach the ultimate consumer and he will certainly benefit in terms of quality of food. Offsetting this, local authority costs will increase and the extra cost will certainly be passed back to the manufacturer and the householder.

Allen Jones

Down to Earth



by Lawrence D. Hills

Fly away home

1970 was not only European Conservation Year—it had a summer dry enough for the mealy cabbage aphid (*Brevicoryne brassicae*) to swarm across Southern England with its frail winged forms following the wind like gliders without rain to batter them to the ground, attacking even turnips which normally escape this major pest of the cabbage tribe. Behind them swarmed the ladybirds, for both adults and larvae of the commonest of our forty species are eager aphid eaters with a sporting chance of overtaking the pest at temperatures of 52°F and over, but dropping behind at even 51°F—so chill drying winds as well as sun won the *Brevicorynes* the “Ashes” of many a ruined cabbage crop.

Though conditions were just right for a ladybird swarming, the increase was a minor one compared even with the last in July and August 1952 when the tide line along forty miles of the Lincolnshire coast was red with drowned ladybirds in search of further food. Once only spectacular swarms made news, as in Yorkshire and Lancashire in 1945, and the outbreaks of 1847, 1826 and 1750. 1970 saw only about ten times normal numbers.

When John Curtis the entomologist wrote in 1857 of “congregations of myriads” every year that reminded him of red-coated soldiers, British ladybirds had been controlling the aphides in the hop gardens that ringed an almost entirely beer-drinking London, ever since Henry VIII introduced the crop from Flanders, rather before the less successful introduction of Anne of Cleves.

The fall in the ladybird population and the rise in aphides that every old gardener will insist has occurred, like the decline in the swarm sizes even under the most favourable conditions, arises from the change in pesticides. The organo-chlorine and organo-phosphorus compounds are used in immense quantities against the broad bean

blackfly, the sugar beet aphid that carries the “yellows” virus and the peach and potato one that makes us grow our seed potatoes in Scotland where the winds prevent its spreading Leaf Roll and Mosaic. They kill the aphides, but never completely, and slaughter the ladybirds and their larvae.

In the past, from the 1880s onwards, gardeners used nicotine which spares the larvae of both hoverflies and ladybirds and the adult beetles to fly on in search of further prey. Nicotine, which is spent in four days, unlike the permanent and cumulative DDT type pesticides, is both safe and selective. Unfortunately it is hard for gardeners to buy, because it is an Official Poison demanding a signature in the Poisons book, even though garden shops sell far worse poisons such as malathion and paraquat without restrictions.

The best way for amateurs to return to safe methods of ladybird control is to simmer 4 oz of filter tip cigarette ends in a quart of water for half an hour, filter the result through a nylon stocking and dilute with four parts of water, for use against aphides of all types and even the toughest caterpillars. Filter tips hold 0.221 per cent nicotine compared with only 0.037 per cent for plain, and if only enough is made for immediate use, there is no danger of anyone mistaking a hoarded tinful for sweets, while a bottle of brown liquid might be doubtful.

Aphides vary in their value as ladybird fodder, with pea aphid the highest, capable of raising the egg yield per “hen” from 145 a season on broad bean blackfly to 1,500 in the case of the two spot species (*Adalia bipunctata*). *Brevicoryne* can increase the rate to about 800, and is such a fattening diet for the seven spotter, (*Coccinella septempunctata*) that “WX” and “OS” ladybirds three-times normal size were a feature of the autumn of 1970.

Ladybirds do not need the presence of aphides to stimulate them to lay, and their bright orange or yellow oval eggs are found in clusters of 20-30 even on stones and fences, though most are laid at random on plants where the adult has found food. In 6-8 days the larvae, which resemble tiny six legged crocodiles, begin searching blindly for aphides, and one has been recorded as walking 21 feet in four days just missing colony after colony. Should they find other ladybird eggs on their journey they will eat these, gaining longer

searching time than those which have only the energy capital inherited from their own egg. This cannibalism can mean a 70 per cent mortality, but with swarming *Brevicorynes* in every cabbage bed, not even the dimmest larva could fail to find food.

Their main enemies are the ants that “farm” many species of aphid for their excreta or “honeydew” and defend their flocks against what to them are bears and wolves. Both adults and larvae can discharge a yellow fluid that ants dislike, but when their “ammunition” is spent, a team of ants can toss the larvae off the leaf to start their long search again, or drive adults to fly off in quest of undefended flocks. Ants do not farm *Brevicoryne* which has excreta attractive only to sooty mould fungus—which is another reason why dry summers mean ladybird swarms.

Each larva will eat from 200 to 500 aphides in the 3-4 week period before it becomes an adult beetle and eats its way through still more before it must seek a hibernation home for the aphideless winter. This must be dry, to avoid mortality from several fungi; off the ground, to be clear of ground beetles and centipedes which do not have taste-buds so are not warned away as birds are by the gaudy black and red spots that advertise unpleasant flavour; and not too warm, to avoid waking before the first aphides are ready in spring and wasting flying fuel on wanderings.

They mate about April and the “gentleman-birds” do not survive though the scent of their bodies serves to bring back their descendants to the safe quarters that may be used for as long as twenty years. A recent letter in *The Times* drew about a hundred reports to the Henry Doubleday Research Association of ladybirds in clocks, on curtains and among sash cords, returning year after year.

The Association is attempting to develop the ideal ladybird “hibernation home” and the best yet appears to be a clay field drain hung horizontally from a tree or fence, because it is porous to hold the scent, dry inside and cheap—costing about 5p each bought at any country builders’ merchant. If this can be given the scent by placing sleeping ladybirds inside, to return in quantity the following autumn, this could lower the winter mortality by perhaps 1 per cent, which could be enough to restore our ladybird level to something nearer the 1857 standard.

student action

Students and Industry

In recent months, Student Action has attempted to show work already undertaken by students at colleges and Universities in the UK. By publicising what groups of students have done it was hoped to interest hitherto inactive students in emulating those actually doing something. Now the time has come not merely to describe what has been shown to be possible, but to discuss the full scope of activities of a student movement committed to the rational use of the environment.

Let us consider just one example of the conflicting interests of a large corporation and the individuals comprising the society which supposedly it serves. Since August of last year the debate over the future of the Snowdonia National Park has grown in volume. At the Public Inquiry in December, Rio Tinto Zinc, whose application to drill is seen by the other international mining consortia as a test case, politely refused to divulge the full scope of their intentions.

The economic arguments which comprise an important part of RTZ's case are futile. RTZ argue that the answer to the long-term unemployment problem of North Wales can be solved by a short-fifteen year exploitation of the National Park by such enlightened and socially-responsible companies as Rio Tinto Zinc. This is not the case. Merioneth County Council adequately refuted such claims at the Inquiry.

Waiting in the wings for the outcome of Rio Tinto Zinc's application are Union Corporation of South Africa and Noranda-Kerr. These companies have carried out extensive prospecting in the National Park and if RTZ gets the go-ahead, will effectively complete the destruction not only of the relatively unspoilt grandeur of Snowdonia but of the National Parks concept itself.

So what do students care about National Parks, and the power of large

corporations to fashion the future of a region independent of the real needs of the local people? The answer would appear to be "not very much".

If they did care then they'd already have been through the list of RTZ and Geochemical Remining directors, available from Companies House, discovered their connection with different Universities and colleges, and invited them to explain their motives. Is it really for the national good that RTZ want to maximise their profits? They would have written letters and drafted petitions. They would already have put pressure on Mr Maurice Orbach, who as well as being a director of Geochemical Mining, which trades in mineral options, is also what is (often euphemistically) described as a public servant, MP for Stockport South.

It is no longer enough for students to sit around discussing the threat of population expansion or the undesirable nature of industrial blight. The time has come for students to latch on to corporations, to identify their intentions and to judge their merit. To tackle the profiteers in this manner is less dramatic than to sit down in front of bulldozers when it is all too late. But company dissection has one virtue—it's more effective.

Britain has been carved up by mining corporations and oil companies alike. They have reached agreement between themselves over who digs where and who gets what. Somewhere there should be room for people with no financial motive to have their say. There doesn't seem to be room at present; we must make some.

General studies

The recent growth in the establishment of college courses involving studies on environmental problems follows many devious paths and the results are extraordinarily varied. Very few courses however provide the opportunity for students to actually do something about

the problems instead of just learning about them. It is too often left to the students themselves to organise their own activities outside the course.

One of the recent developments in environmental education are courses which provide the information and develop the action but do not require any form of assessment. Environmental projects and studies are ideal for Liberal or General Studies Departments of Colleges of Further Education, Technical Colleges and Art Schools. Lecture courses can be flexible and experimental and really involve students in environmental action to the educational benefit of everyone.

At the London College of Fashion and Clothing Technology, Nicolas Holliman, who is also a lecturer in post graduate Town Planning at Central London Polytechnic, runs a course in "Man and Environment" for the Department of General Studies. The course starts from an understanding of the nature of man, through man's impact on nature and the resulting problems and concludes with what individuals can do and the new directions needed. It includes field trips to Zoos, building sites, parks etc. Topic discussion, especially on the environmental impact of the clothing and fashion industry, provides a controversial background to the course and should obviously form part of the education of any socially responsible student of fashion.

The General Studies departments of several art schools are quite active in this field, such as the Royal College of Art which has gone so far as to organise a Student Society for the Advancement of the Natural Environment (SANE). There are quite a few other colleges in the thinking and planning stages of general studies courses on environmental problems. Students should urge that these become more action-orientated rather than only lecturing or discussions.

Graham Searle

Feedback

1 Cleaning up the cash flow

Professor S. J. Pirt of Queen Elizabeth College, London, has written a letter to the *Guardian* demonstrating how addled are some of our expenditure priorities. We spend about £200 million a year on effluent purification, yet the Water Pollution Research Laboratory's budget is only £400,000 a year. The Natural Environmental Research Council, he says, "might be expected to encourage the universities to investigate the fundamental problems of effluent purification but, oddly, it has avoided having almost anything to do with it". Apparently the NERC prefers "the loftier aspects of conservation", like marine science (£3,200,000—including £1,500,000 for a new boat).

If that sum were spent on research into effluent disposal, argues Professor Pirt, "great advances could be made. If the support were on the scale of that for the Concorde project, we should have no effluent problem—all our rivers would be running sweet and clean, and industry would largely regain the freedom to site factories without limitation by water supply and effluent disposal problems."

Guardian, 9.3.71

2 Further setback for nuclear power
Dungeness B, Britain's first gas cooled reactor (the second generation of the CEBG's nuclear programme), has hit another snag in its history of trouble. It has been discovered that some of the reactor core components are likely to corrode, and they will have to be replaced.

Fortunately this is not likely to add to the delay in commissioning the power station—already three years behind schedule. However, it will probably increase costs, which have grown from £84 million to over £114 million. It is possible that the final bill will be as high as £150 million.

Times, 11.3.71

3 Leopards out, monkeys in

The small grey vervet monkey, which no longer leads a hunted life because of the near disappearance of its natural predator, the leopard, is proliferating at an alarming rate in Sierra Leone where it is invading fields and menacing crops.

Mr Joshua S. Sawyerr, Chief Conservator of Forests in the Sierra Leone Ministry of Agriculture, told a meeting of the Food and Agriculture Organisation's Ad Hoc Committee on Forestry that there was little doubt that the alarming disappearance of leopards and other felines, due to population pressures on the land and excessive hunting, was mainly responsible for the monkey invasion.

"When I was a boy," Mr Sawyerr recalled, "I used to see leopards in the woods around Freetown. The older boys went after them with bows and arrows and when they had killed one, they were so proud they paraded through the streets, their quarry hanging from a pole, singing and dancing to the sound of tom-toms. You do not see that any more."

Now the poorest villagers had guns. "They have killed so many leopards that you have to travel many miles from the capital, deep into the forest to see one."

Leopards weren't the only victims of today's eager hunters, said Mr Sawyerr. "Due to the absence of hunting regulations, our country is being stripped of its most precious fauna. Local hunters look for rare specimens, which they sell to zoos, laboratories and rich amateurs who will pay high prices for them. Consequently, some of the rare species are now almost extinct. Such is the case with the cheetah, the picarhates—a rare baldheaded bird which will fetch £100 in Europe—and the bongo, a kind of antelope which can fetch up to £4,000. This is a lot of money for our

villagers, and they will spend days and nights on end beating the forest and setting their traps in the hope of hitting the jackpot."

Mr Sawyerr said that big offers were made by zoos and circuses for baby chimpanzees, which were more docile and easily trained than adults, which often died in captivity. "But to get the baby, hunters have first to kill the whole family."

He said that local hunters were the real problem because they lived in remote places and were hard to control. "We aren't bothered by the hunter from abroad, who does it for sport. He shoots one elephant, for which he will pay in hard currency, and then go away. It's our own people who are the danger."

Mr Sawyerr asked FAO to help launch a wildlife protection project and set up a number of national parks in which rare animals could live and reproduce in peace.

FAO Release, 5.2.71

4 WHO condemns DDT . . .

The World Health Organisation's latest statement on DDT urges that it should not be applied to water nor used in widespread aerial applications. Outdoor applications should be reduced to the minimum, and in fact WHO recommends that DDT be restricted to indoor residual spraying only.

The accumulation of DDT in the biosphere is killing crabs, lobsters, shellfish, fish embryos, and various hawks and eagles; and it has impaired the productivity of fisheries.

Financial Times, 4.3.71

5 . . . USA hangs on to it

The Environmental Protection Agency (EPA) has decided not to ban DDT in the United States. Mr William Ruckelshaus, EPA's administrator,

while conceding that DDT endangers the survival of rare species like the American bald eagle, the peregrine falcon, and the brown pelican, insists that the environmental hazards of DDT have not been proved great enough to outweigh its benefits.

Times, 23.3.71

6

Dutch trouble

The Dutch central statistical office has set up a new division to work out the costs (both short and long-term) of industrial pollution, and their preliminary findings have given them a nasty shock. Over the next 10 years they will have to spend as much money repairing environmental damage as was earned in the last 10 years by the burgeoning chemical and steel industries. And this will only restore the *status quo*—how Holland will cope with her 5.5 per cent growth rate nobody knows.

Sunday Times, 22.3.71

7

Monitoring marine pollution

The early launching of basic pollution studies in the North and Baltic Seas and in Puget Sound in North America as a prelude to global action has been strongly urged by a group of marine scientists, the Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP).

The group, representing six intergovernmental agencies and the United Nations, is elaborating the scientific aspects of a world-wide programme for monitoring and controlling marine pollution.

The scientists agreed that, given the existing technical know-how, the time was ripe for baseline studies of the effects of pollutants on marine life and man in the North and Baltic Seas and in Puget Sound, three areas with distinct marine characteristics. Puget Sound, lying between western Canada and the United States, is not highly polluted and offers the opportunity to study changes in water quality.

Since up to two years are required to initiate actual monitoring, action to launch the studies as soon as possible was recommended. The studies should be carried out by marine laboratories and research vessels in countries bordering the three areas.

The studies should cover petroleum, DDT, mercury and other chemical

and metallic pollutants, and their way of entry into the marine environment, including through atmospheric fall-out. A report received by the group estimated that 150,000 tons of lead and an equal amount of DDT found their way into the oceans each year through precipitation.

FAO Release, 2.3.71

8

Protecting tigers and rhino

In the 1930s, the Royal Bengal tiger (*Panthera tigris tigris*) of India, Pakistan, Burma and Nepal numbered about 40,000. Today there are less than 3,000 left, and they are seriously endangered by poaching and pressure on their habitat.

As from 1 March, therefore, Nepal has banned tiger shooting, bringing this country into line with India and Pakistan.

Nepal's rhino are also urgently in need of protection. As a result of poaching and destruction of their habitat through heavy overgrazing by domestic animals, there are now not more than 80 left—all confined to the Chitawan area of the Terai hills. When last estimated (in 1959) their numbers stood at 300.

Accordingly, the International Union for the Conservation of Nature and Natural Resources (IUCN) has asked the Nepal Government to see that no further capture of rhino takes place. IUCN's Survival Service Commission has also asked the world's zoos not to buy rhino originating from Nepal until the population has recovered.

IUCN Bulletin, March 1971

9

Caesium 137 still on the menu

Nuclear fallout from the 1950s and 1960s is still polluting our crops, according to Mr Jack Lucas, a radiation specialist at Manchester University. So persistent is the fallout that it may well become the most important crop pollutant, he says.

In 1964, high concentrations of caesium 137 (a radioactive isotope with a particularly long half-life) were found in food, largely because crops were exposed to contaminated rain-water. Now the isotope has entered the soil where it is chemically "locked in", and from there it continues to find its way into food. The long-term genetic effects could be

considerable and serious.

The Leverhulme Trustees have given £14,000 to the Radiation Protection Service at Manchester to study the problem.

Guardian, 24.3.71

10

More mums, more misery?

The dependency ratio (the number of children under 15 and adults over 65 in relation to each 1,000 people of working age) is going up. According to the Treasury's February Economic progress report, the dependency ratio "has climbed steeply from 488 dependants per 1,000 in 1941 to 655 in 1969. It is projected to increase slightly to 677 in 1981, and then, with fewer old people, to fall, reaching 643 in 2001. These projections clearly have important implications for the amount and type of health services we will need in the future, the supply of schools, university places and teachers, and the future demand for new flats and houses.

"For industry one of the main long-term implications is that while the number of people of working age increased by only 4 per cent between 1941 and 1969, it is projected to increase by 20 per cent between 1969 and 2001. In long-term planning of industry's production for markets of different types and age-groups, in forming defence, transport and regional development policies, and in many other areas of our national life, study of likely future population trends has also an important part to play."

The Treasury goes on to predict that the number of women of child-bearing age will increase by over 20 per cent by the 1990's, as most of them are already born. "It is more difficult to tell how many children they will have. Although the number of births fell each year from 1965 to 1969, there is no evidence yet that completed families are getting smaller, except those of people marrying very young.

"Allowance has therefore been made for some further fall in family size for women marrying below the age of 20; but a constant average family size is assumed for other ages at marriage, giving an average of just under 2½ children per family in all future years. At present it is the increasing number of potential mothers, not more children per mother, on which the forecasts of a growing population are based."

Times, 10.3.71

Oil at the bottom of the garden

The search for oil in England is intensifying. According to the Department of Trade and Industry, 34 groups hold a total of 158 exploration licences covering 63,702 sq. kilometres.

Grizzly Petroleum (UK), a subsidiary of Pinnacle Petroleum, Calgary, holds concessions covering 1.4 million acres and intends drilling seven exploratory wells near Birmingham and two near Bath.

Penzoil (UK), a subsidiary of Penzoil United, Houston, is drilling at Middleton-on-Sea in West Sussex. Already 1,000 ft deep, the well could go as deep as 2 miles. Penzoil plan two more wells at Climping, and they expect to strike oil towards the end of April. Together with Mesa Petroleum of Amarillo, Texas, and Ulster Petroleum of Canada, Penzoil have licences covering 1,200,000 acres of Kent and Sussex.

British Petroleum are to have a well in the New Forest, and at Kimmeridge in Dorset they are already producing between 10,000 and 15,000 tons of crude oil a year.

UK on-shore production now averages about 82,000 tons a year (incidentally, a drop from the 1961 peak of 127,000). Although this figure is bound to grow—if the companies strike oil in commercial quantities and are allowed to go ahead—it can never be more than a fleabite compared with our current consumption of 100 million tons a year.

Times, 8.3.71, *Observer*, 14.3.71, and *Financial Times*, 25.3.71

Buses are best

Public transport in the US has long been in a state of chaos. In the last decade, when the proportion of Americans living in cities and suburbs has grown from 69.9 to 73.5 per cent, nearly a hundred bus lines have gone out of business. Commuter train services and underground lines have gone from bad to worse, and more and more people have been forced to travel by car—thereby adding to congestion on the roads.

Until recently, the trend from public to private transport has been exacerbated by the Department of Transportation, which has spent most of its funds on road-building—particularly the interstate highway

project, which has been interpreted by many as a plot to pave the entire country.

Now, however, the Department has shifted its ground and persuaded Congress to vote \$10,000 million over the next 12 years to be spent on “mass transit”. Significantly, the money is to go not to grandiosely futuristic schemes which would not leave the drawing-boards till about the 1980s, but to the urgent improvement of existing systems.

Peter Gwynne of the *Financial Times* gives a good example: “Commuters from Virginia townships have been saving up to half-an-hour on their journeys into Washington by the simple expedient of travelling on buses allotted the exclusive use of one lane of a motorway. Motorists, ensnared in the suburban crawl, have watched enviously as the buses roared past. Since the reserved lane system started, the number of customers for the buses has swollen by almost 20 per cent.”

Financial Times, 26.3.71

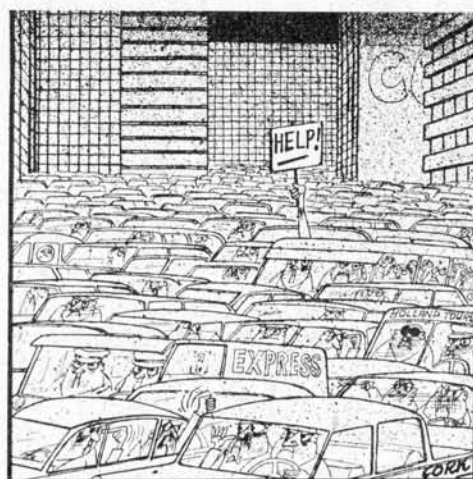
Good riddance

Suffolk County, New York, has imposed a total ban on the sale of detergents. In place of the 70 brands of detergents which used to be sold there, now only 6 brands of soap powder are permitted.

Most housewives seem reconciled to the change. Mrs Linda Childress told Michael Leapman: “I have six children and I’m going to have a problem getting things clean. But I also want them to grow up drinking clean water and breathing clean air”.

Mrs Frances Martin said: “I guess I used to use soap powders before we could get detergents. I don’t remember my wash being unclean then.”

Times, 2.3.71



Laporte in a storm

Not surprisingly, Laporte Industries’ plan to build a 72-acre reservoir for mining waste in the Peak District National Park has enraged the park’s planning board.

Laporte have been mining fluorspar for some time, and they already have two lagoons covering 25-30 acres, into which they pump the tailings left after the milling operation. These lagoons are almost full, and the planning board has given them permission to build another one (of about 30 acres) on the same site, provided Laporte start research into alternative methods of disposal.

The proposed reservoir, which will be needed by 1973 and will last about 10 years, will be at Blakedon Hollow, at the head of Coombs Dale, an unspoiled valley in the park. Once it is full and the slurry settles it can be grassed over, but the natural contours and character of the valley will be permanently changed.

Mr Theo Burrell, the park’s director, commented: “Lagoons are being filled twice as quickly as we expected. The reservoir would fill the valley; and what happens after that? We know from experience that the rate of mineral extraction is increasing. It is the open-ended nature of the threat that is so alarming. The effect of the reservoir on the landscape would be permanently changed.”

Fluorspar is used in aluminium and steel smelting and in the manufacture of hydro-fluoric acid for refrigerants and aerosol sprays. *Observer*, 28.3.71

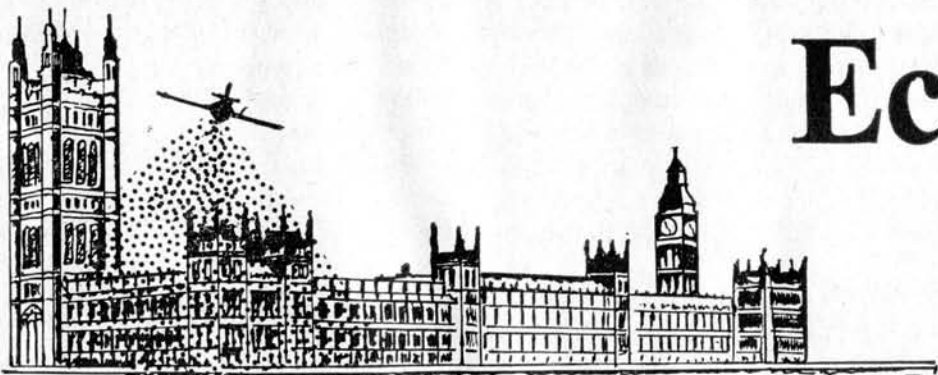
Food for thought

DDT is good for you, claims Los Angeles pesticide dealer, Robert Loibl. In an attempt to demonstrate that DDT does not harm humans, he and his wife have been taking 10 milligram capsules of it every day for a month. This is about 300 times more than is consumed by people taking it via a normal diet.

So far, Mr Loibl, who is 60, reports an improved appetite and a marked feeling of well-being. His 44-year-old wife has done even better: DDT has made her teeth and gums healthier and cured her dandruff.

We hope that all who deal in pesticides will be encouraged to follow the Loibl’s example.

Daily Telegraph, 15.3.71



Ecopolitics

by Robert Allen

A civilised act

The refusal by Congress to allow further funds to America's SST is a milestone in the growth of environmentalism. As the circumstances of the SST's demise are crucial to the development of environmental politics in general and the fate of Concorde in particular, it is useful to consider some of them.

The campaign against the SST was well-organised, thorough, and persistent. A *Times* leader (26.3.71) noted that letters to Congressmen and Senators "were running four to one, and even ten to one, against more taxpayers' money for the corporations which promised that the plane would be a commercial success but wanted 90 per cent of the finance to be put up by the public. The Friends of the Earth and the National Taxpayers' Union have proved to be a winning combination".

Ecological arguments were of fundamental importance. In the closing weeks of the campaign, Senator Proxmire released signed statements by medical experts arguing that commercial operation of SSTs could reduce the belt of ozone which protects us from excessive ultra-violet (thus raising the spectre of an increased incidence of skin cancer), and the Administration could only confess that such a hazard required investigation. The White House failed to get away with its contention that two prototypes couldn't do any harm. SST's opponents not unreasonably assumed that two prototypes would be more difficult to cancel than none at all, that the proposed 500 production aircraft could have a considerable effect on both the atmosphere and the stratosphere, and that (given our environmental ignorance) it might not be possible to predict this effect from the results of two prototypes.

In an industrial nation like the US,

which for too long has suffered ecological blunders in the name of profit (somebody else's) and progress (never defined), such warnings carried weight. They reinforced the rising discontent of people who are fed up with mounting expenditure on Vietnam, missile defence systems, and the man in the moon, and disgusted by diminishing and paltry expenditure on more urgent domestic problems like the clearance of derelict land, pollution control, and the provision of a decent transport system. Those commentators who played down the role of environmentalists in SST's demise by stating that economic priorities weighed more heavily than ecological arguments do not understand the philosophy of environmentalism, which incorporates both.

We can be sure that the environmental movement in the US will do its best to keep Concorde out of America. If they succeed they will have done this country a service, for we can no more afford the luxury of putting its effects on the environment to the test than they. We too have better things on which to spend the money—at the moment £1 million a week in this country alone. The question one American asked of the SST applies with equal force to the Concorde: "If the airplane industry thinks this is a great plane, why don't they put their money where their mouth is?"

That much put-upon creature, the British taxpayer, is being forced to finance a project which BAC and Aerospatiale would not for a moment contemplate alone. Even the airlines would rather be without it. According to Air Cdr. Donaldson, the *Daily Telegraph's* Air Correspondent, world airlines would prefer to buy jumbo jets rather than the costly Concorde—"but if one airline has Concorde, the others will have to have it or go out of business" (22.2.71). With this in mind, it

looks as if France will try and force Britain's hand by guaranteeing Air France a subsidy.

It is time for our Government to end this expensive farce. And it is time for all those concerned for a humane and just reordering of this country's economic priorities to unite and press for cancellation of Concorde. The Americans have looked at the future of their society and environment, and have seen that they must change their ways. Their rejection of the SST is a truly civilised act, and one that gives them hope. If we too are to look forward to the future we must emulate them.

The SST is dead. May Concorde be buried with it.

Stockholm and the public

Mr Peter Walker, Secretary of State for the Environment, has appointed four chairmen to assemble working parties in preparation for the UN Man and Environment Conference in Stockholm next year.

Sir Eric Ashby chairs the working party on the control of pollution. Lady Dartmouth chairs the one on the human habitat. Mr Ralph Verney chairs the one on the management of natural resources. And Mr Dennis Stephenson chairs the working party on participation by young people.

Anyone can send memoranda, evidence, ideas and suggestions to the working parties, and is invited to do so care of the Department of the Environment.

Peter Walker

This month we were to have published a report resulting from an interview with the Secretary of State for the Environment. Owing to unforeseen circumstances, we have had to postpone this report—an attempt to find out when the Government's promises to clean up the environment are likely to be fulfilled—until July.

Ecotechnics

by Arthur J. Puffett

Water from sewage

A two-year programme of pilot plant experiments which has begun at an abandoned water treatment plant in Essex, will show to what extent "typical" sewage can be restored for water supply purposes and whether the cost of treatment is economic.

The experiments, the first of their kind in Britain, are being undertaken at Essex Water Company's old Langford plant, near Chelmsford, which is no longer in commercial use. They are the result of collaboration between the Department of the Environment and the Water Company, and they follow laboratory tests, carried out by the company, which indicated that effluent could be purified to a standard similar to that of river water currently taken for supply—and at a cost comparable to that of bringing raw water to the area from elsewhere. The tests on a larger scale will reveal any technical difficulties to be overcome in commercial production and, it is hoped, will show conclusively whether the method of treatment is practicable.

Initially the pilot plant is designed to produce up to 2.5 million gallons of water a day which is discharged into the River Chelmer downstream of the company's raw water intakes. The effluent, which comes from Chelmsford, is regarded as "typical" as it is from a variety of domestic and industrial sources.

The results of the experiments will show whether it will be possible for water produced in this way to be used eventually to augment rivers used for water supply; for direct "second class" supply to industry; to recharge aquifers; or ultimately to produce potable water from heavily polluted rivers normally unsuitable as raw water sources.

The cost of the programme, estimated at £40,000, is being shared by the Essex Water Company and the Department of the Environment. A steering committee on which the DoE, the Water Company and the Water Pollution Re-

search Laboratory are represented, is supervising the investigations. Day-to-day control is in the hands of the Water Company, and complementary sampling and analysis programmes are being carried out by the Company and the Water Pollution Research Laboratory assisted by Essex River Authority.

Industrial cooperation in USA

The Climax Molybdenum Company plans to open a new mine near the Continental Divide, near Empire, Colorado. Although it is not scheduled to begin operation until 1975, a gigantic planning effort has been going forward for several years to minimise the impact on the environment.

The mine will cost some \$200 million just to get started, but nearly two billion pounds of molybdenum are buried in the mountain. Molybdenum is highly valued for its strength, which is retained even at very high temperatures. Almost all machinery makes use of metals that contain small percentages of molybdenum.

In a co-operative study and planning effort with members of the Colorado Open Space Co-ordinating Council (which represents nearly all of the 16 conservation groups in Colorado), it was decided that each step in planning the mine was to be considered from both the economic and environmental standpoints. This way, businessmen, engineers, and conservationists would be working together, not after the environment had been polluted, but before the project had even begun. However, a Climax vice-president said at one meeting, "we want to make it clear that this co-operative effort doesn't require large expenditures. We're trying to do all we can, but we don't want people to think we're making sacrifices".

Co-operation has been most successful on the problem of tailing. Tailing is finely ground rock that comes out of the mill in the form of 60 per cent water, 40 per cent solids. Before the mine is exhausted, more than 300 million tons of tailing will have to be disposed of. For every ton of mined rock, only 8 pounds of molybdenum disulphide are extracted. In most mining, the tailing is stored behind dams to prevent stream pollution and allow the water to separate from the tailing and be recirculated. To enhance this system, the Climax engineers came up with a plan to locate the tailing disposal area

off-stream and protect it with a system of ditches to carry off natural precipitation. This will prevent washouts of tailings that might otherwise enter the natural stream flow.

This means that the tailing pond and a mill will be on the other side of the Continental Divide—13 miles from the ore deposit and relatively removed from public view. A standard gauge electric rail system will haul the ore, first through nine miles of tunnel, then four miles above ground, much of it hidden from sight as the railroad slips behind a spur of the mountain.

The mill will use recycled water from the tailing pond in order not to require vast supplies of water from the natural system. Since this industrial process water will be used in a closed circuit, it will also prevent entry into the natural streams. A series of canals will be placed above the pond, allowing water running off the mountain to bypass the pond and flow into the natural streams. This will remove the threat of flooding, which would carry tons of finely ground rock that could pollute vast areas.

Revegetation of cuts and fills will bring about a stabilisation of the area to prevent erosion.

(The above is an extract from an Environment Case History Report Service bulletin, issued by the Freed Publishing Company, P.O. Box 1144, FDR Station, New York 10022. The company issues two bulletins a month and covers schemes for raising money, organising campaigns, and case histories of completed projects.)





Towards a unified science

The Brain as a Probability Calculator

If a bridge player is to maximize his chances of winning he must be able to calculate the most probable distribution of the cards yet to be played among the three other players. Similar probability calculations are required on the part of all gamblers if they are to maximize their chances of success. A little reflection will reveal that this must apply to all behavioural processes. *In each case, the hypothesis that is postulated, and on which a behavioural response is based, must be the one that has the highest probability.* The fact that this is not evident at first sight, as it is in a game of chance, is because what constitutes the most probable hypothesis to explain a given situation will be different in each case, since the information in terms of which probabilities must be calculated will, like Heraclitus's river, be modified with each experience.

Are we not over-estimating the capacity of biological organisms in suggesting that they are capable of making such precise calculations? I do not think so. The ability of relatively simple organisms to perform mathematical feats which would test the capacity of the most able mathematician has been clearly demonstrated.

For instance, experiments with the lesser white-throated warbler have revealed that they are guided by the stars during their migrations. The skill with which they are able to do this is quite surprising. Sauer writes:

"Warblers have a remarkable hereditary mechanism for orientating themselves by the stars, a detailed image of the starry configuration in the sky, coupled with a precise time sense which relates the heavenly canopy to the geography of the earth at every time and season. At their very first glimpse of the sky, the birds automatically know the right direction. Without the benefit

of previous experience, with no key except the stars, the birds are able to locate themselves in time and space, and to find their way to their destined post...

"Not only does this 'Time-sense' allow them to take account of the sun's motion across the sky, but it must also be able to make adjustments to astronomical evolution, for, in the course of time, the pattern of constellations in the sky is slowly but constantly changing."

It is clear that these birds are in possession of an advanced piece of measuring equipment, which our best engineers would have difficulty in designing.

Another example is provided by a little fish (*Gymnarchus niloticus*) that lives in the Nile. It is capable of darting in muddy water after the small fish on which it feeds, and never bumps into anything, in spite of the fact that its eyes are quite degenerate and only sensitive to extremely bright light. Lissman, who spent 12 years experimenting with this fish, found that it owed its capacity for finding its way around so skilfully to its ability to discriminate between minute differences in the conductivity of the objects in its immediate environment. This skill is so developed that the *Gymnarchus* can tell the difference between mixtures of different proportions of tap water and distilled water entirely on the basis of their different conductivity. If salts or acids are added to the distilled water so that its electrical conductivity matches that of the tap water, it can no longer discriminate between them. Here again a complicated calculation must be made. To give an idea of the precision involved, Lissmann worked out:

"...that the *Gymnarchus* can respond to a continuous direct-current stimulus of about 0.15 microvolt per centimetre, a value that agrees reasonably well with the calculated sensitivity required to recognise a glass rod 2

millimetres in diameter. This means that an individual sense organ should be able to convey information about a current change as small as 0.003 micro-microampere. Extended over the integration time of 25 milliseconds, this tiny current corresponds to a movement of some 1,000 univalent, or singly charged ions."

Similarly, Noel-Martin noted the extraordinary mathematical ability of bees:

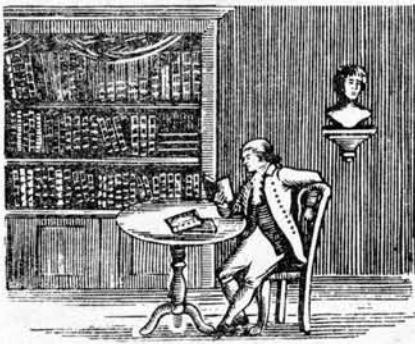
"Honeycombs are built according to maximum efficiency principles. Being hexagonal, the cells make use of available space in the most economic and symmetrical way possible, and the angle between adjoining cells is such that the smallest possible amount of wax is required for their construction."

It may be thought that these examples are simply curiosities of Nature. However, if our thesis be correct, they are but striking examples of a principle in terms of which we must explain "perception" and "thought" at all levels of organisation.

Thus, when I look out of my window and see a tree, a road, and people walking about, I am in fact formulating that hypothesis as to the nature of the environmental data isolated by my detecting mechanisms that has the highest probability in the light of my model of the environment. The same is true when I identify one of the passers-by as John Smith, and also when I assume that he is going home for dinner. And so it is when I guess that his dinner will consist of shepherd's pie and bananas and custard.

In each case, I am formulating that hypothesis which, in the light of my model of the environment, *has the highest probability*, though there may be a reduction in the degree of the probability involved as we proceed from the first case to the last.

Edward Goldsmith



Environmental Web

LIFE WITHOUT BIRTH, by Stanley Johnson, Heinemann, £2.50; 21 POPULAR ECONOMIC FALLACIES, by E. J. Mishan, Pelican Books, 35p; ECO-CRISIS, edited by Cecil E. Johnson, John Wiley & Sons, £1.55; THE ENVIRONMENT, by "The Editors of *Fortune*", Harper & Row, \$1.25; WELSH WILDLIFE IN TRUST, edited by W. S. Lacey, North Wales Naturalists' Trust, Bangor; NOISE, by Rupert Taylor, Pelican Books, 35p.

The environmental crisis and the movement, one might almost say the industry, devoted to finding solutions to it, is like a spider's web. All roads lead to the centre and the closer you come the more forcibly is it brought home to you that population growth is the source of most of our ills. It matters not a whit where you enter the complex, the conclusion will be the same.

Stanley Johnson has more experience of the population problem than most people. He has worked with the statistics in his office at the World Bank and as Project Director for the UN-USA National Policy Panel on World Population. But statistics are only numbers and Mr Johnson set out to see the problem at first hand. His travels took him through Latin America, Asia and Africa, to the places where population growth means people and where the numbers we all agree are too large turn out to be children playing in the dust outside their shack of a home.

The prospect is not optimistic, but it is not all gloom either. There are many people, all over the world, working away doggedly at the problem, and Mr Johnson is generous in his praise and encouragement.

He is never smug or patronising: two of the more common pitfalls awaiting the "man from Head Office". He writes well and his book should be read by everyone who wants to grasp the complexity and the pity of it all.

Population growth leads to other difficulties and also to the acceptance of a number of doctrines, particularly economic doctrines. We are all brought up to believe, as an article of faith, that economic expansion is good and that the GNP must come before all else, that increased taxes cause inflation, the national debt is a burden, consumer choice rules the market, and so on. At last some economists are willing and competent to challenge some of these

beliefs and if there is a classic in this field—how long does it take for a book to become a classic?—it is *21 Popular Economic Fallacies*, by Dr E. J. Mishan. Dr Mishan is Reader in Economics at the London School of Economics and Political Science, so it is doubly encouraging that not only does he hold the beliefs that he does, but that he is, presumably, passing them on to his students. Dr Mishan challenges and demolishes many of the most basic economic assumptions of our society. His book first appeared in 1969 and now it is re-issued as a low priced paperback. This will widen the book's readership, and so it should. Perhaps even one or two politicians and other economists may be able to afford a copy!

Having established that population growth, plus a number of highly dubious economic assumptions are leading us into trouble, what is that trouble? Now we meet the heavyweights. *Eco-Crisis* brings together all the loose strands and presents a series of 16 papers that add up to as near to Doom as most of us care to venture. There is no shortage nowadays of such anthologies made up of articles and book chapters that turn up everywhere. There are one or two that I greet now as old friends, pat them on the back and read on. *Eco-Crisis* brings in some newcomers. Along with the big names: LaMont C. Cole, Paul Ehrlich, Paul B. Sears, Rachel Carson and Garrett Hardin—himself the editor of an anthology—there are Aldous Huxley, J. Robert Oppenheimer and Linus Pauling. The aspects of human ecology covered include population, of course, and the politics of ecology, chemical and biological warfare, physics in the modern world (by Oppenheimer), deserts on the march, dwindling lakes, silent spring and the economics of wilderness. The book probably offers little to those already aware of the existence of an impending crisis, but for those who are just coming to this awareness, and who would like a quick sight-seeing tour of the field, this book will be good value. Most of the crisis is there and the guides are the most authoritative in the world.

The Environment is another such anthology. It begins with a statement from President Nixon. Then it goes on to describe the degradation of the American environment. The book is wholly US-oriented. The emphasis is different from that of *Eco-Crisis* and the two books do not really conflict. *The Environment* is concerned much more with the politics and

economics of repairing damage already done than with the biology of the damage.

Environment means different things to different people, but to many of us it must mean the wild places, the hills and the coast and the tamed farm land. *Welsh Wildlife in Trust* begins with a quotation from King George VI: "The wildlife of today is not ours to dispose of as we please; we have it in trust and must account for it to those who come after". The book is published by the North Wales Naturalists' Trust and I hope I am not treading on too many toes when I say it is by far the best book of its kind to have been produced by a voluntary body. Its approach is that of the naturalist, of course. Many ecologists are concerned with the human survival and it is refreshing to meet a non-anthropocentric concern for a change, an approach from people who believe that the protection of other species and the provision of habitats in which they may thrive is worthy in itself. It was produced for European Conservation Year and it provides detailed coverage of the work and achievements of most of the voluntary bodies—not only the naturalists' trusts. Also, it has an excellent index, which gives it a value as a reference book. I was not able to find the price marked on the book, and so I cannot say whether it is good value for money.

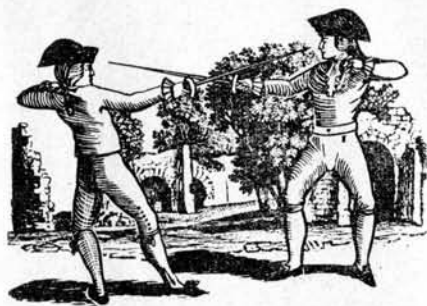
Noise, by Rupert Taylor, was also published in 1970. We are working from the general to the particular and here is a book devoted to one environmental hazard alone. Mr Taylor is an independent noise control consultant and although he claims he is not an academic, he has to explain some of the technicalities of the science of acoustics. We all know, or think we know, when a noise irritates us, but measuring its volume is a more subtle business than it might appear and the quantification of its "nuisance value" subtler still—but possible.

Most of us are well aware of the dangers of atmospheric and water pollution, of the damage done to the soil by over-intensive farming, on the pollution of the sea and the assaults on the best of our towns and countryside. Noise pollution is every bit as real as any other form of pollution, but it tends to get left out.

The reason there is so much noise, of course, is that there are too many people and not only are we dirty and destructive, we are noisy with it. And that completes the circle and we are back at the centre, discussing population again.

Michael Allaby

Letters



The New Forest

Sir,

May I clear up one or two matters of concern to us which arose from articles in your March issue?

Firstly, Professor G. W. Dimbleby's article about our conservation methods in the New Forest. This article gives the Professor's own views on the Ancient and Ornamental woodlands which are, of course, of considerable interest to us. But we must emphasise that the management of the New Forest, of which the Ancient and Ornamental woodlands are an integral part, is a highly complex problem and that ecological considerations have to be seen in the perspective of other important interests such as those of the Commoners and the general public.

We of course realise the importance of ecological research and have been in correspondence with Professor Dimbleby on this subject. Further, in June last we arranged for him to spend a day in the Ancient and Ornamental woodlands with the Deputy Surveyor of the New Forest, and later arranged a meeting between the Professor, our Commissioner for Forest and Estate Management, and our Director of Research. Although it presents difficulties, the possibility of setting aside some part of the Ancient and Ornamental woodlands for the purpose of ecological research has been discussed with the Professor and will of course be taken into account by the Minister of Agriculture during his present consideration of the Commission's management objectives in the New Forest.

In the article by Mr Robert Allen on the recent Report "Conservation in the New Forest", it is odd to read "...the Government should allocate these funds and see that the Commission implements the Report's proposals". The Commission was one of the four Authorities which voluntarily set up the steering group and working party which produced this Report, and was represented on both. It would therefore obviously be the sincere wish of the Commission to implement the Report's proposals and not, as your correspondent's words imply, to drag their feet.

Yours sincerely,

D. B. Rooke, Principal Information Officer,
Forestry Commission, 25 Savile Row,
London, W1X 2AY.

Emigration selfish?

Sir,

While recognising that some form of population control is unavoidable, I feel that in certain cases the end does not justify the means. I am referring to Mr Goldsmith's unfortunate remarks on immigration and repatriation in "The stable society: can we achieve it?" (Vol. 1. No. 6, December).

If Britain really wants to be magnificently selfish, then an immigration ban and repatriation are convenient if not fundamentally significant contributions to a solution. If, however, we are sincere in our desire to alleviate the world population problem, I fail to see how this policy would ameliorate the much more desperate situation in India, for example. There are also the obvious ethical and humanitarian objections to such a scheme.

I only hope this suggestion was made just for the sake of completeness and consistency, as I usually find myself in complete agreement with everything written in *The Ecologist*.

Yours sincerely,

Michael McLaughlan,
18 Panmure Place, Edinburgh, EH3 9JJ.

Conservation Corps

Sir,

Does it not occur to Mr Jennings ("Letters", Vol. 1, No. 8, February) that publicity could be a significant means of remedying the lack of funds which hinders greater expansion in the Conservation Corps? Concern for the planet's condition is increasing but still lags far behind the rate of deterioration and, encouraging as the Corps' work is, it remains a drop in the ocean. Universal action is essential, not just with the agreement of the public, but with its active cooperation.

Finally, I must emphasise that I am not opposed to his excellent organisation, and that my comment was of a general nature and not, as Mr Jennings decided, a concentrated attack. I am pleased to hear of the proposed appeal.

Yours sincerely,

John M. McAuley,
64 Barshaw Road, Glasgow SW2.

Environmental Politics

Sir,

In the March issue of *The Ecologist* it was proclaimed that the article 'Environmental Politics in Britain—why don't they exist and a plea that they be started', would be published.

'At last,' I thought, and waited impatiently for April to come. But as usual I was bitterly disappointed. It was all talk and no action—no suggestion as to how we could influence the Government on environmental policies—just a vague outline of why we were not so doing and why it was difficult to do so.

Is it so impossible? Would not a concerted effort to co-ordinate environmentalists be welcome all over the country? Could not *The Ecologist* act as a focal point at least in the initial period?

I suggest that the following points should form the basis for agreement:

i) The increasing population is the basic evil and all other problems stem from this. Control must be started if catastrophic consequences are to be avoided.

ii) Economics is not the most important way of evaluating life.

iii) Conservation of certain amenity areas with their populations should be given priority e.g. Snowdonia, New Forest could be declared a heritage of the nation and any development should be forbidden. These areas should be carefully controlled to prevent damage by cars, litter etc. . . .

iv) Pollution should be fought in all spheres. The biological pollutants such as weedkillers, pesticides and animal feed antibiotics should be subject to rigorous control and research of their effects must be carried out. Industrial and sewage effluents need to be under constant surveillance and where possible should be trapped *in situ* and used in the manufacture of other products. Metals etc. could be recirculated to a far greater extent than at present.

v) Research into all aspects of the environment is of paramount importance and should be treated as such. The results should be used in all practical applications instead of mouldering in the universities.

I stress that these points are coloured by my own personal viewpoint. If a lobby were to be formed, serious discussions would have to be held to modify the policy and of course to introduce fresh ideas. *The Ecologist* lobby can be formed and with luck and hard work it will be—soon if it is to have any chance of success.

Yours sincerely,

P. Forey,
107 Howard Road, London E17.

Standard of Living

Sir,

In the February issue of *The Ecologist*, the phrase "standard of living" appears on two consecutive pages.

On the first of these pages (p. 28), "a low standard of living" is mentioned as a deterrent to Kenyans who are not making sufficient use of birth control. On the following page can be found the sentence "It all follows from the desire for higher standards of living . . .", "it", being various types of pollution.

I realise that neither of the writers concerned are specifically concerned with *The Ecologist*. I merely think the fact that the two views on the desirability of a high standard of living are in direct opposition is worthy of comment.

Yours sincerely,

Nicholas Harrison,
Saundersites, Charterhouse, Godalming,
Surrey.

This month's contributors

Peter Bunyard is Science Editor of *World Medicine* and an Associate Editor of *The Ecologist*.

Charlie Maclean is a free-lance writer and an Associate Editor of *The Ecologist*.

Brian Johnson is a Fellow of the Institute for the Study of International Organisation and the Institute of Development Studies at the University of Sussex. He is also an Associate Editor of *The Ecologist*.

Henry A. Schroeder is Professor of Physiology at the Trace Element Laboratory, Dartmouth Medical School.

Michael Allaby is Editor of *Span*, the Soil Association monthly, and an Associate Editor of *The Ecologist*.

Stanley Johnson was until recently Project Director for the UN-USA National Policy Panel on World Population, and is the author of *Life without Birth*, reviewed in this issue.

In the next issue of *The Ecologist*

The Rape of North Wales. Environmental disruption in Anglesey and Snowdonia: a critique by Friends of the Earth.

Environmental genetic hazards—the impossible problem? by Dr Bryn Bridges, Director of Medical Research Council Cell Mutation Unit and Senior Research Fellow of the University of Sussex.

In defence of the primitive by Conrad Gorinsky. A statement of the intrinsic value of primitive peoples, the vital contribution they can make to our

world, and how we can ensure their survival by helping them to make it. Together with this article we are publishing the aims and objects of *Survival International* (incorporating the *Primitive Peoples Fund*), the only organisation with a programme for helping primitive peoples throughout the world; and a discussion by *The Ecologist* of the ecological importance of contemporary primitive societies, and why their survival is of immediate concern to the UN Conference on Man and the Environment. Originally scheduled for this month.

Classified Advertisements

FIELD STUDIES OFFICER. London Borough of Enfield, Education Committee, Kapel Manor Horticultural Centre, Bulls-moor Lane, Waltham Cross, Herts. Tel: W.S. 38480. *Field Studies Officer*—Applications are invited for the above post from 1 September 1971 to develop a Centre for environmental education within two adjacent parkland estates comprising a total of 88 acres. Salary grade: Lecturer I (Burnham S.E.). Further particulars and application form obtainable from the Chief Education Officer, Education Department, Church Street, Edmonton, London N9 9PD, to whom completed forms should be forwarded no later than 7 May 1971. D. B. Denny, Chief Education Officer.

FORTY YEAR OLD FARMER wishing to atone for wild DDT sown in youth, seeks interesting post in conservation. Box E131.

ESCAPE FROM SMOG, stress and noise to unknown, unspoilt Orkney Isles. Holiday cottages in Sanday from £12 weekly. Apply

Mrs Grimond, Firth Orkney. Tel: Kirkwall 2251.

KALEIDOSCOPE/Encounter groups, today's most rewarding form of group interaction. Free brochure: Kaleidoscope, BM/Box 750, London WC1. Tel: 935 1990 or 435 9200.

KEEN YOUNG MAN, 19, holding A-level Geography and Economics, plus 7 O-levels, and currently employed in civil aviation, requires satisfying and interesting employment in environmental conservation. Prepared to work hard and travel anywhere. M. W. Green, 34 Leamington Road, Southall, Middx.

AGE 22. IQ 150. Widely travelled young man requires position with organisation (independent or otherwise) researching into the environment. Write Box 11A.

BEEKEEPING—Full of interest, written by Beekeepers for Beekeepers about Beekeeping. 60p per year post free from A. C. Davies, Woburnia, Seaton, Devon.

Coming events

8 May—Association for Neighbourhood Councils first National Conference on Neighbourhood Councils at Hoare Memorial Hall, Church House, London SW1. Information from John Baker, 18 Victoria Park Square, London E2 9PF.

10 May—Pollution and International Law. Seminar led by Ian Brownlie from 5 pm to 6.30 pm at Linacre College, Oxford.

17 May–29 May—Countryside Festival in Wester Ross. Information from the Festival Office, Ullapool, Ross-shire, Scotland.

24 May—Environmental Influences on Reproduction. Multi-disciplinary symposium at Royal Society of Medicine, London. Information from Dr R. E. Lister, Inveresk Research International, Inveresk Gate, Musselburgh, Midlothian. Closing date for registration is 3 May.

24 May—Murderous Providence. Seminar on pollution as a social and economic problem with no "technical" solution led by Harry Rothman from 5 pm to 6.30 pm at Linacre College, Oxford.

29 May–31 October—11 am–6 pm on Wednesdays, Thursdays, Saturdays, and Sundays, Weald and Downland Open Air Museum, Singleton, near Chichester, Sussex. Fascinating collection of old buildings saved from demolition.

7 June—The Case for a Real Doomwatch. Seminar led by Kit Pedler from 5 pm to 6.30 pm at Linacre College, Oxford.

Ecology Action Conservation Directory Additions:

L *The Men of the Trees*, Hollybank House, Emsworth, Hampshire PO10 7UX (Telephone: 02-434 2701). Founded in 1922 by the well-known forester, writer and conservationist, Richard St Barbe Baker, the Society is now international with branches throughout Britain. Encourages preservation and planting of trees for practical and aesthetic reasons. Publishes a journal, *Trees*, three times a year. *Protest. Information.*

FRAME is closely linked with ENVIRONMENTAL and CONSERVATION problems and is doing something positive about the matter.

POLLUTION — accurate assessment in humans of the effects of the many chemicals, etc. to be found in our food today is a matter of vital importance to our survival. The "Fund for the Replacement of Animals in Medical Experiments", which is professionally advised, is doing all in its power to promote more exact, efficient, speedy and often more economical techniques for use in these studies.

CONSERVATIONISTS are perturbed at the threatened extinction of various species of animals due to the heavy drain being made on them by laboratories. **FRAME** is tackling the problem in a practical manner by exploring and publicising experimental techniques not requiring the use of animals.

PLEASE HELP our efforts by donating generously and read of the many developments in this scientific field by sending for our pamphlet, "Alternatives to Laboratory Animals". Write to:

FRAME

35 Wool Road, Wimbledon,
London, S.W.20

Microbes and Biological Productivity

Edited by D.E.HUGHES and A.H.ROSE

In the fight to feed millions who are threatened with starvation, new ways are constantly sought to increase the yields of crops and livestock. One way in which food production can be increased is by harnessing the microbes which play a part in all biological processes; this report is an up-to-date account of our knowledge of microbial interventions in the productivity of plants, animals and soils.

Two themes emerge in these discussions. Several of the papers can be labelled *ecological*, while the rest deal with *microbial technology*. In the ecological contributions, there are attempts to quantify complex associations of microbes. Such quantification is essential in any ecological model which will be used to predict the overall yields of a system.

The quantitative picture is extended in economic terms by articles on deleterious intervention of microbial systems on growing plants and animals, and on the preservation of stored food from microbial attack.

The articles on *microbial technology* discuss advances in our ability to control microbial growth, reproduction and chemistry, and how they affect large scale production of food or food additives.

These papers will interest biologists, industrial microbiologists, ecologists and food technologists, especially in developing countries.

Symposia of the Society for General Microbiology 21

396 pages

£5 net in UK

CAMBRIDGE UNIVERSITY PRESS

HEALTH FOR ALL

The Pioneer Self-Help Health Magazine

May issue now
on sale 10p monthly

***OVERCOMING
GALL-BLADDER
TROUBLES**

***CANCER—WHAT
ARE THE REAL
CAUSES?**
Are other culprits
hiding behind the
tobacco smokescreen?

***LIFE-LINES IN
DANGER.**
Roy Bridger's Anti-
pollution and pro-
conservation feature

***SHALL I BREAST-
FEED MY BABY?**

Organic gardening,
cookery, conserva-
tion and other
regular features.

If you have a health
problem **HEALTH FOR
ALL** will help you to un-
derstand it—and solve it.

Ask your health food
store or newsagent for a
copy today, or send this
coupon for a recent issue
—**FREE**

TO HEALTH FOR ALL
Gateway House, Bedford
Park, Croydon CR9 2AT,
Surrey.

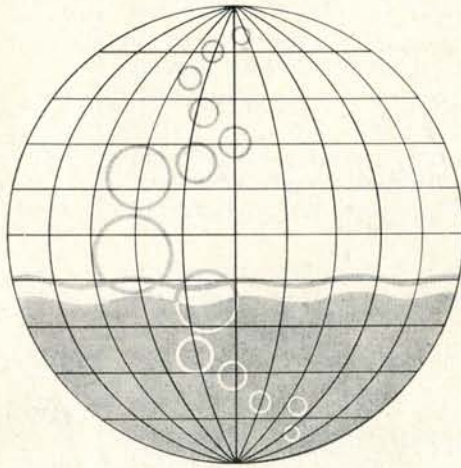
Please send recent issue
FREE to

Name

Address

.....E2

Environmental Pollution Control *and* Effluent and Water Treatment Exhibitions



and supporting conferences

Effluent and Water Treatment Convention
Association of Public Health Inspectors Conference
Waste—The Management Problem of the 70's
The Society of Environmental Engineers Symposium
Preventing Industrial Pollution Conference

**VISIT THE MAJOR
EVENT IN 1971
OLYMPIA JUNE 22-25**

Make sure of your tickets and conference
information by completing the coupon below.

To: BRINTEX EXHIBITIONS LIMITED		E5/71
3 Clements Inn, London, WC2A 2DB		Telephone: 01-242 1200
<i>Please send me complimentary tickets to the above exhibitions and sets of conference information.</i>		
Name		
Address		
.....		
.....		