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The **New Ecologist**

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	Editorial	
Nicholas Hildyard	Genetic Consequences	2
	Eastura Articlas	
John Stewart	Pandora's Panacea The weaknesses of a dangerous science exposed	3
Ronald Higgins	The Seventh Enemy: the human factor in the Global Crisis Inertia is the deadly enemy that threatens the future of mankind	6
Nicholas Hildyard	Overexposed: Health hazards of high voltage Power Lines Private citizens battle with public companies and governments to expose another threat to human health	11.
Ross Hume Hall	What's in a Pizza?	18
la medicana di mani di mana adi	Ecopolitics	
Jonathan Porritt	Gearing up for the General Election	20
	Reports	
Ruth Lumley-Smith	Artificial Nonsense: phosphates in Florida Can the destruction of Florida's heartland be justified?	23
	Gleanings	25
Peter Bunyard	Review Article: Fuelling hope	27
	Authors in this issue	26
	BOOKS	30
	LETTERS	36
	COTCI, DICHAIL DOMACH	

Note: While every care is taken with manuscripts submitted for publication, the Editors cannot guarantee to return those not accepted. Articles published in The New Ecologist do not necessarily express the views of the Editors.



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Genetic Consequences

It has always been a major plank of those who support genetic engineering that today's laboratory techniques are so sophisticated that the risks of an accident involving recombinant-DNA are now almost infinitessimal. That claim has shaped the guidelines regulating research in genetic manipulations throughout the world. In Britain, for instance, new laws passed last year under the Health and Safety at Work Act now make it obligatory for scientists wishing to carry out genetic manipulations to notify both the Genetic Manipulation Advisory Group (GMAG) and the Health and Safety Executive. These bodies are responsible for ensuring that safety standards in the laboratories are up to scratch. So long as dear Dr. Frankenstein has a laboratory specially fitted with airlocks and filters, biological safety cabinets, facilities for changing clothes, and autoclaves within the building, he can continue his work in the knowledge that his experiments are quite safe. With recombinant-DNA subject to the statute book, the government is fully satisfied that it has the genetic genie firmly bottled up - so much so that GMAG are now considering relaxing their guidelines and easing the safety precautions required for a whole range of experiments. But can we be so confident that any laboratory practices will ever be of a sufficiently high standard to safeguard the public? Indeed can rules be made to overcome human fallibility? And should we trust scientists to police themselves?

Recent events at Birmingham University's Smallpox Laboratory — where Janet Parker, a medical photographer, died last September after being infected by a virus that escaped from the laboratory — shows that it is dangerous to rely on any safety measure. Professor Reginald Shooter's confidential report on the incident, which Clive Jenkins, leader of Janet Parker's Union, rightly decided to publish despite official objections, relates an apalling history of bureaucratic incompetence, professional ineptitude and downright dishonesty (see *New Scientist*, January 4th 1979 for a full review of the Shooter report). It emerges:

• That the head of the laboratory, Professor Henry Bedson (who committed suicide shortly after Janet Parker was found to have smallpox) failed to inform the authorities of changes in his research that could have affected safety. He was in fact working with recombinant techniques.

- That the Dangerous Pathogens Advisory Group inspected the laboratory on two occasions and each time recommended that smallpox research be continued there, despite the fact that facilities at the laboratory fell far short of those required by law. Among other deficiencies, the entrance to the laboratory had no airlock.
- That several of the staff in the laboratory had received no proper training. Bedson even allowed a school-leaver to work with smallpox after only nine months as a trainee technician.
- That inspectors from the World Health Organisation had told Bedson that the physical facilities at the laboratory did not meet WHO standards, but had nonetheless only recommended a few changes in laboratory procedures — such as banning mouth-pipetting.
- That Bedson lied to the WHO about the volume of work handled by the laboratory, telling them that it had progressively declined since 1973, when in fact it had risen dramatically as Bedson desperately tried to finish his work before the laboratory closed. Shooter estimates that the workload in the tiny laboratory had increased tenfold since 1973.
- And finally that Janet Parker had not been vaccinated recently enough to protect her against smallpox.

Such a woeful litany of incompetence hardly inspires confidence in the claim that the public will be protected from the hazards of recombinant-DNA by the pro-



It's perfectly safe, Obergurgl, I've notified the Genetic Manipulations Control Board!

fessionalism of scientists.

But is it not inevitable that such accidents will occur? As Dr. Tom Pollock, Director of the epidemiological department of the Central Health Laboratory, put it to *The Daily Telegraph*, "You get awfully used to the same techniques day after day and so it is easy to take a few short cuts with them. But, although it is understandable, it is of course totally wrong". Wrong it may be, but it is precisely this human factor that makes calculations of risk in genetic engineering almost totally meaningless. Paul Berg, father of recombinant-DNA research and author of the 1974 call for a moratorium on genetic engineering, found that nearly all the researchers in his laboratory had built up immunity to the SV40 virus they were working on. Proof that they had been infected.

There is a strong argument for assuming that where committed proponents of genetic engineering are concerned the risks of human error are even more serious than amongst their more wary colleagues. If they see no dangers, why should they bother with the safety procedures? "Practising biologists will not find it easy to adhere to restrictive and time-consuming rules, and ensure that others do too, when they have so little confidence that these rules have a rational basis," writes Professor R.H. Pritchard, one of the most vociferous proponents of genetic engineering, in *Nature* (29.6.78.).

The pro-engineering lobby like to repeat risk estimates that calculate the probability of a contagious form of cancer being created in a laboratory and subsequently escaping as one in ten thousand million trillion. They claim that the bacterium most commonly used in experiments, *E. Coli* K-12, is 'crippled' and thus could not survive in the human gut should it escape from the laboratory. In fact, *E. Coli* K-12 does persist —albeit briefly — in the human intestine and is quite capable of transferring plasma to the resident flora. Were an accident to occur with a new bacterial strain, the results could be catastrophic — particularly since it is unlikely that either humans or the rest of the living world will have had any evolutionary experience of it, and will thus totally lack resistance.

And what right have a handful of scientists to take it upon themselves to impose on the rest of humanity, risks that could, in the worst instances, threaten every living thing? Scientists are no less fallible than the rest of the human race, and herein, perhaps, lies the greatest danger; a dedicated man like Bedson, who was respected by his colleagues and utterly trusted by his staff, will always be subject to human frailty. In his case dedication to a research programme, in a situation where no-one doubted his integrity or suspected the risks that he was quite deliberately taking in his own laboratory. However stringent the precautions the government may impose now, or in the future, they can never guarantee against the accident of a man believing that his own work is too important to be subject to the law. There is only one way to eliminate the possibility of disaster, and that is to outlaw further experiments.

Nicholas Hildyard



FALLACIES IN THE GENETIC ENGINEERING DEBATE

by John Stewart

Genetic engineering embodies the belief that technology can solve all our problems. To some it has the look of the supreme technical fix. But it is not so simple.

Will genetic engineering really solve the overwhelming problems that confront us today? Can it seriously bring an end to hunger, disease, poverty and alienation? For its part, the US-based CETUS Corporation has no doubts. It describes the future contribution of recombinant DNA in glowing terms:

'We propose to do no less than stitch into the DNA of industrial micro-organisms the genes to render them capable of producing vast quantities of vitally needed human proteins . . . This concept is so truly revolutionary to the biomedical sciences that we of CETUS predict that by the year 2000 virtually all the major human diseases will regularly succumb to treatment by disease-specific artificial proteins produced by specialised hybrid microorganisms.'

Such claims are riddled with fallacies. They add fuel to the widespread belief that new technologies automatically offer striking gains, and conveniently ignore the negative consequences that are so often dominant. But most seriously, they are made on the assumption that the remedy to all our problems — from famine to ill-health — lies in improved technology. In fact our problems are not of a technological nature; their *real* solution is not significantly limited by existing technology but rather by economic and political factors. The emphasis on technological solutions simply diverts our attention from the goals that are essential for real progress. It is this distortion of aims that makes the development of genetic engineering such an alarming prospect.

Producing enough food

In the case of world food production, it is claimed that existing productive capacity is insufficient to feed present and future populations. It is therefore proposed, by using recombinant DNA, to give certain nonleguminous plants the capacity to fix nitrogen, thus expanding output considerably. What is overlooked, however, is that the limiting factor in food production is not only capacity, but rather insufficient market demand. As explained in a recent study, prepared under the auspices of the World Bank (but not endorsed by it), the majority of those who are starving and undernourished have insufficient income to purchase food that would otherwise be readily available. The study found, for example, that although seventyfive per cent of the population of the underdeveloped countries receive less to eat than the WHO's recommended daily diet, the resulting calorie deficit amounts to a mere four per cent of the world's cereal production.

The tragedy is that even if food prices were substantially reduced (as *might* happen with the introduction of a new technology), the depressed section of the world's population would still be denied a competitive place in the food market-place. So long, that is, as the fundamental problems of unemployment, income maldistribution, land ownership and the retention of political power by an elite minority, remain unresolved. The only groups to profit from the prospect of increased yields through recombinant DNA technology would be the owners of large agricultural resources – the relatively few who own the best land in most underdeveloped countries - and the large corporations involved in all aspects of global agriculture - from farm machinery to fertilisers, pesticides, processing and marketing.

Recent technological developments in agriculture, applied globally, have had adverse effects. The introduction of hybrid varieties during the 'Green Revolution', for example, tended to further stratify rural class structures, favouring those large landowners who could afford the costly inputs required - irrigation, fertilisers, tractors and other machinery - and encouraging further consolidation of land holdings. Landless and jobless peasants were forced into the cities (and shanty towns) at an even faster rate than before. There was destruction of traditional local crops with further erosion of nutritional status, while the new crops had increased vulnerability to unexpected pests. The effect of these changes for the poorest sector of the Third World was to exacerbate the maldistribution of income, and consequently the ability of the people to buy, let alone grow, enough food. Presumably new varieties created through recombinant DNA technologies will be introduced into a similar economic environment.

Accompanying the belief that advances in modern agriculture together with population control will provide the solution to the world food crisis is a political structure that clouds the real issues and makes essential changes even more remote. These changes must include a full-employment rural economy and selfsufficient, small-scale industrialisation. 'Advanced' agricultural technology requires heavy financing, and this often means that the credit which is vital for small farmers becomes less available. It encourages government investment in irrigation, storage and transport, which suit the needs of export-orientated large farms. It creates dependence on agricultural inputs from foreign sources rather than local ones. It strengthens the economic and political position of the large operators and weakens that of the rural workers, thereby further delaying basic and vital change in the rural economy.

Conquering disease

It has been claimed that recombinant DNA techniques promise important advances in combating 4 disease through lower drug prices and the creation of new drugs. The possibility of the rapid, inexpensive production of human insulin by genetically engineered bacteria has often been cited in this respect. Another example frequently given is the rapid and efficient production of antibiotics by new processes of fermentation. Still more exotic medical benefits are promised with the development of human proteins, specific metabolic enzymes, blood clotting factors, immunoglobins and hormones — all of which could have a variety of uses. One direct application that has been suggested is to provide specific proteins which are absent or defective in people with certain genetic diseases.

Rather than dwelling on technological solutions for medical problems, however, we should recognise that the primary medical problems facing us today from hypertension and other cardiovascular diseases to cancer, anxiety, depression, alcoholism and obesity derive directly from our technological way of life. Their roots lie in bad working conditions, urban stress, chemical pollution and poor nutrition — none of which are primarily dependent on technological innovation for amelioration (one doesn't, after all, escape the rain by plunging into the sea) and all of which are the inevitable consequences of the prevailing economic order.

The new drugs being developed to treat these 'diseases of civilization' are increasingly sophisticated, requiring more technical expertise for their safe use and providing ample opportunity for their misuse. The proliferation and irresponsible use of antibiotics is a concrete illustration of this problem. Widespread use of antibiotics has created a selective environment favouring drug resistent pathogens as well as compromising the immediate health of patients. A number of drug-resistant strains of major pathogens are now in wide circulation and antibiotic-resistant epidemics have not only been predicted but realised. This trend towards technological medicine will be magnified many times when the products of recombinant DNA begin to appear. There are awesome hazards presented by the clinical development of these therapies, an activity which will continue and increase in Third World countries where the regulation of research is less stringent. Aggressively marketed, difficult to regulate and highly complex therapies will be available within a health-care system incapable of assuring their correct use.

Emphasising the claim that a new class of wonder drugs and therapies will be made possible by recombinant DNA research, not only sustains the current excessive reliance on drugs as medical panaceas, but also cuts off other alternatives for addressing contemporary problems, including those which look at our entire way of life and social order (e.g. pollution and working conditions) and those which increase the participation and responsibility of patients in their own health management.

The funding of cancer research provides a graphic illustration of how 'high science' diverts our attention from the root causes of our problems. Less than ten per cent of the budget of the U.S. National Cancer Institute is spent on basic environmental research identifying the chemical agents responsible for the

majority of cancers and their mode of action. The bulk of NCI funds supports programmes in vital research. based wholly on the speculation that viruses are involved in human cancers: in immunology, hoping to harness the resources of the immune system against existing cancers; and in chemotherapy, attempting to poison cancers. Cancer research is thus directed almost exclusively at treating symptoms - rather than eliminating causes, (see The New Ecologist, Dec. 1978). There is a grave danger that research into recombinant DNA will further sustain this wild goose chase instead of allowing the emphasis to shift towards vital epidemiological studies and programmes aimed at eliminating exposure to carcinogens. Ultimately, investment in costly containment facilities for genetic experiments does nothing more than divert funds from research into ways of eliminating the problem at its source, and (to make matters worse) it may well compound already existing health hazards.

Controlling the individual

Today there is a strong tendency in science and public policy to give special importance to genetic explanations of human behaviour and disease. Such views are, for the most part, based on entirely speculative theories. They derive their support from those concerned to preserve the status quo, precisely because their conclusions do not bring it into question. Screening for genetic factors in behaviour provides a convenient method for dealing with problems whose real causes are not willingly acknowledged by social policy makers. Thus tendencies towards aggression are glibly explained as being the result of the XYY karyotype in males, and more specific and subtle components of human behaviour are now being explained in the same manner through the new pseudoscience of sociobiology.

The proponents of recombinant DNA techniques are contributing further to this emphasis on genetics in social policy. The consequence is that programmes for providing services that change the social environment will be neglected in lieu of genetic assessments; attempts at understanding the interaction of environmental and genetic factors in social problems, with the aim of best serving people as they are, will be deferred in favour of developing systems which track or channel individuals based on their genetic 'limitations'.

To focus on the, as yet, undefined genetic components of human behaviour and to pursue technological means of compensating for individual genetic variation, simply reinforces the economic, social and political status quo - when the crying need is to change it. Genetic screening provides a prime example. A rapidly developing technology, it could - under ideal circumstances - provide a social service of genuine value. But in fact, it has created a new method of stigmatisation and discrimination that large institutions have begun to use to their own ends. Insurance companies and employers in hazardous industries now use screening techniques to avoid dealing with 'susceptible subjects'. Thus the very people who are creating the hazards are able to discharge their responsibilities on to their potential victims.

Brave New World?

At present the belief that all behaviour is genetically determined remains little more than an ideology. The danger is that through genetic engineering, that ideology will be allowed to take a grip on society, leading us unwittingly towards a Brave New World in which individuals are allotted predetermined social roles that 'fit' their genetic make-up. It would be wrong to place all the blame on individual researchers who may themselves totally reject such a monstrous possibility, nonetheless it remains true that one possible consequence of their work may be to provide the fertile ground in which this disturbing ideology can take root and flourish.

For a long time, Aldous Huxley's novel *Brave New World* has been considered little more than science fiction. Now that 'fiction' looks alarmingly like fact and could be realised all too easily. Like Huxley, I have no utopia to propose in the place of the future I have been criticising. On the contrary, I join him in hoping that 'a new age will begin when intellectuals and civilised people will dream about *avoiding* utopias and of returning to a non-utopian society, less perfect but more free.'

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Ronald Higgins

The Seventh Enemy: the human factor in the global crisis

The greatest threat confronting mankind today is his own refusal to face the mounting global crisis. Indulgent optimism has bred inertia and collective complacency. Perhaps what we most need today is to be adequately frightened by the global crisis confronting us, both as individuals in a personal crisis and as members of a species. Fear can certainly sap the will to act. Yet its absence fosters complacency and hence the same outcome a perilous passivity. Rational fear recognises the realities for what they are. It acknowledges them clearly and as a whole. It is constructive. It is indeed, as Tertullian said, the foundation of safety.

This proposition is especially relevant to our own extraordinary phase of civilised man's story, a story that is still brief and could prove tragically evanescent. It is a view which confronts and denies the unthinking parrot cry that we have 'a duty to hope' where hope is construed in the conventional secular terms typified by the 'Better Tomorrow' slogans of ambitious politicians. Or for that matter of utopian ecologists who fail to see that humanity has entered not just a crisis but a permanent crisis, a climacteric.

But rational fear is not enough. There are several other more obviously positive directions in which our consciousness needs to develop, and is indeed beginning to develop. I shall come to these later but let me stress that, if the first round of the so-called 'doom debate' (precipitated by Rachel Carson and others) was primarily concerned with the impersonal threats to mankind's future, there is now an urgent need for a second round which will concentrate on the human factor in the global crisis. Overmuch attention to the technical challenges of, say, environmental pollution has too often led to neglect of the causes of mankind's overall failure to respond to the problems confronting him

I have come to think that the buck stops; not on the technologist's bench or the statesman's desk, or even in the inadequate values or sympathies of us as individual citizens. The most crucial questions lie in the sometimes dark and misty interior realm within each of us where we deny or evade the objective evidence of unwelcome facts.

Facing up to the real world

Mankind is blundering headlong towards multiple calamity. In the

twentieth century it has already suffered upheaval, repression and barbarism on a massive scale. The human cost of the decades of neglected desolation amongst the poor of the world has been even higher than that of the deliberate atrocities committed from Auschwitz to Hiroshima, from the Gulag Archipelago to Vietnam. Yet we blindly resist the mounting evidence that worse is almost certainly in store. We have erected line upon line of psychological defences to avoid recognising the realities and the demands of our time. Even the 'Doomsayers' who have so vigorously warned us of the perils to 'Spaceship Earth' have tended to encourage expectations that saving action is likely to be taken in time. I am compelled to doubt it.

The gathering crisis is unique, the first in history involving the whole earth and the entire species. The next two or three decades will witness the convergence of six immense and seemingly remorseless threats. Only through the most drastic yet sensitive action could we substantially moderate their impact. The human factor will be decisive in both its aspects, the personal and the collective. But the behaviour of twentieth century man does not encourage confidence. Quite the opposite: in our individual blindness and the frightening inertia of our political institutions we must locate the greatest of all dangers, what I have called the Seventh Enemy.*

We seem to be afflicted by a sort of madness which may be more menacing because individually most of us appear so respectably sane. We pass our daily lives in a measured enough fashion, soberly adjusting to immediate circumstances, playing some part as citizens and caring for those around us. We are not unkind or lunatic.

Yet the final results of our individual reasonableness seem like the product of a collective insanity. We have somehow created a world of profound and increasing inequalities, in which the top third of our fellow men and women live in restless affluence and the bottom third

* The Seventh Enemy is published by Hodder and Stoughton, London £5.95, and McGraw-Hill, New York, \$12.50. in degrading poverty. It is a world which absurd expectations. in compulsive appetites and human exhausting multiplication are scarce resources and endangering the land, the waters and the atmosphere. It is a world where deprivation and injustice have become so profound and so public that they make even more precarious the balance of nuclear terror which has become the extraordinary and permanent context of our lives.

These are familiar propositions. Taking them one by one, many will admit they are true. Yet we rarely weigh them up together. And we know them with mind, not heart. Sometimes by night we may detect the rising dread, the awful Yeatsian awareness that 'Things fall apart'. But then we are swiftly reassured or distracted by the conventional bustle of meeting the next morning's needs. We are apt to say that things are never as bad as they seem.

They are a great deal worse. I believe that we must prepare ourselves for a world of rapidly mounting confusion and horror. The next twenty-five years, possibly the next ten, are likely to bring starvation to hundreds of millions and hardship, disorder or war to the rest of us. Democracy, where it exists, can have little chance of survival. Nor in the long run can our extravagant urbanindustrial way of life. We of the rich world are probably the last comfortable generation. We could well witness the last act in the strange and in some ways glorious drama of materialist modern man. The evidence as a whole strongly suggests that an era of anarchy and widespread suffering is swiftly coming upon us.

Such judgements may sound alarmist, even hysterical. That is not how we describe a doctor who diagnoses a terminal cancer. Either his facts and his interpretation are right or they are not. He may underestimate the resilience of the patient. He may overestimate it. Either way it is not his business to encourage false hopes.

Many, however, while accepting this argument, will find my forebodings intrinsically implausible. After all, they will say, mankind can control his own destiny; injustice can be remedied, dissensions mediated, dangers averted. With our astonishing intelligence and adaptability, we have solved a multitude of problems — in medicine, for example — over the last two or three centuries. Are not the current threats equally susceptible to vigorous treatment. Have we not had over a decade of encouragingly realistic debate about the global condition? Have not dozens of experts in human ecology pointed to the paths we ought to take? Surely there is time to avoid catastrophe?

The danger of optimism

There *is* still time to save ourselves but that fact may prove no more than the last twist in the knot of tragedy. The challenge is so immense and is gaining such momentum that a sufficient response at this late stage seems increasingly unlikely. Unless something quite extraordinary happens to transform our consciousness of the human plight, I believe we shall do much too little, much too late. Nor can we *expect* such a transformation, not with the speed or on the scale that the situation now demands.

One of the reasons for this stark conclusion is our complacent addiction to the secular optimism which our thrusting Western civilisation invented and has profoundly depended upon. The idea of inevitable progress was buried in the quagmires of the First World War. But the flow of technical and material successes has preserved a foolish confidence in our capacity to solve almost any problem through the exercise of will and reason alone, and has sustained a common obstinate determination not even to contemplate the possibility of humanity's defeat.

I believe this sort of optimism is now obsolescent, indeed dangerous. It mists our perceptions of disturbing facts and menacing trends, lessens our sense of urgency and reduces our willingness to take sacrificial action.

The notion that we have a duty to hope surely confuses spiritual and temporal hope. Spiritual hope is a matter of faith. It often begins with despair about human nature but ultimately it refuses outright cynicism. Temporal hope, hope for one's own time, for society *en masse*, must be one of balanced calculation about the factual realities. We can respond to claims



about man's unquenchable spirit without taking a sanguine view of mankind's collective future. In 1933 Franklin D. Roosevelt said, 'The only thing we have to fear is fear itself'. This common view is, I think, no longer appropriate. Now we must fear hope. We have reached the point where the only source of rescue may lie precisely through fear: a wholesome fear, not a neurotic despondency; a courageous willingness to face the full and terrible dimensions of humanity's plight.

We may need to revive what Henry James called the imagination of disaster, to see the skull beneath the skin, to recognise with feeling as well as thought the real possibility of mankind's failure. This unblinkered view should not be seen as morbid or unconstructive, but as a terrible necessity for driving us to consciousness of our perilous position and its awesome demands. It is an idea strange and difficult to the contemporary mind; that fear may work what love has not and light appear from the depths of darkness.

The effects of fear

Any advocate of what Albert Camus called 'courageous pessimism' must meet one especially powerful objection. Once when I was talking to a distinguished liberal academic about the threat of famine, he said something like this, 'The problem is worse than you say. We shall have to write off South Asia for a start. But we should not say so. It would paralyse the will to act.'

There is no easy answer to this contention. Optimism has certainly so far been the spur to problemsolving in our civilisation. Now, however, it is obscuring a selfdestructive course. The psychologist Karen Horney long ago pointed out that if a patient can be brought to see that he has been secretly driving at self-destruction, this recognition is much less dangerous than letting a potentially suicidal impulse silently operate. The experience is, of course, frightening but counteracting self-preserving energies are mobilised. It is only when people have their fears brought into the open that they can begin to grapple with them.

Perhaps then we may dare to tell the truth - as we see it - rather than insult healthy adults by concealing it for fear of their reaction. We must all know that our civilisation is no more immune to destruction than earlier ones. Why indeed should our species be exempt from extinction? Through its unique ingenuity? That is just as likely to work against us. Ingenuity is exactly what has enabled our generation to create the Promethean means through which absolutely all life could be extinguished from the planet - another of those immense facts of our day we have allowed to grow dull. The superpowers' capacity for overkill (a unique term for a unique time) is already ample.

Six impersonal threats

The vulnerability not only of the affluent but of mankind at large is primarily due to six immense impersonal threats — each of which will be too familiar to readers of *The Ecologist* to need spelling out in detail.

The first is the population explosion — if mammoth 'death control' is excluded, it is already effectively too late to avoid yet another doubling of our numbers, to eight thousand million, in the next forty or so years.

The second threat is that of famine — less a matter of absolute shortage than of savage maldistribution due to a combination of the dietary preferences of the rich and the lack of 'effective demand' amongst the world's poor.

The third is the scarcity of fossil fuels and other vital resources from minerals to timber, certainly at recent levels of economic growth.

The fourth is the rapid degradation of the environment. This is more than a matter of chemical pollution of air, water and land, for it also involves the systematic destruction of the natural environment, including fertile soils, and menaces climatic stability. The fifth threat, nuclear abuse, is a potentially fatal cocktail of obsessive accumulation of East-West overkill, of the continuing proliferation of nuclear technologies into ever more erratic hands and of the various dangers implicit in the emerging Plutonium Economy.

The last of the six threats is the general tendency of science and technology to gallop on without humane control. And this is not just a question of the spread of intrinsically ominous technologies like biological weaponry or molecular engineering but of the gross disproportion of effort directed to the escalating appetites, needs and fancies of the affluent minority including an industrial proletariat, Western and Eastern, which has joined the world's exploiting classes.

Problems of response: the Seventh Enemy

It is true of course that not all these threats present the same level of danger and all are to some degree responsive to sheer ingenuity. Yet, they are not only converging fast but are doing so in a profoundly unstable world arena. In attempting to grapple with them we soon find that purely technical responses are inadequate even when not self-defeating. Miracle crops and new food technologies butter no parsnips for those who can't even afford the parsnips. In Bangladesh and the Sahel families can starve outside bulging stores of grain. Neither food shortage nor population pressure can be met without radical agrarian reform, the provision of basic social security and rigorous attention to the status of women. Our essential task is to meet not the 'tame' problems preferred by the people in white coats but the 'wild' problems which also involve political choices.

Collective inertia

We come then to by far the greatest complication and far the most dangerous threat to what is euphemistically called the family of man — man himself. The seventh of the threats — the Seventh enemy — has two faces: collective inertia and individual blindness. Neither governments nor electorates have responded with the vision, energy or decision that the man on the Martian omnibus might have expected of us, even in our own selfish interests. The tragi-comic performances of the major U.N. conferences on the environment, population, food and the rest are evidence enough of the international apparatus doing far too little, far too late.

Yet to blame the politicians is much too easy. The inertia is partly to do with the objective scale and complexity of the problems and the bureaucracies — and partly with the age-old treacherousness of political management. It has much to do with historic and ideological antagonisms, with conflicting interests and the essentially short term focus which political 'realism' seems to require.

When I once bearded a British Defence Minster about the potential of terrorists to build their own backyard nuclear bombs, he sighed saying it was never easy to spend time weighing hypothetical dangers. He had a lot on his plate. He had to be practical.

As someone who spent over twelve years in the Foreign Office, working with ministers and in embassies abroad, it would be arrogant of me to denounce this kind of response. I have seen for myself how little real power lies in those corridors and chancellories which people fantasise about, but also how far this paucity of power is related precisely to the unwillingness of us, the governed, to accept radical change or make deliberate sacrifice.

We ourselves, as citizens, make up the concensus within which governments have to operate. Leaders who move too far ahead of us are cut down. Rulers can issue edicts but even in police-states their decisions are often deliberately misheard, reinterpreted, ignored or obfuscated. (Sometimes just as well!) Even the Kremlin turns out to be a fumbling gerontocracy, incapable of contriving a healthy agriculture and at least as anxious to meet the housing needs of its restless people as to foster the proletarian revolution its ideologues prattle on about.

When friends of mine at Oxford an era ago — used to joke about Eisenhower's 'delusions of adequacy' I laughed with them. After only a few years in Whitehall I saw The New Ecologist No. 1 January/February 1979 that adequacy was something of a triumph. Those tempted to imagine that political change alone is capable of meeting the six threats ought to consider how a much lesser, purely domestic, problem like Britain's industrial relations could resist so long both the calculating guile of a Wilson and the obstinate courage of a Heath. Political inertia is important, political action is important, but the second face of the Seventh Enemy, individual blindness, is the crux.

After the U.S. artillery, helicopter gun-ships and troops, including Lieutenant Calley, had finished with My Lai Hamlet No. 4, everything that moved had been killed. But the shock that ran through America did not last long. In a Time magazine survey, sixty-five per cent of those interviewed denied even being upset by the events. Nixon wrote it off as an 'isolated incident'. The typical reaction was 'It didn't happen and, besides, they deserved One American interviewed it.' simply said. 'I can't take the responsibility of the world on my shoulders too strongly myself . . . it upsets me. I'm having my problems and can't take this stuff too seriously.' We may well sympathise but if we cannot respond with a full heart to the horrors of war it is less surprising that we pay so little heed to the concealed violence of our world.

The morality gap

When my wife and I were in the British Embassy in Jakarta our servants lived in our small back garden in sheds which made slave row in Roots look like a houseperson's dream. As this was standard practice I did not notice. The aged washerwoman shared a two-bunk hut half the size of a chicken coop with the gardener's boy. Then, when the cook's woman became pregnant, my wife said we ought to move them out of the ramshackle kitchen shed into the brick-built garage. An obvious answer? My immediate thought was, 'How impractical, the tropical sun will ruin the paintwork of the car!' Mutual neglect can be absurdly banal.

The late Arnold Toynbee once warned me of what he saw as a widening gap between man's everincreasing technological prowess and the obstinate inadequacy of his



social performance. Certainly the gulf between what is and what could be has probably never yawned so wide. But can we attribute the extraordinary horrors and perils of our time to some singular wickedness in modern man? I doubt it. As individuals we are not obviously more cruel than our forebears. In many ways we are more compassionate. We would not send our children down the mines or tolerate the barbarities of earlier legal codes. A British majority may want hanging brought back but not for sheep stealing. Nor do we share the bleak indifference of earlier times towards the destitute. There are minorities devoted to any cause we might name; the young seem specially sensitive.

Yet if our face-to-face morality has not deteriorated, our behaviour en masse certainly has. Witness the almost total erosion of traditional inhibitions on the methods of war. Before the nineteenth century it was generally fought, by deliberately limited means, for limited objectives. Lewis Mumford has plotted our downward course since then; from Sherman's destructive march through Georgia to the unrestricted submarine warfare of the First World War and on to the Nazi's aerial destruction of Warsaw and Rotterdam. This, as he pointed out, did not make the allies recoil in horror and concentrate their might on the fighting area. We imitated our enemies' methods. As he said in The Human Prospect, 'This general moral disintegration paved the way for the use of the atomic bomb. Nihilism had set up a chain reaction in the human mind . . . our last inhibitions were removed."

There is an evident contradiction. From Hiroshima to the onslaught on Hanoi, hosts of frighteningly well-intentioned individuals have continued to aid, abet or commit quite monstrous acts while speaking of freedom, justice and their own sincerity.

This remarkable moral blindness also shows in our acts of omission. We of the rich countries have not intended the distress of the South nor, of course, its dangers for world order. Likewise all but one of the six threats is the outcome of a multitude of separate, often innocent decisions. The devising of nuclear weapons was wholly deliberate but no parent intends a population explosion or means to contribute to a food crisis. No entrepreneur wants to exhaust scarce resources or to corrupt the air and the rivers. No one meant there to be a global emergency. The 'morality gap' is partly due to a 'consciousness gap'. We have simply not realised what we are doing.

The need for political action

This is not to suggest that awareness of the wider repercussions of our actions is enough by itself to stop us doing harm. The Indian peasant couple may be acting quite rationally in begetting extra children to help on their land and secure their old age, even though they are also aggravating India's over-all population problem. Only if there were nation-wide restraint could they expect net benefit rather than loss from their own restraint. Only then, for instance, might the state accumulate the resources to assure their future by other means.

Similarly it can only weaken a company's competitive position if it voluntarily incurs high extra costs in cleaning up its effluents while others continue to foul the environment. Governments argue similarly - and again 'rationally' - against suggestions that they unilaterally disarm or curb their arms or nuclear sales abroad or stop over-fishing. They say of course that if they do not pollute the river, sell the tanks or build the reprocessing plants, others will. Restraint in such cases becomes undeniably self-interested only if the rules of the game are changed, when imposed by superior authority backed up by the threat of force. In the absence of such coercion, appeals to the individual whether nation, company or person - will be futile. Only moral example could then have any chance of swaying the decision.

Refusing to face the facts

Many of the obstacles to an effective moral response to the six threats are cultural - information overload, reductionism, addiction to novelty but the deepest are related to our mostly unconscious defence mechanisms of avoidence and denial. Any psychotherapist will tell you that we have a profound psychic investment in resisting the very knowledge we need, to resolve our problems. A typical client will hide from himself the knowledge that his existing responses and patterns of behaviour are no longer appropriate. Recognition of this would demand change; change is painful; the unknown is frightening. The existing order however precarious – is rigidly preserved. The releasing recognition only comes when the client gains confidence that he can use his new awareness constructively. The same patterns occur in society. When people encounter disaster or threats of disaster they find ways of insulating themselves from them unless they feel they can do something about them. The contemporary sense of powerlessness is therefore critical - and another essential focus for the second round of the doom debate. We need to contrive political ideas and programmes that are large enough to meet the global crisis but practical enough to attract the politician's respect and the public's participation.

A new consciousness

Yet to meet the human situation solely in the political dimension is, as I have suggested, grossly insufficient. To counter the political inertia of others we must also counter our own individual blindness.

It is not enough, however, to speak in airy terms of the need for a new individual consciousness. I therefore specify seven distinct aspects of our awareness, where the contemporary (particularly Western) view of things needs radical correction:

**First*, the rational fear I have already talked about, instead of the current state of complacency.

*Secondly, self-awareness — a recognition of our unconscious duplicity in place of a blithe confidence in our ordinary worthiness. We all tend to make scapegoats of others rather than detect our own complicity:

**Thirdly*, the visionary awareness elegently discussed by Theodore Roszek — an awareness of what it is to exist, which transcends what William Blake called 'the single vision', of the often simplistic and reductionist science which now dominates our outlook:

*Fourthly, a revaluation of the feminine — to redress the gross over-masculinity of our intellectual style. We need to redevelop our feeling side and our 'maternal' caring capacities:

**Fifthly*, a willing acceptance of tensions in thought and action in opposition to the modern heresy that they are undesirable and avoidable. Thornton Wilder rightly said that every good thing stands at the razor-edge of danger:

*Sixthly, we need to develop an 'ethic of consciousness' — in contrast to an over-idealistic 'ethic of goodness' which makes us foolishly perfectionist. We must know what we do; only then do judgements of right and wrong become relevant: *Lastly, there must surely be a reawakening of the spiritual dimen-

sions of life — exposing the selfdefeating secular gods we unwittingly worship and reviving a reverent sense of our dependence on Planet Earth and of our spiritual membership of one another.

None of these recommendations would figure in the official submissions of civil servants or even in the proposals of many sophisticated ecologists. None of them owe much to orthodox thinking. None of them are quantifiable. None of them would enlarge a gross national product. Yet all of them could be deeply significant for mankind's next century, perhaps its whole future.

I must stress again that to argue the need for a serious reappraisal of our most rooted moral and spiritual attitudes is not to suggest that this is an alternative to decisive economic and political action. We do not have to choose between the call of the sanctuary and the call of the market place. We must respond to both. The vital need is consciousness; if we achieve this it may yet be possible for mankind's present nightmare to foreshadow some sort of rebirth.

10

Overexposed!

The health hazards of highvoltage power lines

by Nicholas Hildyard

The furore over nuclear power and the hazards of ionising radiation has drawn our attention away from another alarming prospect. For some years now, villagers living under the high-voltage pylons that straddle the small hamlet of Fishpond, Dorset, have been complaining of chronic headaches, eye-strain, blackouts, exhaustion, depression and even blood-cell disorders. Their claim that these ills are caused by the electromagnetic fields created by transmission lines is supported by a growing body of evidence from the USSR and elsewhere. Predictably the Central Electricity Board scoffs at the suggestion, dismissing it as the private neurosis of a few cranks. Yet scientists in the USA now warn that 'electrical smog' generated by power lines, television transmitters, radar stations, microwave ovens and a host of other electrical devices - is a possible cause of cateracts, birth defects, genetic damage, decreased fertility and cancer. Last year, Paul Brodeur, author of The Zapping of America, further fanned the flames of the controversy by accusing the Pentagon, together with the electronics and communications industries. of being involved in a massive coverup of these dangers. What then are the effects of low-frequency radiation? And why have both government and industry shown such calculated lack of interest in them?

Fishpond's plight has been brought to the public's attention largely through the efforts of one extremely tenacious woman, Mrs. Hilary Bacon. Since 1973, when she moved into her present cottage,



a converted chapel, she has been engaged in a running battle with the CEGB, whose reluctance to part with information has only been matched by her own determination to unearth it. The opportunity to pin the CEGB down in public, forcing it to justify its bland assurances that power lines have no important biological effects on those living beneath them, came about only by an extraordinary chance. Partly due to the ill effect of the pylons on their health, two of Mrs. Bacon's closest allies, Eustace and Kathleen Yeomans, moved from Fishpond to Innsworth, Gloucester, only to learn a year later that plans were afoot to reroute a nearby section of a 400 kv. supergrid so that it would now run closer to Innsworth. They also heard that the CEGB were intending to increase the capacity of the power lines in order to take electricity from four nuclear power stations that it is planning to build in the area in the late 1980s. A public inquiry was called last October to hear objections to the scheme and local residents, through the Yeomans, invited Mrs. Bacon to testify on their behalf.

The determination of the villagers of Innsworth to raise the issue of health hazards was, in part, inspired by the outcome of a similar inquiry in New York. At the end of two years of hearings, environmentalists won a considerable victory when a ruling was made that a new 765 kv. line could only be built on condition that 50 million dollars are spent on independent health research and that the right-of-way around the pylons is widened. Although the presiding judges clearly recognised the possible health hazards from the line, they saw the issue primarily

in terms of human rights. Why, they asked, should people have to suffer high-voltage pylons being erected across their farms, over their vegetable patches and in their back yards. 'What is necessary', they declared, 'is to remove the involuntary feature — to insure that persons working or living near the lines are not involuntarily exposed to dangers and that persons who enter the rightof-way do so with the knowledge that chronic, long-term exposure may entail some risk.'

Whether the Innsworth Inquiry will go the way of the objectors remains to be seen. But if it does, the implications for the CEGB quite apart from raising serious doubts about its integrity, could be devastating. Power lines suspended over ten thousand homes in Britain will have to be moved or buried a phenomenally expensive business — and inevitably further questions will be asked about the safety of present methods of electrical transmission for both the public and the CEGB's own workforce.

Russian Evidence

Perhaps the first indication that high-voltage power lines could prove detrimental to human health came from Russia. 'In 1962, after the first 500 kv. lines had been operating in the Soviet Union for several months,' reports Louise Young in Environment (May 1978), 'men working at the substations began to complain of headaches and a general feeling of malaise.' Other workers complained of abnormal fatigue, sleepiness and decreased sexual vigour - symptoms they associated with exposure to electrical fields.

A long-term study of these effects was undertaken. The investigators concluded that work at 500 ky. and 750 kv. substations without protective measures resulted in 'shattering the dynamic state of the central nervous system, the heart and blood vessel system and in changing blood structure.' That initial finding has subsequently been confirmed in over one hundred reports published in the Soviet Union. Other effects have also been documented: mice exposed to magnetic fields of 50 hertz quickly lose the ability to expel foreign matter from the liver, spleen, lungs, marrow and lymph 12

nodes: the function of the pituitary and adrenal glands of rats exposed to fields of similar intensity is grossly impaired: and a survey of some two hundred workers at 220, 330 and 500 kv. substations has shown a significant increase in the haemaglobin content of their blood. Russian scientists now believe that electrical fields as low as 50 volts/cm can have an adverse effect on human health.

As a result of these findings, the Soviet authorities have imposed strict rules relating to exposure of electricity workers and the general public to electrical fields. No work whatsoever may be carried out without protective clothing in electrical fields of more than 250 volts/cm., and even in fields of 200 volts/cm. unprotected workers may only be exposed for ten minutes in any twenty-four hour period. A 360-foot zone centred on the line is restricted to certain authorised personnel: it may not be used for recreation; buildings, bus shelters and other places where people might congregate are forbidden in the area. No vehicle is allowed to stop or be refuelled under the line - for fear of a spark igniting its fuel - and if a vehicle does break down it must be towed away before any repairs are done on it. Finally metal shields must be used over the seats of farm machinery.

By comparison measures taken to reduce risks under power lines in Britain and the USA are derisory. Refusing to admit any health hazards, the only precaution taken by the CEGB is to warn farmers not to stack crops or use ladders and tall equipment near overhead lines, and not to place electric fences beneath or parallel to the wires.

The Official Reaction

American and British electrical companies reject the Russian evidence outright. They claim that it is not objective; that it lacks sufficient data and precise clinical diagnoses; that the reports are couched in vague terms and cannot be taken as incontrovertible evidence; that the scientific methods used by the Soviets are less sound than those used in the West (who, one might ask, put the first man into space?); that no-one knows the basis on which the Soviet safety standards are fixed; and, finally, that research in the USA refutes the evidence in the Russian studies.

Precisely the same reaction was shown by Western scientists when the Russians produced evidence on the low-level effects of x-rays and other ionising radiation. When it first appeared it was ridiculed by American researchers: now it is accepted scientific fact. If so little is known about the Soviet studies on low-frequency electromagnetic fields, it is because virtually no effort has been made to find out about them. Indeed, when Mrs. Bacon questioned officials at the CEGB about the Russian data, they at first denied all knowledge of it - only admitting that they had heard of it when it was actually presented to them. In fact, there is no recorded instance of an official request - from either side of the Atlantic - to the proper Soviet authority requesting copies of all the relevant reports. Yet independent researchers who have taken the trouble to contact their Soviet colleagues have always found them keen and willing to supply whatever information is requested.

Far from the Russian evidence being scant, it is the philosophy behind British and American safety standards that is lacking. Dr. Karel Marha, a professor at the Institute of Industrial Hygiene and Occupational Diseases in Prague, put his finger on it when he remarked - in respect of microwave radiation - that Eastern European standards are set 'not only to avoid damage but to avoid discomforture in people'. Can it be that we in the free, democratic West really care less about our citizens than the Soviets? Or is it that we care more about the viability of our industries?

No Studies

American and British objections to the Russian studies might be on firmer ground if proper epidemiological surveys had been carried out on workers in their own electrical industries. The only study that has been made in the USA, for example, was based on a very small and inadequate investigation undertaken at John Hopkins University and financed by a major electrical utility, The American Electric Power Company. 'Starting in 1963, eleven linesmen were given medical



Florescent tubes lit by the electrical field under power lines at Binghampton, New York.

examinations over a nine year period', reports Louise Young. 'No control group was used; no quantitative data was reported on the length of time and level of exposure experienced by these men; and no clinical information was reported. During the nine years, one man dropped out of the study (because he quit his job) and eight of the others became supervisors. At the end of the report, a general statement was made that no significant changes of any kind were found as a result of general physical examinations. Three of the men did have apparently low sperm counts in the last examination, but the counts had been quite varied throughout the nine years and therefore it was concluded that 'it would be hazardous to draw any conclusions from such a small sample'. Indeed the small number of men studied is the most serious flaw of the whole experiment.'

Significantly, the Russians have never claimed that linesmen whose job it is to maintain the transmission lines — are likely to suffer ill-effects in their work. They point out that this is easily explained because of the sporadic nature of their work. Unlike employees in substations — who are subjected to highly intensive fields for up to eight hours a day (at least in the USA) linesmen only come into contact with electrical fields when the power lines need repairing.

For its part, the CEGB has carried out no research into the health The New Ecologist No. 1 January/February 1979

hazards of low-frequency electrical fields. Instead it prefers to rely on foreign studies, citing only those that support its position and rejecting out of hand those that do not. Indeed its attitude could be summed up by the comment of one of its senior officials at a meeting held in Fishpond in June 1976. Dr. W.T. Norris, head of the Electrical Engineering Division of the Central Electrical Research Laboratories, told his audience that the CEGB knew that the electromagnetic field under power lines was harmless because no complaints had been received about its effects. Why then was he in Fishpond - if not to answer complaints of just this nature? In a similar vein, an expert witness for the New York Power Authority testified at the New York hearings that he was certain that cows suffered no ill-effects under power lines because he had observed them happily wagging their tails whilst grazing. So much for the rigours of scientific research.

Despite the absence of detailed epidemiological surveys, the CEGB claims that its own electricity subworkers are just as healthy as other members of the workforce. 'Yet there have been no medical checks, before or during the course of employment and no epidemiological surveys of distinct groups of workers exposed to electrical fields,' comments Martin Weitz in the New Statesman. 'Furthermore the experience of workers exposed to high voltage electrical fields may have no bearing on individuals who are *continuously* exposed day and night seven days a week to levels of electrical pollution which could be between 40 and 1000 times higher than occurs naturally.'

The CEGB, however, deny that such high levels can be reached under high-voltage lines. They point out that at ground levels, the strength of the electrical field in Fishpond village measured only 6000 volts/m which. although sufficient to light up a fluorescent tube, is well within the Russian safety limits. In fact, the measurement is largely meaningless. As Dr. David Smith, a physicist at Bangor University, explained at the Innsworth inquiry, any object under a power line tends to concentrate the electrical field, thus greatly enhancing its strength. Levels as high as 120 volts per metre could be reached at Fishpond, he told the inspectors.

Nor is this the only example of the CEGB trying to allay fears by sloppy and often quoting ----irrelevant - measurements. For a long time it has been known that positive and negative ions electrically charged particles - are formed around the high-voltage wires and that a preponderence of positive ions in the atmosphere is associated with a cluster of health risks from behavioural changes to a general feeling of malaise. Not surprisingly when it was learnt that Dr. Leslie Hawkins, of the University of Surrey, was going to measure the concentration of ions around Fishpond, the CEGB rushed to borrow an ion measuring device and spent a day taking readings under power lines in Surrey and inside one of their employee's kitchens. These measurements were then presented as evidence that power lines do not ionise the atmosphere to any significant degree. Significantly, however, they were taken on a particularly calm day when the chances are high that the positive and negative ions around the wires would recombine thereby neutralising each other before they reached the ground. Dr. suggests that under Hawkins

posed mice were also observed to sleep more than mice that had not been exposed. But these alterations in growth rate and activity were not followed up in spite of the fact that further studies were recommended by the researchers.' Another experiment by Donald S. Gann, a Professor of Surgery at John Hopkins Medical School, found that the blood pressure of dogs exposed to 15kv/m fields dropped alarmingly and that their heart rate also decreased both signs that their central nervous systems had been damaged. Funding for the project, originally provided by the Electrical Power Research Institute, was terminated shortly been criticised for using a faulty statistical method but Marino and Becker have now completed further research (this time on mice) that provides equally damning evidence. Subjected to vertical electrical fields, the mice not only lost weight but, like the rats, showed increased rates of infant mortality.

Electricity and the Body

Becker and Marino are convinced that low-frequency electromagnetic fields affect biological systems, not by supplying the energy for a given process to occur, but by building up sufficient energy to *trigger* specific responses. Indeed



Dizziness, irritability, blackouts and even blood cell disorders are among the symptoms caused by chronic exposure to electromagnetic fields.

windier conditions this recombination would not occur, particularly if the earth's natural electrical field were strong in the area. In any event, a measurement taken on one day at a different location hardly supplies convincing proof that ionisation around power lines is inconsequential. Once again, it seems the villagers of Fishpond were fobbed off with a schoolboy study masquerading as serious science.

Experimental Evidence

Where experimental research has been carried out on animals subjected to low-frequency electrical fields, consistently shown they have positive effects. Even those studies financed by the electrical industry have found biological effects although the powers-that-be have, equally consistently, disregarded them. 'In an experiment on mice, sponsored by the American Electric Power Company', writes Louise Young, 'the size of male offspring exposed to strong electrical fields was significantly reduced. The exafter the initial findings were reported.

Perhaps the most comprehensive research on the biological effects of extremely low-frequency fields has been carried out by Dr. Andrew Marino, a biophysicist, and Dr. Robert Becker, an orthopaedic surgeon, both working at the Veterans' Administration Hospital York. Their in Syracuse, New first experiments were conducted on rats exposed to electrical fields, comparable in strength to that produced at ground level by a 750kv. power line. They found that the rats' growth was severely stunted; that blood steroid levels decreased: and that there was a dramatic rise in infant mortality. The rats also showed symptoms consistent with chronic stress. Becker and Marino concluded that the electric field affected the central nervous sytem and activated the stress-response mechanism, producing a wide range pathological diseases and of conditions.

That experiment on rats has since

it has been known for some time that small electrical currents within the body play a vital role in controlling biological activities. 'Cells in the body exist in equilibrium with their immediate electrical microenvironment,' Marino told the New York 'Certain changes in this inquiry. microenvironment result in information being transmitted to cells which is capable of controlling their function. Thus a given cell may be triggered to differentiate, or build bone, or increase protein systhesis or decrease its hormone output.' Because these electrical charges only convey information - the cells themselves providing the energy for a process to occur - even a small electrical stimulation could produce a biological effect.

Orthopaedic surgeons have made use of this insight to develop techniques for speeding up the healing process of fractured bones by placing the injured limb in a small electrical field. But whereas the accelerated growth that results is beneficial to *broken* bones (a fact

14

that the electrical industry makes much of), it is known to produce tumours in unbroken bones. Privately, many scientists now express fears that the body's natural electrical current may be such a vital force in cell differentiation that by presenting abnormal signals to the cells, low-frequency electromagnetic radiation could cause long-term genetic damage. Already experiments have shown that cell division is disrupted in mice subjected to electrical fields of 50 hertz. Indeed so little is known about the body's natural use of electricity that in Becker's view 'the chronic exposure of humans to electrical fields should be viewed as human experimentation."

CEGB's reaction

Confronted with this evidence at Innsworth, Dr. John Bonnell, Deputy Chief Nuclear Health and Safety Officer for the CEGB, simply denied the validity of Marino and Becker's research. Animal experiments, he told the inspectors, are notoriously unreliable for assessing hazards to human health. With a supreme sense of logic, he then went on to claim that the most recent animal experiments, undertaken by Battelle Pacific, clearly demonstrated that electrical low-frequency fields present no dangers to human health. In the event, this new evidence was never presented publicly to the inquiry and it later emerged that far from disproving Marino and Becker's work, it tentatively endorsed it.

The objectors were quick to point out that even if the Battelle findings had been negative, they would have proved very little. In fact there is no contradiction between some researchers finding positive effects from low-frequency electrical fields and others finding none. Negative findings do not vindicate the position of those who claim that the hazards are non-existent: they simply show that under certain conditions. electrical fields will not induce biological effects. As Marino put it to the New York inquiry: 'A whole range of different interactions are possible between transmission line fields, people and the environment. They vary from a brief encounter to chronic exposure such as occurs for individuals living very close to the transmission line. The lesson of the

literature is that some situations will probably result in biological effects, and others will probably not . . . Obviously both conclusions can be true simultaneously, and the truth of one does not imply the falsity of the other.' Yet if positive results are found, the warning lights should begin to flash, for however experiments animal inadequate might be, they are the only advance indication we have of possible dangers to human health from our various activities. To ignore them is both intellectually dishonest and foolhardy.

With his testimony effectively demolished, Dr. Bonnell turned to a personal attack on Mrs. Bacon, suggesting — none to subtly — that her illnesses were psychosomatic and that her feud with the CEGB was simply a means of attracting attention. 'Like a child in a tantrum?' prompted one of the inspectors, who sadly seemed to prefer this line of argument to the scientific evidence placed before them.

Microwaves

Higher up the electromagnetic spectrum - a scale by which physicists gauge the strength of radiation according to its wavelength and frequency - health hazards have been demonstrated which have a considerable bearing on the possible dangers of high-voltage cables. The electrical fields created by transmission lines lie at the lower end of the spectrum, oscillating at only 50 cycles per second; at the opposite end are gamma rays whose wavelength is well-nigh infinitessimal. In between, in ascending order of frequency, are microwaves, infrared radiation, visible light, ultra-violet radiation and x-rays. Unlike gamma rays and x-rays, low-frequency radiation is incapable of transforming the internal structure of atoms, although it can penetrate deeply into the body. Because of its non-ionising properties, it has long been considered benign - its only possible danger being capacity to heat human tissue. It was on the basis of this heating effect - the principle behind microwave cooking - that, in 1953, scientists set a maximum exposure limit of ten milliwatts per square centimetre. Below that level, microwaves do not have the energy to heat tissue, and therefore, it was

claimed, their radiation would prove harmless. Indeed, despite evidence to the contrary, from animal experiments in the 1930s, scientists were so convinced that heating was the only danger from low-frequency radiation that when Dr. Charles Barron, Medical Officer of the Californian division of Lockheed, found significant changes in the white blood cell counts of workers exposed to microwaves, he dismissed the results as a laboratory error.

For their part, the Russians were less sanguine about the dangers of microwave radiation. In 1960, it was learnt that the official standard for a safe level of exposure to microwave radiation was one thousand times lower than the U.S. standard. It turned out that the Russians had first become aware that microwaves could affect the central nervous system in the thirties. 'During World War Two, Soviet scientists had taken complaints of headache, eye pain, and fatigue on the part of Soviet radar workers seriously enough to conduct full-scale investigations into them, whereas in the United States similar complaints had been dismissed as "subjective symptoms"" writes Paul Brodeur. During the 1950s, 'Soviet investigators found that in addition to headache, eye pain and weariness, workers undergoing prolonged exposure to microwaves complained of stabbing pains in the heart, dizziness, irritability, emotional instability, diminished intellectual capacity, partial memory loss and loss of appetite.' They also found that low-intensity microwave radiation could cause alterations in the normal rhythm of brain waves, and that high intensity beams could provoke hallucinations. Unlike their American counterparts. Russian scientists did not dismiss this evidence as uninterpretable, but warned that the most serious protective measures needed to be taken. Nonetheless the Pentagon dismissed the Russian evidence as another cold-war ploy for undermining US defences which were (and still are) totally dependent on the use of microwaves in radar and tracking stations, missile guidance systems, range finders, bugging devices and telecommunications.

In 1964, official complacency was momentarily shattered, when Dr. Milton Zaret published a report,



financed by the US Air Force, which indicated a strong link between cateracts and microwaves. His suspicions of a connection were aroused when he examined a young radar worker who developed a cateract on the posterior of the eyelens as well as areas of opacity on the lens capsule. Zaret had only seen such symptoms before in the eyes of glass-blowers and other workers exposed to the intense heat of infrared radiation. In that instance, the cateracts had been explained by the eye's inability - because of its poor blood circulation - to compensate for a rise in temperature by increasing the rate of blood flow. Zaret believed that microwaves harmed the eyes for the same reasons.

The Air Force, however, was clearly unimpressed by such ideas, and they terminated his study and announced that there would be no follow-up research. 'By this time', Zaret told Brodeur, 'I was beginning to wonder about the military's attitude to the problems of microwave exposure. Here I had spent three years examining nearly sixteen hundred microwave workers, and except for one case that didn't count, because diabetes was involved, I hadn't come across a single cataract. Then, right in the middle of my survey, some of the very firms that were taking part began sending me patients on the side - patients who had been diagnosed as having catar-

acts. Why weren't such patients included in the official survey? Why did they all come from private companies? Why had I not seen any cataracts among military personnel? Had I been examining a true cross-section of people exposed to microwave radiation? Or was something funny going on in the selection process?" He also revealed that he had been visited on several occasions throughout the study by the Central Intelligence Agency (CIA), although their main preoccupation seemed to be whether or not microwaves could be used for brainwashing. Like the Air Force they seemed not to want to know about possible health hazards.

From Cancer to Genetic Damage

Meanwhile Dr. Barron's findings — dismissed by him at the time as a laboratory error — that blood cancer could be caused by exposure to microwaves were increasingly being supported by numerous other studies.

The bombshell came, however, with the revelation that the Russians were beaming microwaves on the US embassy in Moscow, and that those working there had an abnormally high rate of cancer and blood disorders. It also emerged that a significant number of babies born to women employed at the Embassy were deformed and that serious chromosome damage had been discovered in blood samples of four other embassy employees. Moreover the US government were found to have covered up these effects for some ten years. Even when they were leaked, the State Department continued to deny any connection between the high cancer rate and exposure to microwaves.

Paul Brodeur believes that behind these worried denials lies 'the deeper anxiety in high government circles that the radiation to which tens of thousands of civilian and military personnel have been subjected has inflicted genetic damage upon them'. He points out that it has been known for nearly two decades that low levels of microwave radiation can cause chromosomal abnormalities in garlic root tips and genetic mutations in mammalian cells and in insects. Indeed in 1964, Dr. Abraham Lilienfield and his colleagues at John Hopkins Univer-Down's syndrome sity linked (mongolism resulting from chromosomal damage) to radar exposure. And in 1969, researchers who had induced chromosomal abnormalities in kangaroo-rat cell cultures concluded that 'the types of chromosome aberrations observed are the same as those induced by ionizing radiation in other organisms including humans.'

The best documented evidence of genetic damage to humans from exposure to microwaves comes in a study of congenital malformations in Alabama, where the army has a massive helicopter-pilots' training centre at Fort Rucker, Dale County. Within thirty miles of the base, there are forty-six radar installations. Dr. Peter Peacock, Professor of Public Health and Epidemiology at the University of Alabama, discovered that between July and November 1970, there had been a significant increase in certain birth defects in seven out of the State's sixty-seven counties. The highest rates occurred in Dale and Coffee County.

'Peacock found that during the seventeen month period, seventeen white children suffering from congenital clubfoot had been delivered in these two counties. The expected number of children with this affliction had been less than four', writes Paul Brodeur. 'They also learned that the rate of children born with congenital abnormalities of the heart was significantly higher in Dale County than in other parts of Alabama.' All seventeen children had been delivered at the Lyster Army Hospital at Fort Rucker, and all were the children of helicopter pilots who, because they fly at low altitudes, are exposed to radar waves

for most of their working lives.

Although Peacock was at pains to point out that these findings did not establish conclusive proof of a connection between congenital malformations and exposure to radar, the army immediately began to block further research into the problem. It refused to release medical files on military personnel at the base, maintaining at one point that to do so could be contrary to the Privacy Act. It repeatedly turned down proposals by Peacock for a follow-up study, claiming that the epidemiological method to be used was inadequate. Nor were the Navy and Air Force, who were contacted in the hope that they would co-operate, any more helpful. The study, they said, would be meaningless unless the radar levels to which pilots were exposed were known. And (catch-22) those levels could not be released to civilians.

Conclusion

Whilst the radiation from highvoltage pylons is certainly of a lower frequency than that from microwaves, its dangers may well be as

serious. A blood sample taken from Mrs. Bacon has already shown a slightly increased cell count. The truth is that nobody knows the real dangers of low-frequency radiation: to assume that it must be harmless simply because it is non-ionising is to show a crass disregard for human health. As Mrs. Bacon put it to the Innsworth Inquiry: 'The CEGB seems to think that it is up to us to prove that working, living and sleeping in the electro-magnetic field generated by 400kv. cables can be harmful to human beings. We feel that it is up to the CEGB to prove that it is harmless, in the face of the vast body of evidence to the contrary which has been gathered and published by reputable scientists throughout the rest of the world."

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What's in a Pizza?

by Ross Hume Hall

Although discarded as an economic doctrine, laissezfaire remains alive and well in the field of technology. In the food sector, technological innovation has sparked off a major departure from traditional forms of human nourishment. The new technology reduces the fundamental biological structure of food, subtracts its important nutrients and alters its molecular architecture. Because this new technology evolved without any input from the biological sciences it has greatly distorted the smooth biological relationship that should exist between humans and the food they eat.

Human health and well-being is inextricably bound up in the quality of nourishment, and the fact that the food revolution has taken place without proper reference to the organic nature of humans has immense implications for the state of the nation's health. The food technologists have in effect interposed a vast and complex industry between the naturalness of food as provided by nature and the human organism. With only economic objectives as a guide to the evolution of food technology, it was inevitable that the exacting relationship between humans and nature as expressed through nourishment would become grossly distorted.

The processing merry-go-round

The nature of modern food processing can best be described in terms of a typical product, a frozen pizza. The pizza, on reheating, has the same appearance, aroma and taste as one that has been freshly prepared, a feat achieved by highly sophisticated technology. The ingredients have to be able to withstand the rigours of processing, the demands of distribution and marketing systems and the desire of the consumer for a rapid tasty meal. This modern progressive pizza is constructed from a shell of refined wheat flour, layered with artificial tomato paste, artificial cheese and dotted with slices of simulated Italian sausage. Its fabrication proceeds in four distinct stages: (see figure I):

Stage one — Milling. The grains are milled and the flour is fractured to yield the bran and germ and starch. The vitamin and mineral-bearing bran and germ components are discarded and the refined flour becomes the basic raw material for further processing. Milling and refining of flour is as old as the ancient Greeks and Romans, and the techniques they used continued unchanged until the present century — when modern food technology began to take the process a step further.

<u>Stage two — Chemical Treatment.</u> Wheat flour is treated with an oxidizing agent, bromate or peiodate, which alters the molecular structure of the protein by stiffening the molecules. This treatment improves the 'rising' properties of the flour when it is made into dough. The flour is also treated with a bleaching agent, usually a chlorine compound which, as well as bleaching it, adds chlorine atoms to the fatty acid molecules in the flour, resulting in unnatural fat structures.

The corn starch used in the artificial tomato paste and artificial cheese is treated with a chemical agent that links the loose molecular structure together forming a rigid lattice: much like taking the loose strings of catgut and making them into the rigid lattice of a tennis racquet. The modified starch withstands the high temperature and mechanical shearing of industrial processing which, naturally, favours its use over that of untreated starch. But whereas in its natural loose form it is digestible, experiments with rats have shown that they have difficulty in handling chemicallymodified starch; it tends to coat the lining of the digestive tract. Modified starch has been used in a large number of food products for a long time. Recently, however, a committee of the Federation of American Societies for Experimental Biology urged that its use receive serious review.

The soy protein flour used for the 'Italian sausage' is chemically modified in one of several ways. In a typical method the flour is dissolved in lye and the protein is precipitated in an acid bath in the form of fine threads that are wound on a bobbin, cemented together, dyed, flavoured and cut into hamburger sized chunks.

This product is called Textured Vegetable Protein (TVP) and is fashioned into products called simulated meat, on the basis of their protein content. In this respect the protein is of lowered quality in comparison to the original soy bean. Two essential amino acids, lysine and methionine, are damaged and a highly toxic substance, lysino-alanine is generated in the processing. Genuine meat offers much more in the way of nourishment than just protein. Yet in the opinion of many technologists at the World Soy Protein Conference (1974) TVP is one of the great developments of the twentieth century.

Stage three — Intermediate Fabrication. The chemically-modified basic products are now fabricated into the artificial tomatoes, cheese and Italian sausage. In order





to achieve the texture, flavour, aroma and 'mouth feel' of a real pizza — as well as the ability to withstand the rigours of cooking, freezing, thawing and recooking the basic ingredients are mixed with emulsifiers, acidulants, coal-tar dyes, artificial flavours and various conditioning agents.

Stage four — Final Fabrication. The intermediate ingredients, the simulated cheese, tomato paste and sausage, are now fashioned into the pizza which will be partially or fully cooked, frozen and packaged.

The frozen pizza as sold to consumers will not be described on the label the way I have described this one. Its artificial components will be masked by a general ingredient list which gives little hint of the nature of the processing. Moreover, if it is sold in a café or restaurant, the consumer has no access to information as to how the pizza is prepared.

The Eaters and the Eaten

Biologically there are two components to the process of nourishment, the eaters and the eaten. Their relationship is exceedingly complex. The new food technology cannot change the fundamental organic nature of the eaters — us. It can, however, change the nature of what we eat thus disrupting the delicate relationship between the eater and the eaten.

In addition to giving humans the ability to eat many forms of life, nature also endowed us with an incredible resilience with respect to privation. This is part of our species' survival mechanism, because early humans could never be assured of a supply of food in quantity and quality. But, in providing us with this resilience nature exacts a severe price. Rene Dubos points out that most of the diseases of civilization (cancer, heart disease, diabetes and general malaise) result from the difficulties encountered by both body and mind in adapting to biologically unnatural environments.

Consumption of frozen pizza and similar foods may satisfy hunger, but do they satisfy man's basic needs? If people seem to thrive on these foods, they may in fact be maladapting and a temporary appearance of well-being may be a mask for deep-seated problems. Because the introduction of processed foods was so rapid their inadequate nutritional qualities have yet to be noted in the general health of the population. The adaptation, or more correctly, maladaptation that Dubos discussed, delays the adverse effects of poor nourishment for a lifetime or even until the next generation. In the meantime the population risks slipping into a chronic state of malnourishment which will come to be accepted as the norm.

We should not accept the idea that because the food revolution is an accomplished fact we must now learn to live with its products. We should insist that henceforward policy making decisions by government and industry take into account how the resulting action affects the quality of nourishment. Because of general scientific ignorance of human nourishment the best that technologists can do is to intervene as little as possible with nature's offerings. This in effect means that food technology and marketing operations be shifted from an economic basis to a biological basis. What's left for nourishment?

What happens to the nutritional quality of food during this modern processing? By the end of the first stage of our frozen pizza, the refined flours have lost a substantial proportion (up to 80 per cent) of each of their known vitamins and minerals. At each successive stage losses continue.

Secondly there is a disastrous loss of biological sophistication. The essence of living tissue is arrangement, context, timing — features that are all destroyed by high food technology. We know, in general that proper digestion and assimilation of food substances requires that they arrive simultaneously in the gut in the proper proportions. Calcium absorption, for example, can be impaired by the unnaturally high ratio of phosphate found in processed foods. Trace amounts of copper improves absorption and too much zinc interferes with copper absorption.

Another aspect to biological sophistication is biological diversity. Because nutritionists cannot detail precisely all that nature provides in natural foods, they have long recommended that, for good nutrition, one should eat a wide variety of foods. Where is the biological diversity in fabricated foods? Four basic crops (wheat, corn, soybean and sugarbeet) provide the basic raw materials from which the food industry can fashion products as diverse as tomato paste and mozzarella cheese. Ten thousand items may grace a supermarket shelf but they are almost all constructed from these four basic ingredients. The sophistication of the food industry lies in duplicating the appearance, taste and smell of a pizza freshly made from natural ingredients. To achieve that sophistication it has been necessary to destroy the biological sophistication.

Thirdly, the protein, carbohydrate and fat molecules of processed food are all chemically modified. This is an entirely new phenomenon in the course of human evolutionary history. Nature has had no prior experience of such molecules. Further, science has not studied in any detail how these molecules are digested and assimilated into the human body. Yet the risks of forcing foreign molecules into living systems shows up in another context - the PCBs, DDT and other chlorinated substances. These compounds cannot be digested by living organisms, consequently they persist in the environment for years, poisoning all organisms they contact. Certainly the modified food molecules are not quite in the same category as the chlorinated pesticides because they can be digested, but do they cause molecular indigestion? Does not forcing the body to digest large amounts of such foreign molecules place a strain on the body? Evidence suggests that it does.

Fourthly, high technology food processing requires a lot of chemical additives to facilitate the manufacturing process. These are introduced at every stage of processing. In addition, chemical treatment of food ingredients produces impurities, such as the chlorinated fat molecules in 'enriched' wheat flour. Science has very little information on how all these impurities react in the total context of processed food.

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Gearing up for the General Election

by Jonathan Porritt

Why the Ecology Party will field fifty candidates

By any reckoning, the gestation period of the Ecology Party has gone on long enough. Conceived in 1973, in the fervour of the 'Blueprint for Survival', this funny little political foetus has resolutely hung on to life, and is now beginning to show distinct signs that the womb of oblivion, which has for so long succoured it, can contain its growth no longer.

Just what will happen when it bursts forth into the big, bad world of national politics, is anybody's guess. It has always been strangely paradoxical that this of all countries should have proved so hostile an environment for the growth of an ecological party. For no country in the world has a higher percentage of its population pursuing hobbies or supporting pressure groups which in one way or another, from Friends of the Earth and the Conservation Society through to the Ramblers Association and the Royal Society for the Protection of Birds, demonstrate some degree of environmental awareness.

Inconsistency

Why then do the majority of voters uncomplainingly continue to endorse candidates of the three major parties, whose policies lie at the heart of all environmental disruption and threaten many of the activities they so keenly pursue? To sign a petition against nuclear energy one day, and register a vote for the Tory/Labour candidate the next, involves the sort of intellectual inconsistency without which these parties simply could not survive. Which is why the existence of ecology groups within the three main parties is to us something of a mystery. For there seems to be a fundamental deficiency of reason in anyone who claims on the one hand to be an ecologist, yet who works within, and gives primary allegiance to, a political party dedicated to the economics of growth and the crudely materialist way of life that goes with it. So debilitating a contradiction flaws their reasoning, and hence their influence, even before they begin to chip away at 20

the immovably growth-bound bastions of the rest of their party.

Hardly surprising therefore that many of our members are refugees from these parties, seeking a little consistency in their politics. We may lack the reassuring security and glamour of big-time politics - for which ineffectual reclusiveness we have, until now, been only derided by the 'eco-growthists' of the major parties - but at least we need not feel ashamed, by belonging to a party that builds Concordes, commissions nuclear reactors, actively promotes the Road Lobby, operates exclusively according to 'economies of scale', spawns bureaucrats and, for lack of anything better to do, blames everything that goes wrong on somebody else. Just what sort of price must they pay for marginally more 'effective'? being

Fifty candidates

Effectiveness is perhaps no longer a relevant yardstick. If the example of Europe is anything to go by, the embryonic stage of eco-politics in this country is drawing to a close. We often take heart from the early days of the Scottish Nationalist Party, finding ourselves obliged to contemplate our own birth-pangs with the wry amusement of political historians. We were not too nonplussed to be informed only recently by a 'media consultant' that we were suffering severely from the complex hassles of an on-going chicken and egg situation". However committed our membership, however convincing our analysis, however persuasive our ideas, it is impossible to achieve national credibility without a lot of money and a few big names; without national credibility, it is impossible to attract the big names or raise the money! Short of eco-catastrophe appalling some which might thrust us undeservingly into the public eye, it is unlikely that this impasse would be cleared at our present rate of growth. We are naturally encouraged at having doubled our membership this year, but we are still woefully thin on the ground in comparison to the other parties.

It was this sense of frustration which persuaded us to go all out for a campaign of 50 candidates at the coming General Election. It seems the only way of breaking through the restraints that curtail the development of any new political initiative, by making ourselves known to the widest possible audience, and testing out our somewhat delicately nurtured policies in the hurly-burly of General Election politics.

A decision more easily taken than carried through. For there is no doubt the Ecology Party suffers from pretty severe 'image-problems'. In the first place, the very word 'ecology' is a difficult, unsympathetic, uncompromising word. To many it sounds too clinical and scientific. In stark contrast to France and Germany, surveys in this country indicated an almost negligible percentage of people who knew what the word meant. And even when that semantic hurdle is cleared, many people tend to associate ecology with muesli, open sandals, brown rice and real ale all fine products within themselves, but hardly the constituent parts of ecology.

The 'newness' and 'toughness' of our message presents a problem in itself. For we are not at variance with the major parties on technical issues only; many eco-policies have profound social implications, demanding far-reaching changes in the way we think about things and the way we organise society. It is certainly a radical message, even, some would way, revolutionary. But so effectively have the politicians of the Left monopolised the notion of 'radical politics', that one plays a dangerous game in risking the stigma of any such epithet. For many, the claim that our politics is neither of the Left nor of the Right, and that we eschew this redundant and sterile polarity, is often held to be naive or simply incredible.

Transforming politics

Such is the straightjacket of politics today that it is impossible to be 'radical' without being a trendy Leftie, and impossible to emphasise the importance of tradition, stability and a sense of values without dead-from-the-neck-up being a reactionary. Yet we would claim to do both. It is certainly one of the more ambitious of our long-term aims to change the very ground of political debate, debunking the primacy of the politics of Left and Right, replacing the glossy but essentially false symbolism of Red and Blue with a new politicial polarity of Green and Grey.

An important part of any such transformation would be embodied in a move away from the materialist ethos of our present society, laying the emphasis on personal rather than material growth, in a society working through co-operation rather than competition. Any society which allows its members to fulfil themselves primarily, if not exclusively, through the realisation of material aims, will tend to become increasingly unstable — as we saw this winter.

But again, this is not the easiest of messages to transmit via politics. It is no good ranting away at materialism per se, for it is clear that people are articulating quite genuine individual and social needs (for status, for self-respect, for security) in a material way. It is not necessary, even were it possible, to transform the needs themselves, but rather the way in which they are expressed. However, whatever else happens, this is going to be a hard-fought, recriminatory and fiercely polarised election, with the same mixture of threats and bribes that now dominates the political scene as our industrialised way of life splinters around us. In conditions of economic scarcity, the politics of materialism perpetuate the meaningless antagonism that exists between management and worker, between people of different generations and backgrounds, between black and white.

A breakthrough?

There is good reason to believe that more and more people have had enough of the 'politics of blame', and would gladly exchange it for the 'politics of trust'. An appeal to join together in the business of creating a sustainable, saner and quite simply pleasanter way of life, for our children as much as for ourselves, may well prove unexpectedly effective. Ecology lays special emphasis on the qualities of diversity, acknowledging and putting to good use the differences that exist between people and encouraging the widest possible variety of life styles rather than forcing everyone to accept the same mould. While the

forces of Left and Right squabble with increasing stridency about how best to distribute the ever-diminishing slices of decaying materialism, it may just be possible to do a flanker on them, and offer a recipe for a new 'national cake', to be mixed and baked together. It would certainly be the only cake on offer for which the ingredients are likely to last.

Pitching the message

To whom then might we direct such a message? To the disillusioned, apathetic young, offering an escape from the sense of futility that besets so many of them? To young married couples, concerned for the future into which their children will be born? To the industrial worker, spending eight meaningless hours a day doing something in which he can take no pride so as to 'buy' the leisure to make bearable the next round of daily drudgery? Or to the old, so often denied the chance to play their part in the community, treated as 'someone else's problem',





their experience and knowledge under valued?

Historical analysis indicates that almost all new, 'radical' political movements consolidated a middleclass, intellectual base before pitching their message on a 'populist' level. Yet in the volatile atmosphere of 20th century French and German politics, the ecology movement succeeded, if only briefly, in mobilising mass support by concentrating on the issue of nuclear energy. Even in this country, the rapid growth of the Anti-Nazi League demonstrates the speed with which the young can adopt a cause. However, it still seems most unlikely that ecology will ever mushroom into prominence in quite the same way.

No mass movement

For one thing, it requires too steady and carefully thought out a response to elicit conversions on a mass-scale. It forces people to question rigorously their own values and political convictions. It asks people to commit themselves to policies which entail far-reaching changes in our society, and few relish change unless there are good reasons. The ecology movement as a whole has not yet become sufficiently adept in presenting the force of such reasons, all too often sliding over into doomladen rhetoric. This tends to reinforce people in their ways, as they block out the more apocalyptic visions of the future. After all, what can you or I do as individuals in the face of global catastrophe?

Moreover, the acceptance of an ecological perspective in politics implies a readiness to become more self-reliant and to work towards a democratic decentralised more society. The Ecology Party exists not to fight for survival on any terms, but for survival through democ-racy. It is questionable just how welcome such a message will prove. For though on the surface politicians and voters alike pay lip-service to the ideals of democracy, many voices are being raised in support of a 'strong hand on the tiller'. And no wonder! As one short-term, expedient measure after another fails to provide any significat relief to our problems, those voices will become yet louder. In conditions of deteriorating political and economic stability, it will take perspicacity on behalf of the voter to realise that the solution is not to be found in centralised government taking ever-firmer measures, but rather in the wholedecentralisation of power, sale 22

forcing individuals to take back responsibility for themselves, forcing communities to give new and vital expression to the concept of participatory democracy.

For many, by now well accustomed to others taking decisions for them, that is an unnerving prospect, to which some sort of 'benevolent dictatorship' or soft totalitarianism may seem preferable, even at the expense of individual freedom and democracy.

An unlikely prediction of Britain's future? Perhaps it is. It depends on how much confidence you have in the existing political parties' ability to renounce the time-serving politics of the short-term, and prepare for the likely stresses and strains of the future. And that means a rejection of the dogma of economic growth and an acceptance of certain fundamental ecological principles. An unlikely development!

Forcing the issue

Which is why the Ecology Party is gearing up to confront the electorate with these issues on a national scale. Our critics sometimes accuse us of ambivalence on this point: that since we are committed to a policy of decentralisation, what are we doing playing the centralist parties at their own game''? Should we not rather be working "from the grassroots up''? It is a fair point and one best acknowledged by agreeing that our primary responsibility is to be seen in terms of local politics - in which we have already had some success - but that to give ourselves the greatest possible chance at that level, we need to be well-known nationally. It is of course a sad reflection on local politics that few succeed as independent, purely local candidates, but for all our brave words we are not likely to change that overnight. Idealists we may be, but there is enough pragmatic realism about us to see where and when the battles must be fought. Such is the urgency and such the scale of the problems we now face, that to turn our backs on national politics would be to give up before we've even started.

Television time

That decision made, it was obvious we had to go for fifty candidates. The regulations controlling how much broadcasting time is allotted to political parties arbitrarily decree that with fifty candidates one gets one television and one radio broadcast of five minutes each. We see those ten minutes as potentially the most vital in the party's development.

We shall be able to pick our target, be it the eighteen to thirty-five year olds, or those environmentalists already half in sympathy with us. We will have the opportunity to make a fresh, demanding challenge to the voters, even to those whose political activity is limited to five minutes at the ballot box every five years. It provides one way of gaining national credibility; it is the best way (and a relatively cheap way) of getting the basic principles of ecology across to an enormous audience; it is a way of getting new members and desperately needed cash.

Risks of failure . . .

It is of course a high risk policy. If it is a Spring election, we will have quite a job reaching the magic number of fifty. To field that number of candidates will be to stretch the resources of the party to the absolute limit — it represents an astonishingly high proportion of candidates to party members. We will not be able to fight each and every campaign as fully as we would wish, probably having to concentrate our efforts in the South West, the Leeds area and London. There is the possibility that over and above losing our deposits, we may get such low results as to offset advantages gained elsewhere. The morale of a political party is a delicate beast, and would not take too kindly to humiliating failure.

... And hopes for success

But having assessed these risks, we still believe that it's imperative to go all out to make the biggest possible impact. During the last twelve months the Ecology Party has found a completely new sense of vitality and purpose. We have spent most of that year getting our written material and our local branches together. We know that what we have to say is good, and that it is relevant - for much of our effort has been in strengthening policy on 'their' sort of issues (unemployment, inflation, law and order), rather than continuing to rely solely on 'our' sort of issues (energy, agriculture, the environment). Our membership has doubled in numbers and more than doubled in terms of energy and commitment.

Above all, we believe that the time is now right for a new political initiative in this country; so much the better that it happens to be an initiative in which ordinary people can enthusiastically join and fashion their own way, and the only initiative which offers the chance of a stable, better-balanced and more democratic future. With a little help from our friends, such an initiative may just have such an effect as to surprise even ourselves. It is never easy to predict the vagaries of the winds of change, but if and when they do change in our direction, we'll be there!

REPORTS

Artificial Nonsense

Phosphates in Florida

The story of Florida's phosphate mining industry illustrates a worldwide problem - the clash of commercial greed with environmental responsibility. Here, in the heart of one of the most popular and fertile regions in the United States exists a supreme example of the 'bonanza' mentality. First discover an area with an abundant supply of a potentially valuable mineral resource. Foster the idea of the usefulness of this mineral until 'use-'necessity'. fulness' becomes Inculcate into the minds of the community, whose environment you are destroying, the belief that without this industry they would be unemployed and poverty-stricken and into the minds of the customers - in this case the farmers the world over - the idea that by using your product they are not only helping themselves, but are rendering an unequalled service to all mankind by reducing the threat of global food shortages. Finally, and regardless of objective truth, pursue your operation through thick and thin even when it is seen to be:

- a) Destroying the environment
- b) Undermining the health of the people
- c) Extravagantly wasteful of other natural resources
- d) Increasingly costly
- e) Unnecessary

Let us examine these five aspects of the phosphate mining operation in Florida.

a) Destroying the environment The environmental impact of mining is sadly too familiar to need describing in full. Whatever mineral is being taken out, landwaste is inevitable and unavoidable. There must always be a very high proportion of waste material or overburden that will cover tracts of land adjacent to the mine. In some cases the tips or slag heaps will remain for ever, but today there is pressure on mining concerns to reclaim mined out land. Even in Florida's mining area the

The New Ecologist No. 1 January/February 1979

reclamation ethic is produced to whitewash the commercial operation - but here there is one terrifying difference - because associated with phosphate rock there is a 'leach zone' of concentrated radioactivity which, when exposed by strip mining, releases decay products of uranium into the atmosphere. Reclaimed land is therefore radioactive land, dangerous to wildlife and agricultural stock, unfit for housing development, frightening in the degree to which its long-term effects are unpredictable. In Polk County, once described as one of the ten richest agricultural counties in the United States, cattle have fallen sick and died after grazing polluted land; cereal crops have failed and citrus fruit trees have withered.

Lost too have been areas of crucial importance to the wildlife of the area — the unique wetlands, the pine flatwoods, the hardwood swamps and the hummocks.

Secondly there has been pollution of natural water resources. The vast consumption, estimated at over two hundred and fifty million gallons a day, has caused a significant decline in the water table throughout the one hundred and fifty thousand acres of the mining area itself and beyond it. Salt water intrusion into potable sources has followed the lowering of the table; waste water from the mining operation stored in vast fourhundred acre slime ponds, (in all it is estimated there are forty-five thousand acres of slime ponds in Florida) seeps into the water supply. There have been more than thirty major spills since 1940, one of them, in the early seventies, polluted the Peace river damaging aquatic life for eighty-five miles of its course. In 1975 an acid pond collapse, triggered by a sink hole, dumped ninety thousand cubic yards of gypsum slime and four and a half million gallons of acidic effluent into underlying artesian water table aquifers.

The air near processing plants is polluted by airborne fluorides, hydrofluoric acid, sulphuric acid mist and radioactive particulates. In a nutshell, the land, from which the local population derive much of their food, the water they drink and the air they breathe are all polluted — in exchange for this ravaged environment the citizens of Bone valley, of Polk and Manatee and Hardee Counties, of the Peace river valley and the Highlands are offered job security in a polluted world.

b) Undermining the health of the people.

It is impossible to measure the amount of radioactive poison the industry is generating and releasing into the atmosphere, the soil and the water supplies. The radiation in question arises from the presence of uranium decay products which are naturally present in phosphate. No one should have any illusions about the hazards involved, and if doubt remains in the mind of the public about the extent of the risk it is because the truth is kept from them. Homes built on reclaimed land have been found to have radioactive levels far above the acceptable level, but the people have not been moved out; radioactive up-take from food plants grown on reclaimed land are



ultimately passed on to the human population, either as the vegetables they eat, or as fodder fed to milch cows and stock ultimately destined for the butcher or in cereals used to produce staple foods such as bread and flour.

It has been estimated that a phosphoric acid plant sends out as much radio-active material as a large nuclear power plant. The quantity of uranium oxide mined with phosphate rock exceeds the quantity extracted by the domestic uranium mining industry, and there are plans afoot for significant quantities of uranium from phosphate ore to be recovered and supplied to the nuclear industry. The claim put forward that this will in some way reduce the uranium threat in the mining areas is nothing more than a further example of misleading the public. Removal of the uranium will not reduce its environmental impact because it is a type of radiation known as Technologically Enhanced Natural Radiation (TENR) - in other words it is radiation that, through the mining has been released. operation, redistributed and concentrated, to an extent that it constitutes a health hazard. It cannot be reharnessed or eliminated.

Further radioactive air pollution comes from the rock driers which emit 64.5 tons per year of radioactive dust producing 2.450 million picoCuries of radium 226 described as "an amount which exceeds the quantity of equivalent radionuclides which would be allowed by the Nuclear Regulatory Commission, from a 1,000 Megawatt nuclear power plant.' (From the EPA 1973 Radiological entitled: Report Pollution from Phosphate Rock Mining & Milling)

c) Extravagantly wasteful of other natural resources.

We have already seen that the amount of water used daily by the industry has had a deleterious effect on the entire water table of Florida — known as the Floridan aquifer. Ten thousand gallons of water are needed to process one ton of phosphate rock. Some eighty-five per cent of the water is recycled after it has become polluted during the ore washing and flotation processes. Through mechanical surface and subterranean changes, strip mining irrevocably alters the natural flow patterns and storage capacities of surface and ground water systems inducing changes in regional hydrological regimes which no amount of reclamation can ever restore.

In some places the level of the water tables has already dropped disastrously — in the city of Sarasota the level in wells is now half what it was ten years ago, and at the same time the population rises and the civic demands increase. Supplies for farmers, for citrus orchards and for the people of city and country town are threatened both as to quantity and purity. Equally wasteful is the industry's consumption of electricity estimated to be in the region of 3,845 Kw hours per year.

d) Increasingly costly

The rich and easy veins are mined out; more machinery, more men and more water are needed for every ton produced; nevertheless so huge is the investment in plant that the companies plan to continue to process phosphate rock even when the raw material of their operation must be brought in from outside sources.

Under this heading we should also list the costs to the community that are not borne by the industry. Thus the companies do not pay one cent for the millions of gallons of water they extract; they do not pay for the servicing of hospitals where the victims of cancer and other pollution induced illnesses are cared for; they do not pay the Counties for the loss of amenity suffered through the irreparable damage to their landscape and the amenities they can offer to their people and the tourists who once flocked to them. They do, however, pay for reclamation schemes which can never return the devastated land areas to anything resembling their original condition, and they receive handsome hand-outs and tax relief for doing so.

e) Unnecessary

Here perhaps we reach the most crucial question. The argument confidently promulgated by the industry that the World *needs* Florida's phosphate rock fertilisers. It is without doubt true that increasing world population has given rise to the need for more food and this must now be grown on land that has hitherto not been naturally fertile, or has become infertile following mismanagement and erosion. In either case such land is most easily brought into productivity by massive applications of phosphate based fertilisers. At present Florida produces about eighty per cent of all phosphate rock in the United States and a third of total world production. The question is: Does she need to? and the answer is emphatically 'No'. Florida's phosphate reserves represent only two per cent of the total estimated world reserves, that is some three billion metric tons. In Morocco there are known reserves of ten billion tons and estimated reserves of up to forty billion tons. Enough to supply the world's farmers for many decades after the Floridan supplies have died out. Indeed at the rate they are now ripping it out of the land, it is likely that the United States will begin to depend on imported supplies by the turn of the century. What folly is this. When that day comes the USA will find herself facing the same dilemma, the same threats, the same trade cartels as she is now experiencing with oil. How much better to conserve and husband this resource than to lay waste thousands of acres of good land in order to dig it up and sell it to the rest of the world.

Finally it must be recognised that phosphate rock, like fossil fuels, is a finite resource. The time must come when it will no longer be economically feasible to transport dwindling supplies thousands of miles across land and ocean. When that happens the fertility of the land will once more be dependent upon skill and good husbandry; upon the rotation of crops and the manure of farm livestock. If the phosphate companies of Florida have succeeded in turning their product from a useful commodity into a 'necessity' it is up to the farmers to show them that necessity is still the mother of invention.

Ruth Lumley-Smith

Preston Cloud 'Mineral Resources today and tomorrow' in *Environment Resources, Pollution, Society*, Sinauer Assocs 1976

Sources: Sarasota Herald Tribune 9.5.78. Keith Reid in Man Nature and Ecology Aldus 1974.

Children sue giant drugs firm

A giant drugs firm is being sued by four young heart-disease victims whose parents blame a pregnancytesting pill for their condition. Writs are being issued against the German-based Schering Drugs Company on behalf of the children, aged between four and ten.

The drug involved is Primodos, available to family doctors since 1958. It contains the female hormones, Oestrogen and Progestogen. Opponents of the drug claim it is responsible for malformation of the foetus, producing congenital heart disease, harelips, loss of limb movement, cleft palates and brain damage.

The Department of Health was ordered to investigate the drug in 1967 but it was not until eight years later that the Committee on the Safety of Medicines issued a 'yellow warning' to family doctors about the possible link with congenital heart disease. Predictably the drug company deny that there is 'any proof that our drug is responsible for the children's condition'.

Daily Mail, 30.11.78

U.S. lowers estimates of World oil supply

The U.S. has lowered its estimates of the amounts of oil which will be available to supply world markets in the mid-1980s. World oil production, at present running in excess of 60 million barrels of oil a day, should not be counted on to increase by more than 20 per cent before reaching its practical limits, Mr. James Schlesinger US Energy Secretary, told a meeting in London at the end of November. The latest figures forecast a reduction in supplies from OPEC countries.

If oil consumption increased at 4 per cent a year, as in recent years, demand would outstrip supply before the mid-1980s, warned Schlesinger. "Even if the growth rate were to be reduced to 2 per cent a year — a considerable achievement — we would still reach that crunch point by the early 1990s, a period when we expect conventional oil production to peak."

Although Mexico's oil reserves are possibly equal to those of Saudi Arabia, Schlesinger suggested that the Mexicans would probably wish to exploit them slowly, setting a production limit of around 4m-5m barrels a day by 1985. "One should not count on any massive increases offsetting reductions in OPEC production or avoiding the finiteness of oil supplies'', he said. He went on to point out that even an oil reserve like the North Sea could only satisfy world demand for about one and a half years; that Alaskan supplies represented about six months of total world demand; and Mexico, six to seven years. "To maintain reserves, a new Kuwait must be found every three years".

Financial Times, 30.11.78

Mechanical pastures

What's the point of putting cows out to grass when you can keep them inside all the year round? Thanks to a new computer system, farmers need no longer tramp through muddy fields to feed their cows or worry themselves about overgrazing. The new system involves feeding cows with computer controlled rations made up from tapioca, bananas, carrots and other cheap sources of vegetable waste. A leading dairy machinery company has added an extra dimension to the system by inventing an automatic cow feeding device. The cows learn to respond to a bell which rings when mechanised food dispensers are ready to dole out individual rations. Each cow has a miniature transmitter around its neck which sends out a signal to a central control unit which is programmed to the animal's individual needs. Already a farm near Norwich is using the new technology to feed 300 cows which are kept in all the year round.

Sunday Telegraph, 7.1.79

Two die in Czech nuclear accident

Charter-77, the Czechoslovak human rights movement, recently entered the nuclear debate with an exposé of conditions at Jaslovske Bohunice nuclear power station. According to a report from the Charter movement, employees at the power station have been compelled (under threat of loss of premium payments) to expose themselves to radiation levels considerably above the safety standards, while, in the course of the last three years, two serious accidents, one of them causing the death of two workers have taken place at the station.

In 1969, before the Jaslovske Bohunice station was completed, the Czechoslovak nuclear energy industry was switched, following a Soviet 'recommendation', to lightwater pressure reactors of the VVER type, for which the Soviet Union would supply a substantial part of the main equipment. Whether this change of plan affected the final stages of work on the plant is still not clear: it appears, however, that the projected automatic system for mounting new fuel elements was never brought into operation, and the mounting was done manually. Workers on the reactor were, says the Chartists' report, ''under psychological stress'', often working a 16-hour shift. On January 5th 1976, an error occurred in the mounting process. The element shot out of the reactor, together with a large quantity of radioactive CO2. Since the emergency gas-traps and filters were insufficient for an accident of this magnitude, radioactive gas escaped into the atmosphere. Emergency evacuation plans went into operation: unfortunately, one escape door had been locked, apparently to reduce petty thefts, and two workers were suffocated.

Some six weeks later, disaster struck again. During the mounting of new fuel cells, the primary circuit overheated, the air-tight seal of the steam generator ruptured and as a result, the primary circuit, the secondary circuit and the working area all became contaminated. Radioactive material entered the drainage system of the plant and a stream in the vicinity had to be 'fenced off' as contaminated.

Nature, 7.12.78



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Who cares about Cadmium?

Cadmium levels in the soil of Shipham, Somerset, are at least as high as those that caused an outbreak of serious disease in Japan. The condition is known as 'itaiitai' (literally 'ouch-ouch' disease) and is characterised by painful joints and brittleness of the bones.

The levels found in soil samples from Shipham range from 11 to 100 parts per million, with occasional readings as high as 998ppm. The levels found in rice paddies in Japan ranged between one and fifty parts per million.

The 1200 inhabitants of Shipham have been advised to cut down on smoking and to stop eating homegrown vegetables while a further survey is made to establish the extent and possible effects of the contamination which is linked to old zinc mine workings. The villagers remain unconvinced that there is any danger to their health from the cadmium and are more frightened by the possibility of a slump in the value of their homes. For its part, the Department of the Environment maintains that although there is no cause for alarm, there is cause for concern.

High exposure to cadmium can inflict irreversible damage on the kidney, inhibiting the normal bone repair mechanisms and leading to the agonising collapse of the skeleton. At low levels it leads to high blood pressure, hypertension and heart attacks. It is also known to be a potent carcinogen and has been shown to be capable of inducing birth defects in animals, including rhesus monkeys, which implies that the findings probably apply to man. Virtually nothing is known about its long-term effects.

It seems, as Anthony Tucker suggests in *The Guardian*, that the villagers of Shipham should brush up on their toxicology.

Öbserver, 21.1.79 Daily Telegraph, 22.1.79 Guardian, 22.1.79

Think no Secrets?

The Harvard undergraduate who wrote a 400-page paper detailing nuclear weapon designs has had his work, and even his thoughts classified by the US Department of Energy. Dmitri Rotow, a 22-yearold economics major with only a year of college level physics, developed several workable bomb designs using only unclassified information. Now the DOE's acting assistant director of Security, Donald Kerr, has told Rotow that his study will be considered 'restricted data'. Furthermore, the DOE has threatened to prosecute Rotow under the Atomic Energy Act if he talks about

parts of his treatise to any person not having top government security clearance. The Department has also told him that his thoughts about the classified data are top secret too.

In a generous moment, however, the DOE told Rotow that he could talk about his work in general terms as long as he did not discuss the classified parts. Rotow is still trying to find out what those parts are and the DOE show no signs of letting on.

Critical Mass. Sept. 1978

Radiation Increase at Windscale

Radiation exposure for people living near the Windscale plant is up to 15 times higher than in estimates published four years ago. Because of an increase in the amount of radioactive waste being pumped into the sea, people in Whitehaven and elsewhere on the Cumbrian coast are receiving doses at levels that are causing concern, according to a report from the National Radiological Protection Board.

The level of exposure involved is of up to 240 millirems a year — about a fifth of that experienced by workers at the plant, but double the longterm value recommended by the International Commission for Radiological Protection. The NRPB's report also shows a 20-fold increase in the amount of radiation reaching the British public through nuclear activities.

Daily Mail

Economists . . .

"Anyone who believes exponential growth can go on forever in a finite world is either a madman or an economist."

Professor Kenneth Boulding

Down the drain

There was something suspicious about an 8,000-gallon tank truck pouring its load down a sewer in the dead of night, thought a New Jersey policeman. He became convinced when some of the contents slopped onto his feet and his shoes began to disintegrate. The case was one of several recent prosecutions in a crackdown on the booming business of illegal and indiscriminate dumping of dangerous chemical wastes. Officials worry that the problem is growing and they are particularly concerned about groundwater contamination. One Southern New Jersey town lost its entire water supply several years ago when an illegal cache of chemical containers rotted and seeped into the water table.

Audubon

Authors in this issue

John Stewart

is a Cambridge-trained geneticist who dropped out of an academic career after ten years research as a result of a political critique of science. He is presently based at the École des Hautes Études in Paris and is working on a book on the social implications of genetic engineering.

Ronald Higgins

spent twelve years in the Diplomatic Corps and subsequently joined the Observer. In February '75 an article in its colour supplement caused a furore which led to the commissioning of his book The Seventh Enemy, from which the article in this issue is partly drawn. He is now working with The Richmond Fellowship for Mental Welfare and Rehabilitation.

Ross Hume Hall

is a graduate of Cambridge (Mass). He has had extensive experience in cancer research and the biology of growth and development. He is an Associate Editor of *Plant Physiology* and has conducted a research programme at McMaster University to assess the effects of contemporary technology on the quality of nutrition and the resultant effects on health and wellbeing. In 1974 he published *Food for Nought, the decline in nutrition* (Harper and Row).

Little fish stops big dam

The U.S. Supreme Court has ruled that the Tennessee Valley Authority must abandon work on its nearly completed £66 million dam across the Little Tennessee River. The cause of the court's decision was the five centimetre long Tennessee snail darter, a species of perch found nowhere else in the world. The snail darters feed on snails which can only survive in the shallow and rapid waters of the river - which would have been turned into a lake by the dam. Luckily for the fish it is listed as endangered, and the court ruled that under the 1973 Endangered Species Act it must be protected whatever the cost.

Wildlife, August 1978

Fuelling Hope

A LOW ENERGY STRATEGY FOR THE UNITED KINGDOM by Gerald Leach, Christopher Lewis, Ariane Van Buren, Frederick Romig, & Gerald Foley, published 1979 by **IIED Science Reviews. £7.50**

For those suffering from severe bouts of 'energy gap phobia' Gerald Leach and his colleagues' report for the IIED should be better than any pill and without any of its legendary bitterness. The basic message in ALow Energy Strategy for the United Kingdom is that if we are prepared to develop enery-conserving technologies and to implement their widespread use through market and government-sponsored incentives, then not only can we attain the high standard of living we are supposedly craving for, but at an even lower energy consumption than today. Leach gives us some fifty years of gradual, painless change to arrive at that magic moment - the year 2025.

To avid readers of Which magazine, and the technologically minded who cannot abide inefficiencies and shoddy performance, IIED's proposals will seem just the sort of thing the country has been waiting for. Every piece of apparatus, from cookers and freezers to the family car, as well as the industries that manufacture those things, will have energy-saving concepts built into them. Proper lagging and insulation, heat exchangers, heat pumps, thermal wheels, combined heat and power devices, draught-free even solar heated houses, electronically controlled car engines and transmissions, possibly energy-conserving fly wheels, updated manufacturing techniques, all will become options we will hardly be able to refuse; for by being energy-saving they will ultimately save us and the nation a great deal of money as well as fuel.

For years now we have been nurtured on the notion that Gross Domestic Product and energy consumption are intricately linked and that if we are to have progress we shall have to go on consuming a greater quantity of energy than ever before. The UK Atomic Energy

by Peter Bunyard

Authority economists are particularly good at informing us that without more energy, especially of the nuclear kind, we shall be in danger of regressing to savagery and a troglodyte existence. Leach's group are now suggesting the opposite: if we want to progress we had better start by becoming much more energy efficient, thereby stretching what supplies we have and making them do a lot more work for us.

The report itself is remarkably compact, full of numbers, graphs and tables, and in typical Leach style, eminently sensible in its conclusions. In many ways the report is a first of its kind and not likely to be superseded easily. Leach and his colleagues have looked at every sector of the economy - the domestic, commercial, manufacturing, public and transport - and disaggregated energy-use for some four hundred different groups within those sectors. They have looked at technological developments, some already being implemented, others to be commercialised, which are affecting energy end-use efficiencies or would certainly do so if taken up. When they aggregate future end-use energies on the basis that the technologies will be introduced at a reasonable rate they find the savings in total energy consumption to be substantial. According to Gerald Foley, "it became more a matter of finding ways to consume energy in order to take up the slack, than to try and cut out consumption."

But is such a programme feasible? In fact the downward trends in energy consumption tied to better energy use are already happening, and the IIED report notes that UK fuel consumption in 1977 was lower than in 1970 despite an increase in gross domestic product of over 10 per cent. Even the Department of Energy seems to have grasped something, and according to Leach, at the rate the Department is lowering its projections of UK energy trends, it too will soon be forecasting zero-energy growth.

While saturation effects are bound to play their part in levelling off energy demands - we can only drive one car at a time - the main impact is from technological innovations. In line both with forecasts of growth in GDP and what they consider to be a reasonable target of such growth, Leach and his colleagues have reckoned on GDP reaching either three times its present level in the *high* case or two times in the low case, against a total population growth rate of between 3.6 and 4.5 per cent over the whole period until 2025.

Reading the study's conclusions the energy planner will certainly have to think twice before sending the curve on his energy graph climbing ever upwards. According to IIED, while business goes on as usual, or even better than usual, energy demand will fall gradually after 1990 to its pre-1970 level in the low case — that is to a doubling of present GDP - and will remain at a slightly elevated 1980 level in the high case - when GDP trebles. Thus by 2000, primary energy demands are 330 - 361 million tons of coal equivalent (mtce), which are far below the current Department of Energy forecasts of 460 - 570 mtce.



The consequences of the IIED's forecast are far reaching, and are outlined in the report as follows:

- * 'In 2000 the UK could be entirely self-sufficient on North Sea oil and gas even on central estimates of reserves.'
- * 'Coal production need be only some 120 million tonnes a year, far below the 170 million tonnes target in the ''Plan for Coal''.'
- * 'From 1976 2000 we have assumed the construction of only 4.5 - 6.5 gigawatts of nuclear capacity, or three to five average-sized stations, compared to 30 GW in the current Department of Energy reference forecast. If more were built there would be such a surplus of generating capacity that a choice would have to be made between leaving nuclear stations idle or reducing coal to uncomfortably low levels.'
- * 'Over the same period only 26 - 30 GW of generating capacity of all kinds need be built (most of it replacing existing plant) compared to 83 GW in the Energy Department reference forecast. The saving in capital investment would be around £26-30,000 million for the plant alone, or well over £1000 million a year. We would be most surprised if this did not greatly exceed the costs of all the energy conservation measures we have assumed for all sectors and fuels.'
- * 'After 2000, the only significant fuel shortfall is in North Sea oil, taking the central estimate of reserves. This ''gap'' reaches an annual 36 - 47 million tonnes of oil by 2025 in the Low and High cases respectively, or roughly half recent levels of oil imports. It could be filled from several sources, either from the large quantities of crude oil

that should even then be flowing in world trade, or by the import of liquid fuels made from crops grown in the tropical belts.'

- * 'If North Sea oil reserves are at the upper end of current estimates, a small shortfall appears only after 2020 in the high case. In the low case self-sufficiency lasts until 2025.'
- * 'With natural gas the UK could be self-sufficient until 2015 -2020 on the central estimates of reserves. On the upper reserve estimate, which is now being used by the Department of Energy, self-sufficiency would extend until well after 2025.'
- * 'Coal production need be only 128 - 148 million tonnes in 2025, or well below the present target for 2000.'
- * 'Electricity output can be met by building only 6 GW of nuclear capacity in the first quarter of

For the past half dozen years Gerry Leach has been applying a no-nonsense approach to energy matters and coming up with commonsense answers. Those who would like to count him among themselves, in the unending energy debate, have found Gerry somewhat difficult to pin down, because he refuses to let himself be trapped in what he feels may be an indefensible position. Not that he sits on the fence, far from it, but his findings rarely endorse either the energy pundits who fear 'energy gaps' like the plague, or the antigrowth movement who would eschew industrialism and the consumer ethic that goes with it.

As Science Correspondent of the Observer, Gerry obviously found it frustrating merely to pass on and interpret other people's findings. He felt one step removed from the source, and when he left in 1972, about the time of the UN Environment Conference, it was to carry out his own investigations on the relationship between energy and man's use of it. Consequently he did an excellent report on natural resources and the motor car for the OECD, in which he showed that rapid growth in the number of vehicles in the world would inevitably lead to a fuel crisis. He proposed various schemes for reducing the impact of the car, including substantial improvement in fuel performance. It is interesting to see similar, but expanded technological arguments now appearing in the IIED report on UK energy.

Energy and food production then came under Leach's scrutiny, and although he confirmed that the energy utilised in the food-producing industries, including agriculture and manufacture, often exceeded the natural energy content of the food itself, his conclusions were that agriculture in Britain consumed only a relatively small proportion — some five per cent — of total primary energy per year. Nevertheless total food production was consuming some 0.8 tons of oil equivalent per person per year in Britain, and Leach

Gerald Leach Man of Energetic Vision



the next century. Nuclear power in our projections thus becomes a peripheral issue and could be abandoned as an option if — for whatever reason — it became prudent to do so. We have however assumed a continuing nuclear programme at a "tick over" level sufficient to keep the industry alive as an insurance measure."

* 'The fast breeder reactor and the plutonium fuel cycle, with all their risks of nuclear proliferation and public opposition could be shelved indefinitely.'

The prospect the IIED offers seems so benign and enticing in materialistic terms that people are bound to wonder where the catch is, especially since it is without the usual provisos of masses of nuclear power. Where it may fall down is in the lack of will and direction to see it through. A programme of energy-

was quick to point out that such energy consumption, for food alone, applied to the world population, would lead to as much as 40 per cent of the world's energy consumption being channelled into that one sector. A mind-blowing proposition.

After a period as a visiting fellow to Sussex University's Science Research and Policy Unit, Gerry took up with IIED. At the time of the debate over the energy balance of a rapidly expanding nuclear power programme, when Peter Chapman from the Open University and others at FoE in London, were showing that the energy invested in constructing and fuelling nuclear power stations would take several years to pay back, and that in a dynamic building programme could lead to an overall energy deficit, Gerry came back with a reminder that there would be a ceiling to any such programmes, and that ultimately nuclear power must provide a substantial energy surplus. It was a timely bit of reason injected into an argument that had begun to get somewhat out of hand.

Leach is a pragmatist, and not one to get caught up in the emotional aspects of an argument. He takes the straightforward view that energy policies, at both government and consumer level, will ultimately be determined by economics. 'If there is a dollar return', he says, 'then there will be an energy return', and he describes how the sort of energy savings to be made with a solar collector system in Britain's uncertain weather may not tally with the cost of installation. The dollar return on insulation make it a much better proposition, given the current cost of fuel.

Leach is scathing about economic forecasting methods which carry on the trends of the nineteen fifties and sixties without any real appreciation of the effects of technological improvements and energy conservation policies. 'Such methods take no account of the effects of simple strategies such as insulation, and what will happen if we pump more energy into our houses. Do

saving which fails to go the whole way but allows inefficiencies and discrepancies to creep in, like building more power stations than are needed, just to keep the boilermakers and nuclear industry going, can make a nonsense of good intentions, especially when capital resources are limited and competed for. And what happens far in the future when oil and natural gas will really have gone, will society have to turn to nuclear power then? Is it simply a matter of putting off the evil day?

Undoubtedly the IIED's projected society will have to be affluent. None of the gadgetry proposed comes cheap even though there may be ultimate savings when costed against energy otherwise used. It will also require an army of highly trained plumbers, electronic engineers and special car mechanics, and the wherewithal to educate and then pay them. Overall employment and wage-earning prospects in an energy-mindful society should be good.

The IIED study raises an interesting paradox. In order to save energy, and hence money, society will have to be affluent, yet in being affluent it will obviously want to spend its money on more energy-consuming goods. Will such an affluent society stay within the energy bounds delineated for it by the IIED? Or will it get caught up in an energy-growth spiral? The future will tell, meanwhile the work Leach and his colleagues have produced will be food for thought both for those used to equating well-being with energy growth, and for those who believe that the problems generated by the industrial society are beyond technological solutions.

they expect us to go around with our shirts off?'

'In our study,' says Leach, 'we've projected a future with a high material growth in which everyone will live in a reasonably sized house, with adequate heating and hot water. It's a business as usual future that the government believes in. Not that we necessarily believe ideologically in that position — but we have come through the 1973 energy crisis, and have seen that man is clever and adaptable enough to pull 'soft energy' rabbits out of the bag. We expect there to be feedback between production of these things and employment, hence there will be no need for radical change.'

'In knocking the 'energy gap' argument, we have also knocked the notion that we shall need a big nuclear programme, and by choosing the same language as the government, we should at least ensure ourselves a hearing. Indeed our interim reports had an explosive effect, and we know that three cabinet ministers had their minds changed over Windscale.'

Perhaps our scenario won't be liked by vested interests, but in conversation representatives of one oil company told us they were interested in expanding to the whole range of energy, and gave us a thousand pounds for a computer. In the same vein we have the gas council producing an efficient heat pump, and the electricity council interested in an energy conservation house.'

Leach now plans to do an energy study with IIED on Western Europe in general, while other members of his team do some work on the situation in the Third World. Meanwhile those who are gloomy about the industry's prospects in Britain may take hope and gain inspiration from Leach and his IIED report. Perhaps we do have a future after all.

Peter Bunyard



It's a lovely day tomorrow

EUROPE 2000 by Peter Hall, Duckworth, £4.95. THE MAN-MADE FUTURE by C.H. Waddington, Croom Helm, £9.95.

I suppose many readers will be too young to remember the words of the song we oldsters used to sing during the war. They may seem inappropriate today. Remember, though, that things were not exactly rosy in England around 1941. We had to cheer ourselves up somehow and in the event we were justified. Tomorrow was a better day. It was not altogether lovely perhaps, but it was better. Could it be that tomorrow will be a better day for us again? Could it even turn out to be the lovely day we were promised all those years ago?

Consider this scenario. Europe is administered as a large number of regions, each of which enjoys a high degree of autonomy. The regions are composed of communities of a few hundred to a few thousand people. Many of them are in rural areas, so that the population pressure on cities is eased, but within the cities each district runs most of its own administration. Population is stabilised, local groups produce many of the things they need from their own resources and participatory democracy, darling of liberal consciences everywhere, actually arrives and works. Communities may be remote, but they are not isolated, because electronic communications systems link thern, so allowing many activities to proceed without the need for people to leave their own village or town. To some extent these communications systems would be used by the community as a comm-30

unity, to exchange ideas with other communities. People would have more than one job and although special skills would be needed as they are now, for most people work would become more interesting because more varied and more satisfying because its benefits would be felt, and appreciated, close to home. Since each community would require a wide range of skills, it would provide a wide range of employment opportunities so that young people would not be compelled to leave to find work, although there would be no need to compel them to remain, either, if they wished to leave. They would not have to leave home even to be educated. When the history of our age is written I suspect that Britain's most important contribution to the world will be seen as the Open University, whose resounding success has proved beyond all reasonable doubt that it is possible to educate people to a high standard, at a low cost, without them leaving home for more than a week or two a year - and not every year at that. With a less mobile population, the old extended family, or some version of it, will reappear. Retirement, of course, will be abolished, as people change their social roles and associated occupations throughout life.

Such communities could provide great psychological satisfaction and although their consumption of resources would be far lower than that of any European community today, their standard of physical comfort would probably be higher.

It all sounds very Utopian and, in some senses, it is. Yet it is part of a scenario advanced not as a picture of what ought to happen were the world a perfect place, but of what is likely to happen as the most rational and probable response to changes that can be seen to be occurring now. The reasons advanced in its support are compelling.

It is to be found at the end of *Europe 2000*, a study of the past, present and future of Europe that is the most impressive work of its kind I have had the pleasure of reading. I use the word 'pleasure' deliberately, for this is a book you can read. It avoids that technical jargon that so often masks imprecise thought and near illiteracy. It is a literate book.

Europe 2000 is the final report of a study sponsored by the European

Cultural Foundation that ran from 1967 to 1975. The research on which it is based was conducted by more than 200 people in ten countries. This makes it more than slightly remarkable that any final report appeared at all and even more remarkable that it should appear at a length and price that will make it available to a general readership. For this we must thank Prof. Hall, who edited the text and who wrote much of it.

The approach is historical. That is to say it reviews the recent past to show how the present evolved before discussing the possible future implications of the historical process. Starting with a consideration of the political structure of the subcontinent and the ways this may change, especially in the light of possible governmental responses to economic and demographic constraints, it moves on to the theme of the landscape, from a social as well as a political point of view. This leads to the ways in which land may be used for urban development and for agriculture, and so to more specifically urban problems. It suggests that the future for cities may lie in a gentler, more gradual programme of renewal than we have seen in the past, leading to the creation of urban landscapes that are ecologically balanced and that provide human beings with visual stimulation and pleasure. The role of industry is discussed, and the possibility that heavy manufacturing and such operations as car assembly, should be transferred to developing countries, which possess the resources, space and labour for them, leaving Europe to develop new industries, including many craft industries, requiring highly developed skills. The performing arts will enjoy a major revival and education will become a lifelong process so that the division between school and the world outside will vanish. This expansion will be based on new communications technology which, with its dangers as well as its benefits, seems certain to affect our lives within the next few years. Three chapters then deal with the roles and special problems of groups within society, and the relationship between class structure and inequality that may generate stresses during a period of material constraints and little or no economic growth. Even here the outlook is positive, for the report suggests that the very alienation of working people in modern industrial societies may become a force for change, leading to what it calls a 'new rationality' based on criteria other than those of economic advantage. Finally we are presented with the scenario, designed to emphasise the extent of the changes, although to people living through them life may well seem to go on in much the same way from one day to the next.

The book represents the distillation of some very hard and profound thinking and has in it much to encourage those who find attractive the kind of change advocated for so long by the environmental movement. It deserves to be read widely, and to be taken seriously.

Professor Waddington's book is his own personal statement of his views about a future that, for better or worse, will be shaped by man. At the time of his death he had completed the manuscript apart from the addition of a few titles to its bibliography. The book begins by considering population, the environment, and the food situation, then moves on to natural resources and energy. It is when he begins to consider solutions to problems of urbanisation that he becomes fully warmed to his theme and as he advances through discussions of health, pollution and war it becomes very evident that like many other writers he sees the essential problems in moral terms. He defends science, quite rightly, from attacks that have been made on it for claims it has never made and devotes several pages to a general criticism of Theodore Roszak's Where the Wasteland Ends, and to putting into perspective the views of Barry Commoner and Paul Ehrlich. Like Prof. Hall, Prof. Waddington believes that problems can be solved, if we have the will to solve them; and in the last words he was to write he passed on his conclusions to the young people who must bring together the efforts of individuals seeking new goals and the social pressures tending toward change in order to avert the alternative future, which is disastrous breakdown.

Scavenging for Fuel

RENEWABLE ENERGY RESOUR-CES AND RURAL APPLICATIONS IN THE DEVELOPING WORLD, edited by N.L. Brown, AAAS Selected Symposia Series 6, £9.75. SOCIAL AND TECHNOLOGICAL MANAGEMENT IN DRY LANDS, edited by N.L. Gonzalaez, AAAS Selected Symposia Series 10, Westview Press (USA) 1978. UK Price £10.70.

These books may, superficially, seem to fit the rut of dry, academic outpourings, with the sad laurels going to the 'Filibusterovs' of this world. However this is far from being the case — these books are 'instant print' versions of the papers presented at two Association of American Scientists meetings, one concerning the real energy crisis, the other relating to the new scourge of desertification. And they are excellent books — with their high cost being due, most likely, to the expected low sales volumes.

The first book contains inputs from eight contributors, covering aspects of the energy situation in less developed nations - in particular the oil import dependent LDCs and the solar/renewable alternatives. While the contributors are anything but 'controversial', and stick, in the main, to technical and economic questions, these are themselves a vast new area little known or understood in the urban industrial nations. It is for instance 'well known' that crop residues, firewood and dung make up a lot of the energy input in rural areas of LD nations but how much? What proportion do they provide in rural India, China, Tanzania, Ghana, and so on? If this might not seem 'important', one only has to look at the number of people involved - just in India there are better than 400 million people living in villages of under 2000 people which have no centralised electricity services (and not much scope for it in the next twenty years, at least).

Finding new, effective energy sources that halt the desperate scavenging for fuel that is destroying forests at a fantastic rate in the Himalaya edge and Sahel nations is not just a sensible, humane act of altruism, but an assertion of a real sense of priorities, and a step towards halting the slide to ecocide. Small scale renewable energy sources fit the bill, but finding ways to foot the bill is another matter. As Joseph Ermenc, the contributor on micro-hydro systems notes, there is plenty of cash around for grandiose mega-hydro schemes that will pay off (if ever) in 20 or 30 years from now, but the same quantities of cash broken down to hundreds of 50-100kW hydro plants can provide the same aggregate electric power, but at the village level, and the worst cases (villages with most need) can be treated first.

The richer developing nations are doing something about the energy crisis. The paper from Miccolis, a Brazilian science policy advisor, presents the positive aspects of their race for development. By developing the renewable energy sources - in particular biomass alcohol - Brazil can shake loose from the poverty and debt trap that, in another guise, is part of the 'petrodollar recycling system' of the West. And while Brazil might be more than a little murderous towards its deep forest dwellers, it is at least showing the North nations where to get off - which is good for both parties. Energy independence, as Miccolis says, is a basic part of this new equation.

The second series of papers canvasses views and facts on human responses to arid lands. Two papers in particular, because of their length and subject areas, are most impressive. These are Moseley's on prehistoric agrarian collapse in the Moche valley of Peru, and Bedoian's paper (originally an anthropological dissertation) examining the man-Sahara interaction. In both cases they throw detailed light on the whys and hows of desertification. In the first case, the Moche valley, the of undertaking, radically scale increased ritual destruction of wealth (social pyramidisation), and climate change induced, perhaps, by ocean current migrations, combined to bring down a vast system of irrigation that had been in operation at least 1500 years before its collapse about 600 years ago. With many wry asides on how ineffective today's high technology irrigation is by comparison with that of 2000 years

Michael Allaby

ago — for example it cannot irrigate anywhere near as much land in Peru — the author shows how sensitively balanced and controlled irrigation must be.

This, basically, is the problem in the Sahara today — economic and political systems just do not appear to have enough feedback (as opposed to brute energy) to prevent desertification from winning a few more acres, every hour, every day.

Bedoian's contribution takes apart the elements of the situation climate, agrarian landholding and techniques, cash and energy values of farm inputs and outputs of the study area (a region of Tunisia that once was part of a huge, rich and very much more green farming zone). His suggestions of what measures might be taken to limit erosion are very cautiously offered - that deep ploughing, goat grazing and the belief in subdividing land and therefore responsibility for it, among other things, should be limited. The importance of the contribution, and many of the others in both these books, is that wholly new areas of study are being covered with only the shortest of gaps between research and printing. It is to be hoped that sales of these AAAS Symposia might be such that sale prices can be reduced (another possibility is paperback editions).

Andrew MacKillop

Highway robbery

MOTORWAYS VERSUS DEMO-CRACY by John Tyme, Macmillan £6.95 hardback, £2.95 paperback.

John Tyme has gained some notoriety as a fanatical opponent of motorways. This account of the real campaign he has been waging should serve to set the record straight. Motorways versus Democracy is a temperate and factual account of how our parliamentary and democratic system of government is failing to deal, within the confines of the law of the land, with the issues and challenges of a technological age. 'Parliament no longer has control over expenditure; civil servants hold real power; our representative system of government has broken down', states Mr. 32

Tyme (p. 92), and he produces many illustrations to back this up. Though the book is concerned with motorway planning inquiries, he recognises that the problem is by no means unique to them. It affects also most industries which are driven on by what he calls the 'technological imperative': the oil industry, nuclear energy industry, computers, among others.

Mr. Tyme, a senior lecturer in environmental studies at Sheffield Polytechnic during the period covered by the book, argues his case against the background of Acts of Parliament and case law. For instance, the Highways Act, 1959, requires that the Secretary of State in proposing a road scheme must take into account local and national planning considerations, and hence that the departmental brief to any Inquiry should indicate how the particular local proposal fits into a national transport plan. But this has never been done. No national transport plan approved by Parliament exists to this day and it therefore follows that inquiries into a proposed motorway or other road scheme, have never been able to take into account how a local proposal fits into the national plan. The tactics at planning inquiries adopted by Mr. Tyme were to start with a procedural objection: that the inquiry was ultra vires the Act. How could any proposal for a motorway be presented to a local planning inquiry as prescribed by the Act, that is by showing how it fitted into national transport plans, when no such plans having Parliamentary approval existed?

No such plans exist even now, in spite of long-sustained efforts by members of Parliament to force the government of the day to produce them. The book lists many references to Hansard proving this. It is, indeed, unlikely that a national transport plan properly balanced between rail, road and waterways could be produced while the staffing of the Department is so heavily biassed towards roads. This inevitably gives disproportionate power to those outside interests concerned with road construction and use who have not been backward in establishing informal ways of influencing officials.

Mr. Tyme sets his account in the

framework of history, quoting Magna Carta, John Hampden, and many time-honoured *obiter dicta*. This gives the book a depth and interest which transcend current controversies.

The picture which emerges of Mr. Tyme himself is very different from the hot-headed fanatic too often painted by the mass media. Few readers, after finishing this book, will deny that he has waged his influential compaign disinterestedly, and at considerable cost to himself in money and peace of mind. If our democracy is to survive in this age of rapid technological innovation it will be due in no small measure to the efforts of the John Tymes amongst us. May the supply match the need!

Kelvin Spencer

OTHER BOOKS RECEIVED

Agricultural Records A.D. 220-1977. J.M. Stratton, John Baker £4.95. First published in 1969 and now brought up to date, this book makes compelling reading, but what a pity it concentrates so much on the weather and has nothing to say of the men and women who worked on the farms — their wages and conditions of service are surely an essential part of any agricultural record. The tables of comparative prices would be enhanced by the inclusion of an occasional note on the purchasing power of £1.00.

Acceptable Risks? Who says so? Trevor Timpson. A British Safety Council Publication. £1.00.

Small, succinct, full of useful material. The author discusses every aspect of the acceptable risk/ potential hazard, syndrome and concludes that in most cases factory accidents can be traced to human error and that health hazards could be very considerably reduced by greater attention to safety measures.

The Penitent Butchers. Richard Fitter, illustrated by Sir Peter Scott. The Fauna Preservation Society and Collins, £2.50.

Hidden behind the dreadfully offputting title is a book by the Hon. Secretary of the Fauna Preservation Society which will appeal to everyone concerned to arrest man's destruction of the flora and fauna of our shared environment. The hard won respect now accorded to the FPS and its status in the World-wide movement to conserve endangered species gives it a unique opportunity to educate future generations so that the obligation and necessity of preservation is never again in doubt.





Grange Farm Barn dominates the skyline of the Essex village of Coggeshall. It is one of the oldest timber-framed buildings in the world and, with its crown post roof, one of the most impressive. Thirty years ago it was the village hall, 10 years ago its condition began to cause concern and today half is collapsed and the other half is ruinous. For 800 years Grange Farm Barn was maintained before listed buildings and planning committees were even thought of. How has it slipped through our fingers in the last 10? Its decline, chronicled here, is symptomatic of our efforts to save neglected buildings which, too often, are pusillanimous and unsuccessful.



Victims of Apathy

LEFT TO ROT. Architects' Journal November 22, 1978. Architectural Press Ltd. 35p.

This devastating report, specially compiled by Timothy Cantell and George Allen for Save Britain Heritage, concerns the thirty thousand and more historically important and architecturally significant buildings of Britain that are already, or shortly will be, lost to posterity. It should be read and distributed as widely as possible.*

The abysmal story it unfolds of historic and listed buildings left to rot or torn down, less for the expected purposes of development and road building, than through official apathy and public indifference, is calculated to set boiling the blood of anyone who has ever stopped to gaze appreciatively at the grace and proportions of some of the country houses, town halls, Regency terraces, farmhouses, barns and churches that our forefathers built.

Thousands of such buildings, both large and small, disappear every year; no register is kept, no regular checks are made, few penal-

ties for failure to comply with the terms of listing are imposed and worst of all there is a huge loophole through which those who want to be rid of a listed building may jump if it decays enough, permission to demolish it on grounds of public safety can be obtained. Local authorities too often turn a blind eye to the deterioration of buildings in their administrative area, either because they simply do not care, or because they are too weak to use the powers they have to bring offenders to heel. While owners themselves may sometimes be too poor to finance repair work they are more often ignorant of their responsibilities; lack of information, encouragement and guidance may be the real cause of irreparable neglect which could well have been averted by grants or other forms of help. The owners of rotting buildings are not, however, confined to private individuals but include public bodies like the Post Office and National Coal Board; ecclesiastical bodies, commercial companies, Corpus Christi College, Oxford, Barclays Bank and others who should know better.

because it is not only a record of the many superb buildings that, like the barn illustrated here, are being lost when they could have been saved. but is a record too of a chronic lack of action by the responsible authorities. An enormous effort is needed to stop further deterioration and the authors are to be commended for the depth of their inquiry and the valuable practical information their report contains. They end with fourteen recommendations for action including much more money being made available for repairs - (as they point out there is sheer waste involved in allowing a house to fall into decay when it could be repaired to livable standards) - powers for repair to be carried out on any listed building at the expense of the owner; greater responsibility by local authorities; tax and VAT relief and the setting up of a new Historic Buildings Agency. The Save Britain Heritage should be given every support in their effort to get these measures adopted.

Ruth Lumley-Smith

The report is doubly depressing

Offprints are available, from Save Britain's Heritage, 3 Park Square West, London N.W.1, at 50p each, post free.

A Chronicle of Collapse – Coggeshall Barn 1140-1978

1140	Land granted by King Stephen and Queen Maud for foundation of Coggeshall Abbey	Nov	ECC serves repairs notice but takes no further action. Repair costs estimated at £25.000.		to Secretary of State: ' in the present economic climate they feel they cannot take any
1150	Barn built.	1974			action which would involve any
pre		June	Owner agrees to present barn to		financial burden, and request the
1539	Part of barn roof reconstructed.		ECC on condition that it re-		Secretary of State to purchase the
1539	Abbey dissolved: barn and land		moves it to another site.		barn and restore it at its own ex-
the state	sold off.	Oct	Secretary of State accepts desig-		pense if he considers it warranted'.
1958	Present owner buys Grange Farm		nation of Coggeshall Conserva-	1977	
	and barn.		tion Area as 'outstanding'. Search	July	ECC decides to ask Secretary of
2960	Barn becomes disused.		for new uses fails: nearby owner	0	State to interveneo
1966	Barn listed grade II (it ought to		refuses to allow access via his	Aug	One further bay of barn collapses.
	be grade I).		land. Owne applies for consent	Oct	ECC decides to take no further
1967	Coggeshall Society expresses con-		to dismantle for re-erection.		action: no reply from DOE.
「美」	cern at condition of barn,	Nov	Costs estimated at £35,000.	1978	•
1968	Barn included in Conservation	Dec	Grange Barn Fund formed by	Mar	Little over half of the barn now
	Area.	•	local residents.	计位 如果 计	standing. Costs of repairs esti-
1969	Local request for service of re-	1975			mated at £65,000.
	pairs notice.	Mar	Fund offers to take responsibility	May	DOE indicates willingness to give
1971			for restoration. Owner informally		a 'substantial' grant for dismant-
Jan	Coggeshall Parish Council offers		agrees to grant lease but then		ling and re-eredction elsewhere but
	to buy barn: offer rejected. Essex		changes his mind.		declines to take any responsi-
	County Council surveys building.	Apr	Owner applies for consent to de-		bility directly.
May	DOE refuses to help and refers		molish.	Today	
	ECC to Historic Buildings Coun-	Sept	Major collapse of two bays at	de ser se	The Grange Barn Fund has re-
	cil.		west end of barn.		luctantly agreed to organise the
1972		Nov	Public inquiry into application.		removal of the barn and is study-
Feb	Section 101 notice served: three		Costs estimated at £45,000.	•	ing the formidable problems in-
	bays (the barn has six) at east end	1976			volved. Essex has now agreed to
	stabilised by ECC.	Apr	Consent for demolition refused.		carry out further stabilisation
1973			DOE accepts inspector's report		works if Braintree agrees to match
Jan	HBC says in view of attitude of		that barn of extreme import-		the £2000 it has set aside for this.
	owner pointless to recommend		ance . Money for repairs allocated		Braintree has yet to decide whether
	grant unless ECC acquires build-	Oct	Breintree District Council		to make the money available.
	ing. ECC negotiations for pur-	Oct	brantiee District Council de-		
24.4667-1	chase of barn in situ fair through.		cides to take no action and writes		



Taboo to you

Dear Sir,

After reading a couple of atrocious articles in your Sept. - Oct. New Ecologist, I almost considered not renewing my membership of your publications. However thanks to the excellent and competent articles, 'The National Cancer Institute and the Fifty-year Cover-up' and 'Wasting Away', in your Nov. - Dec. issue, the balance has more than been restored.

The article that angered me most in the Sept. - Oct. issue was by your editor Nicholas Hildyard, namely 'There's more to Food than Eating'. As I am a member of several Wisdom Traditions [ancient and modern] which hold a lot of deeper knowledge about man's Spiritual, Psychic and Material situation, I feel qualified to say that Mr. Hildyard showed little or no discernment as to why certain food sanctions were given, along with laws, to certain peoples at specific times in history [by their religious leaders]. Also to place on a par regulations stemming from Religious Traditions of widely varying status is a terrible error commonly found among those who have little esoteric perception.

In general I felt he drew too much from Anthropological sources which tend, apart from being very materialistic, to prefer abstract academic speculations rather than the true Reality. He would do far better [in the future] to draw from Anthroposophical sources, which contain valuable knowledge on the constituents which make Man very much more than just a Man-animal.

One sad thing I felt was to characterise 'the rise in vegetarianism' as a mere 'symbolic statement of difference', because this automatically labels all the other 'Alternative' Movements, such as Alt. Medicine, Education, Technology, Politics, Ecology etc., in a similar way. These all have their roots in a great stirring in the depths of Man which has led the more perceptive of us to see how far Man has perverted and distorted the [indispensable] laws that are woven into every level of existence, and have thankfully given us the chance to mobilise and coordinate all the Human fight-back potential so as to pull Society and the Life

Structure of this Planet back from the brink of global disaster.

To undermine the reason which animates any of these Alternative Movements is to undermine the foundation stone of the Ecological Movement. My clearest image of the article was that it presented poorly understood subject matter in a badly organised form verging on the self-contradictory at times.

As I have read good articles by Nicholas Hildyard in earlier issues, all I can say is that it would be far better for the Ecologist if he did not write on Religio-Social-Food questions until he has availed himself of the higher knowledge essential for an in depth understanding of such complex matters.

Yours sincerely,

Johnny Johnston, Editor of *Qabalistic Research Publications*, *Edinburgh*.

Not a LEG to stand on

Dear Sir,

The report by Keith Rushford on the Liberal Assembly 'Ecology Motion' was, on the whole, fair comment and certainly factually correct, but Keith's assessment of the facts was somewhat biased. To say that it was 'a sad day for Ecology' implied that there had been some retrogressive movement by the Liberals when, in fact, the reverse is true. Surely it is a good day when the third largest political party: 'Believes that it is the duty of the Government to . . . protect the future from despoilation and desecration by the present'; 'Recognises that . . . social and economic policies of maximum consumption are having a disastrous effect on resources' and 'Affirms that if an ecological approach is not adopted . . . all other political initiative will be to no avail'.

LEG is aware that the resolution was inadequate ____but we must learn to walk before we can run. Our first task was to get the party hierarchy to acknowledge the need for change — from conventional thinking to an entirely new concept. The Party already has many admirable Ecopolicies but they are all on specific issues, unrelated to other subjects. Our aim was to point out that this is not enough, what is needed is a holistic view and an integrated approach, and we believe that this has now been accepted by a large section of the Party although, doubtless, many remain to be convinced or enlightened. Nevertheless, the passing of this resolution, in spite of its shortcomings, commits the Party to an ecologically based strategy from now on.

We believe that LEG has had some impact on the Party, it has made its presence felt in a number of ways and was responsible for reshaping some of the resolutions (which lacked 'Eco-Logic') through LEG members who are also members of the party's advisory policy panels and we have been consulted on many matters by those who are in a position to shape party policy. We noted a much greater sense of 'Ecological awareness' at the Southport Assembly, we enrolled many new members; and applications, enquiries and requests for our magazine (Threshold) are still arriving daily. We also have a very full programme for this year with invitations to attend or speak at meetings and conferences all over the country.

Hopefully, this will lead to far more radical events at the next Liberal Assembly.

Yours sincerely, Doreen Elton (Co-founder & membership Sec.) Liberal Ecology Group, Storrington, Sussex.

Chipping away

Dear Sir,

I was pleased to see that your last issue contained two articles on microprocessors. These were mainly concerned with unemployment, but surely as Ecologists we should be just as concerned with the possible consequences for natural resources and the environment.

Microprocessors may appear at first to save energy and resources, but this has been greatly overestimated. For example, they may monitor petrol consumption in cars and thus save a few miles per gallon. But this will surely allow more miles to be travelled, thus restoring total consumption to its original level. It has been argued that a 'chip-controlled' factory would not require heating, as there would be no people in it; but the people who would otherwise be working there will still need heating somewhere else (unless they are to spend all their time out of doors).

Far more important, however, are the longer term implications. In a few years, the microprocessor revolution will make available many more consumer goods, right throughout the world. This will immensely increase demand, and meeting it will require far more natural resources and will put more pressure on the environment due to congestion and waste. These effects may far outweigh the marginal benefits which may occur when micro-technology is first applied; indeed the boom could quickly collapse because of these difficulties.

We must therefore present the horrors of massive unemployment and resource shortages. In coping with the microprocessor revolution, the ecological answers still apply: create more jobs in industries and agriculture which use fewer resources per person employed and which put less pressure on the environment. We shall have to consider very carefully whether some judicious use of microprocessors might be appropriate in an ecological society.

Yours faithfully, Ruth Cohen, London Branch, Ecology Party.

Classified

CONFERENCES & COURSES

SOIL ASSOCIATION ORGANIC HUSBANDRY COURSE April 8 — 12 inclusive at the Shropshire Farm Institute, Baschurch, Walford, Shrewsbury, Salop.

The course will include soil structure and plant nutrition, followed by lectures on the practical application of organic methods on the farm and in the garden, small-scale husbandry and the homeopathic treatment of animals. Visits to an organic farm and a herb nursery are also included. Course fee of £40 includes accommodation, tuition and meals.

Details and booking forms from: THE SOIL ASSOCIATION, Walnut Tree Manor, Haughley, Stowmarket, Suffolk IP 14 3RS. S.A.E. please.

PRELIMINARY ANNOUNCEMENT: The 1979 International Federation of Landscape Architects World Congress and the Landscape Institute's Golden Jubilee Conference will be held jointly at Cambridge University from 6th to 8th September, at Jesus', King's and St. John's Colleges. For booking forms and further details write to: The Congress Secretary, IFLA/LI Congress 1979, Derek Lovejoy and Partners, Forest Dene, Worth, Crawley, Sussex, RH10 4RY, England.

IMPLEMENTING THE CONTROL OF POLL-UTION ACT, 5-7 March 1979. Residential seminar at School for Advanced Urban Studies, University of Bristol. Fee £70.00 (reductions available). Bookings and further information from Course Secretary, SAUS, Rodney Lodge, Grange Road, Bristol BS8 4EA, Tel. Bristol (0272) 311117. EVERYTHING KEEPS GOING PERFECTLY. Not everyone sees life this way. Some training is needed. Part of that training is offered in our 6-day courses to those who are no longer willing to allow their lives to be dominated by problems. We are a community of 15 people, living on an organic smallholding in beautiful countryside. Write for details to: The Director, The Brackenber Trust, Brackenber, Appleby, Cumbria. Tel. Appleby 52145.

PLANT FOODS FOR HUMAN HEALTH with special reference to THE DISEASE OF AFFLUENCE AND THE NEEDS OF THE DEVELOPING WORLD. Dr. Frey Ellis Memorial Lecture to be given by J.W.T. DICKERSON, Professor of Human Nutrition at the University of Surrey, Thursday, March 29th at 8.00 p.m. Vegan Buffet 7.00 -7.30 p.m. at: Friends' Meeting House, 52 St. Martins Lane, Westminster. Collection in aid of the Dr. Frey Ellis Research Fund. Details and background literature: Vegan Society, 47 Highlands Road, Leatherhead, Surrey. S.A.E. please.

PERSONAL

RAPPORT is the intelligent person's introduction service. Whatever your age, location or preferences, enrich your quality of life immeasurably with RAPPORT — and rediscover the joy of living. Special introductory rates this month for men over 45. S.a.e. for details to RAPPORT, P.O. Box 94, Oxford.

TWO FEMINISTS BUYING HOUSE to raise children in, need sympathetic male help as GLC only mortgage big houses to engaged couples. Man must be under 30, on rising scale of pay (GLC conditions) and around 6-9 months preferably emigrating, or becoming unemployed or non-employed, or disappearing without trace after that, and using pseudonym, but anyone considered. £50.00 reward if necessary. London area. Box No. 131.

SITUATIONS VACANT

THE LAST ANTI NUCLEAR FESTIVAL after its great success at the Almost Free Theatre in London is now going on tour. It comprises three theatre shows, films, exhibition, street theatre. If you are interested please contact: Manfred Waffender, INTER ACTION, 15 Wilkin Street, London NW5.

TUSCANY - 17 miles from Florence. Couple, (30s) having rented property with vines, olives, forest, and enormous possibilities are looking for girl/couple interested in active life in countryside. Bee-keeping, animals, biological vegetable garden, artisanal activities. Disposed to share fully. Write to: Feneira-Soares, Fiesso 10, Pagiano a Paterno, 50060 Pelago, Florence, Italy.

IMMEDIATE OPENING IN JORDAN for experienced horticulturalist, with knowledge of vegetable growing and market gardening, to direct developments of a pilot arid land recovery project. Ability to organise, lead and motivate people, and immediate availability essential. Terms negotiable. Apply with CV to Green Deserts Ltd, Rougham, Suffolk, or phone Beyton 70265.

FREE FOOD AND ACCOMMODATION, (summer – showman's wagon, winter – out-building) to female econut in exchange for occasional limited help with family (five boys). Suit person doing own thing. Small, remote village. Garden. Stow-on-Wold 30537.

BOOKS & PUBLICATIONS

THE COMING AGE: magazine of the primordial religion of the one Goddess. A faith in harmony with nature, against patriarchal urban rationalism. 35p, Lux Madriana (NE), 40, St. John St., Oxford.

DIRECTORY OF ALTERNATIVE COMMUN-ITIES lists many such groups, £1.50 (cash with order, please) from The Teachers (MG2), 18 Garth Road, Bangor, N. Wales.

CLASSIFIED ADVEF	RTISEMENTS MUST BE PR	REPAID.	
To: The Ecologist Adv Please insert the follow Cheque/P.O. to <i>The Ec</i>	vertisement Dept., 73 Moles wing advertisement in the n cologist enclosed.	worth Street, Wadebridge, Cor ext issues.	nwall.
Word rate 10p per word.	Box No. 50p. Minimum charge	£3.00].	
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Name: (Block letters p Address:	olease)		
Date:		Signed:	

WORLD SYMPOSIUM ON HUMANITY The Wembley Conference Centre. 7th-14th April, 1979

THREE SIMULTANEOUS EVENTS LOS ANGELES TORONTO LONDON

POPULATION & HEALTH	PROF. WORSLEY MARCUS MCCAUSLAND MARCEL MARCEAU STAFFORD BEER	ENERGY	AMORY LOVINS
TECHNOLOGY & HUNGER	R.D. LAING CORRIE VAN LOON	FOOD	LAWRENCE D. HILLS
ECONOMICS & POLITICS	AMORY LOVINS AURELIO PECCEI JAMES ROBERTSON	THE FUTURE OF INDUSTRIAL SOCIETY	EDWARD GOLDSMITH JAMES ROBERTSON RONALD HIGGINS
ENVIRONMENT & COMMUNITY	RAM DAS BISHOP VERNEY PIR VILAYAT KHAN	HUMAN SETTLEMENTS	ZENA DAYSH
	KIT PEDLAR JAMES CAMERON TONY BUZAN	THIRD WORLD	JIMO OMO FADAKA
HUMAN RIGHTS	AL HUANG	RECLAIMING THE DESERTS	RICHARD ST. BARBE BAKER
SCIENCE, SPACE & FUTURE	PROF. KEYSERLING FRANK HERBERT SATCHIDANANDA	TREES FOR PLANET EARTH	ALAN GRAINGER
RECONCILING MAN & NATURE	JOHN DAVY SIR PETER SCOTT	A SPECIAL FEATURE FOR THE LONDO EVENT WILL BE EARTHSHOP Details: Tickets from £3 (a session) Humanity Foundat Playspace, Peto Pla	
Contribute your experien EARTH OUR COMMON	ce and insight to the theme GROUND	to 200 (Whole Week)	Marylebone Road, London NW1.