The Ecologist

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December 1971

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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:AglibrairiLondon 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.





We are all addicts

Not to brush one's teeth is to run the risk of becoming a social outcast, yet in most of the 3,000 or so societies we know about, toothbrushes, let alone toothpaste, were unheard of, and teeth were probably cleaner than they are now.

I once saw a film of a European doctor teaching Samoans how to brush their teeth. Particularly striking was the fact that their teeth were white and shiny, while his were black. The trouble is that once people start using toothbrushes, there is no looking back. The self-regulating mechanisms that once kept the teeth clean become redundant, and, in accordance with the law of economy, probably the most basic law of science, they cease to be operative. Toothbrush addiction has set in!

Unfortunately the toothbrush and toothpaste are unlikely to be isolated phenomena. The sort of society that produces them is also likely to manufacture countless other mass-produced artefacts. Among these will figure processed foods of different types, made from, among other things, refined carbohydrates and saturated fats, which are increasingly associated with tooth decay. As these form an ever more important part of our diet so must there be a corresponding increase in our addiction to toothbrushes.

Eventually these clumsy devices are not sufficient to maintain our teeth in good condition. All sorts of other ruses must be resorted to, to prevent their further decay. Hence the need for dentists who specialise in devising and implementing such ruses. As their services become more generally available, so tooth decay must become correspondingly more tolerable. In this way, we become addicted to dentistry!—a service that our population, growing in numbers and in the degree of their addiction, can ever less afford.

Hence our government finds itself obliged to provide it free. State welfare is an inevitable feature of a society geared to the methodical substitution of technological devices for the complex self-regulating mechanisms of our biosphere—whereas in a sound, stable society there is no need for state welfare, as the sick and the old are cared for as a matter of course by their families and friends. By usurping functions that should be fulfilled at the family level, state welfare renders the family redundant, causes its disintegration, and thereby becomes evermore indispensable. In this way we now become welfare-addicts!

Eventually even dentists are of no avail: our teeth fall out, false teeth are resorted to, and as these become generally available, so there is a corresponding decline in our preoccupation with the preservation of the real ones. Brushing one's teeth becomes less of a ritual. Refined carbohydrates can be consumed with a clear conscience and dentists rather than painstakingly repair decaying teeth can now indulge in an orgy of tooth extraction-in other words we become false-teeth addicts, and the extent of the addiction can be gauged by the fact that there are today 17 million toothless people in this country!

In much the same way, our society is becoming even more addicted to glasses, antibiotics, vaccines, caesarian operations, contraceptive pills and all the other gimmicks resorted to, to ensure our survival in ever less favourable conditions.

Similarly, our agricultural system becomes addicted to various technological devices, designed to increase shortterm output.

Thus farmers take far greater liberties with their soil than they used to before artificial fertilisers were available. In Tuscany wine growers in hilly areas are dispensing with their traditional terraces. After all, soil erosion is of no consequence when artificial fertilisers can be resorted to to ensure soil fertility!

In Egypt, the Aswan Dam now prevents the Nile from depositing its annual layer of silt on the adjoining land, once among the most fertile in the world. This is held to be of no consequence as artificial fertilisers can always be acquired to enrich the impoverished fields. Everywhere farmers are neglecting to return manure to the land where it belongs. It is redundant, bulkier, messier, and in Britain at least, it doesn't benefit from government subsidies as do artificial fertilisers. In the meantime the soil, saturated with inorganic nitrogen, no longer depends on the nitrogen-fixing bacteria for its supply. These slowly become inoperative and the system's ability to ensure self-fertilisation is correspondingly impaired. Addiction to artificial fertiliser has set in.

The more pesticides are used, the more the natural mechanisms ensuring the control of insect populations become redundant. Also, since pesticides accumulate as one moves up the food chain, the predators which previously ensured this control receive a far higher dose than do their prey, and their demise must lead to the latter's further proliferation, and so our crops become "hooked" on pesticides.

And so it is with all the other aspects of our technologically dominated life, and the result is that the satisfaction of all our ever more numerous addictions whether they be toothbrushes, toothpaste, dental-services, false-teeth, state welfare, fertilisers, pesticides, etc., makes it imperative that the economy be maintained on a course of continued expansion. If there is the slightest respite, withdrawal symptoms begin to appear. If "economic stagnation" sets in, then these symptoms become so pronounced as to menace the survival of society.

Unfortunately, economic growth cannot go on indefinitely, as our planet has a finite capacity to provide the necessary raw materials and to absorb the industrial wastes.

Still more unfortunately, we are now approaching that point where countless physical, biological and sociological factors must bring it to an abrupt end unless we are wise enough to ensure a transition to some sort of steady-state society. To do this we must somehow contrive to recover from our addictions. How can this be arranged?

It clearly cannot all be done at once without causing the collapse of the whole system.

In fact to recover from them at all is not possible unless we gradually reintroduce at the same time the selfregulating mechanisms that they have been allowed to usurp.

To create conditions in which this recovery can occur so that technological intrusions are reduced to that level which the biosphere can support must be the basic aim of all those seriously seeking to solve the present environmental crisis.

The Anglesey Story Extended

by Richard Thompson Coon

Bull Bay, looking east towards Amlwch.



"The British Petroleum Company and the Royal Dutch/Shell Group together account for about one-third of the international trade in crude oil and products. Their sales abroad, which are nearly five times as big as the United Kingdom's oil consumption, bring the country substantial invisible earnings."

White Paper on "Fuel Policy" Labour Government, 1965.

Preface

In June The Ecologist printed an article "No oil at Amlwch". It began by stating that the demand for energy in the British Isles was rising at the phenomenal rate of between 7-8 per cent p.a, and then went on to describe the early stages in the development of a massive project which incorporated the construction of a deep water oil terminal off Amlwch on the north coast of Anglesey, a crude oil pipeline across North Wales and the expansion of refining the petro-chemical facilities at Stanlow, Ellesmere Port and at Carrington near Manchester. The project is indeed massive; it involves the Royal Dutch/Shell Group and permits the importation of up to 50,000,000 tons of crude oil p.a. The area chosen for the terminal is one of outstanding natural beauty.

If readers are able, it is important that the June article be consulted before continuing with this one. Abbreviations used:

- ADAG = Anglesey Defence Action Group, formed to consolidate all opposition to Shell's project in North Wales.
- ACC = Anglesey County Council.
- AMTB = Anglesey Marine Terminal Bill.
- H of L = House of Lords.
- SBM = Single Buoy Mooring: 50' diameter buoy anchored to the seabed and having a rotating attachment for mooring lines and floating hoses to connect with tanker. The whole apparatus is linked to the shore by twin sets of pipelines.

The object of this article is to attempt a critique, through a study of this project, of the democratic machinery when it is dealing with what are called "environmental problems" or, even more incorrectly, "amenity issues".

The calendar of events in the theatre of the Anglesey project since March 1971

March 18th. Motion passed at the AGM of the ACC to present a Private Bill to Parliament for Shell (U.K) Ltd seeking authority to construct an oil terminal and other shore installations at Amlwch. At the time of this debate no planning applications from Shell had been received, and, not for the first time, the County Planning Officer's Report on the matter was suppressed (in general it opposes the project), nor was he given an opportunity to speak.

April 16th. Local papers announced that the ACC had received Shell's planning applications.

April 30th. Communication from the H of L to the original Anti-Oil Campaign at Amlwch, stating that petitions opposing the Bill could be lodged up until 6th February, 1972.

May 6th. Local papers announced presentation in Parliament of a Private Bill entitled "Anglesey Marine Terminal".

May 18th. Communication from the H of L to the Anti-Oil Campaign contradicting their letter of April 30th and stating that petitions should be lodged by May 29th.

May 20th. First Reading, H of L, AMTB.

May 27th. Formation of the ADAG. May 28th. ADAG registered at the Private Bill Office, H of L, as a petitioner against the AMTB.

June 8th. Selected Peers circulated with draft petition and cover note. Petition finally deposited with the H of L, representing 20 organisations and about 8,000 individual signatories. The petitioners asked that Parliament put the whole matter before an INDEPEN-DENT court of inquiry.

June 9th. Second Reading of the AMTB. Debate lasting one hour. AMTB referred to Select Committee (consisting of five Peers).

June 29th. Select Committee begins its hearing.

Select Committee hearing ends.

Select Committee passes judgement on the evidence they have heard and permit the AMTB to proceed. "Special Report from the Select Committee of the House of Lords on the Anglesey Marine Terminal Bill." Its verbage would lead one to believe that the hearing was a waste of time; it was not however a waste of time, but for other reasons.

Parliament adjourns for the Summer recess and ADAG prepares for the forthcoming Public Inquiries.

ACC debate whether or not to let their own senior Planning Officer give evidence at the first Public Inquiry; by a close vote they decide that he cannot. Shell at loggerheads with the ACC for ever having allowed such a debate to take place, since they rightly suppose that wide knowledge of its occurrence will be interpreted as yet another manifestation of their own lack of real interest in the opposing arguments.

October 1st. Letter from Shell to the House of Lords and members of the Select Committee stating their regret that they had been misinformed on the reality of the amount of pollution that results from the operation of the SBM system of transferring oil at sea.

October 5th. Public inquiry begins in Anglesey in connection with the land based installations (not the pipeline).

Third Reading, H of L, AMTB.

The Bill has still to pass through the Commons, and there has still to be yet another Public Inquiry in connection with the pipeline.

What the 'Marine Super' said and forgot to say

For Shell, the word pollution means "Where the spillage of oil results in the fouling of a beach or of damage or inconvenience to an individual." Characteristically, damage to marine ecosystems does not appear to constitute pollution.

In January 1970, local people were told by the Chief Marine Superintendent and also director of Shell International Marine Co Ltd (responsible for tanker operations for the Royal/Dutch Shell Group), Captain Dickson, that "There should be no cause for concern", and that "There might be a small quantity of spillage, but not enough to pollute. About a couple of barrels are spilt every time a tanker is connected to the pipeline." These quotations come from the minutes of a local meeting attended by various interested parties, and although they are probably not word perfect, their import lodged firmly in the minds of many present.

Under cross-examination in the H of L, Shell tried to discredit this evidence, declaring that they had been misreported etc. They had never actually made a public denial, but Captain Dickson did write the following letter, seven months after the meeting described above.

Dated: 14th August 1970.

- Sent to: a) Editor, Holyhead and Anglesey Mail
 - b) D. E. Sutcliffe, Amlwch and District Residents Association.

"My attention has been drawn to the leaflet on this subject, circulated by the Residents' Association. It contains a serious error of reporting and of fact, where it says 'Company officials recently admitted that spillage of about two barrels is inevitable every time a pipeline is connected. . .'. As the only spokesman, so far, on marine matters connected with this project, I would like to clear up this misunderstanding. In 1969 alone, Shell handled 50 million tons of oil, involving 1,000 ships, through 166 SBM's around the world without a single pollution incident. We are convinced that pollution from SBM operations off Amlwch is certainly not inevitable and we have very substantial operating experience to prove this. The misunderstanding appears to have arisen because I have been unwilling to give an absolute assurance that mistakes will not occur which could involve the release of a small quantity of oil into the sea, but we would regard this a very serious matter happening on only rare occasions when someone might make a mistake. I personally believe it to be most unlikely that in such circumstances the oil released could cause any pollution whatsoever of the Anglesey coastline."

signed: Capt Dickson Capt Dickson's "personal belief" was of course conditioned guess-work, since no specific studies had been carried out to elucidate this question at that time, nor indeed had there been any more than cursory investigations by the time the matter came before the H of L, 10 months later.

Up until the Select Committee the only incident of spillage Shell were ever heard to admit too, concerned a spillage in Malaysia, which they said caused no "pollution". Capt. Dickson eventually put an end to this myth when under cross-examination in Select Committee by the Counsel for ADAG. The cross-examination went as follows: Q. Are you able to give me an approximate idea of how many spillages there have been over the years during which these SBM's have been in use?

A: I cannot give you an accurate industry figure for this, I am afraid.

Q: No. I do not suppose this is a decision which you could make, but would Shell be prepared to disclose their records in relation to these SBM's?

A: Oh, yes, indeed.

The fact that Shell had no figures on hand, nor seemingly did they expect to have, was typical of the casual indifference that they displayed all through the Lords' hearing; however, messages were sent out to the 16 SBM installations mentioned above. The figures so far released (October 1st), totally contradict the impression given by Shell in all negotiations preceding the Select Committee, and are given in the table on p. 7.

There are many variables which would affect our considerations in trying to analyse this data and relate it to the situation off the north coast of Anglesev. Besides considerations of equipment and efficiency, the prevailing physical conditions at each terminal would have to be known (most are operated under tropical conditions), as well as the prevailing political pressures. For instance, the obvious discordance between the figures given for Durban in its first year of operation (23 spillages) and the figures for Port Dickson in Malaysia during eight years of operation (3 spillages), would indicate that there was some relation between the active amenity interests in Durban and the rather more desolate nature of Port Dickson. Even the most simple arithmetic however, indicates that spillage at the Anglesey terminal would be inevitable.

Although Shell do not consider that they contradicted themselves by publishing these data, they did write to the H of L and to members of the Select Committee to express their "regret that the Select Committee were given incomplete evidence . . ." It would of course be more accurate to say that certain vital information was not available when it was most needed; Shell ". . . appreciate that the Committee, having reported the Bill to the House no longer has any jurisdiction in the matter . . ." They go on to say that "Should it be considered necessary to recommit the Bill the Promoters would naturally agree to that course being taken." Again we ask, public spirit or charade? Their letter finishes with "The revised information given for these discharge SBM's in no way alters the evidence given on behalf of the promoters . .."

Thus it appears that in order to achieve its ends the company concerned with this project deluded the public. It is possible that Shell were unaware of this, in which case they were deluding themselves as well. The delusion, conscious or unconscious, is still clearly evident in their letter to the H of L.

Shell may not be responsible for the sea of oil that 'RA 2' experienced on its journey across the Central Atlantic, and although Shell may not wish to be ranked amongst the world's greatest polluters, the fact remains that the British Petroleum Company and the Royal Dutch/Shell Group together account for about one-third of the international trade in crude oil and products.

Ducks?

Winds sou-westerly (offshore), often veering rapidly to the nor-west (onshore) in a matter of a few hours, causing the character of waves to change rapidly, i.e. waves can increase from 4' to 20' in a matter of a few hours; maximum recorded wave height in adjacent sea area (Morecambe Bay Lightship) is 28 feet. Large tidal range with fast flowing east-west currents (3-4 knots) and major tidal excursions. The seabed is rock, covered by a thin film of sand. The coastline consists of rocky cliffs and sandy coves. Shipping lanes to and from Liverpool, to and from southern Irish Sea, ostensibly five miles offshore. During sou-westerlies, Point Lynas, only three miles east of Amlwch, becomes a point of rendezvous between large vessels and the Liverpool Pilots; furthermore, this sea area is traditionally used by other vessels not requiring pilots for shelter and for other purposes. These, in summary, are the conditions prevailing off the north Anglesey coastline. It takes only very little intelligence to realise that to manoeuvre 300,000 ton tankers around SBM's, in these circumstances,

LOADING S.B.M.s

| | | | 121.65 | Num | ber of Spilla | iges | | | | |
|-------------------------|-------------------|---------------------|------------------------------|---|--|----------------------|-------|--|---------------------------------------|--|
| Location of Terminal | No. of S.B.M.s | Years in Service | Not exceeding 0·5 tons | Exceeding 0.5 tons but not exceeding 5 tons | Exceeding 5 tons but not exceeding 30 tons | Exceeding 30 tons | Total | Total Number of Ships Handled | Total Tonnage of Oil Handled | No. of Cases of Beach Pollution |
| Gamba Gabon | 1 | 4172 | Nil | 12 | 3 | 8 | 23 | 303 | 11,397,069 | Nil |
| Forcados Nigeria | 2 | 2 | Nil | 11 | 7 | 16 | 34 | 533 | 36,108,000 | Nil |
| Muscat | 3 | 4 | 4 | 3 | 1 | 1 | 9 | 1,676 | 63,400,000 | 1 |
| Halul | 1 | 7_{12}^{9} | 7 | Nil | 2 | Nil | 9 | 816 | 43,738,000 | Nil |
| *Miri Sarawak | 3 | 10 | 15 | 11 | 8 | 10 | 44 | 2,250 | 36,117,000 | laction at |
| Totals | 10 | 29 | 26 | 37 | 21 | 35 | 1 | 5,578 | 190,760,069 | 1 |

*Subject to further check

DISCHARGE S.B.M.s

1 October 1971

| | | | | Num | ber of Spilla | ges | | | | |
|---------------------------|-------------------|---------------------|------------------------------|---|--|----------------------|-------|--|---------------------------------------|--|
| Location of Terminal | No. of S.B.M.s | Years in Service | Not exceeding 0.5 tons | Exceeding 0.5 tons but not exceeding 5 tons | Exceeding 5 tons but not exceeding 30 tons | Exceeding 30 tons | Total | Total Number of Ships Handled | Total Tonnage of Oil Handled | No. of Cases of Beach Pollution |
| Yokkaichi | 2 | 6 | 8 | Nil | Nil | Nil | 8 | 514 | 50,542,149 | Nil |
| Japan Niigata Japan | 1 | 5 | 15 | Nil | Nil | Nil | 15 | 104 | 6,607,057 | Nil |
| Kawasaki Japan | 1 | 3 | 24 | Nil | Nil | Nil | 24 | 194 | 21,926,147 | Nil |
| Port Dickson Malaysia | 1 | 8 | Nil | 2 | 1 | Nil | 3 | 583 | 24,538,133 | 1 |
| Durban S. Africa | 1 | 1 | 13 | 5 | 5 | Nil | 23 | 91 | 7,443,185 | Nil |
| Totals | 6 | 23 | 60 | 7 | 6 | Nil | | 1,486 | 111,056,671 | 1 |

is bringing into the area an even greater risk of collision than already exists.

Tankers using an Anglesey terminal, would discharge their cargoes over a 24 hour period, which means pumping through the night. The characteristically variable weather conditions would mean that they might frequently be forced to disconnect the floating hoses (ship-to-buoy) and even cast-off altogether, a situation inevitably involving a high risk of pollution. It is totally wishful thinking to expect the 60-70' berthing launch attending this operation, under these highly adverse circumstances, to deal with oil pollution as well, or go chasing after an oil slick in 10' waves with a gale blowing, once it has finished.

Professor P. W. Richards, past President of the British Ecological Society and once Editor of the *Journal* of *Ecology*, has described the north coast of Anglesey as ". . . the finest stretch of relatively unspoiled coast, both scenically and biologically between Pembrokeshire and Scotland." This is precisely the reason why those areas stretching out to either side of Amlwch have been designated Areas of Outstanding Natural Beauty, with some parts planned to become Heritage Coasts.

Regarding, more specifically, the biological interest of the area, Professor D. J. Crisp, F.R.S., for many years director of the Marine Science Laboratories on the Menai Straits (they separate Anglesey from the mainland) has written as follows.

"The establishment of a specialised marine laboratory by the University Grants Committee in 1948 in North West Wales, was a recognition of the suitability of the then unspoiled coastline of Anglesey and Caernarvonshire for scientific work of this nature. The laboratory at Menai Bridge, though small, is widely known througout the world, and the shores of Anglesey must be amongst the most intensively investigated in the world. The investment not only in buildings but also in scientific knowledge and achievement is therefore very great indeed. The Marine Science Laboratories at Menai Bridge are the largest and most comprehensive university institution studying the marine environment in the British Isles. Some six years ago, I calculated that well over 1,000 students used the coast annually. ... I must object to their proposals on

the following grounds:

1. Oil Spillage. Past experience indicates that all terminals have caused accidental spillage.... So far as I know, there is no precedent for this kind of operation in a high risk sea area....

2. Petrochemical development. Once an oil terminal is agreed, the next step will inevitably be an industrial plant using readily available oil. It is disingenuous to assert that Shell are at present only asking for a terminal. I suggest that a petrochemical plant is as inevitable a consequence of approval of a terminal as the spillage itself." There is no truth to be found on the question of whether or not a petrochemical plant would come to Anglesey; however, in about 1964, there were reasonably detailed plans in existence for a 2,000 acre petrochemical complex on the island.

Independent scientists, i.e. those not employed by I.C.I., Shell etc, and of course most other people as well are becoming not just annoyed but angry; Professor Crisp writes "I am far from impressed by the undue haste with which this Bill has been pushed forward. It is the kind of haste that is likely to, and perhaps intended to, exclude the proper democratic process."

During the Select Committee hearing it became more than abundantly obvious that Shell knew absolutely nothing about the area they planned to lay waste, that they had neither troubled to consult the most learned people and organisations most intimately concerned, nor had they troubled to carry out more than superficial studies on the physical nature of the coast. Detailed studies for instance, which often take a long time, must be carried out to establish tidal flow patterns etc, before any meaningful attempt can be made at designing, to maximum efficiency, an organisation to deal with oil spillage.

At Shell's main refinery at Stanlow in Cheshire, an enormous scheme to expand refining facilities is already well into its construction phase, and represents an investment of around £150,000,000. This increase in refining capacity is just one part of the Anglesey project, the part at the other end of the pipeline. That Shell should have already committed capital to this part of the project, before either presenting planning applications or even seeking authority in Parliament to build an offshore terminal is typical of the sweeping omnipotence that emanates, more and more, from the giant corporations. It makes an absolute mockery of the local Public Inquiry system as well as any appeal made to Parliament. Having been allowed to go so far, it would of course be exceedingly embarrasing for Shell if this project failed: this is their "point of view", and they will use all in their power to make sure that it prevails. Nearly all of those who are objecting to Shell's plans in Anglesey are aware, to some degree or other, of the total situation. They are people however who "are not in power", they still look to Parliament for help, they still meet in pubs and in each others houses to discuss what to do, they still dip into their own pockets and appeal to the sallow father of Democracy, the British Constitution!

Whose government? Which government? Where government?

Behind the theatre that diverts the public's attention from the central issues and drains their energies and resources, there exists the muddled semblance of Government, gloating over its "invisible earnings". The outward manifestations of these so called "invisible earnings" are of course the poverty now rampant in the non-industrial world, and more recently our own howling about our own environment.

Britain is rapidly becoming the Great Chemical Island. The chemical industry, after mechanical engineering, is the largest in the country, and is growing at roughly double the rate of the national economy. So far, the cumulative investment in petroleum-chemical manufacturing plant is about \pounds 1,000,000,000 and is increasing at approximately \pounds 200,000,000 a year.

Crude oil refining capacity in this country is now about ten times its level in 1950. During 1970, refining capacity reached 112,340,000 metric tons; the country imported 101,539,000 long tons, mostly from Iraq, Libya and Arabia, and Saudi re-exported 17,999,000 long tons of crude oil and refined liquid products worth £171,973,000, 80 per cent of which went to Europe. In 1970, inland consumption amounted to about 95,000,000 tons.

It was against this background that ADAG appealed to Parliament to halt the passage of the Anglesey Marine Terminal Bill. They asked that the Government might appoint a Planning Inquiry Commission under Section 62 of the 1968 Town and Country Planning Act. They wanted the project assessed from all angles, and wanted to hear opinions other than those of Shell. Their appeal was turned down,

firstly by the Department of Trade and Industry, even before evidence had been heard in the H or L, and latterly by the Lords themselves.

Towards the end of the Select Committee hearing a representative from the Department of Trade and Industry was called. In answer to the question "Have you given thought to the position of how to bring oil into the country . . .?", the reply came ". . . this is not something that the Government intervenes in on the policy level although it does, of course, have the planning control." In answer to another question on the siting of terminals the reply came "... we leave the siting of refineries or terminals to the industry; and leave it to them also to push it through the various procedures."

In publishing their facile but predictable "Special Report" the Lords composing the Select Committee were not even "pushed", they just signed along the dotted line. After five days of debating around the whole question of importing oil into this country, one Peer didn't even know where Milford Haven was.

Act II of our play is presently (mid-October) underway on Anglesey. ADAG is again fighting valiantly on private funds. Shell are again fumbling since they wish to avoid the extra cost of sinking tanks underground, whilst ADAG has produced first rate evidence illustrating how successfully this has been accomplished in Scandinavia.

Before the curtain rises for the next Act, our Government should seriously consider the principles at issue.

To what extent is the pattern of life in these islands to be dictated by large commercial enterprises?

To what extent should we be willing to sacrifice what remains of our natural environment in order to permit further economic growth?

To what extent should we not now be developing a society less dependent on fuel consumption rather than continually increasing our dependence on a commodity that will be ever less available in the forthcoming decades?

We must hope that our Government will have the courage and foresight to face these issues now—while there may still be time.

Unfortunately, its fixation with economic growth at all costs augurs ill not only for Anglesey, but for us all.

Nuclear Games in the South Pacific

by Graham Baines

To the Americans, the British and the French, the peaceful inhabitants of the islands of the South Pacific are "nobody much". Their islands were chosen as sites for the nuclear weapon testing extravaganza of the 1950s and 1960s. Their economies were undermined, their social systems disrupted and their environment polluted. What does the future hold for them?

Exalted at the destructive potential of the atomic bomb which they had unveiled so spectacularly at Hiroshima, the American military eagerly stepped up its development during the late 1940's.

In the absence of a convenient world war, somewhere had to be found where nuclear bombs could be tested in the atmosphere without inconveniencing anyone, or at least nobody much. To the Americans the Micronesian peoples of the central Pacific were, and still are, "nobody much". Conveniently, they are quiet, unprotesting, inarticulate and above all few. Since the American authorities had to experiment with atomic explosions, Micronesia was the place to do it.

The nuclear laboratory selected was known as Bikini atoll. It is, or was, about two miles long when it was "acquired" by the U.S. Navy in 1946 and had about 150 inhabitants. They were taken away. They were re-housed on a succession of other islands, all of which displeased them in some degree, until they were finally deposited on the island of Kili, which is 0.36 square miles in area, and pleased the Bikinians no more than the others.

Twenty three nuclear detonations were "conducted", as they say, on or over or under Bikini atoll. There was no shortage of islands from which to continue testing when Bikini became too "hot" and too small. Eniwetok, an atoll in the same group, had the honour of being the stage for the first performance of the thermo-nuclear H-bomb.

Britain, of course, felt compelled to match the American achievements blow for atomic blow. She coerced an unwitting Australian government into providing facilities for contaminating the great Australian outback. Beginning with a crude device exploded aboard a retired warship in the Monte Bello islands off Australia's northwest coast she advanced eventually to more exciting and powerful weapons which not even the naïve Australian government would accept for test.

There was, of course, the Pacific. The Americans had demonstrated the ease with which an island could be commandeered and its inhabitants evicted without the slightest murmur of protest. The British Army moved in to Christmas Island, used it as a base for nuclear "experiments" in 1956 and 1958 then, with the treaty to ban atmospheric nuclear tests looming threateningly on the horizon, the Americans were offered the facility for a final nuclear fling in 1962. Perhaps in hopes of a test-ban violation by the Soviet Union, which would have given the Americans an excuse to continue testing, they maintained the Christmas Island test centre until as late as 1967, four years after the signing of the treaty.

The governments of Communist China and France, among others, have refused to sign this test-ban treaty. Determined at least to match the atomic might of Britain, the Soviet Union and America, they are pushing ahead relentlessly with nuclear "experiments" in the atmosphere.

France commenced her programme of tests from a base at Colomb Bechar (Algeria) in the Sahara. The test site was located in what, to the French military, though not necessarily to the displaced inhabitants, was harsh and useless desert, suitably isolated from prying eyes and far enough from France that the tests might go unnoticed by those Frenchmen who had expressed fears that the Gaullist nuclear fling was immoral, dangerous and expensive.

Miscalculation of the meteorological conditions attendant upon one Saharan test resulted in the passage of a highly radioactive cloud across the Mediterranean to Europe. Levels of ¹³¹I in Portugal rose dramatically. Sheep thyroids were shown to contain 600 pCi/g of this radioisotope. Human thyroids were similarly affected. The French government took note; this was close to home.

The French move to the South Pacific

A decision was made, in 1962, to transfer French nuclear test facilities to the South Pacific. British and American efforts earlier had proved that local populations were indeed quiet, unprotesting and inarticulate.

The Centre d'Experimentation Atomique (CEP) was founded to organise the South Pacific nuclear test programme. Massive amounts of money, machinery and men have been pumped into French Polynesia over the past decade. The social effects, on simple island communities thrust overnight into the atomic nightmare, have been calamitous.

By 1966 more than a third of the salaries of French Polynesia were paid, directly or indirectly, by organisations associated with the nuclear test programme.

Though the atolls of Mururoa and Fangataufa were uninhabited when the CEP chose them as nuclear test sites there were social upheavals on the island of Hao where a support base was constructed. A town to support 4,000 people, with facilities appropriate to Frenchmen plucked from the comforts of metropolitan France, was constructed. Many local labourers were needed to work on the project. They came from all parts of French Polynesia, one of the effects being that the phosphate deposits of Makatea were neglected while miners left for lucrative CEP jobs. Local patterns of trade were disrupted and prices soared upon the appearance of thousands of wellpaid French technicians competing for limited supplies of goods.

Similar disruptive effects were evident on Tahiti, where French troops who participate in the nuclear experiments are garrisoned. During each test series as many as 40 French warships are in the area for test surveillance and policing activities. Up to 20,000 soldiers, sailors and airmen of the Force de Frappe constitute a serious disruptive influence in an island group whose total population is less than 100,000. Relations with the local population are poor and a false economy, based on the luxury needs of military personnel, has developed. Cultural conflicts have cut deep into Polynesian society. The eventual cessation of CEP activities in the area will result in an embittered society whose ephemeral economic foundations will suddenly crumble. Even if the French were to provide economic props the social wounds could not be healed.

Polynesian plea

During the late President de Gaulle's 1966 visit to French Polynesia a local politician, John Teariki, attempted to convey the concern of his people at this nuclear invasion of their peaceful islands.

"I believe this economic anarchywhich the government has done nothing to temper—is being wittingly exploited to establish in this sector, as in others, the domination of the CEP in Polynesia. Likewise our crushing budgetary problems have been adroitly manipulated to increase the power of the State over local administrative services, leading irresistably towards the disappearance of our last territorial freedom.

"The creation of this thing and its presence here among us, without the Polynesians having been consulted in any way, although their health and that of their descendants is at stake, constitutes a serious violation of the contract which binds us to France and which the Charter of the United Nations recognises we have....

"Could you, Mr President, ... reembark your troops, your bombs and your aircraft?

"Then later on, those of our people who suffer from leukaemia and cancer would not be able to accuse you of being responsible for their sickness.

"Then, our descendants would not be able to reproach you for the birth of mutants and deformed children."

Up to the end of 1970 22 nuclear devices had been tested in French Polynesia. A further series of tests began in May, 1971. The test sites at Mururoa and Fagataufa are less than a thousand miles from Tahiti. Samoa and Fiji are more than 2,000 miles distant. This additional mileage is of small comfort to Pacific islanders, however. The extensive upper atmospheric transport of radioactive particles and the slow exchange between hemispheres means that no part of the world can avoid fallout from this source.

During each test series British technicians are located on Pitcairn Island, 600 miles from the nuclear explosions. Their activities are supported by ships of the Royal Navy. Pitcairners have been led to believe that such activities are designed to protect their tiny community from fall-out hazards. Last word from the French President, Georges Pompidou: when asked if he believed there was a possibility of nuclear collaboration between Britain and France he replied: "Everything is possible. Agreements always on nuclear matters between France and Great Britain are indeed possible, and probably even desirable...."

In any case, the New Zealand government operates an extensive network of radioactive fallout monitoring stations throughout the western South Pacific. They are primarily interested in levels of certain long-lived radioisotopes in air, soil, rainwater and milk. Their data, therefore, give no more than a vague idea of what is happening in marine food chains, where concentration factors can result in radiation levels up to 200,000 times that of surrounding water.

Dubious international safety standards

Along with other governmental monitoring agencies the NZ National Radiation Laboratory adheres to the increasingly dubious standards of health hazard set by the International Committee for Radiological Protection (ICRP).

In using a concept of "permissible level" they give the impression that there is a level of radioactivity to which humans can be safely exposed.

There is no evidence of a safe level. The ICRP's recommendations are founded on the assumption that any exposure to ionising radiation may carry some risk for the development of somatic effects and of hereditary effects. The assumption is made that, down to the lowest levels of dose, the risk of inducing disease or disability increases with the dose accumulated by the individual and that there is no minimum or threshold dose for any effect.

The acceptance of risk is reasonable, to a point, where beneficial aspects of radiactivity are concerned. People involved usually have a choice as to whether or not they are exposed to genetic risks and often the risk is insignificant in comparison with the benefit to be derived. The population as a whole is not required to share this risk.

The morality of governments which will allow whole populations to be exposed to health risks from tests of nuclear armaments, where no potential benefit can be argued, is questionable.

"Permissible" levels, dubious as they are, are vulnerable to misuse by monitoring agencies. A case in point concerns the Agricultural Research Council Radiological Laboratory which was charged with the responsibility for monitoring radioactive contamination of foodstuffs in Britain during that reckless period of the late fifties when Britain, the United States and the Soviet Union were detonating nuclear devices with abandon. The "permissible level" for ⁹⁰Sr in milk had been set at 67 pCi/gCa. Levels rose markedly in 1961. To a public who had been assured by their government that adequate precautions were being taken to protect their health and that no dangers were to be anticipated from levels of radioactivity below that officially described as "permissible", the publication of a figure above this level would have caused consternation. The UK government might even have been obliged to make moves to stop nuclear testing.

Acting under cover of a clause in the Medical Research Council's rationale for the setting of "permissible levels", to the effect that the situation should be reassessed from time to time, the level was quietly raised from 67 to 130 pCi/gCa.

Effects on ecosystems

The local effects of a nuclear explosion in or above a tropical lagoon, such as those at Mururoa and Fangataufa, are drastic. An inward rush of water exposes corals and these, with the intricate complex of organisms inhabiting the reefs, are quickly killed by the searing heat of the nuclear blast.

Surprisingly, many fish in the area escape death by virtue of the shielding effect of water against heat and radiation. The long-term result of this however is undoubtedly detrimental. Local fish do become highly radioactive, if not from the initial blast radiation then certainly from the deadly fallout which follows. Genetic damage then may give rise to aberrant progeny and the role of a particular species in the ecosystem may be altered.

The question that most concerns us here, however, is the passage of radioactivity through marine food chains. Selective metabolism of individual radioisotopes results in a concentration of radioactivity which may be as high as 200,000:1, as in the case of ⁶⁵Zn in oysters off the Coast of Washington, USA.

South Pacific island communities consume very large amounts of seafood. The inhabitants of small coral atolls depend for their survival on fin fish, shell fish and coconuts. On islands where it is possible to grow vegetables the consumption of marine food, while reduced, is still very high.

The tragedy of the Bikinians, whose atoll was sacrificed to American delusions of nuclear grandeur, entered a new phase recently. Insisting on their return to Bikini in spite of its altered size and shape and the ugly relics of its nuclear test days, the Bikinians extracted a promise from the US that their island be "restored" to a habitable form.

The return of the Bikinians

Most of the original coconut palms which gave Bikini its distinctive atoll appearance in the halcyon days of the early 1940's have disappeared in the nuclear holocausts that followed. Everywhere is covered by a dense mass of secondary scrub, coarse and useless. The stubborn healing power of natural growth has led to the island being covered with this obdurate greenery, like a vegetable scar-tissue.

The Bikinians cannot return until certain landscape surgery is undertaken and long-term food crops, such as coconuts and breadfruit, established. Bikini is claimed to be "radiologically safe", though there is reason for conjecture as to what the authorities rate as "safe". The outer islands are still too radioactive for anything but intermittent visits and the charming little surgeon fish darting among the coral heads carries in its tissues a radioactivity created that day when a bomb exploded in his lagoon, generations before he was born.

One important food species of Bikini, in common with many South Pacific islands, is the delicious coconut crab, *Birgus latro*. This species has steadily accumulated ⁹⁰Sr to dangerous levels, and may never be eaten again. A taboo on the consumption of these crabs, and perhaps shellfish, may lead to the adoption, by the new Bikinian society, of a basic diet of coconuts and canned beef!

Similar long-term contamination of islands in French Polynesia is taking place today, highlighting that grotesquely selfish aspect of human nature which results in the sacrifice of natural resources so urgently needed for the future to doubtful short-term gains.

One group of fish widely distributed throughout the South Pacific and consumed in increasing quantities, not only there but elsewhere in the world, is tuna. These magnificent fish constitute the third link in a food-chain which begins with plankton. Such plankton, floating near the surface of the sea are very susceptible to contamination from radioactive fallout. Some of this plankton is made up of the larvae of various fish species whose development appears to be limited by even low levels of radiation. In any case all such plankton are consumed by anchovy-type fish which, in turn, are preyed upon by tuna, the original radioactivity being concentrated at each step in the food chain.

Tuna are known to migrate over distances of many thousands of miles. Though the chance may be slim, we cannot rule out the possibility that tuna being consumed in some island community far from the French nuclear test sites are carrying dangerous burdens of radioactivity picked up from other fish which have grazed downwind of a nuclear explosion.

Most people in industrially-polluted countries assume the South Pacific to provide one of the last remaining uncontaminated environments. This is far from the truth. It has its share of globally deposited industrial aerosols and toxic substances concentrated along marine food chains. Its coral reef communities do not have the resilience expected of communities of such rich diversity. Radioactivity is one of several artificial factors presently threatening the integrity of its ecosystems and the health of its people.

Coming events

15 December—Forum on Public Participation in Highway Planning. The Institution of Civil Engineers, Gt. George Street, London, SW1P 3AA. Further information: The Secretary, Institution of Civil Engineers, Gt. George St., London, SW1.

15—18 December—1971 European Working Conference on Environmental Conservation Education. Convened by the International Union for the Conservation of Nature in co-operation with the World Wildlife Fund. Gottlieb-Duttweiler-Institute, Park "Im Grüene", Rüschlikon at Zurich, (with the support of the "Migros-Genossenschafts-Bund", Zurich.

January 1972—University of Manchester/ Department of Extra-Mural Studies is to start a course which will lead to a certificate in Nature Conservation. For details contact Dr John Powell, Staff Tutor in Biological Sciences.

4-5 January 1972-Incineration of Refuse and Sludge. Symposium. University of Southampton. Booking forms and queries: M. A. McSweeney, Department of Civil Engineering, University of Southampton, Southampton S09 5NH. Tel No. Southampton 59122 (Ext. 884).

7—11 February 1972—Clean Air and Antipollution Exhibition, Lancaster Hall, Belle Vue, Manchester. Also conference on "Clean Air and Industry" organised by the National Society for Clean Air 134-137 North Street, Brighton BN1 1RG. Tel Brighton 26313.

ETHNOCIDE

The theory and practice of cultural murder

By Robert Jaulin

(translated from the French by Robert Allen)



Building the bohio.

For some time now, reports of massacres of Amerindians in Brazil, Colombia, the Guianas, Peru and Venezuela have provoked accusations of genocide.

Most people concerned at the plight of the Amerindians propose acculturation, or integration, the provision of schools and hospitals, etc. But these "enlightened" policies merely obscure—indeed they often express—the real evil: cultural destruction. This destruction of living civilisations, or Ethnocide, is analysed by Robert Jaulin through the dramatic example of the Motilone Indians.

The Motilone occupy an area of almost 3,000 sq km in the north of the Amazon forest, on the Colombia-Venezuela border. For centuries, they were at war with colonists and, more recently, with American oil men. This war was not of the Indian's choosing, but he has fought back, little by little losing his land. A few deaths here and there, on both sides, was the price he paid for the isolation that kept him happy and alive. But the increasing pressure of the colonists, backed by growing publicity of the "among dangerous savages" type, and the courageous madness of the missionaries, created a situation in which the Motilone had to sue for peace in order to safeguard their independence. They had long wanted it, but experience had made them suspicious, though at times they were also marvellously curious about our world, and all too easily duped: a fatal combination.

It was in this peace that I found the Motilone when in October 1967 I began my enquiry. The "civilised" world was represented by the Capuchin missionaries, the oil men, and a few colonists, but when I reached Dakuma, the missionaries, who rarely stay long in one place, had moved on. The air was healthy, in contrast to the mugginess in which I had stifled up to my arrival. High on a plateau, with the forest cleared about it so that one can see the entire landscape as far as the distant horizon, Dakuma is a magnificent place. The Indians there, the Bari, are the survivors of the Ogdobia group of the Motilone and there were then only 35 of them. They live in a strange agglomeration of corrugated-iron buildings: a single school-room, a shed, a chapel, a cook-house, a presbytery, half of which is for the Indians and two large, open sheds which house them. Somehow it all seems absurd and inappropriate.

To begin with the Indians refused to live in the shelter and insisted on building a traditional "bohio"—a big dwelling made with leaf "tiles" on a wooden framework—and moved into that instead. But as the old people died, so the younger ones, amenable as they were to outside pressure, submitted to the repeated "advice" of the Capuchins and left the bohio to occupy the sheds—after all you have to put up with that kind of thing to keep the peace with the whites.

In this article, I shall describe the countless ways in which this move has affected the life of the Motilone, and its important contribution to the destruction of their culture and hence to the disintegration of their society.

Bohios versus sheds

The bohio, is by far the most suitable dwelling for these forests, and even the Capuchins, great builders of metal sheds to the greater glory of God, now admit this. Well-protected by a roof which almost reaches the ground, it is cool and mosquito-proof. It is roomy (5-15 metres high, 6-20 metres wide and 10-43 metres long), and well-ventilated. It is extremely well-designed, very strong, and will last for decades provided that the leaves of the roofing are periodically renewed.

The rectangular corrugated-iron shed generally has a concrete floor. It is designed to admit the light of day, and the central cooking area has been omitted. The imposition of this modified habitat has led to a marked deterioration in physical well-being and has very seriously disturbed their social life, the intimacy of the family, and a division of responsibility admirable for its grace and stability.

The bohio is like an immense, inverted hull, its roof forming the walls, and within it on the periphery each nuclear family has a kind of room where the hammocks are hung. Together, these areas form a large circular corridor. The boundaries between rooms, however slight, are well-defined and help to preserve family intimacy and unity.

Thus, the bohio is rather like a roofed village, and when the 10 to 30 households combine to build a bohio, each will tend to concentrate on its own area which will be its particular responsibility once built. Marriage rather than kinship is the dominating relationship, so that the bohio as a whole is not the property of related families and indeed, there is no collective ownership. Thus the neighbours of each family form a

group into which it is possible to marry.

If a room in the bohio is left empty it will be abandoned, and will not be used or repaired—although if need be a stranger, someone outside the system, a white man for instance, may occupy it.

Amongst the Bari, as with many other peoples, the woman's place is in the home, which here means by the side of the roof, in the family area, under a small window. There she spins, weaves, rests and looks after her children, (cooking is done in the central, communal area of the bohio). Now and then the husband will join his wife and children to sit with them in the privacy of this reserved area. Much of this privacy is created by the very shape of the bohio, and thus of the areas within it, and the happiness and affection which is marvellously evident in Bari family life, largely depends on it. However, the shape of the bohio is not the only important factor shaping their lives: the darkness of the bohio (except for the mat area under the window), the nature of the floor (earth, not concrete), and the fact that cooking is done in the central area, all play a significant part in maintaining the unity of the social structure. It is essential to understand that the "civilised" shed has not provided them with alternatives capable of fulfilling the same functions. The Europeans are much concerned with making the young Amerindians appreciate the merits of daylight, and to understand the horror of their lives as passed in the darkness of the bohio. The equation of good with light and evil with darkness is also used to convince passing visitors, who, equally ignorant of the Motilone way of life and of life under corrugated-iron, and for the most part sure of the superiority of our civilisation and the barbarousness of all others, do not doubt that the equation is valid. In fact, the interior of the bohio is no darker than the average peasant dwelling. It is pervaded by a half-light, a semi-darkness which provides a much-needed element of restfulness and peace from the violence of the heat and the particularly fierce sunlight common in these zones.

The bohio, and the homes within it, are therefore able to fulfil their function as places of relaxation. When a man returns from fishing, hunting or from the gardens, he may relax in his hammock, play with his children, or,

once it is well and truly dark inside, lie tenderly with his wife in their hammock. Should he wish to make arrows or a hammock, he can sit by the door; but normally this is unnecessary for the semi-darkness is light enough for such activities, and in the evening he can work by the light of the fires.

During the day, the woman works either outside the bohio (gardening, gathering, fishing, etc.) or, more often, inside where, sitting on her mat by the "porthole", her loom set in the ground, there is ample light for spinning and weaving. Cooking is done at night in the central area. Meat and fish are smoked—they are delicious and of course keep better. By then, many of the men and children are already asleep, and for the rest the problem of lighting is of little importance.

The rain-forest of the Amazon-Orinoco basin is extremely hot, and there is an over-abundance of small animal life. Davlight alone is enough to attract mosquitoes, and a great many other insects swarm to electric lights. The two corrugated-iron sheds in Rosario have electricity, and the filth created by the thousands of tiny animals attracted by it is indescribably sordid. Undoubtedly, the wire-netting on the windows prevents many of them from coming in, but the frequent comings and goings of the many people using the building make serious protection impossible. Furthermore, in a house where a good many families live together, relatively sophisticated equipment would be required if lighting were to remain a matter for each individual family.

The bohio and the Bari ethic

Thus from whatever way we look at it, criticism of the bohio on the grounds of its darkness is without foundation. The half-light favours, and has helped to create, the Bari ethic, which insists on respect for others, and encourages the establishment of peaceful relations between groups, families, lineages, age grades and the sexes. The destruction of this half-light through the insistence on lighting (whether natural or artificial), results not only in some discomfort, but also in a gross disturbance of the elegance and respect for privacy with which all social intercourse is conducted.

The floor of the bohio is simply one of cleaned earth. Here, in most cases, "progress" has taken the form of a covering of concrete. The road to hell is paved with good intentions....

When I visited Rosario the women there complained that they could no longer weave, and indeed most of them were wearing tattered garments of manufactured cloth, which almost covered their shoulders but were torn open at the breasts. The lovely woven skirts which were once all they wore, have now largely disappeared. The main reason for this is that it is impossible to use the Motilone loom on a concrete floor: traditionally, vertical lengths of wood are driven into the earth floor of the bohio, and if you can't do this you can't weave. Although in Dakuma I found one woman who had managed, with an ingenious combination of wood and twine, to rig up a loom on the concrete, this case was quite exceptional, the only one in the area.

Progress towards filth

Concrete floors would appear to be easier to clean and to keep clean than the bare earth. While this may be true of our culture, it is not true of the Amerindian's. The infants, for example, urinate and defecate on the ground, and presumably will continue to do so until they are swathed in nappies that will restrict bodily respiration, keep them needlessly hot, and make them infinitely more dirty than they are now.

Whatever their floors are made of, the Amerindians clean them as the need arises. But earth absorbs urine more easily than concrete does, and furthermore their cleaning methods are much better adapted to earth than to concrete: they use the flat of a machete to remove any refuse (which is then put in a large leaf and thrown away), and at the same time the cutting edge of the machete is used to scoop up any dirt or urine-soaked earth. It should be obvious that the roughness of concrete itself harbours dirt, which cannot be removed in this way.

"Modernisation" has also meant the substitution of plates for the big *tatara* leaves, which in the past were used only once and then thrown away with the rest of the rubbish. The Motilone women have been taught that this sound ecological custom was savage. Instead they must use what is little better than poorly enamelled scrapiron just as they must clothe themselves in the rags of civilisation.



Above. The interior of the communal dwelling is cool and well ventilated. The villagers sleep in hammocks.

Centre. Cooking is done in a central, communal area.

Below. The "colonial sheds" that are replacing the traditional bohios.

Unhygienic concrete

Concrete floors, metal plates, and the other paraphernalia associated with the introduction of Western standards of living, reduce cleanliness and hygiene. They help to increase the stench and heat of the oven-like corrugated-iron huts. They will not be as clean as earth floors or *tatara* leaves except at the price of a complication of life, which, because of the heat, the scarcity of water, and other environmental and cultural factors, would be unduly burdensome.

The bohio, as we have seen, is a collective dwelling. The colonial shed however, is by its very nature, non-collective, and is nothing but a roof supported by wooden posts. In the Caratumbo area, Jesuits devised a temporary compromise between the two, a kind of bohio whose roof stops three metres short of the ground. At least five of these were built between 1964 and 1967, and the Bari were persuaded to accept them, for they were anxious to keep the peace.

The countryside, in the area we are examining, is one of numerous small hills among which run streams. The bohio was traditionally built on the hilltops, for there the atmosphere is fresh because the air circulates better. But these hilltops are exposed to the violent storms which are a feature of the area, and thus each bohio had to be designed to resist them. Since each family apartment was situated on the periphery, it is clear that the lower sections of the roof (or roof-wall) must be well protected not just from the storms, but also from the coldness of the nights, and the mosquitoes. Without such protection the traditional pattern of life would have been impossible, for the intimacy of the family depended on its ability to find privacy in its quarters around the edge of the bohio. Because of a temporary shortage of corrugated-iron, a number of large houses, roofed and walled with leaves, but rectangular rather than oval were built on the instructions of the missionaries. Because of the equation of civilisation with daylight, they decreed that the roof-walls should stop at least two or three metres short of the ground As a result, every time there is a storm, the Amerindians have to move away from the edge. The floor is of earth, but it might as well be of concrete, for since the periphery is now

so exposed, no-one sleeps, weaves, or lives there, the apartments have almost entirely disappeared and the families tend to crowd together at the centre.

Another disadvantage is the loss of security. The traditional bohio can be completely shut, and at night its two doors are easily blocked with matting. It is obvious that one cannot so efficiently protect what is little more than an open roof. At the time of my first visit this wouldn't have mattered, for there were no thieves among the Bari then. But there are now—yet another benefit of civilisation.

Destruction of family intimacy

The women cook in the centre of the bohio in the evening when most of the men and children are asleep. After sunset the fires provide enough light for them. Traditionally, each woman cooks for her own family, but in the new cramped conditions, two women will often share the same hearth. Game and fish are smoked, and consequently keep much longer than they would otherwise. Manioc is boiled, bananas are eaten raw or cooked on the embers. This means, of course, that the morning meal, which is the most important one of the day, is eaten cold-but it is an easy uncomplicated procedure and suits them. The meal is eaten between eight and ten o'clock in the morning, when the husband returns from the hunt and its preparation and consumption is essentially a family affair.

The Capuchin missionaries in Venezuala have now built a single *collective* kitchen outside the house, because its design does not allow for cooking inside. This communal cookhouse can only be used in daylight, and in building it and insisting on its use, they have destroyed the intimacy of the family meal, including its preparation, just as they have destroyed the intimacy of family life in general.

Whose interests are served?

In Dakuma, some women still cook in the ruined bohios, but the rule is that food should be served in the cook-house, just as it would be in convents. There is therefore a small shed where, crowded together, the women may heat their cooking-pots. Now they are being persuaded that a lot of cooking-pots is unnecessary, and that a single collective pot, as in the convents, would be much better. Attached to the cook-house is an open roof under which there is a large table and some benches. There the people have been persuaded to take their meal, and thus the idea of a religious order is further promoted at the expense of that of the nuclear family.

Modifications bring cultural disaster

The case of the forest Amerindians establishes that the social structure of a people is changed not by drumming in our ideas, but by altering the everyday details of their life-by modifying their clothing, habitat, cooking, dress, the organisation of their time and their needs, so that family life, consumption, production, all communication, can no longer function other than in the new one-sided relationship, with white society. Whether or not the substitution of our cultural model for theirs works to their advantage is not at issue, what matters is that these men are no longer anything to themselves, they are condemned to define their relationship with the world through an imposed relationship with the Whites.

In my experience whatever we bring them that might possibly be of benefit (like medicine), we give inefficiently and often with the covert aim of impressing our power on the receivers. It is plain that while we may now stop short of genocide of the classical American-West type, our civilisation finds it impossible to allow an alien culture to survive.

The reservation problem

There remains a slightly less harmful approach, that of the reservation, but this, although it reduces unnecessary contact between the two cultures, is also unsatisfactory for obvious reasons. The result is that the Amerindians take refuge in alcohol, they refuse to procreate, and they surrender themselves to suicidal squabbles. The phenomena are neither new nor isolated; in their own way at their own level they correspond to world-wide behaviour-patterns. To ask governments, missionaries or the mining companies, with their shortterm preoccupations, to take this into account, is doubtless to ask too much. But unless they do so, cultures from which we have so much to learn will be irreversibly destroyed and the people doomed to misery and extinction.

JAPAN

economic dream ecological nightmare

by Peter Smith

So many Asian countries and their satellites are still virtually an unknown quantity, that Japan has until recently been regarded with the usual mixture of ignorance and awe that west usually feels for east. Western powers still tend to regard the Japanese economic progress since the war with both respect and cynicism. The Japanese people themselves are only too aware that they are known as 'economic animals' by almost every other capitalist community.

To appreciate the Japanese position at present, it is important to know something of her recent post-war history. The various phases of Japan's economic development since the war can be divided into five stages. The first from 1945-49 was a period of war damage reconstruction when the of unemployed reached number 13,000,000 and mining and manufacturing production decreased to 27 per cent of the pre-war level. Temporary housing was erected and intensive efforts were made to reclaim additional land for agricultural use by improving drainage and irrigation.

The period from 1950-55 was characterised by efforts to exploit natural resources especially in areas selected under comprehensive development planning. The so-called "special procurement boom" brought on by the Korean War promoted the economic development. From 1956-60 there was a period of concentrated industrial development with priority given to the production of heavy and chemical industries. The housing shortage was still acute however and living conditions for the poor were made worse by the rise in prices of daily necessities.

How stable is Japan?

The fourth phase from 1961-64 can be considered as a period of corrective measures to cope with the lack of balance in socio-economic conditions between the different regions, and the development of particularly key areas. At the end of 1960, the Japanese Government announced the Ten Year Economic Plan in which the target was to double the national income and real gross national product by 1970. The "key point development formula" aimed at establishing and expanding key industrial areas in selected regions of the country, and was based on the promotion and modernisation of agriculture, and the promotion of under-developed areas. The average annual rate of increase in the economic growth was about 10 per cent and this period saw a massive movement of farm population to industrial sectors, which amounted to an annual average of 400,000 people. The nation began to suffer from the decline of agriculture, the enlargement of wages and income differentials, and the rise in consumer prices.

The fifth phase up to the present day has been devoted to enforcing countermeasures against excessive congestion problems in urban areas and sparsity problems in rural areas, as part of a comprehensive national development plan. The last Economic and Social Development Plan was announced in 1970 as an attempt to realise a balanced development of the regions, including a thorough comprehensive national land development.

How stable is the country however, and how does her economic advance reflect in the social climate and physical conditions within which 102,000,000 people live out their lives? With the advent of the Osaka Expo, Japan suddenly came into focus in the western press, and their industry, housing and highway development was looked at more carefully. The consequences of these on the people and on the country however were largely ignored.

Fortunately the Japanese themselves are in the mood for self-appraisal, and the unquestioning faith in the everincreasing Gross National Product is increasingly turning to doubts over whether or not it is worth the physical difficulties and environmental damage this has created. Japan now ranks as the third greatest economic power in the world, with a surplus of \$180 million in its international balance of payments in August of last year-an improvement of \$100 million on the previous month. However economists are not so happy-recent developments in Japan have led to US economic relations being similar to the 1930s when America imposed high tariffs on its imports, and Japan consequently began dumping goods in South East Asia and the economic conflicts created played a major role in causing World War Two. Japanese exports to all parts of the world are now 23 per cent up on last year, although probably the biggest reason for this is that European industries, Japan's biggest competitor, are fully occupied with the domestic demand. A recent OECD (Organisation for Economic Co-operation & Development) report states that the Japanese expansion is likely to lose momentum within the next year.

The Japan Economic Research Council issued a report before Christmas saying that it might become necessary to revalue the yen if trade and capital investment decontrol did not stop the increase in Japan's foreign exchange holdings. To make matters worse, there is a prospect of a severe labour shortage this year, with a likely growth in the working-age population of only three million over the 1970s. Most Japanese economists admit however, that the worsening economic relations stem from the heavy restrictions imposed by Japan, and if the economic conflict continues to deteriorate, Japan will have only three alternatives-to expand her military activity, to set up Japanese enterprises in foreign countries as in pre World War Two days, or to build roads, houses and other public facilities. Of these the first is unfortunately the easiest and most profitable.

Even these problems however must be considered in a minor key compared with environmental damage through traffic, waste products, and the exploitation of natural resources-the consequences of industrial expansion. Almost overnight the automobile has changed from a status symbol, into public enemy number one. By mid-August it had killed 10,000 Japanese since the beginning of the year. The Government's Institute of Technology recently calculated that automobiles gave out 853,000 tons of carbon monoxide alone in 1967. Most insurance companies have suddenly refused to sell insurance policies to more than half the nation's entire drivers as "irresponsible". Various citizen and student groups have been rapidly organised to drive cars off the streets. An obvious difficulty to such a stance however, is that the Japanese National Railways, Japan's largest business corporation, is on the verge of bankruptcy, being kept afloat by the vast earnings of the New Tokaido (Bullet) Line. The J.N.R. are in fact planning to abolish many deficient local lines and replace their services with buses-a policy which reportedly has the backing of the Ministries of Finance and Construction.

As a final step in dealing with this problem, the police last August began setting up "pedestrian-only" zones in the main streets of large cities including Tokyo, where five main sectors of the city are closed to traffic on Sundays (normally the busiest day of the week) and the famous Ginza is now closed to traffic for one hour every day, so that people can walk and shop freely at lunchtime.

Michitaka Kaino, the director of the Tokyo Environmental Disruption Research Institute envisages banning all automobiles except buses from Tokyo, at least during the rush hours. Prof. Keihachiro Shimizu of Chiba University, a specialist in urban problems, advocates a reduction in the number of automobiles from 17 million to six million. Discussions were made at Cabinet level last autumn, to improve drastic new traffic control measures, including severe restriction on heavy trucks, and the recommendations of the Traffic Policy Headquarters has banned traffic from some of the smaller streets altogether. Restrictions imposed by Osaka reduced congestion by 77 per cent on the designated streets, and accidents there fell by 33 per cent.

In the first eight months of last year, 276,000 cars were newly registered in Tokyo-a 3.1 per cent increase over the same period the year before. In September, Tokyo Metropolitan Government started checking the carbon monoxide content in automobile exhaust, and 40 per cent were found to be emitting exhaust gas with higher CO levels than the legal 5.5 per cent limit. Owners of cars with over 9 per cent level were ordered to make immediate repairs. Photochemical smog develops when the sun's ultra-violet rays work on hydrocarbon and nitrogen oxides from exhaust gasses. Tokyo's press and broadcasting systems carry frequent warnings on the smog, particularly bad in the summer months. Information is issued on the basis of meteorological data gathered by the Research Institute of Environmental Protection. People are asked not to use cars and to reduce the operation of other facilities which issue smoke. Warning cars patrol the area and advise children against excessive exercise. Fifty students at a school in Osaka were taken ill with dizziness and nausea whilst swimming recently, whilst across the street, 16 pets kept by pupils at Naka Toyoshima Primary School died on 22 July. In another area students were stricken whilst playing basketball on a campus after failing to hear a publicity car's warning. National newspapers have compared the recent situation with the

last war when panic-stricken residents ran into air-raid shelters whenever an alert was sounded.

The Public Health Bureau will soon start investigating links between death cases and pollution, in a survey dealing with people who lived within a 200 metre radius of Tokyo's ten most congested intersections, and who died within the past four years. Kaino recently warned that Tokyoites will have to carry a gas mask ten years from now to survive polluted air.

Pollution in the atmosphere however is only part of the problem. Government survey boats, dredging the sludge at the bottom of Tokyo Bay, have found large amounts of mercury, cyanide, copper, manganese, phenol and eight others poisonous elements. The investigation was made after three prefectures nearby-Kanagawa, Tokyo and Chiba-combined their efforts to reveal the degree of water pollution in the Bay. Two hundred fishing boats staged a demonstration in Tokyo Bay in August, to demonstrate against pollution, having first to make their way through drifting oil slicks, trash and other floating debris. They are now seeking damages from both prefectural and state governments.

Following this up, the authorities of Kanagawa Prefecture claim to have found that a leading chemical company has been dumping mercury waste into Tokyo Bay instead of at sea. Off Chiba, officials charge that factories are openly emptying their waste into the bay waters. The plight of Taganoura Port in Shizuoka Prefecture exemplifies the situation. The city of Fuji and the nearby port of Tagonoura have a paper mill, and a thriving fishing industry existed until chemical plants and machinery factories were brought into the port. Now the paper mill has been found to have been discarding mercury waste into the ocean for a number of years. This time however the public would not be appeased -the fishermen faced with the loss of their fishing grounds were joined by the man in the street who also had cause for concern, as mercury waste is known to cause dreadful diseases such as Minamata Itai-Itai. They brought a suit against four companies suspected of causing the pollution and against the governor of Shizuoka.

Following this a group of people campaigning against a large corporation accused of having caused the outbreak of mass mercury poisoning in Minamata, have formed a Corporation to buy 14,500 shares in the company. The group plans to take up the issue at shareholder's meetings of the chemical corporation in the future, and the cost of this was raised during a campaign in Tokyo's streets.

Some firms however are taking the initiative on their own, as in Osaka where six major enterprises have pledged to have their plants cut their pollutants by half in the next two years, spending a total of Y2,700 million to establish pollution-control facilities. The Osaka City Office is assisting this by plans for a mammoth sewer system to dispose of contaminated water in the area.

Deformed fish and disturbed trees

Perhaps one of the most disturbing things of all, is that the balance of nature is being upset. The Tokyo Metropolitan Fisheries Experimental Station has been collecting data on deformed fish, which officials suspect have been caused by liquid waste from factories along the Sendai River. The deformities include spinal curvature, inflamed skin, and stump tails. In most cases the roe in the female fish were found to be dead, and eel larvae is becoming dangerously scarce. Shellfish have gradually decreased and sea cucumbers and clams are dying from suffocation in the Inland Sea because discarded polyethylene and vinyl products cover the sea bed. The Health and Welfare Ministry is subsequently planning to start investigations into the contamination of fish and shellfish in four different sea areas around Japan.

Himemasu, a kind of trout enjoyed as a delicacy in the area around Lake Towada, is gradually getting smaller and the annual haul is decreasing breeders fear that it might become extinct in the lake before long. Pollution has been traced to a river bringing in lead waste from a mining company. (Later a director of the mine committed suicide and with true Japanese aplomb, left behind a note regretting the mine's contribution to the contamination.)

In the Keihin industrial zone that spreads over Tokyo, Kawasaki and Yokohama, trees are growing and shedding their leaves four times a year. This phenomenon is apparently created by increasing automobile exhaust gasses. The white oak trees in Tokyo now shed the old leaves before sprouting new ones-a characteristic usually found only in deciduous trees. On 18 July, the first day of photo-chemical smog testing, the oxidant not only affected students in a Tokyo Junior High School, but the leaves of trees in the school's garden fell off. Even the giant Himalayan cedars in Hibiya Park in Tokyo are withering. Tests conducted by the Industrial Science and Technology Agency using artificially generated oxidants subject to vehicle exhaust and ultra-violet rays, have

Tokyo policemen wearing helmets and gas masks as they spot-check the exhaust from a car.



shown definite signs of weakness in many species of plants and trees.

Even Mt. Fuji, the traditional "sacred" mountain of Japan, is becoming defiled with enormous piles of garbage, and the Subaru Railway Line taking visitors halfway up the slope is accused of slowly killing off fauna. Forestry officials say that every year 18,000 trees die alongside the route, which has broken the delicate balance of nature and is destroying the weaker species which do not adapt easily to changing conditions.

In Tochigi Prefecture, 10,000 cubic metres of forest over 300 years old have been cut down, and many species of animals and rare species of insects have completely disappeared. Every tree is cut indiscriminately of its fitness or function, and there seems to be no policy of long-term planning. This forms part of the 20 million cubic metres of forest that are cut down annually in Japan, mainly as a source of revenue for the government which exports a large percentage of the lumber. Some of the worst destruction is to be seen in National Parks, under the guise of developing tourism, although they are theoretically protected by existing acts of legislation.

Many of the rare plants collected from various parts of the world were housed in the famous Shzenkyo-ikuen National Park in Tokyo until recently. A newly constructed expressway has disrupted the flow of underground water to the park and the increased use of concrete has contributed to changing the soil from acid to alkali, which together with increased traffic fumes, has caused the death of many species of plant life.

The Japanese mania for collecting insects has become intense because the rapid urbanisation has radically decreased the number of insects. At Seibu Department Store in Tokyo, 6,000 insects a day have been sold since a special sale of insects started in June. A report from Usaka said that officials at Tennoji Zoo were hard pressed to find enough earthworms to feed their kiwi, rare birds presented from New Zealand.

In Shimane Prefecture, the prefectural government has urged farmers to start breeding beetles because overproduction of rice is affecting them. In some areas however, insects have had to undergo mass-sterilisation, as insecticides have had tragic results. Herons which arrive every year from South East Asia have decreased drastically in recent years, the reason being that the birds were killed with insecticide that had been washed out of the rice paddies into a stream and accumulated in the fish the birds fed on. Similar decreases have also been noted in the number of swallows visiting Japan every Spring. Many birds are now found with respiratory diseases such as asthma and bronchitis. Owners of racing pigeons have reported many deaths of the birds who have drunk contaminated water, or become exhausted in polluted air conditions. Crows, sparrows and grey starlings have all been reported to have moved from villages and towns to the highlands, apparently instinctively seeking cleaner air.

The search for solutions

All is not lost however, and there are signs that the problems are at least being recognised. Newspapers and television are now giving full-scale coverage to the pollution issue, and political parties have banded together to try to find a solution to the problem. Prime Minister Eisaku Sato himself serves as the chairman of the newly formed Central Antipollution Headquarters, and even the Emperor has been called to give warnings on the subject.

It involves more, however, than mere warnings, and the co-operation of the private citizen. It involves strong legislation and a determination to give environmental problems the first priority over industrial expansion-a policy that politicians have been loathe to admit. If the nation needs an entirely new regime without 25 post-war years of close ties with the business interests in order to reorient the nation's entire economic life, the only alternative would be a change in government. The Gross National Product is now being inextricably linked with Gross National Pollution.

The Health and Welfare Ministry has plans for a preparatory committee of pollution experts to work out a national master plan for pollution control, complete with "data-bank" and electronic computers for the collection and exchange of information on environmental problems among government agencies. Specifically, the plan calls for the establishment of a laboratory the size of the National Stadium in which temperature and humidity can be artificially adjusted and the effects of air pollution by various pollutants, gauged. The Government has called for the deletion of the clause in the Antipollution Measures Basic Law calling for harmony between economic development and control of environmental disruption. At present the law studies the six major types of hazards-air pollution, water contamination, noise, offensive smells, and the shaking and sinking of ground. It is also foreseen that the Government would transfer greater authority to local governments to fight the environmental hazards.

The three major government opposition parties have agreed to take a cooperative attitude in tackling environmental problems, and the government themselves have responded to a US request for closer co-operation in discussing specific measures for advising and assisting both governments on the pollution question. Minister of Justice Takeji Kobayashi is also attempting to revise the civil code to make pollution a criminal offence and the defender being obligated to produce evidence in his defence. In January, the Labour Ministry conducted an inspection of about 60,000 factories, plants and mills which use poisonous substances in production, especially on those using helium gas and generators of carbon monoxide.

The Construction Ministry has plans for a five-year Y2,600,000 plan to improve the nation's sewerage system: (at present only one-fifth of the total urban area is drained by public sewers). This is being hampered, however, by people who refuse to pay for a pipe from the public sewer to their houses.

The Board of Education is at present compiling a textbook of "Environmental Pollution in Tokyo" to be used in schools. This will contain a summary of a publication on environmental disruption in Tokyo issued by the Tokyo Government, news features, and UN reports on air, sea, and land pollution. Formal lessons on environmental pollution will be launched in elementary education later this year.

Regulations to prevent the establishment of new offices in the heart of Tokyo are now being studied, and the construction of new industrial plants have already been regulated in Tokyo and Osaka. The Capital Region Development Commission has begun studying measures similar to those enforced in London and Paris, to combat the vast increase in offices with the consequent congestion and public hazards. Even car manufacturers are showing concern. Nissan Motors has just signed a contract with the American Kinetics Institute for the joint development of a pollution-free engine. A pilot car based on the "vapour engine" is to be produced within two years, and Nissan plans to replace all its engines if the test results prove favourable. The Government has also decided to raise Y700 million necessary for dumping colloidal sediments from Tagonoura Port into the Pacific by floating Shizuoka prefectural bonds, and the actual operation was able to start at the end of September by means of two ships remodelled for the task.

In the meantime, a local department store in Tokyo is drawing enthusiastic crowds with a gadget the size of an attache-case. Inside are placed hydrogen peroxide, crystals and water. The chemical reaction from this mixture produces oxygen which is then inhaled through a cone-shaped mouthpiece. Cartoonists, generally the most perceptive of people, gleefully depict the oxygen mask as indispensable survival equipment under present environmental conditions. However, in one instance at least, the waste is being put to good effect-so much sludge has so far been dredged from Tokyo Bay, that the Metropolitan Government is planning to build three artificial islands there by utilising the waste. These will take five vears to complete and sludge, sewage, garbage waste, oil and scrap iron will be used as a core within the ferroconcrete outer wall.

Ultimately the problem of pollution is a problem of preserving this planet as man's only habitat. Perhaps the UN Conference on Protection of the Environment in 1972 will recommend a study of the globe as a single ecosystem calling for the determination of total amounts of elements essential to human existence, together with an inventory of human resources. Perhaps this will be coupled with international co-ordination of efforts by the many governments. Before getting to that level however, Japan is in dire need of urgent solutions to her intranational problems.

N.B. One Pound is approximately equal to 860 Yen.

Structure of the Soil under Stress

by Neiton Pilpel

It took hundreds of millions of years for the soil in Britain to be formed. It has been cultivated with increasing success for some 2,000 years. But in the last decade damage has been done to its structure by modern farming methods. Scientists are now investigating how the structure is formed and are seeking ways of restoring it in the affected areas.

Earlier this year the Agricultural Advisory Council published its report on *Modern Farming and the Soil*. It admitted in the guarded manner usual to such bodies that the structure of the soil in certain areas is being chronically damaged by modern farming methods. Agricultural productivity which, in the twenty years between 1947 and 1967 increased overall by about 30 per cent, is now beginning to decline.

It would be an overstatement to ascribe this entirely to the breakdown of the soil's structure, or to claim that British farmers were turning their land into an American type of dustbowl. Agricultural productivity depends on many factors, on the weather, on the incidence of pests and diseases, on the availability of labour, on consumer demand and on prices.

Nevertheless, many people have become uncomfortably aware that something quite unusual is beginning to happen to the soil in many parts of Britain. Soil scientists are now investigating the matter and trying to find practicable solutions to the problem.

What is happening to the soil

Many people have noticed that during wet weather, the heavy clays of the South East and of the Midlands around Warwickshire and Northamptonshire are tending to become waterlogged and turn into an intractable sticky mass with a consistency like butter. The process has been aggravated in recent years by overstocking fields with cattle and by the use of heavy farm machinery, which consolidates the clay to a considerable depth below the surface.

For many reasons, not the least of which is economic pressure, farmers are now working their fields with heavy machines under weather conditions which would have been almost impossible a century ago.

During the dry weather, the clay shrinks and sets. Cracks, sometimes several feet deep may develop, which help to break up the mass. But this does not usually occur before June, which is generally too late for crops sown in the Spring to germinate. From the air one can increasingly notice fans of hard packed earth stretching out from the entrances to fields where cattle and tractors have so consolidated the ground that grass will no longer grow.

The damage that is being done to the soil's structure in the drier regions on the Eastern side of England is rather different.

On the one hand there is the problem of blowing, or erosion of the soil by wind, which occurs on exposed sandy loams and on sands and peats in the Vale of York, Lincolnshire, the Fen Basin and East Anglia. Here dust storms are becoming quite common during dry weather.

On the other hand there are the effects of ploughing up former grasslands in Cambridgeshire, Huntingdonshire, Essex and the Home Counties and applying intensive mechanization to the growing of cereals, potatoes, peas, sugar beet and root crops. These effects are less spectacular and can often go unnoticed for years.

By depleting the soil of humus and other natural binding agents, by excessively tilling soils which become structurally unstable unless allowed a period of recovery under grass, by working fields with heavy machinery under adverse weather conditions, by failing to provide proper drainage and by various other types of mismanagement, farmers in particular areas are causing the crumb-like, or granular structure of the soil to break down.

There is little evidence to suggest that this is necessarily accompanied by a decrease in nutrient fertility, measured, for example, by the availability in the ground of nitrogen, phosphorous, potassium and other chemical elements which are essential for plant growth. Chemical analysis shows that the level of these has been satisfactorily maintained by the use of artificial fertilizers. Nevertheless, the results of structural breakdown on the fertility and productivity of the soil can be just as serious.

The crumb-like structure of soil

The soils of England and Wales may be broadly divided into a dozen main types ranging from coarse and medium sands, through peats and loams, to a variety of silty loams and clays. A convenient guide to each type is provided by its texture, or feel. Sands are gritty, silts and soils with a high organic content feel smooth, clays are cohesive, or sticky, while loams are mouldable when wet, but are not otherwise distinguishable by their texture.

Ultimately, all soils are composed of fine particles of silica, but these normally aggregate together in a soil to produce a crumb-like or granular structure.

The crumbs vary in size from less than a tenth of a centimetre to 2 centimetres or more and typical examples are illustrated schematically in Fig. 1. Some are spherical, others blocky, others are shaped like flat plates and others like irregular prisms.

Many factors play a part in determining whether this crumb structure will remain stable, or whether, on the one hand it will become consolidated into a hard packed mass, or on the other will collapse to form fine dust, which can be blown away by the wind. For example, in many soils a proportion of the silicon atoms become replaced naturally by atoms of other elements, like iron, aluminium and calcium and this causes valency forces to develop between the particles, which help to hold them together in the crumb structure. Considerable variations occur in the shapes, sizes, roughness and hardness of the ultimate particles of which different types of soil are composed and all these factors affect their structure.

Platy

Blocky

It is essential, if they are to remain stable, that the crumbs should contain moisture and adequate amounts of certain natural binding agents. Any pastry cook knows that the way to turn flower into a crumbly dough is to mix it with fat and a little water. The binding agents that promote crumb formation in the soil are, for the most part, the organic residues and breakdown products of animal and vegetable tissues. These are derived from the roots and leaves of dead plants, from farmyard manure, from worms, insects, bacteria and a host of other microscopic denizens of the soil. In addition, most soils also contain hydrated oxides of iron and aluminium and these, like clay itself, assist in the binding action.

Formation of crumbs

There are basically two different ways in which the crumbs are formed. The first is by comminution, that is to say by the breaking down of larger lumps or clods to a smaller size. The second is by aggregation, or building up.

One of the most effective natural breaking agents is water. As it evaporates from clays they shrink and the resulting cracks and fissures break up

the mass. When water freezes it expands and water that is present in minute pores in a lump of soil causes the lump to disintegrate. Earthworms, burrowing insects, and the roots of growing plants assist in the process and their action is reinforced by the weathering of sun and wind and by the normal processes of cultivationploughing, harrowing, hoeing and rolling.

As regards the building up of crumbs from smaller particles, this also occurs during cultivation in the mixing of the soil with humus and other binding agents. But of at least equal importance are the biological and mechanical actions of earthworms and of the roots of certain species of grass.

An average fertile field contains about 3 million earthworms per acre in the first foot of topsoil, equivalent approximately to the weight of six sheep. There is evidence that complex organic substances, like mucins, are excreted by worms into their castes and that soils which have been well worked by worms contain a higher proportion of stable crumbs than those without worms.

One way of assessing the stability of the crumbs is to shake them on a sieve

Fig. 1. SHAPES OF SOIL CRUMBS Fig. 2 WELL STRUCTURED SILTY LOAM Schematic. Schematic The her Ar and Michael Milli Ale Min Michael Alle Martine Granular spherical 12' Prismoidal

Fig. 3. BADLY STRUCTURED SILTY LOAM Schematic

and measure the change that occurs in their size distribution. Professor Newitt in London and Professor Dankwerts in Cambridge showed that in any batch, the stronger crumbs tend to grind up the weaker ones and absorb their material on to their surface. These, therefore, grow in size while the weaker ones gradually disintegrate.

One can also assess the crumb-forming tendencies of different soils by directly measuring their cohesion and tensile stress in equipment similar to that used by constructional engineers when planning the foundations of bridges and dams. In London University we are measuring the cohesion and tensile stress with a series of different loads being applied to the samples, and by substituting the values into certain mathematical expressions are deriving parameters which provide information about the strength and stability of the soil's structure.

The ability of grass to maintain fertility and to restore a damaged crumb structure was explicitly recognized in the 1880's, when it was found that yields of corn could be increased substantially for periods of 2 or 3 years by ploughing up and sowing fields which had previously been under permanent grass.

Before then various types of rotation had been employed. In the cereal growing regions of East Anglia the classic one was to divide the fields into strips to lie fallow every third year. But it was not until the 19th century that grass was sown on arable land specifically for its remedial action.

Scientists at Rothamsted Eperimental Station have discovered that grass produces its effects in two different ways. Firstly, it protects existing crumbs from rain, frost and sunshine so that they persist longer. The roots suck surface water down to the lower levels of the soil and thus prevent crumbs in the topsoil from being dispersed as a slurry. Secondly, the roots of the grass produce new crumbs. This is thought to be due to mechanical action and also to the dead bodies of rhizosphere bacteria associated with the roots, which act as natural binding agents.

Not all strains of grass are equally effective in producing crumbs. Those with large quantities of strong roots seem to produce more crumbs than those with smaller, more fibrous roots. Clover grown by itself seems to be less effective than an effective grass, but it may enhance the action of the grass when both are grown together.

But it can take many years for grass to produce an improvement in the crumb structure of a soil that has been badly damaged. On the Lias clay at the Drayton Grassland Improvement Station near Stratford it took 4 years and on the less tenacious clay at Rothamsted 13 years before improvements could be detected in soils which had previously been under cultivation for long periods.

The usual method for following these changes is to section the soil in both horizontal and vertical planes and examine the structure in each horizontal layer. This not only provides information about the current condition of the soil, it also enables predictions to be made concerning its likely stability in the future, particularly if it is to be subjected to heavier stocking or to more onerous cultivation.

To illustrate the point, let us consider Figs. 2 and 3 which show sectioned profiles of two different samples of silty loam. The first has been under grass for some years and possesses a generally good structure. The second has been damaged by cultivation and its lower layers have become consolidated. Each soil has about $\frac{1}{4}$ inch of plant and other animal debris in the surface.

In Fig. 2 there is then a dark coloured layer containing both organic and mineral matter, then a lighter layer from which the brown coloured compounds of iron have been leached and then another dark layer. Down to about 8 inches, the crumbs are small, well formed and approximately spherical in shape. But below this platy and blocky structures begin to appear, which suggests that the soil might begin to deteriorate if excessively cultivated.

The structure of Fig. 3 is quite different. Without the protection of grass, exposure to rain has turned the crumbs in the surface layer into a slurry or glaze. Between 1 and 8 inches down, further slurrying has produced a mixture of massive lumps, with relatively few small granules. Between 8 and 12 inches down (the limit of ploughing) there is a massive, platy layer with very few fissures and this has been produced by a combination of slurrying and pressure from above.

In Fig. 2 the crumb structure is such as to allow surface water to drain into the sub-soil and prevent the land from becoming waterlogged. Nutrients, oxygen and carbon dioxide can diffuse freely to and from the root systems of growing plants. The crumb structure would provide adequate mechanical support for holding cereal crops upright, but because the structure is relatively open, the roots could penetrate unhindered and earthworms and insects could move about freely.

This crumb structure will reduce the tendency of small particles of soil to block the pores and fissures lower down and to form the glazed surface layer and the massive lower layer exhibited by Fig. 3. It should also help to ensure that in dry weather the soil will not become excessively dessiccated, which would permit the ultimate small particles of which it is composed to fall to dust. However, should it be decided to plough up the field from which sample Fig. 2 was taken and sow it repeatedly with corn, without liming or proper manuring and without allowing periods of recovery under grass, within a few years its structure would almost certainly deteriorate.

Restoring the crumb structure

In attempting to suggest ways in which farmers can arrest developments and prevent the occurrence of further damage to the structure of their soil, account must be taken of the fact that widely different conditions prevail in different parts of the country.

There are some soils which are intrinsically stable. As long as they are not cultivated in bad weather conditions, they will continue to provide good yields, which can be maintained by applying organic manure and/or by allowing periodic breaks without cultivation under grass or leys for one or two years. Soils in this category include the well structured chalky boulder clays and medium loams on the Eastern side of England and the chalky soils of the Berkshire, Wiltshire, Sussex and Hampshire Downs where the rainfall is sufficiently low for most of the cultivation to be completed while the soil is relatively dry.

Then there is a range of what may be described as intermediate soils, whose structure is at present reasonably satisfactory, but which could speedily deteriorate if subjected to excessive and untimely cultivation or to overstocking with animals. Soils in this category include the medium textured and moderately well-drained, non-chalky loams of Hertfordshire, Herefordshire and East Devon and coarser textured sandy loams and podzoles. The latter have been under almost continuous cultivation for 1,000 years in East Shropshire and South-west Staffordshire, but are prone to compaction in wet weather.

Another example is afforded by the medium textured mineral soils of Northumberland, Cumberland, East Lancashire, West Devon and much of Cornwall and Wales. These are acidic and have traditionally been used in rotation with grass, as they are unsuited to continuous arable farming. Unless great care is taken in regard to liming, manuring and drainage, their structure deteriorates. This has occurred on a small scale in parts of Pembrokeshire, following the ploughing up of the grass and the introduction of intensive growing of early potatoes.

As regards the 1 to 2 million acres of land in England and Wales whose structure has already been badly damaged by modern farming methods, several types of remedial action would now seem to be urgently needed.

In the worst affected clay regions of the Midlands and the Home Counties, it may be necessary to give up arable farming altogether and restore the land to permanent grass. Buckinghamshire, Warwickshire, Leicestershire and Staffordshire have traditionally been dairying and mixed farming areas and in many parts the soil is undoubtedly better suited to grass than it is to intensive cultivation. There would be a precedent for this course of action, for similar problems arose in the 19th century when extensive attempts were made to grow corn in these areas. After one or two satisfactory harvests, yields so declined that the attempt had to be abandoned.

Even under grass, however, considerable damage can be caused by overstocking. Dairy cattle are the worst offenders, because of their weight and frequent movement: in wet weather they cause consolidation, or poaching of the ground.

The effects can be minimized by liming the soil, by restricting the sizes of herds, by providing them with adequate housing during wet weather and by improving drainage of the land with ditches, tiles or shallow ploughing of the sub-soil.

Elsewhere improvements could be achieved by reducing the intensity and degree of specialisation. By reverting to more traditional patterns of mixed

Clay, which has been puddled and consolidated to the consistency of butter by the wheels of tractors. (Photo by courtesy of Rothamsted Experimental Station.)



farming in which, for example, sheep and calves were periodically folded on to stubble and root crops, the lands would benefit from organic manuring, while the reduction in cultivation would enable this to be done under the best available weather conditions. There is little doubt that untimeliness of cultivation, deficiencies in organic binding agents and inadequate drainage have been major causes of damage to the crumb structure of clay soils.

Lime is a very effective agent for improving the crumb structure of acidic soils with a pH value below about 6.2 and naturally chalky soils almost invariably have a good, stable structure. But since excessive amounts of lime can reduce the availability of phosphorous and trace amounts of elements such as manganese and boron, some care is needed in its application.

The problem of blowing soils in the East of England can be tackled in various ways, depending on the type of soil, the crop, the size of fields and the general climatic conditions.

Peats and sandy loams, which have become deficient in organic binding agents can be stabilized by applying bulky organic manures. At Swaffham, in Norfolk, improvements have been achieved by excavating clay from below and mixing it with the peaty topsoil. But elsewhere in the Fens, natural mixing of peat with the underlying silt has had an adverse effect on the soil's structure.

Many blowing problems have arisen because of the cutting down of trees and hedges, which act as natural windbreaks in otherwise exposed areas. This leads to several different types of soil becoming amalgamated in single, large fields, which then become difficult to drain and cultivate.

Surface cultivation, as opposed to deep ploughing, and the interleaving of wind-resistant barley and mustard with vulnerable cash crops, like peas, are all being used to combat the blowing problem. But all have economic and practical drawbacks.

It took hundreds of millions of years for the soils of England and Wales to be formed. They have been cultivated with increasing success for some 2,000 years. In the last decade many of them have been damaged by modern farming methods.

It now requires time and money and much patient effort to restore them to fertility.

Rhine Pollution

Down the middle of Europe runs an open sewer over 600 miles long: the river Rhine.

Into it, and its many tributaries, pours the industrial waste from hundreds of mines and factories, and the inadequately purified water and sewage from millions of households. Yet millions of other people rely on it for their drinking water. "By the time it reaches us," said one Dutchman ruefully, "they've already drunk it seven times."

By the time it crosses the Dutch border, the Rhine is carrying 40,000 tons of salt a day, 16,150 tons of sulphate and 295 tons of iron. Experts have counted over 6,000 poisonous products.

"Twenty years ago," said friends in Wiesbaden, "we used to swim across the Rhine." Today swimming is forbidden anywhere below Strasbourg. The Rhine fishing industry, too, has virtually died out. Only the eels still thrive.

A trip down the Rhine from Lake Konstanz to Rotterdam brings a new shock every few miles. When the Rhine leaves Lake Konstanz to make its way along the German-Swiss frontier it is relatively clear. You can even see an object six feet under water.

Basle 101 miles

At Basle comes the first real trouble. Geigy, the Swiss chemicals giant, pipes its dye-stuffs waste out into mid-stream, and a photographer from the German weekly Der Spiegel recorded from the air a bright red stain spreading for hundreds of yards down the river. As of today, waste water and sewage from Basle, a city of over a million inhabitants traditionally proud of its cleanliness, flow directly into the river. Situated right on the double frontier with France and Germany, it had no room to build a sewage plant on Swiss territory. Now after years of international negotiations, land has been acquired to build two plants, one in France and one in Germany. But they won't be ready until 1974.

There are many more cities down the length of the Rhine in France, Ger-

many and the Netherlands that pour a flow of filth into the river. Most of them have mechanical sewage works: but these, which do little more than break up and sift out solid waste, are inadequate for coping with the liquid waste water of our modern industrial society. The only effective answer is a biological works, where bacteria get to work on the waste, household or industrial, and can cope with anything except certain residual elements from oil, detergents, metals, or some chemicals. But in Germany, cities like Cologne, with 1,200,000 inhabitants, or Krefeld with 540,000, are still at only the planning stage for their biological sewage works.

Mulhouse 125 miles

On the left bank, in France, are five potash mines generally recognised to be the Rhine's biggest single polluter. Every year they dump 7.5 million tons of salt into the Rhine. Their victims are Dutch farmers and market gardeners hundreds of miles downstream. For this one source alone accounts for 40 per cent of the salt in the Rhine when it crosses the Dutch border, helping to make the low-lying land sour and unproductive. Over the years, the



International Commission against the Pollution of the Rhine has devoted 27 sessions to the problem. Many solutions have been suggested, from carrying the salt to the sea in ships to putting it back in the mines-as they do now far away across the river, in similar mines in Germany. Now the Swiss, the Germans and the Dutch are all paying their share of a 1 million FF scheme for building a trial salt tip. It has to be on a special platform that will prevent seepage ... harmful to French farmers. Critics on the other side of the Rhine say the real problem is that the French mines are not efficient, and should be shut down anyway. But in 1969 demand for soda for the glass industry led to higher production, more salt and a more acute problem for the Dutch.

Ludwigshafen 265 miles

All along the Rhine it is the chemical industries that pollute the most, and are also the biggest water users. The main works of the BASF (Badische Anilin und Soda Fabriek) at Ludwigshafen, currently spews out 2.4 million cu.cms. of polluted water a day into the Rhine. After years of determined pressure from the Rheinland-Pfalz regional authorities they are finally committed to building a full biological purification works by 31 December 1974. And the city of Ludwigshafen, also at present without a biological sewage disposal, will share the BASF works. BASF is installing two sets of drainage, one for water that needs purifying, another for water that doesn't-and the cost is high because most of the work has to be done by cautious hand-digging among a network of drains that has accumulated over decades.

But the whole operation will cost them 155m. DM—as compared with distributed dividends of 292m. DM in 1969 alone. In other places where industry has been obliged to act, it's the same story. Farbwerke Hoechst, for instance, has spent 165m. DM on purification installations, compared with dividends in 1969 of 265.5m. DM; and Bayer at Leverkusen 230m. DM for purification over the 15 years since 1956 against a 1969 dividend of 256m. DM.

Mouth of the Neckar, 266 miles

Here the Rhine gets its first injection of filth from a major tributary. The Neckar brings the waste of major industrial cities like Stuttgart, Tübingen and Pforzheim.

Mainz 315 miles

Mainz is the seat of the regional government that has been so effectively putting the screws on the big industries. I talked to Hans-Erich Klotter, a chemist employed by the regional government, who has been fighting the pollution battle for the last decade. He claims the industrialists make less fuss than the municipal authorities (and certainly the case of Mainz bears it out; the city last year opened a multimillion mark concert hall, but its biological purification plant is still at the planning stage.) Klotter used his expert knowledge to find solutions for the firms: one of them is now profitably selling wall panelling made from (gips) plaster that used to flow out in its waste. Now waste from smaller towns will be turned into compost which in turn will change the soil composition and prevent seepage.

Koblenz 360 miles

Here the International Commission Against Pollution of the Rhine has its seat. But to attend one of its meetings I had to travel to Tours...on the Loire, west of Paris; (It was the Commission's turn to meet in France, and over the years since 1962 when it was founded its members have got tired of Strasbourg). The Commission brings together the top civil servants officially responsible and also the men lower down the scale who are working full time on the water pollution problem in Switzerland, France, Germany and the Netherlands. But like other wellmeaning inter-governmental bodies it has no powers to decide. It can only recommend-and when it comes up against a problem like that of the French potassium mines it soon proves powerless. Back in Koblenz, its secretary-general, an earnest young Dutchman called Huizenga, has one office (not even overlooking the river) in the building of a German water research institute. Mr Huizenga told me how it is that the pollution doesn't just get worse and worse as the Rhine nears the sea. Any river is able to purify itself, through the action of bacteria, and the Rhine, with so much water,

has an enormous capacity to do this. The key to it all is oxygen content. When there is a lot of waste in the water, there is more work for the bacteria and they use up more oxygen. If there is less water in the river, the problem is more serious. And if the oxygen availability drops to zero, then the river is dead.

This point has already been attained at certain times in the tributaries, like the Main. The latest threat comes from the power stations, including nuclear ones, going up all along the Rhine to meet the needs of industrial growth. They consume vast quantities of water for cooling-and return it to the rivers several degrees warmer: but even travelling the whole length of the river such water will lose only 70 per cent of the extra heat. Higher temperatures encourage the bacteria, which in turn consume more oxygen, increasing the risk of a "dead river" crisis. The International Commission has established norms-aimed at keeping the temperature below 28°C-but the overall effect of more and more plants can not yet be foreseen.

Mouth of the Moselle 361 miles

Where the Moselle joins the Rhine in the middle of Koblenz you can see that the water it brings is even murkier than the Rhine. It carries a big new dose of salt from the French salt mines, iron-laden sludge from the Lorraine steel works, and a big load of waste from the Saar, which flows into it upstream at Trier. In the Saarland coal and steel area, the Saar has the highest degree of pollution in the whole Rhine catchment area.

Bonn 410 miles

In the Federal German capital the government last month launched a crash programme to fight all kinds of pollution; air, water, noise, and the dangers to health from insecticides and fertilisers, and firmly enunciated the principle "whoever pollutes, must pay". The estimated total expenditure needed is 8,000m. DM for 5,000 missing sewage disposal units and 20,000m. DM for the necessary canalisation systems. In Bonn they say it will be a long haul: 10 to 15 years. Planning a sewage plant for a city takes up to 6 years and building it as long again.

Düsseldorf 460 miles

From Cologne onwards, the Rhine

begins to get its biggest beating of all. Not only are there factories and industrial cities all along its banks. It receives the filth-laden tribute of the Wupper and then in quick succession of the Ruhr, the Emmersch and the Lippe. The old industrialised Ruhr, with most of its industry built before there was any question of water purification, contributes a bouquet of poisonous material. The coal mines pump out salt water (more admissible to the Dutch than the solid salt from Alsace). The following observations, made by the authorities of North-Rhine Westphalia and published in an official pamphlet, give something of the picture.

"411 miles left bank. The water was a vellowy brown and smelt strongly of carcasses.

417.5 miles left bank. At this point there were very many oil stains.

419 miles left bank. Here the water had a lot of froth on it, a lot of oil stains and a strong aromatic smell. 440 miles right bank. Water still brown in colour. Vegetable waste and faeces in the water".

That was in 1965: but anyone walking today along the banks of the Rhine can confirm it. And the anglers who still persist-105,000 licences granted for North Rhine Westphalia alonetell how the quality of the fish still alive, and the taste of the ones they catch, get steadily worse. In Düsseldorf, in the regional ministry for agriculture, the fish were a vital safeguard (rather like canaries warning against mine gas) "When the fish die, we know there's poison in the water".

Emmerich 535 miles

Here Dutch and German co-operate in an ultra-modern checking system, which measures just how bad things are. By the time it reaches Emmerich the Rhine has recovered a bit from the effects of the Ruhr, but it carries the staggering total of 24 million tons of solid waste every year. To transport it all to the sea by rail, it has been estimated, would need 3,000 waggon loads a day.

For the Dutch, the Rhine means "fresh" water, which they need in ever bigger quantites. Grimy though it is, it is all they've got. Recently, by a vast feat of hydraulic engineering, they became masters of all the Rhine can bring them. One morning, three sets of giant semi-circular weirs 30 feet high and 150 feet wide were lowered into place in the Rhine's shallower slower branch near Arnhem and began to divert water northwards to the Yssel lake. A few hours later with a giant three-quarter mile long sluice-gate that is part of the 25-year Delta anti-flood plan, they shut off the Harringvliet gap through which most of the Rhine water reached the sea. From now on, the Yssel and the Delta will become vast reservoirs filled by the Rhine and the Meuse. Concerned though they are about drinking water, the Dutch were no quicker than the Germans in awakening to the pollution problem, and towns and factories add to the pollution of the river after it enters the Netherlands. Not so long ago, when a German official was explaining to the representatives of a big American chemical concern what they would be required to invest in water purification, they could hold up an empty sheet of paper and say "that's what the Dutch require".



From this autumn things have changed, and the Netherlands too has legislation requiring the installation of water purification in any new works even on the coast. The result initially will be to encourage new plants to choose an Antwerp site inside Belgium where they can pollute the Scheldt and its estuary at will. But it is only a matter of time before the other European countries come into line with stricter legislation. Even when all the sewage plants have been built, there will still be problems. Not the least comes from the shipping. Some 17,000 vessels, mostly barges, ply the Rhine and its waterways network. In defiance of strict national and international rules, it is estimated that they tip a total of 12,000 tons of oil a year into the water-cleaning tanks, rinsing bilges, or through leaks in transshipment of oil. And this figure doesn't include the oil leakages in the 600 accidents every year 20 per cent of which involve tankers. Every drop of water taken from the Rhine for drinking needs purifying. Only a fortnight ago the public and private companies along the Rhine responsible for purifying drinking water formed their own organisation. They are worried that the percentage of products which do not vield to break-down by bacteria is increasing. Among them are oil products which react with chlorine, used in purifying, to give a taste that cannot be got rid of. But others run directly into the rivers from the fields or from the roads. And no one will lightly forget the five barrels of thianol, dropped overboard in the summer of 1969 somewhere near Mainz, that killed millions of fish from there to the sea and brought large parts of the Netherlands within a week of a drinking water crisis. The experts all admit they were thankful for that episode because it shook public opinion into awareness. Dr Zijlstra, at the Dutch Institute for the Purification of Waste Water, in Voorburg, says that the only long term answer is to eliminate the products where they are produced. As a result of growing awareness, increased public spending, and legislative pressures on industry, the Rhine may yet be nursed back to a relatively healthy state. But

it will have been touch-and-go. And for many years to come the greatest river in Europe will continue to bear foul, stinking witness to the past irresponsibility of industrialists and city authorities alike.

John Lambert

What future for the Auto?

Hearings raise fundamental questions about the problems caused by cars in urban America.

Americans often are said to have a "love affair" with the automobile but the evidence is piling up that this love affair has become a painful marriage contract increasingly restrictive, binding and painful. In fact, the main thing holding the marriage together may be the cosmetic allure of annual style changes and advertising. A new contract providing a partial divorce may be inevitable one day soon as Americans (and, for that matter, Europeans and Japanese) become more disillusioned.

The aggravated problems of the automobile were pointed up sharply recently as the Environmental Protection Agency held two days of hearings to determine if the automobile industry is making "good faith" efforts to meet 1975 and 1976 emission standards required under the 1970 clean air amendments. It strongly appears the companies are making such efforts. But it also appears that meeting the standards, even if this goal can be accomplished, which is in doubt, will not do the job of making urban air safe for breathing.

For one thing, experience to date with new automobiles that meet current emission standards is that it is often difficult to make them meet the standards after they have been driven a few thousand miles. Another problem is that automobiles proliferating at today's rate even with emission controls that meet the 1975 and 1976 standards, will cause the urban air in 1895 to be as polluted as it is today. Thus it may turn out that ambient air standards required by the 1970 amendmentswhich set absolute maximums for major air pollutants in ambient air, based on public health criteria-may be far more important than the muchballyhooed emission standards.

It became clear at the hearings that all possible emission control systems will enable the internal-combustion (ICE) to meet the new standards will be costly and fragile, and that if the systems manage to reduce one kind of emission they likely will increase another. S. L. Terry, a Chrysler vice president, said, for instance, that a catalytic converter for oxidation of exhaust hydrocarbons and carbon monoxide—the main approach by the companies to these pollutants—could easily be damaged by excessive heat from unburned fuel from the nonfiring of a single spark plug. Burning of the fuel in the converter would overheat the catalyst.

Chrysler is aiming at a maximum of 10 per cent increase in fuel consumption from emission controls. (Environmentalists concur with this target because of the ecological problems of increased petroleum production.) Terry listed the technological changes necessary to achieve the goal and at the same time meet the standards: engine modification for 91-octane, unleaded fuel; either improved carburettors with fastacting choke, or electronic carburettor control; fully electronic ignition supplementary exhaust-air systems; systems; partial exhaust manifold reactors, and oxidation catalysts (with temperature controls to avert the spark plug problem). "It is readily apparent that the system is extremely complicated and costly," said Terry.

But this is by no means the end of the problems. Nitrogen oxide standards for 1976, not yet set, are likely to be stringent, says Terry (with other manufacturers agreeing): Successful control of CO and hydro-carbons will increase NOx emissions. To cope successfully with all pollutants, the manufacturers and many scientists agreed, would result in seriously impaired fuel economy and "driveability."

Auto executives at the hearings generally agreed that the emission controls for the ICE would be difficult and delicate to maintain; they also agreed that the average motorist probably would not be willing or able to get the work done. (Here there is sharp disagreement between the companies which stress the "willing", and environmentalists who stress the "able".) The companies claim the average motorist is not motivated to keep his auto well-tuned; environmentalists claim commercial maintenance facilities, many of them controlled by the auto companies, are notoriously unreliable, and the only way to enforce maintenance would be

to set up elaborate state or Federal inspection systems. Even if instruments of the necessary sensitivity were available (they are not yet) the cost would be immense—about \$4 billion, one witness estimated.

Numerous solutions to the emission control problem were proposed. One witness suggested easing CO standards so that NOx emissions (a major component of photochemical smog) could be better handled. Another suggested easing NOx standards so that CO emissions could be reduced, but the most obvious alternative appeared to be the substitution of simpler steam or gas turbine engines for the ICE. Representatives of companies working on such alternatives said an all-out effort might make them feasible in time to meet the standards or shortly thereafter. But auto company witnesses were pessimistic. Among the many problems: NOx emissions from gas turbines, the high power factor required for the turbines and the lack still of a feasible automated control system for steam engines.

Reprinted from Science News

Classified Adverts

YOUNG MAN, 22, former Mechanical Engineering undergraduate would like to gain work and experience in the field of ecology as represented in this magazine. Box E138, *The Ecologist*.

CAMBRIDGE ENGLISH GRADUATE seeks to change the world and would welcome a post in which to do it. Will consider any offer. A. G. Jones, Claremont, Ramsey, Isle of Man.

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CONSULTANT IN O.R. increasingly disillusioned with commercial objectives of profit and growth, seeks opportunity to apply himself to the development of saner models. 34 years old, diverse background covers mining engineering (Australia) Rhodes Scholar, P.P.E. (Oxford) and development of computer based models. Wife is graduate in history, has Library qualifications and is fluent in French and Italian. Box E141, *The Ecologist*.

DOUGLAS CAMPBELL, Farm Director, and **CHRISTOPHER SHARMAN**, his Deputy from the Soil Association's Haughley Research Farms are seeking employment as a result of redundancy due to take over by the Pye Research Centre. Knowledge of most ecological problems, organic farming, conservation, pollution etc. Curriculum Vitae on request, any suggestion or propositions considered. Reply to New Bells Farm, Haughley, Stowmarket, Suffolk. Tele. Haughley 275.

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In which the author treats of war, its pretexts and methods

The Automobilians are a most mild and peaceable Folk, so far as concerns every-day social Intercourse between Persons: so much so, that the Gentry never wear Swords even for Ostentation, far less for Use. The Practice of Duelling is not merely illegal, but obsolete. But this praiseworthy Docility and Lenity is not shared by the Politicians in their publick Occasions: who seem, indeed, no less stiff-necked, malicious and bloodthirsty a Gang of Cut-throats than our own Leaders, and more dangerous, as their Instruments of Harm are infinitely deadlier.

I have spoken of the Automobilians as one People, and may thus unwittingly have misled my Readers. In Truth, I know not whether to term them one Nation or many; for their Manners, Dress, Houses, Carriages, Food are everywhere alike, while their Differences are little apparent to the impartial Observer, consisting mainly in separate Governments and Languages. The various States of Automobilia are divided into two opposing Factions, who regard each other with more fitter and resolute Hostility than very Whigs and Tories: but the exact Nature of the Difference betwixt them eluded my most diligent Enquiry. For, when questioned, the Advocate of either Party declared themselves Believers in Democracy, that is to say,

Government by the People: together with other pious Protestations with which my readers are doubtless familiar, such Coin being current among Politicians of every Place and Time. Now, the People do not in any Part of Automobilia govern themselves; *that* Work is everywhere done for them by Persons whose Upbringing is held to fit them for the Task: so I was forced at last to conclude that this Democracy is a Belief honoured in the Letter only, as the Throne of France is included for Form's Sake among the Titles of the King of England.

But whatever their real or imagined Differences, it is not possible that they could be great enough to justify Use of so demoniack an Arsenal of Weapons, devised by Artificers more ingenious than wise. No Region of the World provides a Sanctuary from their martial Power: they have Ships of Iron which lurk like baleful Leviathans in the Deeps of the Sea, and Vessels to carry War into the Air, and inflict upon their Foes the Doom of Sodom and Gomorrah. They have perfected Essences and Vapours, which if a Man but touch or inhale, he falls at once insensible or dead, or goes stark mad: and Decoctions of Plague and Murrain to slay all without Discrimination or Pity. But worse than all else are the Bombs which they are able, they claim, to direct to any Spot upon Earth: of such explosive Force, if I understood aright, that were St. Paul's Church in London all one



Men and Women of Courage and Determination who have the will and tenacity to actively help in combating water pollution should get in touch with

> G. H. FLOWER 13 McLeods Mews, Kensington, S.W. 7. Telephone: 01-373 0638

Keg of Powder, its Detonation would not equal one of these hellish Devices. Such a Bomb could destroy by Burning or Blast all the Houses in a County: and for the Inhabitants, those might be accounted fortunate who were instantly consumed by Fire or blown in Pieces, for the Rest would suffer, in common with all living Things, a lingering Death by an incurable Disease.

As yet, these last weapons have been little used: and indeed, it would demand a rare Degree of Fanaticism to precipitate a Conflict inevitably fatal to Aggressor and Victim alike. Automobilia does not want for powerful Fanaticks: but Providence has made them also Cowards, and they are reluctant to stomach in Person the Sufferings they would be ready enough to endure, if they might, by Proxy. But the warlike Enthusiasm of Rulers and Populace is not to be totally denied: and as a serving Wench, full of Spleen against her Mistress, yet fearful for her Place, must needs belabour the Cat by way of Substitute, so the Automobilians exercise their Prowess, and make trial of their Armoury, in Assaults upon Blackamoors, Asiaticks, and other inoffensive Peoples. For Automobilia held of old great Sway in the tropick Zone: but the Notion of Democracy being in the Ascendant, she resolved to give to her subject Nations Liberty to choose henceforth their own Fate, and reserved only the Right to intervene and direct their Choice, should it seem likely to be at Variance with her own. War, in short, is a Commodity this People reserve solely for Export: and by paying to Mars this steady Interest, they hope to avoid his seizing the Principal. This Hope we must all share: for their Power and their Folly have placed the whole World in the Seat of Damocles, and none can know at what Moment the threatening Sword may fall.

Nicholas Gould



Paper tigers

Christmas tree spruces in Norway and Sweden take about forty years to grow the 60-70 feet of whispering height they need to make your personal paper and cardboard supply for just ten weeks. We are not all guilty, just greedy, demanding $6\frac{1}{2}$ million tons a year at roughly 17 trees to the ton.

From babies who are only consuming disposable bibs and nappies to the business man with his *Times* (complete with Business News) and his *Financial Times* to read in the train going up, his *Evening News* to leave in the firstclass carriage coming down, his *Economist* on Saturday and his two Sundays both with colour supplements, we average 17-lb a week each. This is about half the weight of our dustbin refuse and by far the most of its bulk.

Out of the mighty forest felled for our 56 million people every week, over half must be completely wasted. Paper panties, paper handkerchiefs, the square of greaseproof paper weighed with the old age pensioner's tiny piece of meat or fish, the tissue paper that enfolds a wedding dress, the cigarette packets of the chain smoker, cereal cartons, envelopes, love letters, crackers, gift wrappings and all the clean gay rubbish swept up after the party, are all unreclaimable because there is no economic way to sort them.

They must go to the dump where air trapped in tins will start the thermophilic fungi towards the population explosion that will start them smouldering and stinking, unless the soil filling is adequate; to the incinerator; or with great good luck to the Municipal Compost plant. Here they will provide a major part of the sterilising heat and the humus apart from the plant foods, especially the potash, which the spruce trees have gathered through their forty years of sun, rain and snow.

The real bargain is the business man for his daily papers add up to over a pound a day, when the average family with just a Daily, a popular Sunday, the local weekly, the *Radio Times* and *Woman*, adds up to about 5-lb. This is the best quality of all for recycling, and in 1970, 800,000 tons were reclaimed. From Britain's three de-inking mills at Grimsby, Gravesend and Aylesford, it went straight back to newspapers again. We did even better with flattened cartons, which made 1,150 tons of new cardboard.

Newspapers tied in 28-lb bundles are worth £4 and £5 a ton in two ton loads collected by the paper maker's agents, magazines are worth rather less, and so are flattened cartons, but these pile up the weight more quickly. Very few Councils still run trailers behind the dustcarts for salvaged waste paper, among them are Colchester and Leicester, and 70 per cent of our reclaimable paper and cardboard is still wasted. The money that is waiting for this "paper gold" could finance a hundred worthy causes in the time that is spent on Committee meetings and dances that may only break even.

The question the charitable should ask themselves is, whether they are aiming at the publicity and enjoyment of organising a sponsored walk, a whist drive or a fête, or is the object to gain the most money for their cause. In terms of money for time and hard work, a waste paper campaign wins every time.

The first essential is a large shed, garage or stable that is dry and has access for a lorry to load. A ton of bundled newspapers makes a stack five feet long and wide and four high so the space required is not impossible. Then you need vehicles and volunteers to collect at 4-6 week intervals, clearing a different district each weekend, because then it is usually possible to borrow a 30-cwt. van from a supporter who will not be using it then for his business. An ordinary car will hold well over half a ton of bundled paper with the back seat out and in the boot, but it will be hard on the springs.

Publicity is easy in the local paper, which will certainly print a letter if your cause is one that thousands of people will feel deserves help, and probably will make a news item, too, and follow it with a photograph and a "story" on your first collection. You also need handbills setting out what you will do with the money you are raising, what you want saved, that is bundles of clean newspaper, magazines and cartons tied separately, and when you will call and collect. There are plenty of printers who will do 1,000 for £2, 10,000 for £7-10, if you forget about good layout and photographs, for it is better to save the money for petrol and oil to get round collecting.

The nearer your depot is to the waste paper merchant the better the price, so look in the yellow pages of your local telephone directory. Messrs. J. & J. Maybank Ltd of Maybank Wharf, Herringham Road, Charlton, SE7 are Europe's largest waste paper merchants and they have depots at Aberdeen. Bristol, Blackpool, Dearham (Cumber-Glasgow, Liverpool, land), Hull, Lowestoft, Norwich, Oldham, Plymouth, Portsmouth, St Albans, Wallsend, West Bromwich and Worksop. For London and suburbs and exact addresses, write to their head office.

Action Committees for defence against gravel pits, new roads, reservoirs, or any danger to the environment can all become "Paper Tigers" to raise the money to win the Stansted battles of the future. Here a borrowed lorry, hung with removable slogans, collecting waste paper to help the fighting fund is of priceless propaganda value. There is nothing that appeals so strongly to age and middle age as the sight of youth working hard and cheerfully to "Save Waste Paper and Save your Town", or whatever is threatened by the planners.

The major problem of all who are concerned with conservation is that there is no money at all to finance the research that is needed to establish the dangers of pollution before it builds up to dangers that can no longer be explained away. Those who are responsible for the pollution, or who wish to minimise its threat, have the laboratory space and the funds. The existing conservationist bodies have barely the resources to deal with the clamour of those who demand the information that they have never had money to gather.

It would be possible with enough Paper Tigers collecting to build up a fund called perhaps "Youth against Pollution", that could support the many organisations in this field that are starved for money, and pay for the research that cries out to be done. They would also save the rates by cutting the number of dustcart trips a week by about 25 per cent because paper and cardboard are the bulkiest items, and also spare about fifty-five million splendid spruce trees a year.



Towards a unified science

The disintegration of pre-Islamic society in North Arabia

We know very little about the city states of South Arabia. One thing is certain: they achieved what we would regard as a high level of civilisation. Their decline was probably due in part to a shift in the main trade routes used by Roman traders transporting goods from India to the rich cities of Phoenicia. When they passed through South Arabia, they were a source of considerable income to its inhabitants, but, eventually, this trade shifted to the Red Sea.

It was also the result of the incessant struggle between the two great empires of the time: the Byzantine and the Sassinid which had South Arabia as its theatre.

With the decline of South Arabia, the focus shifted to the Hedjaz, whose principal cities, Mecca, Medina and Tanif, slowly succeeded in taking over a good deal of the trade between India and Byzantium, now lost to their Southern brothers, and they grew rich on the proceeds. Unfortunately, however, this wealth was short lived. Decay soon began to set in, and the civilisation of these North Arabian cities gradually broke down.

Why did this decay occur? Are there any lessons to be learned that might be of use to us in understanding the current decay of our own society?

In this short paper I shall try to answer these two questions.

First, however, let us see how North Arabian society was organised in these pre-Islamic times. Surprisingly enough, the pre-Islamic city was very much like the Hellenic city of antiquity. Its population was divided up into tribes, which in turn were sub-divided into clans. The more important of these lived in the centre of the city from where they directed matters of public importance. They constituted, in fact, a political aristocracy. The less influential clans inhabited the area towards the periphery of the city.

The city itself was self governing, and was the seat of a municipal religion. Power was in the hands of a council of elders called the Djamaa, an assembly made up of all the adult males capable of bearing arms, which was the real sovereign body. Occasionally chiefs, (Referred to as Amin or Kabir) were elected but these did not appear to wield any absolute power. Decisions were taken unanimously or at least with the general consent of the assembly. The latter possessed legislative, administrative and judicial powers, and its decisions were implemented by the heads of the clans and of the individual families. To enable them to do this, the latter could levy fines and had the power to exile those who refused to obey the traditional law. This, as we know, is the most severe penalty that can be meted out in simple, stable societies. The exiled man excluded from all public ceremonies and from his own family and community was reduced to the status of a despised isolate: a fate worse than death.

The institutions of self-government, according to Lammens' (*l'Arabie Occìdental avant l'Hegire* Imprimie Catholique, Beyrouth 1928) were in fact very highly developed. At Mecca there was a sort of senate called the Gar-Al-Nadwa, which met when important decisions had to be taken. There was also a council or Mala, representing the different tribes. Above all, there was a strong tradition of public service, without which a stable society cannot conceivably survive.

Mecca was an important commercial centre and apparently the Suq or Mawsim, rather than fulfil the function for which it is today famous i.e. that of a Bazaar, was in those days more like the Agora in the Hellenic city. As Chelhod writes (Introduction à la sociologie de l'Islam GP Maisonneuve, Paris 58) writes :

"In addition to the bargaining and the commercial transactions which one finds in all fairs, all important affairs of state were dealt with here. It was here that treaties of alliance were concluded or cancelled, disputes between groups and individuals settled, and the principal religious festivities, in particular those connected with pilgrimages or sacrifices, were celebrated." (My translation.)

As we know from Robertson Smith (Lectures on the Religion of the Semites. A. & C. Black 1914), the religion of the Bedouin was primarily ancestor worship, so it was in the pre-Islamic North Arabian city. Each family undoubtedly had its own domestic cult as did each clan and each tribe. and the municipal god was in fact nothing more than the supreme ancestor, dominating a hierarchy of lesser deities, constituting a pantheon closely approximating in structure that of its earthly subjects. It is precisely in these terms that Lafcadio Hearn describes the patheon of the Japanese (Japan: an Interpretation The Macmillan Company, New York 1904). It is in these terms too that Fustel de Coulanges describes the gods of the Greek and Roman city state. (La Citè Antique, Librarie Hachette.) Chelhod describes the Arabic city thus:

"It is a seat of a political confederation. It is also a cultural centre and a highly hierarchised political unit bound by the same religion and worshipping the same local divinities. It is made up of different clans, each having its own independent organisation, its own ancestor and its own group in the assembly of notables or elders that deals with public affairs." (My translation.)

This description fits that of any city at this particular level of organisation. It may now be asked how did a universal religion such as Islam succeed in establishing itself in what would appear to be such unpropitious conditions? The answer is that the social structure we have described broke down in the ensuing chaos. Islam provided a new cultural pattern for the socially and culturally deprived masses, just as did Christianity in the case of the disintegrating Roman Empire, and Marxism with the break-down of preindustrial society at the turn of the 19th century.

The social structure of the pre-Islamic city could only be maintained in given environmental conditions. It could not resist the radical changes which occurred in the aftermath of the disintegration of South Arabian culture.

Let us try to see what happened. As South Arabian culture broke down, a large number of tribes migrated to the Hedjaz. Among these were the Khozas who made their way to Mecca, and the Aws and the Khazraj who ended up in Medina. Their arrival upset the established balance between the tribes dominating these cities. This gave rise to incessant civil wars, which had the effect of seriously weakening the tribes. One of the results of these wars was that the Qorays succeeded in establishing their dominion over the other tribes of Mecca. This upset the traditional political organisation of the city and also permitted it to expand commercially at the expense of its two rivals whose leading tribes were still busily engaged in civil wars.

With the rise in the importance of Mecca came a corresponding rise in the importance of its particular religious pantheon, at the head of which was Allah, who was probably the original tribal god of the Qorays. It is clear that before the rise of Mohammed, a national religion was slowly developing "pari passu" with the establishment of the quasi-imperial status of the Qorays proved themselves to be brilliant businessmen, and slowly Mecca was transformed into an international commercial centre.

With the increasing importance of its local religious cult, it succeeded in attracting pilgrims from the whole of the Arab world. This also considerably increased its revenue. One of the principal effects of this prosperity was to attract all sorts of people—foreigners from every part of Arabia and elsewhere, mainly the unattached and the unwanted. Among these were a large number of Christians who built their own cemetery and their own church. This process was accentuated by the total disdain with which the proud Arab regarded manual labour which rendered essential the importation of foreigners to fulfil all menial functions in this fast-developing centre.

At the same time, increasing wealth led to the degeneration of the Qorays themselves. They became idle, pleasure loving and permissive. The strict and austere life style prescribed by the traditional law or Forf slowly ceased to be observed, and material gain to be spent on luxuries and short-term entertainments must have slowly displaced concern with the fulfilment of family, clan, tribal and city obligations as society's principal occupation. In these conditions it is impossible for social stability to be maintained, and slowly Meccan society broke down and chaos reigned. Man does not like social chaos. He needs to be a fully integrated member of a family and community. He needs to have a precise identity and cannot bear just being someone in a crowd. To be alone in a big chaotic city is far more intolerable than to be alone in a desert.

There is thus a tendency in times of social breakdown for religio-political movements to develop, usually around the person of someone with charismatic appeal-a messiah of some sort. He will predict an ideal society which can be brought about by following his instructions carefully. Such movements tend to be aggressive. A group of people must be singled out as responsible for the people's plight, and their extermination is often a necessary step towards achieving the 'ideal' society. (See Norman Cohn's Pursuit of the Millenium-Macmillan, 1970, and Vittorio Lantenari's Religion of the Oppressed-McGibbon & Kee 1961).

At Mecca countless such movements appeared among the demoralised masses of the city, who probably lived in hideously over-crowded conditions, and whose social behaviour pattern must have corresponded very much to that of the inhabitants of our modern industrial slums.

Just as in the social chaos of the disintegrating Roman Empire there was also a plethora of similar movements, among those that developed in the Hedjaz were Judaism, which had already made many converts in Saudi Arabia, Christianity, Manicheism (see Andrae T, Mohamet: sa vie et sa doctrine. Adrien Maisonneuve, Paris 1945), and Hanifism, which Andrae defines as the cult of a Hanif, ". . . a man who, without belonging to a precise religious community, directs himself in accordance with his natural inclinations and dispositions, which God has given him, deviating in this way from popular paganism."

Such men included many prophets, among them the poet Omayya Ibn 'abi Celt. Another was Khalid Ibn Sinan (See Goldziher, *Dogme et loi de l'Islam*—P. Greuthner, Paris). The most important was apparently Abu-l-Qasim.

The tenets of these cults shared a belief in the apocalypse, a general feeling that the end of the world was at hand and a desire to believe that their particular messiah would lead them to salvation.

Though he is not normally classified as a Hanif, it is not quite clear in what way Mohammed differed from them, except, of course, that he was the most successful. Mobilising the demoralised and culturally deprived hordes of the oppressed against the citizens of Mecca, he brought about the end of what remained of its municipal religion and of the other institutions and beliefs that had previously maintained it as a self regulating social unit, and thereby laid the foundations of that vast universal religion that is Islam.

Edward Goldsmith

In the next issue of The Ecologist

Industrial Society cannot last much longer. The reasons why this must be so have been set out in CAN BRITAIN SURVIVE edited by E. Goldsmith. Rather than wait for it to collapse, we must start now working out what sort of society can replace it, and how to ensure the very difficult transition to such a society is effected as peacefully and humanely as possible.

This task has been given to a small committee that has been meeting regularly over the last few months. Its conclusions will be published as the January issue of *The Ecologist*, under the title of: A Blueprint for Survival.



Friends of the Earth Newsletter

With this December issue of The Ecologist, the editors make space in their valuable columns for the first of a series of regular monthly newsletters by and about The Friends of the Earth. Invited writers as well as staff members will discuss the aims and activities of the FOE organisation, and establish a much-needed communications hook-up for Friends and sympathisers in all parts of the country.

Who are the Friends? The history of the organisation is brief, but eventful. David Brower, America's leading conservationist, established the USA branch in 1969. The dropping of the Boeing SST scheme, the non-flooding of the Grand Canyon and the halting of the Alaska oil pipeline may all legitimately be put down to successful FOE lobbying there. Now the network has reached a dozen countries, and counts many prestigious names among its ranks. In the UK, the Friends have been operational since 1970, with Graham Searle among the directors.

Everywhere, the philosophy and methods of autonomous FOE branches are the same. That is, briefly, to promote a more rational use of our natural resources by all constructive means, and to work against those who are destroying those resources.

The polluters, the wastemakers, are everywhere in our society. FOE selects as its immediate targets those commercial concerns it feels it is strong enough and sufficiently well informed about to take on. Current major projects include the fight against open-cast mining in the National Parks (nine per cent of our precious, diminished British countryside, yet improperly protected by existing law), where the giant Rio Tinto Zinc and a number of *their* friends are attempting to prove the case for the bulldozer and the axe during the next fifteen to twenty years. (The mineral deposits in Snowdonia and elsewhere are low-grade and of limited value. Limited value, that is, when set against the cost of necessarily largescale destruction of Parkland.)

Those well-known soft drink people, Schweppes, have also earned the close attention of the Friends for their naïve belief that 250 million extremely breakable, non-returnable bottles dumped on the country each year will somehow cease to be. In all, 450 million one-trip bottles are produced year by the wastemakers. each Schweppes, though, lay proud claim to the bulk of them. KEEP OFF THE GLASS: by logical projection, it could come to that one day. Undaunted by the expensively promoted image of Schweppes, the Friends have twice this year returned large numbers of bottles to their Maker, delivering them amid wide publicity to the very doorstep of You Know Who. Their bubble is being painfully pricked. . .

Legislation against the importation of furs and feathers of endangered species (the voluntary ban by the International Fur Trade Association has no chance of halting the slaughter of such animals), and the dropping of that largely-unloved new Anglo-French species of predator, the Concorde, are projects similarly close to the hearts of FOE.

Hell is other people—or is it? One of the major problems faced by conservationist groups such as FOE is the individual's belief that not only is hell other people, but also that one can do nothing in the teeth of it. Certainly it is hard to envisage taking on the commercial might of the wastemakers —many of them, according to their own ambivalent testimony, for rather than against the environment. Individually, we are all conservationists, says Lord Byers, Chairman of natureloving RTZ. Really? Modern multi-layered mega-society encourages the retreat from personal responsibility, just as surely as it encourages the growth and proliferation of the industrial and commercial corporation and the cipher-men who press the buttons. How do we halt then reverse the trend?

Part of the pragmatic or dynamic approach is to ignore it. Forget it exists, and press on. FOE has won a reputation for getting things done. Victories have not been achieved by numbers, but rather despite their absence. It should be hastily added that FOE's method rests upon the building up of sufficient cases, and the wielding of all legitimate weapons, including that inadequate instrument, the law.

Not everyone will lose sleep over Parks, nor count the National Schweppes bottles along the roadside; perhaps a Paris-styled tiger skin coat still makes the blood race (though the animal may have met its end with an overdose of weed killer-to avoid damaging the fur, you understand). And surely there will be some who still harbour the belief, despite the growing volume of documentary evidence to the contrary, that Concorde is just what the country needs. The point is an important one, and it is this: allowed to flourish, the polluters, the wastemakers, endanger more than our environment; they debase the human coinage, diminish what had been felt in the nerve endings of the spirit-and themselves turn into cynical, squalid, ultimately dangerous members of the human species. We it is who are the greatest threat to the environment, because of the great threat we pose to ourselves.

Help FOE help. Having read this far, it is probable you feel some sympathy with the organisation's broad philosophy, plans and current projects. In little over one year FOE has won more than a thousand Friends in Britain. Officially, membership is £3.00. FOE is perhaps unique in having so many non-paying members, however: you don't have to pay to belong. But FOE needs money to fight its battles. They're your battles too remember. If you really want to help, please contribute.

Contact:

Friends of the Earth, 8 King Street, London WC2.



Cloud Cuckoo Land

POTENTIAL CROP PRODUCTION IN BRITAIN, edited by P. F. Wareing and J. P. Cooper, Heinemann Educational Books Ltd., £6.

The book is expensive, the contributions are highly technical, but it is all there. Some time between now and the end of the century Britain will have to become self-sufficient in food. Can it be done?

The need is coming to be recognised in political circles as, slowly and cautiously, the captains of our destiny are compelled to admit that the "population explosion" is a fact and as the implications of that fact are brought home to them. As demand for food grows in the third world, global trade patterns will be affected. Or, in laymen's terms, the poor will eat it all themselves. We will pay more for our imports and eventually we may not be able to import food at all.

At present we grow about half of the temperate foodstuffs we consume and this production is heavily dependent on imports of certain raw materials—particularly the high-grade protein from Africa and Latin America that feeds our intensive livestock units.

In July 1969, a symposium on "Potential Crop Production in Britain" was held at the Welsh Plant Breeding Station, Aberystwyth. It all went very smoothly. No one stepped out of line to suggest matching population to food supply. These were the experts, assembled to tell us how they will go on for ever, growing more and more food until the spectre of Malthus is banished to the obscure eighteenth century attic where it belongs.

The proceedings began with an address from Sir W. Emrys Jones, Chief Agricultural Advisor to the Ministry of Agriculture. "It can safely be assumed," he said, "that the loss of land to agriculture, together with a rise in population, will require a level of home food-production double what it is today. One can foresee the need to intensify the kind of research that will raise the yield per acre of crops, improve the efficiency of conversion of food stuffs by all classes of livestock, reduce wastage at all stages of production, storage, processing and distribution and, above all, increase the output per man employed." Then he left them to get on with the job.

The symposium was broken down into sections. The first dealt with the its environment. crop plant and Speakers outlined the influences of macro- and micro-climate on plant growth and went into some detail about what is known of the processes of photosynthesis and energy conversion, speculating on ways in which these might be stimulated. The general conclusion seemed to be that crops appear to grow better when the sun shines and there is adequate water. More startling was the paper by Professor Russell, of Reading University, who illustrated very lucidly just how little is known about the function of root systems in the uptake of nutrients.

This led to the second stage of the symposium, on the biological potential of crops. Can we breed plants that are more responsive to inputs or that are better adapted to growing conditions in this country? I found the contribution by Gillian Thorne, of Rothamsted, particularly interesting. Some tropical plants-sugar cane is the example usually quoted-are more productive than they should be when account is taken of the sunlight, water and nutrients available to them. Miss Thorne says there is a basic biological difference between these and other plants, some having photorespiration and others not. Should we look for new crop plants altogether, ones that do not waste time and energy photorespiring?

Prof. Newbould, of the New University of Ulster, described the comparative production of different ecosystems. "The basic agricultural strategy of monoculture, rapid growth and destructive harvest was inevitable as it evolved," he said, "but may not be so any longer." This is exciting, for it opens up a whole new world of possibilities. Does the future of farming lie in the simulation of natural systems? J. P. Hudson's discourse on horticulture in the year 2000 recognises the need to abandon pesticides in the interests of higher crop quality, but he believes that labour will be in such short supply that processes that cannot be mechanised will be avoided. Where will the power come from? He does not say.

The need to live without pesticides was underlined further by S. H. Crowdy, of the University of Southampton. He finds the degree of dependence on chemicals disturbing. The solution, he suggests, involves "developing systems of integrated control, reducing the use of chemicals to a minimum, and taking full advantage of biological factors to reduce pests and diseases." There are dangers, too, in the over-use of fertilisers. Prof Ivins, of Nottingham University, described some of them, and also mentioned the limitations to the effectiveness of fertilisers. "On some arable farms in the east, the use of phosphates and potash fertilisers is now merely a topping-up operation, and it is difficult to measure or even detect a response to P and K. In this case levels of nitrogen usage are also high and there is no doubt that the limit has been reached, or even on some occasions overstepped, and that yields have suffered in consequence."

We can expect no major increase in agricultural production in Britain unless there is a major breakthrough, leading to new varieties, new species, or new techniques. The symposium considered the potential of the present farming systems, but apart from a few hints, the breakthrough is not yet in sight. Nevertheless, Prof Wareing, of the University College of Wales, wound up on an optimistic, not to say euphoric, note. Use more fertilisers, he said, more sprays, introduce new breeds, and the problem is solved. "It would be possible to supply all our needs for temperate foods if this were desirable." In other words, the reason we do not produce more is that we do not want to. This extraordinary statement will

come as a surprise to the politicians. For twenty years successive British governments have exerted every kind of pressure on the farmer to grow more food, for all the world as though they thought self-sufficiency a desirable objective. The result has been a dramatic increase in production, so that now we produce half of what we eat, but the days of glory may be passed: yields of most of the major products have peaked and some are declining. Where does that leave Prof Wareing?

The danger is that the professional optimists will make it easier for governments to avoid the real issue, which is that of the relationship between growth and resources. The longer that confrontation is postponed, the nastier it will be when it comes. It is possible to devise a humane population policy, so that if the populationists should turn out to be wrong, we will still be better off for having solved the problems of large, poor families and unwanted babies. If Prof Wareing is wrong, and the evidence suggests that he is, then Heaven help us all! Cloud cuckoo land may be pleasant today, but it will vanish tomorrow.

Michael Allaby

Conservation is Survival

THE SURVIVAL OF THE ENG-LISH COUNTRYSIDE Victor Bonham-Carter. Hodder & Stoughton £3.

A unifying element of urgency and drama underlies the work of those who understand that "time is short and that conservation is survival" as V.B.-C. puts it. His recognition of this urgency and the realities of the situation increased while he was writing this book. In The Survival of the English Countryside he searches our history, past and present, for the causes of our dilemma, what we are doing about it and how effective our attempts to save the countryside are likely to be. It is an enthralling story, well documented, but at the end we are left with the feeling that our efforts at conservation are far too half hearted.

English history has two distinct phases—pre- and post-industrialism. The countryside which industrialism so barbarously ravaged was a perfect example of partnership between nature and man. Justice must be done to both. It is often difficult to disentangle these

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two aims: they tend to mask each other, so that what is justice to man is assumed to be justice to the soil and vice versa. The history of Enclosures shows that the needs of the soil were made a pretext for unjustly dispossessing the peasant and the yeoman and turning them into landless labourers while the big landlord cornered all the benefits, so that the beautiful 18th century was founded on inequalities too wide to be tolerated.

In our own time the demands of urban industry which produces machinery, fertilisers etc. and the scare about insufficient food to feed the masses have been a pretext for exploiting the soil by methods of husbandry that keep down prices—their real objective. At the same time the price of land has risen from causes which have no relation to farming, so that the farmer makes more profit by selling his land than by farming it. V.B.-C., like

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many others who have thought fundamentally on this theme, wonders if this does not justify nationalising the land as the only means of integrating it with true social necessities, as was the case in the Middle Ages. A study of the Manorial system as the most highly managed agricultural system in our history is therefore relevant to our own times. V.B.-C. points out that it failed because its rules were too rigid and did not allow enough flexibility to the peasant in arranging his seasonal programme. Could we not avoid this danger while yet harmonising agriculture more closely with the community?

In the days when I first knew Victor Bonham-Carter-over twenty years ago-he was battling with a small hill farm in Devonshire. We were both concerned with finding out why the countryside had become the poor relation of the town and what could be done about it. He taught me that the lasting prosperity of the village must be founded on agriculture and I believe this to be true though it is easy to forget as the village becomes the refuge of the commuter and the retired. Secondly he taught me that the person who has farmed and learned to deal intimately with the soil for a living while at the same time caring about it, acquires an insight and judgment that is a necessary element in the sound judgment of a nation as a whole. To run down the number of people engaged in agriculture too radically-in his own telling phrase, to have the land too lightly manned-is to damage the national character. Later Sir George Stapledon (and on a philosophical level Ortega y Gassett) made me realise that the virtues of which we boast as a nation are not unconditional and that if we alter the environment and the way people earn their living too drastically, then, for good or ill, we shall become a different people. Undoubtedly the changes are for ill. The way the majority of people have to work in the mass industries-which now begins to include agriculture-is undermining the capacity of the industrial nations to meet the social problems that lie ahead of them. The survival of the qualities of

countryside-which the we call amenity-is thus a guarantee of the survival of ourselves as a civilised people. Certainly there was a time when a business ingredient was a valuable new dimension for the traditional farmer enabling him to make a better assessment of the commercial results of what he was doing on his land instead of muddling through with his calculations of input and output. But now the economic dimension-as for instance in vertical integration-has become a vast network in which the personal judgment of the farmer is subordinated to the central decisions of a machine in which he is only a cog. This book gives us a mass of information whose significant points are brilliantly highlighted-a result of a life-time of experience and reflection.

The end of the historical section of the book reveals how we have gradually rejected laissez-faire and turned toward various forms of protection at the same time as public opinion has demanded that, in return, agriculture conserves a landscape that is an acceptable "amenity": this has led to many unresolved conflicts of aims and to the muddle and complexity of the laws, as already mentioned. We are uneasily aware that for all the reports and Acts which look so impressive when described we have been halfhearted. It is this perhaps more than anything else that is so surprising when we have finished the book. It leaves us asking the question, What is the reason? And it is on this note that the author deliberately leaves us. Much of what he advocates is already Government policy. And yet we are almost convinced that it will never be effective: not because people are not well intentioned or do not see the issues, but because the system, the whole way we live, our basic assumptions are against it. In fact, we cannot pursue a policy of constant economic growth, especially in agriculture, and expect to have fertile fields, healthy crops and sufficient land.

The Survival of the English Countryside has for its moral that only a revolution in our values and way of life can bring about what we all in our hearts desire. We are going to be asked to accept a compromise solution—one half of the nation "amenity-farming", the other half caught up in agro-industry where the public dare not venture off the road for fear of damaging a crop or upsetting the neurotic animals crammed in the factory farms. If this solution—which V.B.-C. objectively poses for us—is accepted, then we have failed to understand what is happening to us. For agro-industry is not the necessity it is claimed to be. It will have to meet the full impact of the decline in productivity of the other mass industries when our raw materials and fossil fuels run out. We are preparing a disaster if we let ourselves be enticed by the progressive agriculturalists.

Author and reader inevitably recoil from the dramatic and absolute nature of the conclusions to which our investigations lead. We are led by the long historical survey and the more detailed account of our own time to the conclusion that conservation is survival. Let us hope that Victor Bonham-Carter will spell out in another book exactly what this means. Like all of us he is only half-way yet in his pilgrimage of understanding. But I know of no better book for leading us thus far and thoroughly grounding us in the intricacies of the route.

Robert Waller

Econ. Trick

WEALTH—AN ESSAY ON THE PURPOSES OF ECONOMICS by Charles Carter, a Pelican Book, 30p.

The ecologist knows that a finite planet accommodate exponential cannot growth curves. He senses that there must be flaws in the economic growth orthodoxy that forces all manner of follies upon us. Economists, of course, have long known that the "standard of living" is an horrifically imperfect indicator of society's wellbeing, and any of them with consciences are probably by the absurd awe embarrassed with which its growth is regarded by our leaders. But nobody, I think, has hitherto come into print with such a comprehensible guide to the illogicalities of growthmania. With Carter's little blue book the reader can raise some sharp response to those who urge us to grovelling obeisance and scruffy compromise.

A respected economist and Principal of Lancaster University, the author is no ecologist, but this matters not; his ammunition against WesCiv's growth fixation, once grasped, is commonsense rather than the eco-emotional line we are used to hearing.

Consider advertising, on which we

spend £2 million per day. With offensive and counter-offensive this figure increases, but it is all good solid economic activity, swelling our Gross National Product and so pushing up our "standard of living". Whoopee! But wait a moment; advertising, of its essence, is studiously designed to make us feel envy and dissatisfaction with our lot. Here for Professor Carter is a central idiocy, that the system as it now stands simply cannot countenance widespread personal contentment: "In a society dominated by the need to absorb its own production, the increase in the flow of wealth provides no more happiness or satisfaction, for the consumer must always be kept hungry for the next increase."

His detailed suggestion for controlling expenditure on the stimulation of consumer demand shows a commendable willingness to face up to practicalities. But his plea that this be "backed up by giving assistance to consumer research and unbiased sources of information" looks sad indeed following this year's demise of the Consumer Council, which was selling just such information openly on the newstands.

"The richer a country becomes, the

less need it has to be ruled by economic thinking, and the more it should turn its attention to what Keynes called 'other matters of greater and more permanent significance'." Much of the book revolves round the feeling that our unprecedented wealth is accompanied by an equal poverty of outlook and achievement.

Many items of conventional wisdom fall victim to Carter's pen, including those dreadful international comparisons of wellbeing, of the we're-fallingbehind-in-the-race variety; eg the EEC: "We've got to get in to get on", et cetera, ad nauseum. Such platitudes are about as nearly devoid of meaning as it is possible to achieve. Firstly, there are the genuine differences in human needs in different places: "About £2,500 million, or 8 per cent, of British production would not be needed if the average temperature was 18°C all the year round." And clearly, "in any rich and complex society, a great deal of the work done-and duly counted in the flow of wealth produced-is simply required to offset the disadvantages of living in a rich and complex society." Thus we count as part of our production all the costs of running cars, managing traffic chaos, and supplying ambulances. Likewise we count the costs of making and advertising cigarettes, as well as anti-smoking campaigns and the services of chest surgeons.

In fact, for the economist assessing our all-important "standard of living", anything goes. Nerve-gas or nursery schools, hospitals, Mars bars and plastic gnomes—they are all the same to him; and each is worth exactly what it costs. With every penny spent on each, our "standard of living" rises; £2,200 million on defence is no exception.

This incredible "Look—no value judgements" stance of the economists has, I think, finally been rendered untenable by the boomeranging ecological crisis. To stand aside now and refuse to distinguish between classes of expenditure is to sin by omission. So far from being in that neutered haven of the value-free, they are in fact worse than valueless, since they are now championing, by default, the "stuff the future", "defecate and move on" attitudes that are most to be feared.

We are indebted to Professor Carter, and can discharge this by reading and using his admirable book.

Philip Brachi



"The prophets of doom have done their job. We must now get down to solutions. There is no time for pessimism."

Paul Ehrlich LaMont C. Cole Edmund Leach Rufus E. Miles Edward Mishan Jean Medawar Buckminster Fuller

and more

Edited by Nicholas Pole Photographs and Environmental Directory for 1972 Available from 1st January 1972 Order now from: ECO PUBLICATIONS 6 Cavendish Ave., Cambridge price 60p



Coercive pollution fines

Fisons Ltd. were fined a total of £40 at Ipswich Magistrates' Court recently with £20 costs for polluting the Orwell at Ipswich last May.

This must be a very serious blow to this company and must inevitably deter them from getting rid of their waste products in so irresponsible a manner. We must congratulate the magistrate for his bold and public spirited sentence.

Source: The Times, 6 October 1971 and editorial comment.

Tribe fights atom men

The Herero are a proud nation who once fought a bloody war against the Germans in South West Africa. Unfortunately there is uranium in their tribal territories and Rio Tinto Zinc, in characteristic manner, is bent on cashing in on it, regardless of environmental consequences. In fact this company has agreed to supply 7,300 tons of uranium worth £25 million for the next 10 years to the United Kingdom Atomic Energy Authority. The Chief of the Herero tribe, Clemens Kapuuo, may bring an action in the English courts against the latter organisation. He wants all foreign firms removed immediately from his territory: "Our country is being robbed of its wealth and rendered barren for the future," he says. "Our fear is that when freedom finally comes to this land, it will be returned to us with no minerals left." Source: The Sunday Times, 3 October 1971.

Another crippling fine

A property development company which demolished a 16th century farmhouse five days after a building preservation notice had been placed on it, was fined £100 at St Albans recently.

The company is Maltglade Ltd of Manchester Street, Luton, which pleaded not guilty to demolishing Old Town Farm, Wheathampstead, Herts. The men who appear to be responsible are Richard Percival Walley, an estate agent of Limbury Road, Luton, a director of the company (who has been fined for a similar offence); and Brian Colwell, a builder of Wellgate Road, Luton, who carried out the demolition.

It is clear that such a puny fine can have absolutely no deterrent effect. It is but a relatively unimportant addition to the general expenses of companies like Maltglade Ltd. Source: *Daily Telegraph*, 2 October, and editorial comment.

Forest monoculture

The Ramblers Association in a recent pamphlet calls for a halt to increasing schemes for conifer plantations. It says conifers grow faster than broad-leaf trees, and "thus produce relatively predictable returns. So British forestry is dedicated to the mass production of conifers". The scale and mechanisation of this industry are growing steadily. "Sunshot glades are as out of place in its monocultural gloom as cloisters for meditation between the assembly belts of a factory."

Apart from the non-indigenous conifer looking totally out of place in Britain, its random planting, particularly in areas where previously there had been natural deciduous growth, interferes with the ecology of the soil. Also many a magnificent view in the Highlands of Scotland and in several parts of England (the Lake District for example) has been destroyed for the walker, and all bird life has disappeared from these areas.

In spite of these mass production methods, the Forestry Commission's work is not economic, and requires a subsidy of £40 million a year.

The Ramblers Association calls for an inquiry and demands that afforestation should cease to be exempt from planning control.

Source: *Daily Telegraph*, October 1971 and editorial comment.

S Nuclear fantasy

According to the Atomic Energy Authority's annual report published on 6 October more than 78 per cent of Britain's electricity will come from nuclear power by the year 2000 with more than half this generated by fast breeder reactors developed from the Dounreay prototype. It is interesting to note that there are as yet no breeder reactors in service. The first prototype is destined to function by about 1980. Anybody knows the snags that can be encountered apart from the radio-active wastes that will be generated. In these conditions is it sensible to make such predictions?

L.A. Smog in Britain?

Los Angeles type smog, caused by the action of sunlight on car exhaust fumes and sulphur dioxide, now threatens Britain. The choking haze of California was thought to be unlikely in Britain, not so much because Britain had fewer cars than Los Angeles, but because British sunlight was not intense enough. However laboratory studies have shown that the process goes on much faster than was previously thought. Already the Swedes say they suffer from British sulphur dioxide carried to Scandinavia by the prevailing winds. Sulphur dioxide may also be the reason why fog smells foul as well as chokes, say Harwell scientists.

Source: The Times, 7 October 1971 and editorial comment.

2,000 scientists express concern for human survival

The United Nations Secretary General, U Thant, has been presented with a statement on the urgent global problems that threaten human survival. The document, called "A Message to Our 3.5 Billion Neighbors on Planet Earth" says that "almost unmanageable problems" raise the possibility of the "virtual extinction of human life on earth".

The report identifies four principal areas of concern: (1) environmental deterioration, (2) depletion of natural resources, (3) population overcrowding and hunger, and (4) war.

The scientists call for massive research on a scale similar to that done on space and atomic energy and that such research should "be paid for by the industrial nations, which are not only financially best able to carry that burden, but themselves are the principal users of resources and the major polluters". The report which originated in Menton, France, is known also as "The Menton Statement". Scientists who participated included George Wald of Harvard, Lawrence Slobodkin of the State University of New York, Donald Chant of the University of Toronto, Pierre Leping of the Pasteur Institute in Paris, and Cao Ngoc Phung, currently in exile and formerly of Saigon and Hue Universities in South Vietnam. Source: UN Information Service press release.

Britain's supermarket managers should proceed with caution!

At the height of the conservationists' campaign against phosphate-based detergents, a new laundry powder began to appear in thousands of American supermarkets. Now sold widely, it has the persuasive name of Ecolo-G, is attractively packaged in white cartons decorated with drawings of fresh green leaves. Its manufacturer is a small firm with powerful Mafia associations. Pieced together, the story, revealed recently in a series of Senate Committee hearings, involves extortion, threats, arson and murder by members of the Mafia against supermarket executives who refused to stock Ecolo-G precisely because it was the opposite to what it claimed to be. The nationwide supermarket Great Atlantic and Pacific Tea Company

were the first to classify it as inferior and harmful, and were accordingly threatened by two powerful union leaders, both named by Federal investigators as Mafia types, with strike action which could cost the company millions of dollars. But still the company refused, and then followed a wave of arson and foul murders involving A & P officials.

This was four years ago. In March of this year an independent action against North American Chemical Corporation (the company manufacturing Ecolo-G) was taken by Mr Wayne Warrington, director of the National Food Chains Association. who sent out telegrams to all his members, urging them not to stock Ecolo-G because of a finding by the Food and Drug Administration that it could be damaging to the skin and eyes. He then lifted the ban five days later when FDA insisted that a warning of the potential harm be printed on all packets of Ecolo-G. But his action had already hurt the Ecolo-G image of purity, and on 8 May Mr Warrington mysteriously disappeared and no trace of him has been found since. Source: The Observer, 10 October 1971.

No additives for baby foods Baby foods should ideally be produced without additives, while those which do contain them should be properly labelled to ensure that they are not consumed customarily by infants under 12 weeks of age. This conclusion was reached by an informal meeting convened by the Food and Agriculture Organisation and the World Health Organisation, who indicated doubts about the existence of adequate detoxifying and other protective mechanisms to cope with additives. The kinds of baby foods "that should ideally be free from additives include: infant formula (and other milk-based preparations), cereal-based foods, strained and 'junior foods' and fruit juices, unless appropriately labelled so as to discourage their consumption at an age of less than 12 weeks" said the group's final report. In particular the group recommended that all

the group's final report. In particular the group recommended that all efforts be made to reduce nitrate and nitrite intake from drinking water and foods. Ideally pesticides should be absent but it is recognised that complete absence cannot be expected in all foods, but "baby foods should be manufactured from such raw materials and in such a way that residues in the final product are reduced to a minimum".

What in fact the report is saying is that babies are very much more sensitive to poisons than adults and that the poison they are being subjected to should be the minimum compatible with the continued development of our industrial society. Source: *Span*—Soil Association News, September 1971. Plus editorial comment.

Cancer trip

Lysergic acid diethylamide (LSD) may be a carcinogen. A report from the Albert Einstein Medical Centre disclosed that a particularly rare cancer has been diagnosed in two patients who had been LSD users. A form of cancer is choriocarcinoma of the testicle which accounts for only 1 per cent of testicular tumours. The first patient was a 21-year-old white male, who had been on 20 LSD trips in the two years preceding his symptoms. The second was a 21-year-old white male who had been on 40 LSD trips in 1¹/₂ years preceding his symptoms.

The similarity between the two cases are striking and Drs Leonard J. and Stanley N. Levick who reported the cases emphasise that "When two young normal men develop choriocarcinoma after taking LSD repeatedly, we feel this may be a possible causative factor".

Source: Pulse, 16 September 1971.

Aspirin may harm growth of human embryonic cells

Sodium salicylate, an aspirin metabolite, appears to inhibit the growth of human embryonic cells. Kidney cells show the greatest sensitivity, but lung cells are also affected.

A report states that the growth rate of kidney cells from 12-week-old embryos was reduced almost by half when the cells were exposed to $80 \ \mu g/ml$.

There appears to be a correlation between salicylates taken during early pregnancy and foetal defects. Source: *Nature, New Biology.*



An Eco-community?

Sir,

Your article "Common Market v Environment" adds little to readers' knowledge on the question-indeed important and little debated so farof whether joining the European Community will have effects one way or the other on the fight to save the environment. Instead it adds to the sad confusion of the British debate. Brian Johnson seems, alas, to be another of those who have fallen into the trap of attacking the Common Market for representing, or else for potentially strengthening, the things they do not like and have failed to change in the national set-up.

More particularly, he equates the Community with the growth philosophy that is just as much a British or a western—or an industrialised world —phenomenon. He would like anti-Marketeers to be anti-growth (which is rather like the short-sightedness of the Labour party in deciding to make anti-Market equal anti-Tory). Unfortunately for his case, there are growth maniacs on both sides of the membership argument.

I am afraid Mr Johnson, though he may not realise it, is a nationalist in environmentalist's clothing. Take this sequence: "British sovereignty has not 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". And this in an issue which also contained the article on the industrial assault on Clydeside. And what about "British control" in Anglesey or Snowdonia?

The answer is that a concern for the quality of life is not something you can be "British" about. We have good points and black spots, just as the Dutch have the Rotterdam mess and the Delta Plan's care for the environment, and the French or Germans have good and bad areas and policies. The real question is how we can best carry through a new political approach, and the accompanying rules, to force industry to pollute less in the short-run, and build concern for the environment into our whole political and economic philosophy in the long run. One western European country alone cannot do this: the industrialists would rebel on the grounds that tighter rules made them uncompetitive. It can only be done in an area strong enough and big enough to make such choices-and able to make rules to enforce them. The Common Market offers us that choice.

Mr Johnson can be forgiven for not knowing that the Market has in the last few months moved in on the environmental problem. Plans are now ready for process-by-process approach, unlike the element-polluted approach of most other organisations, intended to lead by 1973 to Community level regulations binding on industry. It will not be easy: but it is promising, and Britain can play a major part. Another Community plan is to act decisively to help save the Rhine and also the Mediterranean and the North Sea. This matters. We cannot hope to tackle such things alone.

Another important step is that the Six and the US government are to consult on up-coming anti-pollution measures, so that they can act in concert. This will head off resistance to such measures on the grounds that they constitute new barriers to trade.

If there were ever an issue where we have to be internationalists, it is in defence of the environment. Go-italone we-can-do-it-better nationalism would be disastrous. There have already been cases of heavily polluting industries, headed off from one country either by citizen action or national legislation, choosing a site in a less aware or less strict country. Even if Britain were an emerald, clean-air-andwater isle set in an unpolluted silver sea, it would be irresponsible to haul up the drawbridge. In fact it isn't as The Ecologist is trying to persuade us: the Common Market will offer new possibilities of joint action. Let's take them.

Yours sincerely,

John Lambert,

Editor of Agenor, Rue Hobbema 13, 1040 Bruxelles.

A lead to removing lead Sir.

It may be of interest to you that I have today sent a letter to the Minister for the Environment, the Right Hon. Peter Walker, with translation-extracts from the Swiss newspaper *Davoser Zeitung*, of 26th August, 1971. The extract reads:

"Switzerland has, 'as a first step towards reduction of the pollution of the environment', reduced, as from the 1st October 1971, the lead content of ordinary petrol by 15%, to 0.54 grammes per litre, and that of the 'super' by 10%, to 0.57 grammes that time per litre. Up to the maximum lead content permissible was 63 grammes per litre. At the same time the maximum content for aviation-petrol is being reduced by 20%, to 1.29 grammes per litre. . . . In the United States the change-over to lead-free petrol is in process of being implemented..... For this reason the American motor-industry produces, as from 1971, only models which show a low compression.... In the German Federal Republic. . . . the lead-content in motor-fuel will, as from 1st January 1971, be reduced to 0.40 grammes per litre. "

How do these figures compare with lead content in our own petrol?

Yours faithfully,

Miss P. Cantor,

16 Alexandra Court, Chase Road, London, N14.

Edinburgh first?

Sir.

I refer to Richard J. C. Barron's letter in Vol. 1. No. 14 of The Ecologist in which he thinks Hatfield Polytechnic's recent graduates are the first to have honours degrees in ecology. I would point out that the University of Edinburgh offers the B.Sc. (Ecological Science) degree with four Honours Schools-Ecology, Forestry, Resource Wildlife and Management, and first The Management. Fisheries students in the Ecology Honours School graduated in July 1970.

Yours faithfully,

Charles J. Taylor,

Director of Studies Department of Forestry and Natural Resources, The University of Edinburgh, King's Building, Mayfield Road, Edinburgh EH9 3JU.

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