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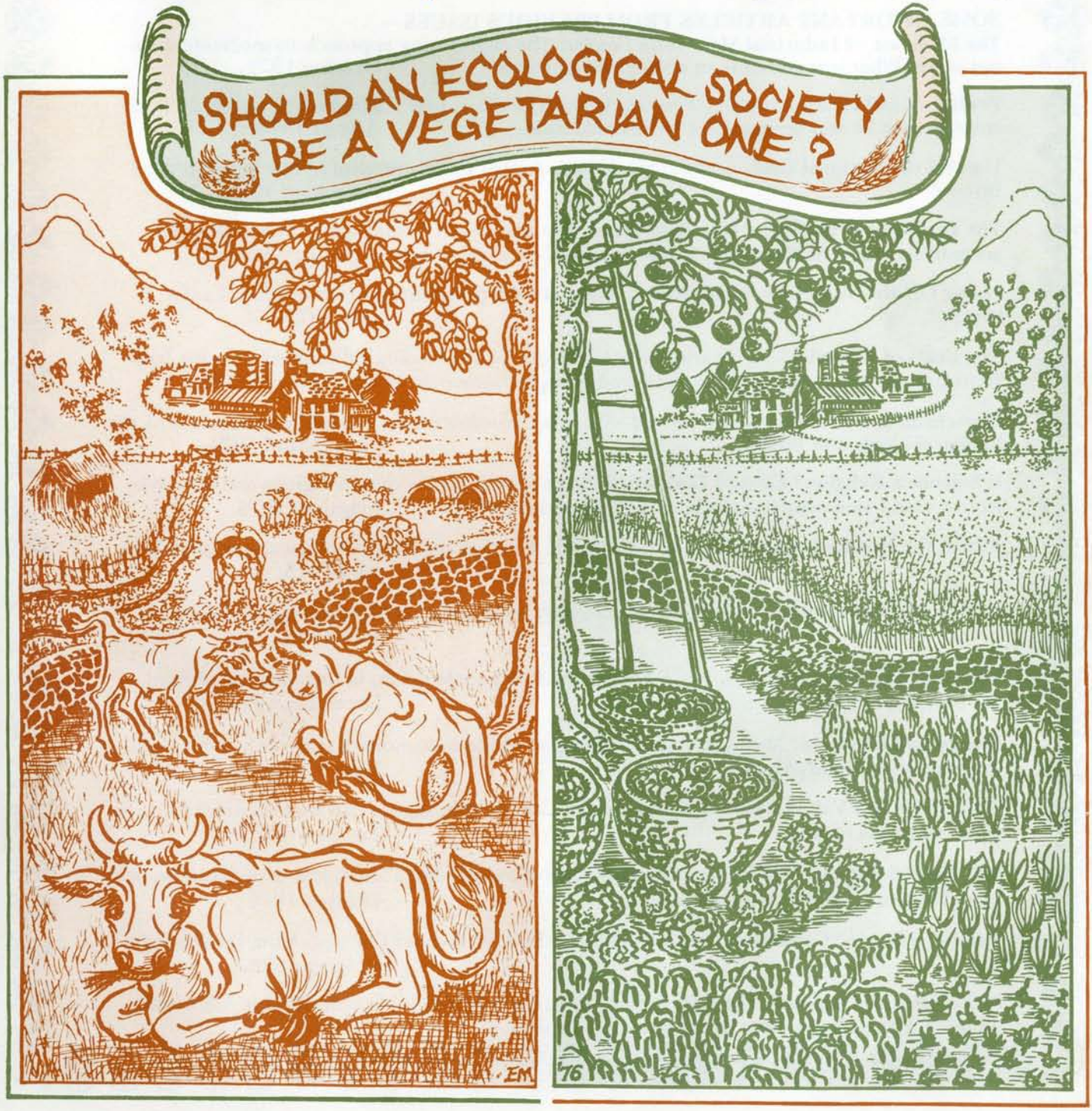
Gearing up for the Plutonium Economy

by Peter Bunyard



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In this issue

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Editorial

What is an Electric Toothbrush ?

Let us suppose that an electric toothbrush blows away from Earth and lands up on Mars, and that it is presented, with the appropriate pomp and ceremony, to the Martian King.

Let us also suppose that he is a man of great intellectual curiosity and that he reacts by calling on the planet's chief scientists to subject it to a thorough examination.

Let us also suppose that Martian scientists cherish the same illusions as do ours as to the nature of scientific method and that, again like ours, they try to understand things by breaking them up into their constituent parts (reductionism) and explaining their behaviour in terms of observing single one-way cause-and-effect relationships (induction) in the artificial conditions of a laboratory from which all "extraneous" factors are systematically excluded (isolationism).

This would undoubtedly enable them, after the appropriate research, to provide the King with volumes of statistics, graphs, tables, footnotes, references and appendices — which would provide, between them, a detailed description of each individual bristle and its component atoms and molecules.

It would *not* enable them, however, to establish the one important thing to know about the electric toothbrush and that is — what the absurd device is actually for, and hence, for general purposes, *what it is.*

Our scientists here on earth are in the same predicament. Over the past decades billions of pounds have been lavished on scientific research of every description, and though millions of tons of scientific data may have been accumulated on practically every subject, our scientists have come to no conclusions as to what living things, and in particular man, are for and hence *what they really are.*

As Rattray Taylor has said, "the only conclusion that has ever been reached by scientific research is that more money is required for scientific research", so that in other words our scientists can keep on indefinitely accumulating more and more useless data.

It is probably our social scientists who are the most blind to the basic realities of the subjects they are supposed to be studying.

For instance they continue to regard the family as something archaic that we have inherited from our primitive past, that serves more than anything else to exert unnecessary constraints on its members, thereby preventing them from developing their individuality.

They still regard a society as nothing more than a mass of individuals who happen to live in the same geographical area and are governed by the same institutions.

In other words, our sociologists have not even understood what a family and a society are. Why? The answer is because they have not asked *what they are for.*

Today's scientists wince at the suggestion that the behaviour of natural systems is purposive or directive, that, in fact, they have been designed to do particular jobs like electric toothbrushes. This, they maintain, implies 'teleology' — which is surprisingly enough still one of the principal taboos of the Religion of Science.

Needless to say, *behaviour within the biosphere is purposive,* as has been pointed out on very many occasions in this journal. The evolutionary process which designed the biosphere is adaptive. That means that it moves in a specific direction, i.e. it is purposive or directive. What is more, if we examine it in terms of a grand theory of behaviour, we can easily establish that the direction is towards stability.

Stability is defined as the ability of a system to maintain its structure in the face of change, i.e. to reduce discontinuities to a minimum: survival in fact, taken in the narrowest sense of the term. The implications are massive, enough to change the very nature of Science. Once we know *what things are for* within the biosphere, we are in a position to determine whether they are working properly or not — whether they are sound, in fact, or aberrant. *We can, in fact, judge them.*

It must be noted that this is something that our scientists refuse to do today. They are willing to provide us with the tools for achieving a specific goal but they refuse to say whether this is the right goal or not. According to them, whether we choose one goal or another is purely a question of individual preference, a 'value judgement' in fact, which implies that behaviour within the biosphere is random — a puerile imbecility.

Once we know that stability is the correct goal, however, behaviour can be judged objectively and, in fact, 'scientifically' (if the term is to have a useful meaning). A healthy organism is then a stable organism — a principle accepted by Audy who writes, "Health is a continuing property, potentially measureable by the individual's ability to rally from insults, whether chemical, physical, infectious, psychological,

or social." An ecosystem can then be regarded as healthy to the extent that floods, droughts, plant epidemics and other discontinuities are reduced to a minimum. A society can then be regarded as healthy to the extent that it is culturally geared to avoid the sort of crises to which ours is increasingly subject — in other words to the extent that it displays continuity or stability.*

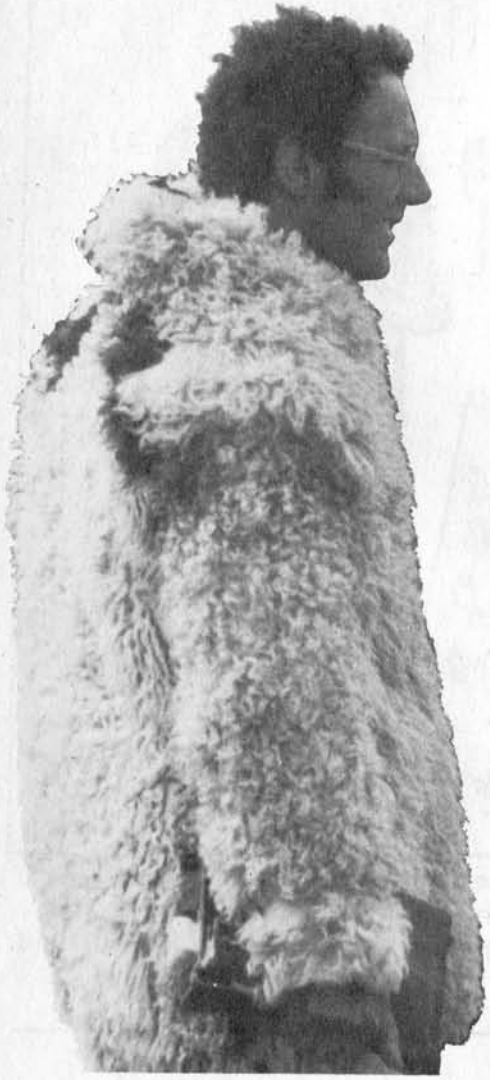
In addition, once we accept that stability is the goal, scientific research, rather than consist in the random accumulation of data, can now consist in striving to understand exactly how the behaviour of different natural systems actually contributes to the achievement of this goal in the specific conditions in which they live. This, of course, cannot be determined by studying natural systems in isolation from each other, but by examining them in the light of a general model of behaviour or unified science.

This approach would reveal to our sociologists that the extended family and the small community are the basic units of human social behaviour, without which it cannot achieve a stable relationship with its environment. It would also enable a hypothetical Martian to understand what is an electric toothbrush and just how aberrant is the society in which the production of absurd devices of this sort has become the dominant goal of social policy.

Edward Goldsmith

* Audy - *Man - The Journal of the Royal Anthropological Institute*, October, 1976.

"1 part per million fluoride cuts tooth decay by half, and solves our problems.
2 parts per million cuts the population by half and solves yours!"



Peter Bunyard at Windscale.

Gearing up to the Plutonium Economy

by PETER BUNYARD

On Wednesday evening September 29th, 1976, the Cumbrian County Council, under its chairman Stephen Murray, held a public meeting in Whitehaven's Civic Hall at which British Nuclear Fuels Ltd., having already submitted proposals in June, answered questions and criticisms about its plans for future development of the Windscale nuclear site.

Only a couple of years ago it would have been unheard of for the British nuclear industry to have to defend and justify its activities to the public. Indeed, six years ago, a demonstration against the proliferation of nuclear power, held on the same day as the Easter Aldermaston march, could muster only some 20 people. Times are changing. At last we in Britain have begun to wake up to the realities of nuclear power and the inevitable growth of the plutonium economy. It is right that the issues should be raised, and it is right that everyone in Britain should know something about them.

The Wasteland

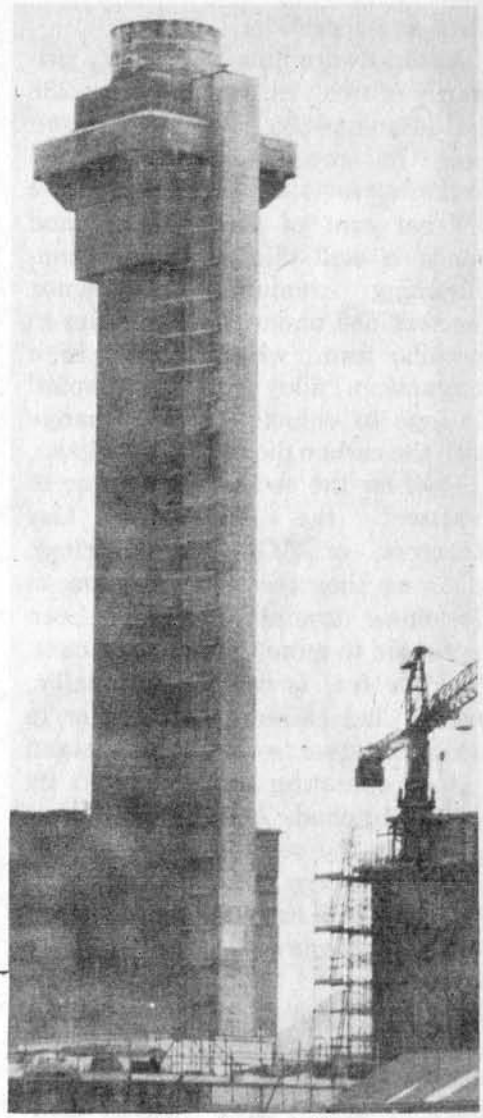
Down by Workington Harbour the eye meets that derelict emptiness which is the hallmark of man the industrialist. Big holes pit the ground and even the shoreline with its long expanse of marshy flats does nothing to entice the visitor. At one end stand a few terraced rows of dilapidated Victorian workers' houses, their lintels vividly painted as if to defy the soul-grinding drabness of the environment. Industry is still there. Splendid in its isolation squats a cluster of oil storage tanks and away over the other side of rubbish tips and attempts at land reclamation lies Workington's big industry, a BSC steel works, itself dominated by its own mountain of waste.

Workington is in Cumbria overlooking the Irish Sea and behind it, still visible in the mist and rain clouds, lie the fells and lakes which make for some of England's most spectacular scenery. Because of those hills, places on the Cumbrian coastline like Workington are effectively buttressed off from the rest of England, and they are effectively forgotten by an 'economising' government. That isolation serves another purpose. It means that the government can put industries there that, both for security and safety reasons, need to be kept in regions of scant population. Thus in wartime the government built a munitions factory on the western reaches of Cumbria, and it is on that site, still shrouded by the Official Secrets Act, that Windscale's nuclear complex stands, with its reactors, cooling towers and reprocessing works.

From up on the hills overlooking Whitehaven all one can see of Windscale are the twin peaks of the number one and number two piles, both now defunct, and the vapour from the Calder Hall cooling towers. Those piles are a monument to the potential dangers of atomic reactors, for in October 1957 the fuel in the number one pile caught fire, and

On November 2nd Cumbria County Council approved British Nuclear Fuel's application to expand its reprocessing facilities. That decision, made in the face of growing public concern, gave the Secretary of State for the Environment 21 days in which to call the application in. At a meeting in Trafalgar Square on November 22nd, Hugh Montefiore, Bishop of Kingston, warned that Peter Shore had a moral obligation to do this, and Lord Avebury, the Liberal peer, said it was 'breathtaking' that the Minister could dream of leaving such a vital decision to a county council. Shore has not called it in and thus, by a terrible default, we are drawn inexorably into the plutonium economy.

STOP PRESS: Minister says he needs time to think!



Windscale No. 1 Pile.

despite a filter over the pile, some 20,000 curies of iodine-131 and equivalent amounts of other radioactive particles, including strontium-90, were vented into the atmosphere. Whitehaven's inhabitants were lucky. The radioactive plume was at first driven towards them in a north-easterly direction, but the wind veered, carrying its toxic burden inland over Cumbria and then south-east over Denmark. As it was, in London more than 300 miles away radiation levels peaked at 20 times their normal reading, and in the countryside around Windscale several hundred thousand gallons of milk had to be poured away until the danger of radioactive iodine contamination had passed. Concrete was poured down both atomic piles to seal them 'forever'.

Right up into this century West Cumbria enjoyed a certain prosperity. The haematite mines provided iron for the steel works, and its fine quality coal, mined from under the sea, kept American industry going for years. Then Whitehaven was a rich man's town with its planned streets and Georgian houses, while Workington, a few miles to the north, was at least humming with humanity, even though its people were the slaves of industry. But iron ore from Spain proved cheaper despite the cost of shipment, and many mines were closed down; while coal proved too treacherous when nigh on two hundred miners lost their lives in separate accidents. The precedent for obliterating the past was set; concrete was poured down the two mine shafts.

Since these times the people of West Cumbria have known the depression; indeed it is still with them in an unemployment rate of 10 per cent. That depression, too, goes some way to explaining the unfettered enthusiasm of many of the local working population to any proposals for future development of the nuclear site, and consequently prospects for employment.

The number one and number two piles were for the production of plutonium for nuclear war heads and their closure late in 1957 coincided with Britain opting out of the nuclear arms race. To emphasize the point, the Queen opened the world's first commercial nuclear power station in 1956, just the other side of the Calder river from the Windscale site, and that reactor together with three other neighbouring Magnox reactors came to be known as the Calder Hall reactors. Because of the need to extract plutonium from the irradiated fuel of the two original nuclear piles, a reprocessing plant was commissioned in 1951. By the early 1960s that reprocessing plant was clearly inadequate for the quantities of irradiated fuel coming not just from the four Calder Hall reactors but from 10 other Magnox reactors operating around Britain, and consequently, in 1964, BNFL and the UKAEA brought a new reprocessing

plant into operation.

Natural uranium consists primarily of two isotopes, uranium-238 and uranium-235. When extracted from its ore, uranium-235, the fissioning isotope, forms only some 0.7 per cent of the mixture, and hence is well diluted by the non-fissioning uranium-238. Magnox reactors use unenriched uranium in metallic form, which is clad in a magnesium alloy can with spiral flutings to enhance heat exchange with the carbon dioxide coolant gas.

Fuel for the second generation of reactors, the Advanced Gas Reactors, or AGRs, is enriched, meaning that the concentration of fissioning uranium-235 has been increased to more than two per cent. And the fuel is oxide not metallic, and is clad either in zircaloy or in stainless steel so as to withstand higher operating temperatures. By being enriched, AGR fuel will last longer in the reactor core and give out more energy.

Thus AGRs have a 'burn-up time' of 18,000 Megawatt Days per tonne fuel compared with 3000 to 4000 MWD/te of Magnox fuel. But a heavy penalty has to be paid for that higher burn-up: the fuel elements become much more heavily irradiated than they do in Magnox reactors, and hence are far more difficult to handle during reprocessing.

Sir John Hill, chairman of BNFL, has reluctantly had to admit to difficulties. "Processing irradiated fuel from commercial nuclear power stations is very much more difficult than anyone imagined ten years ago," he said in the 1975 Cockroft lecture. "At that time all the countries thought they understood what was required . . . All the experience of large-scale processing of nuclear fuel was at irradiation levels of, say, 500 MWD/te. This would now be regarded as the medium active stream."

In the light of an unexpected accident at BNFL's reprocessing plant at Windscale in September 1973, Sir John's statement is wonderfully euphemistic. In order to get some experience of reprocessing oxide fuel, BNFL had installed a small pre-treatment plant, the Head End plant, in association with the Magnox reprocessing plant. According to Nuclear Engineering International no more than 120 tons of irradiated oxide fuel had passed through the Head End plant when there was a sudden blow-back caused by the undetected build-up of solid ruthenium-106. Consequently, 35 reprocessing workers became contaminated with ruthenium, which emits highly penetrating gamma radiation, and the plant was immediately closed down. BNFL is quietly up-grading the Head End Plant and is hoping for the refurbished plant to come into operation by 1978 with a throughput capacity of 400 tonnes per year. Meanwhile some 1500 tonnes of Magnox fuel are being reprocessed each year.

BNFL has not had to ask the Council's permission for refurbishing the Head End plant because the building and plant already exist. On the other hand the company has had to ask permission to build an additional reprocessing plant at an estimated cost of several hundred thousand pounds to come 'on stream' a decade or so from now. The purpose of that building is to create reprocessing facilities for the spent oxide fuel coming from the AGRs that are themselves just beginning to come into operation, some, like Dungeness B, many years behind schedule. The new reprocessing plant is expected to process some 1000 tonnes of fuel each year. Yet, as Nuclear Engineering International pointed out in February 1976, the total quantity of spent fuel from the 5000 megawatts of AGRs is not likely to exceed 200 to 300 tonnes per year; hence the reprocessing capacity of the new plant will be far in excess of Britain's needs. As is known from press reports, BNFL is hoping to take up the excess capacity and hence help pay off the capital and running costs of the plant with spent fuel from other countries. At present, BNFL is negotiating with Japan for its spent oxide fuel, even though Japan is not a signatory to the nuclear non-proliferation treaty.

BNFL has been reprocessing spent fuel for a number of years, some of it imported from Italy and Japan. Why then the sudden furore about the new oxide reprocessing facilities? Undoubtedly the fuss has come about because people have at last tumbled to the significance of having an economy based on a nuclear power energy source, and THORP, the oxide reprocessing plant, represents the next big phase in the development of nuclear power. Hence it is an obvious target for those opposed to atomic energy. At the Council meeting Dr. Paul Smoker, a lecturer at nearby Lancaster University, spoke for the local Cumbrian Friends of the Earth, and for Half-Life, an organisation opposed to nuclear power. He made it clear that neither FoE nor Half-Life were opposed to two of BNFL's proposals, namely to build a new Magnox fuel reprocessing plant, and to develop the HARVEST vitrification process for containing long-lived potent radioactive wastes in solid glass form. But both groups were strongly opposed to the construction of THORP.

Their opposition to THORP is based on the following grounds. It is an extremely expensive unproven technology and every attempt to date to reprocess highly radioactive spent oxide fuel has met with some kind of disaster. The blow-back incident at Windscale is one example, but American experience is equally telling. Fuel from American Light Water Reactors (LWRs) is all in oxide form and has a burn-up rate of around 30,000 MWD/te, which is ten times higher than Magnox fuel. Three different plants have been designed to reprocess the LWR spent fuel. One, the West Valley plant in New York, has been idle for four years, and according to Half-Life is losing Nuclear Fuel Services Inc. millions of dollars a year. To start the plant up again the company is demanding a contract reprocessing price of more than one million dollars per tonne — a price guaranteed to keep every customer away. The plant at Barnwell in South Carolina should have been completed by 1974 and costs are escalating rapidly. As for the third plant at Morris in Illinois, costs are now reckoned at 1.5 million dollars per ton of fuel reprocessed, which is 25 times the original estimate; nor is there any guarantee that the process will work. Meanwhile in Japan, the Tokai Mura plant designed for an annual output of 210 tonnes of oxide fuel has been delayed.

Far from being discouraged by the world-wide failures to get a large-scale oxide reprocessing plant to work, nor put off by its own problems with the Head End plant, BNFL believes it has the necessary expertise to be first in the field with a successful and economically viable THORP. And as Peter Mummery, BNFL's general manager of the Windscale plant, pointed out at the council meeting, a prime purpose of BNFL is to provide reprocessing facilities for the spent fuel coming from Britain's nuclear reactors.

Let us assume, like Smoker, that THORP is part of a broad-based nuclear strategy. Why then should we oppose it? The opposition hinges on three different aspects of nuclear power: on the consequences of bad accidents within reactors or even reprocessing plants; on the consequences of plutonium stealing; and on the growing, insoluble problem of coping with radioactive waste.

Because Windscale has become a reprocessing centre, it makes more sense for objectors to THORP to focus their attention on what happens to radioactive waste after reprocessing. Yet, as pointed out by Smoker, Windscale is an integral part of a future economy based on plutonium fission in fast breeder reactors. And if, as seems likely, the government decides to establish a fast breeder programme, that decision must actively be opposed. How can any government presume to put upon future generations the guarding for ever of radioactive waste and of derelict reactor systems?

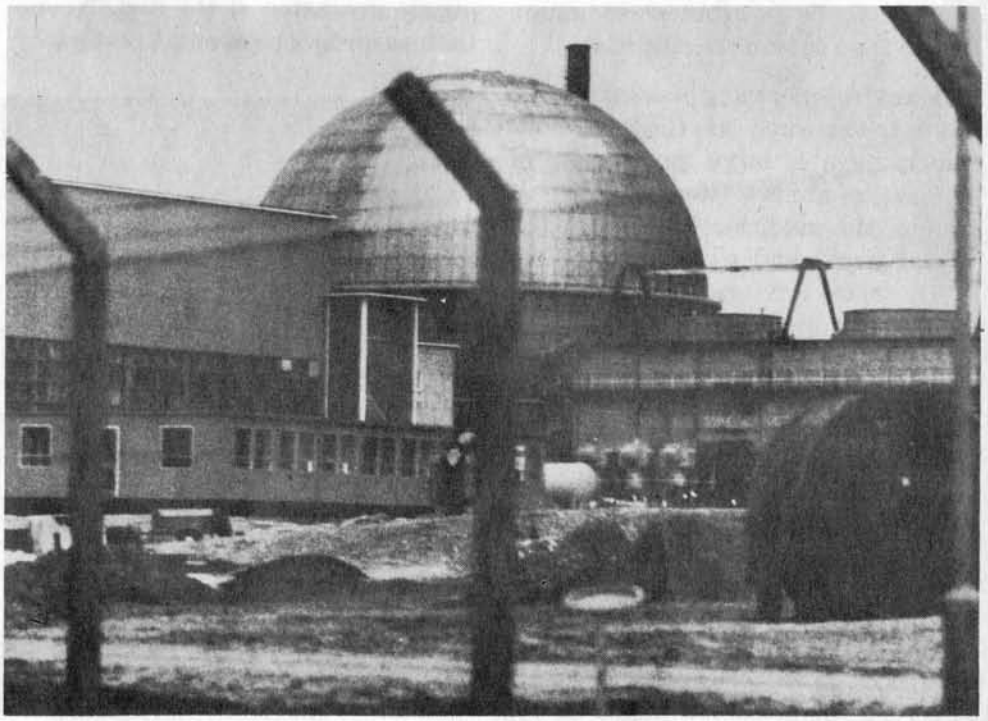
Not that the locals of West Cumbria are too concerned about the broader implications of nuclear activities at Windscale. At the meeting there was a pretty sharp dividing line between those for BNFL's proposals and those against. On one side of the hall sat a solid phalanx of BNFL's upper crust, the scientists, technicians and managers, with a sprinkling of reprocessing workers behind them. On the other side sat the opposition, many of whom had travelled from far. It soon became clear that many of the locals resented outsiders telling them what to do, especially when they felt their jobs threatened. Undoubtedly too they now take some pride in their local 'nuclear' industry.

BNFL knows well that it has general local support and it stressed the employment prospects that would follow in the wake of its proposals. To gild the lily, the company also offered to construct some 90 houses as a bridging operation for its new workers, and to build sports facilities for the local town. Altogether BNFL hopes to take on some 1000 extra permanent staff, and some 500 extra workers during the construction phase. The total cost of the proposals has been reckoned at more than £600 million, which means that more than £500,000 will have to be invested for each job. Since BNFL has stated that most of the jobs will be required for THORP, opponents suggest that if the aim is primarily to provide jobs the money can be better spent. Locals, meanwhile, claim that if THORP fails to go ahead no equivalent investment will come to the area. Hence unemployment will remain high.

In an area where mining and heavy industry are traditional, radioactive pollution inevitably takes on a different perspective. After the meeting was over Czech Conroy of FoE London and myself found ourselves talking to three reprocessing workers at a quiet street corner about some of the issues so vehemently discussed earlier. Two of the men had been active for their Union in getting compensation for reprocessing workers who later succumbed to cancer. Although the Union had won compensation for Troughton's family it had not succeeded yet in getting compensation for four other workers' families. Indeed BNFL denied liability, even when a worker died of a brain tumour and was found to have plutonium particles embedded there. The reprocessing workers thanked activists like FoE who had helped them in their struggle to make Windscale a safer place for work and who had brought about wide-spread recognition of the dangers of radiation.

While in the midst of our conversation several large lorry tankers hurtled past on their way to the chemical factory up on the hill overlooking Whitehaven. I caught glimpses of their loads — phenol and sulphur — either of which could have brought disaster if spilt. A young reprocessing worker who had spent three years working at that detergent factory told me that BNFL was an absolute model of safety and health compared to the chemical factory. He knew where he and many others would prefer to work, and he knew by which factory he would prefer his wife and children to live.

The irony too is that aside from deaths from falling rocks and the like there have been many more cancer



HTR Reactor

deaths among men working underground in the local haematite mines than there have ever been among BNFL workers. Between 1948 and 1967, 36 underground miners died of lung cancer compared to a proportionate rate of 20.6 among their fellow men above ground and 21.5 among the general population. Why iron mining has such a high lung cancer risk is not exactly known. Investigations from the MRC clinical research centre, University College Medical School, London, suggest in the *British Journal of Industrial Medicine* (1970, vol. 27, page 97) that radioactive radon gas in the mines may be a possible cause. The Radiological Protection Service in 1969 found radon concentrations in the air in three of four mines in the Egremont area, ranging from 30 picocuries per litre to above 300, all of which were above the maximum permissible level recommended by the International Commission on Radiological Protection. Nevertheless even the highest level found in Cumberland is far below the radon concentrations found in fluorspar mines in Newfoundland or uranium mines in Colorado, where radon concentrations may go as high as 59,000 picocuries per litre of air. Some experts reckon that Colorado miners have a more than ten-fold higher than normal chance of contracting lung cancer, and accordingly, the Cumberland haematite miners' two-fold increase in lung cancer may well be attributed to radon rather than to iron ore silicosis.

Many reprocessing workers come from towns such as Cleator Moor which have a large population of haematite miners. Recently Dr. J. Leiper, the medical officer of health in the area, and a member of the MRC team, advised miners to give up smoking (which unlike coal miners they are able to do underground) in order to reduce their susceptibility to lung disease. The news about the high lung cancer rate did the rounds and the reprocessing workers, like others in West Cumbria, got to know of it. That information only confirmed what the reprocessing workers already believed: namely that they were better cared for, working for BNFL, than for any other industries in the area. At least radiation levels were being constantly checked both in the working environment and on the reprocessing workers themselves.

All nuclear establishments work on the principle of containing the radioactive wastes as far as is possible. But some wastes, particularly certain radioactive gases like iodine-129, krypton-85 and tritium, as well as some 'low-level' liquid wastes, are discharged into the environment in quantities that do not exceed prescribed levels. As BNFL is fond of reiterating, all the effluents released into the environment from the Windscale works are subject to regulations formulated by the National Radiological Protection Board, under the aegis of the Department of the Environment, which itself complies with the recommendations of ICRP, the international commission for radiological protection. Another independent body, MAFF, samples the environment regularly in the neighbourhood of the works, testing radiation levels in estuarine silt and along the coastline as well as inland. MAFF also measures radiation levels in Porphyra, a seaweed traditionally sent down from Cumbria to South Wales for the manufacture of laver bread, as well as in certain fish species such as plaice, and in local farmers' milk.

BNFL is proud of its record of keeping its radioactive effluents well within the limits, despite its handling of a growing volume of highly irradiated spent fuel. Nevertheless an independent investigator, Joe Thompson, using precisely the same data as provided by MAFF, has come up with a rather more disturbing picture. Rightly he did not speak at the meeting because, in the emotional atmosphere of that evening, what he had to say would not have made a proper impression. He has however produced a report of his investigation which he has submitted to the County Council.

In Britain those authorising radioactive discharges base their maximum permissible levels on what are termed critical groups. These consist of individuals in the population who by their proximity to the discharges or because of their work or their consumption of food are more exposed to the effluent than others. Initially the authorities considered laver bread eaters in South Wales — an important critical group because seaweed sent down from Cumbria contained ruthenium-106, as well as other radio isotopes. Considering than an avid laver bread eater might consume 160 grams of the stuff each day, the authorities then calculated the maximum contamination of Porphyra which, if it was the only source of seaweed for the bread, would give the maximum permissible dose. The derived working limit (DWL) came to 300 picocuries of ruthenium per gramme of Porphyra, and the critical group was reckoned to be 100 Welsh people who were the heartiest eaters of laver bread among some 26,000 Welsh who ate smaller amounts.

As it happened, MAFF reported

March demonstrators.

that in 1971 the ruthenium levels in the seaweed between Nethertown and Drigg Barnscar averaged out at 330 picocuries per gramme of Porphyra. The radiation levels were therefore already above the DWL. Yet because the Cumbrian seaweed comprised only a small proportion of the seaweed used in laver bread manufacture, the actual total ruthenium in laver bread amounted to less than one per cent of the DWL. Since then the women who used to collect Cumbrian seaweed stopped work — BNFL claims that they retired — and the laver bread eaters of Wales are no longer a critical group. Thompson notes moreover that the increase in ruthenium contamination of seaweed occurred even though the actual discharge of ruthenium from Windscale never rose above 61 per cent of the official limit, which seems to indicate some lack of knowledge about the extent to which radio-isotopes are taken up by the local biota.

While the laver bread eaters have been discounted as an 'at risk' population, the authorities still take count of another critical group, ten salmon fishermen in the Ravenglass estuary. The most exposed individual of that group was found to spend 350 hours per year in the contaminated area. Accordingly the DWL was calculated as 1.4 millirems per hour, which would give a total dose for the 350 hours of 490 millirems — just under the maximum permitted dose of 500 millirems per year.

In its 1971 report, MAFF estimated the average dose to the ten fishermen as being 11 per cent of the maximum, and one year later to be 7 per cent. The reason for the decline, Thompson suggests, is because the fisherman who spent most time in the estuary was very often in areas of low radioactive pollution. He now spends even less time in the contaminated area, 300 hours instead of 350, and consequently the DWL has been increased by nearly 20 per cent to 1.7 millirems per hour.

The authorities thus assume that no one will ever want to spend more than 300 hours each year in the estuary. That assumption has led to a situation in which the radiation background in the area, including in

Teddy Goldsmith at Windscale.

Whitehaven harbour silt, is now more than 40 times natural background radiation of 100 millirems per year. Nuclear power is still in its infancy. But is this the kind of price we individuals are going to have to pay? That a public area is allowed to become irreversibly contaminated with a dangerous pollutant, so that people will be permitted to spend less and less time there, until a total ban is imposed? Or worse, when nuclear power has vanished off the scene and the official watchguards with it, that people in their ignorance will become irradiated and succumb to premature death?

Thompson has done a bit of detective work on the radioactive discharges from Windscale as recorded and published by MAFF. Tritium, because it cannot easily be retained, must all be discharged, and the quantities released represent, accurately enough, the throughput of spent fuel via the reprocessing plant. In 1963 the discharge of tritium began to rise sharply and by 1969 it had risen more than 15-fold. Meanwhile discharges of caesium-137, of strontium-90 and of alpha emitters, including various plutonium isotopes and Americium-24 remained at low, fairly stable levels, indicating a certain degree of efficiency at the Windscale plant. Suddenly, however, the discharges of all these radio-isotopes began to increase, the discharge of caesium-137 increasing more than 30-fold, from 1000 curies in 1961 to 36,000 by 1970.

Dr. A. Preston of MAFF gives a clue to the reason. "These studies," he says referring to MAFF's effluent studies, "have provided us with a number of surprises. One of the most recent has been the increased importance of caesium in Magnox power station effluents. The caesium has originated from long burn-up times of fuels and was certainly not anticipated ten years ago."

Caesium-137 is readily taken up by plants and animals, and once in

the body it contributes significantly to the dose to the gonads. In its report of 1971, MAFF's Fisheries Radiobiological Laboratories estimated the population's genetically significant dose from fish as 100 man-rems. In it's next report, covering the years 1972 and 1973, the dose had shot up 15-fold to 100 man-rems. The dose was no longer considered insignificant by the MAFF authorities.

What other conclusion can there be, asks Thompson, than that the reprocessing plant — new in 1964 — *was obsolete less than ten years later because of unanticipated problems associated with longer burn-up fuels?* His surmise would seem to make sense. Since 1972, BNFL has been restricting the throughput of irradiated Magnox fuel through the Windscale plant. As a consequence, spent fuel elements are having to be kept longer in cooling ponds. Indeed Calder Hall I was removed from the National Grid to accomodate more fuel and at Bradwell some industrial 'unrest' occurred when its cooling pond began to fill up with used fuel. Meanwhile at Windscale, reprocessing workers have been getting their maximum permitted yearly doses of 5 rems in less than a year, and hence are having to work shorter working hours in the radiation areas. Both because of the smaller wage packets and because of the increasing hazard of their working environment, the men have been getting a little discontented, according to local rumours.

Officials too seem a little more anxious than before. In a paper on the distribution of caesium-137 in British coastal waters, D.F. Jefferies, A. Preston and A.K. Steele conclude: "The safe discharge of wastes into the sea depends upon achieving adequate dilution of effluents, otherwise inshore biological reserves may be damaged . . . this report suggests that the dilution capacity of the sea may be far less than supposed."

The story is becoming a very familiar one. The sea is vast, and those calculating its ability to dilute pollutants to safe levels are too often misled by the sheer volume of water. Yet different bodies of water, moved by different currents and very often of differing salinity and temperature, do not mix well and pollutants tend therefore to remain concentrated rather than dispersed. Add to that the concentrating ability of marine organisms and one has all the ingredients of an unanticipated pollution problem.

Sometimes, too, those authorising the discharges seem wilfully to overlook a potential pollution problem. Thompson has unearthed a possible discrepancy in the discharge of alpha emitters into the Irish Sea. In November 1970, the authorised releases of alpha-emitting effluents from Windscale were raised from 1,800 curies per year to 6,000 curies per year. By 1971, plutonium, a major alpha emitter, was present in plaice near Windscale, one year later it was beginning to appear in more commercial stocks in the North Irish Sea, and today it is present, admittedly still in low concentrations, in most marine organisms in the area. Another important alpha emitter is Americium-241, which, according to Nobel laureate John Edsal of Harvard, is of equal biological importance to plutonium. Now one plutonium isotope, plutonium-241, is a beta emitter rather than alpha, and when released from Windscale it therefore is counted under beta emissions. However, not only does it have a relatively short half-life of 13.2 years, which makes it intensely radioactive, it also has the property of decaying into Americium-241. Thus it gives rise to an alpha emitter.

In 1974 nearly 40 times more plutonium-241 was discharged from Windscale than all the alpha-emitting isotopes of plutonium put together. Thus as much as 37,000 curies of plutonium-241 may have been discharged as part of the official beta-release authorisation. Within 13 years, half of that plutonium will have decayed into Americium, and consequently the total alpha emission will in time amount to nearer 40,000 curies per year rather than a permitted total of 6000 curies.

Thompson asks what will happen now that fuel elements are being kept longer before reprocessing. Presumably more Americium than before will be present because of plutonium-241 decay, and presumably the presence of the decay product will make it impossible for BNFL to remain within the authorised discharge of alpha emitters. Presumably, too, BNFL will once again get the authority to increase discharges of alpha emitters, both on the grounds that the Americium was there before anyway, and that the individuals of the critical group, namely those who spend time on the contaminated areas of the Ravenglass estuary, are spending ever less time there. Then one day comes the total ban: no one will be allowed there.

The authorities generally agree that most of the plutonium gets bound to oceanic sediments. At one time they thought those sediments would gradually wash away with the currents and so be dispersed. Yet the opposite seems to be true and, rather than dispersing, the plutonium-impregnated sediments are finding their way ashore in harbours and estuaries. Indeed J.A. Hetherington of MAFF states that "Radio-ecological studies have also shown that there is a movement of sediment, showing the same degree of fission-product contamination as the sediment found in the immediate vicinity of the Windscale outfall, into estuaries such as Ravenglass to the South." It appears that the radioactive wastes are moving more or less as a body southwards.

What happens then during violent storms, or during high equinoctial Spring tides backed up by a fresh prevailing wind? Thompson and others suggest that the silt with its radioactive burden could be cast up on shore and present quite a hazard, especially after drying and blowing in the wind. In addition a number of eminent radiobiologists such as Edsall and K. Morgan, also a Nobel Prize winner, feel strongly that the limits for plutonium as a health hazard are set too high. Morgan would like them reduced by a factor of 100 at least, and Edsall observes: "Clearly the prevailing standards of acceptable risk for plutonium are far more tolerant than those for food additives or pesticides."

As happens too often, the opinion of one group of people has been completely overlooked: that of the farmers. Those whom I met are not too happy and they remember too

well the Windscale incident of 1957. Indeed some 12 years after the accident I visited a farmer who lived close to Windscale, but whose farm the authorities supposed had been by-passed by the poison cloud. He showed me photographs of his cattle taken shortly after the accident. A number of his cows had developed curious lesions on the wet pads of their noses, and he had had them inspected by vets from MAFF. They were baffled by the lesions but disclaimed any connection with radioactive fall-out. In their opinion the lesions were caused by a strange photo-sensitisation brought about by a combination of their feed and solar radiation. The farmer remarked that he had never heard of photo-sensitisation in cattle, not in October, nor at any other time in the year.

Inevitably suspicion and a certain apprehension have grown up in the area because of Windscale. Local people for example will no longer eat the local fish despite MAFF's assurances that the danger from consuming that fish is negligible. Such fears are irrational, say the scientists, and they point instead to a hundred other hazards in the environment that are far more dangerous. Professor Fremlin, who, as head of the department of radiation physics at Birmingham University, had been called in to advise Cumbria County Council over the Windscale proposed extensions, was asked to answer questions about the dangers to human health of effluent gases such as Krypton-85 from the reprocessing plant. He told the Council meeting that the danger to the public from these gases in the foreseeable future was no greater than being a non-smoker and breathing in smoke-filled air. Chemical pollutants were the bearers of disease and suffering, he said, not man-made radiation because of its adequate containment. but are we really sure that it is so well contained? The available evidence, theoretical and empirical, points to the opposite conclusion. What is more, even if there persists the slightest doubt on this count, then we should opt for caution, for the stakes we are playing for are just too high. Also, Fremlin and others who would have nuclear power must remember that the energy from those plants is for one prime purpose: to provide energy for those very same chemical plants that are doing all the polluting. They are individually part and parcel of the same industrial process, and now is the time to question how much, if any, of it should be allowed to exist.

As a focal point of the nuclear industry, Windscale activities must come under scrutiny. Moreover the time-worn reasoning that because an industry exists and can offer employment in a depressed area it should be positively encouraged, is clearly an immoral reasoning when it leads to irreversible and biologically damaging changes in the environment. Undoubtedly the working men in the towns of West Cumbria need and deserve employment, but their support for the Windscale works must not override long-term considerations, and they are not to know the full implications of nuclear power. No one in fact does, not even the experts.

Must an Ecological Society be a Vegetarian One

Early in October six distinguished speakers from London and Sussex, Hampshire and Wales, converged upon us in Cornwall, in order to debate the motion that An Ecological Society Must be a Vegetarian One. This took place before an invited audience with Teddy Goldsmith in the chair. The debate and the discussion that followed are presented here in an edited version.

Chairman: **The first speaker, leading for the Vegetarian team is Jon Wynne-Tyson, a publisher and the author of** *Food for a Future* **and the rather more general,** *The Civilised Alternative.*

Jon Wynne-Tyson

One of the more provocative statements to be made about vegetarianism appeared recently in, of all places, *The Times*. The reviewer of a book I am far too modest to mention by title wrote:

> "Its most subtle achievement is the slow revelation that the arguments *for* meat-eating are in fact those that are emotional and irrational."

I believe the motion before us implies much the same judgement and in support of this I would like to begin with a few facts.

Today's food shortage is not global but local. Our planet can amply support its present population. Two

Alan Long, Peter Roberts, Jon Wynne-Tyson, Teddy Goldsmith (Chairman), Michael Allaby, John Seymour and Colin Blythe.

main factors produce shortage — distribution and conversion. Distribution is inequitable because affluent nations consume in excess of need. Conversion of plant foods into meat and its by-products via the extra link in the food chain represented by farmed animals is a grossly wasteful luxury, justified only by habit.

So far from there being a global food shortage, in a relatively brief time an even greater world population could receive adequate food, some even from animal sources. This adequacy could be achieved by the expansion of silviculture (the cultivation of food-bearing trees), as the recent important book *Forest Farming* makes clear.

This may sound like good news, but the implications of silvicultural development are both hopeful and appalling. Hopeful because we know that mass starvation is thereby avoidable, but appalling because population reduction is essential to any future worth visualising, and governments are unlikely to collaborate in population control measures if they realise that food scarcity can be avoided by a change in production patterns. For governments, "The Future" lies little beyond their term of office.

The media, also, concentrate on the immediate and the particular, and are uninterested in coherent arguments and solutions. Experts and specialists proliferate, beavering away in blissful autonomy with little desire to collaborate in any blueprint for a more workable future. Their inclination is so often to focus on points of difference rather than on points of accord. This lack of communication in a world in which short-term greed takes precedence over long-term survival threatens our very continuance as a species, and I think it is extremely relevant to today's debate.

I am sure *The Ecologist* has not invited us here just for the pleasure of seeing carnivore consume herbivore — or even vice versa. Although a few fangs may be bared, I think we already agree about so much that our division into two teams seems almost unnecessary. I hope our exchanges will be more of a collaboration over basics than a squabble over petty details.

We agree, I imagine, that there would be enough food for all if distribution was made a priority and if the meat industry was phased out in favour of directly consumed plant foods. In the long term, we also probably agree that, although silviculture could relieve shortage even for an increased population, its contribution to a world worth living in would be nullified unless it were employed in conjunction with deindustrialisation, deurbanisation and depopulation policies. A huge danger, to my mind, is that silviculture may be adopted merely to feed ever-increasing populations on that Western pattern the affluent nations are trying to make worldwide.

Jon Wynne-Tyson

So I suspect that rationally — if not emotionally — the gap between our viewpoints is closing rapidly. The so-called "crankiness" of a few years ago is becoming the orthodoxy of to-day, and although we do not all recognise the fact, we are on the same road and travelling in the same direction. So are we left with much to argue about?

If we can keep to the thesis that a humane diet is an ecological priority, I do not think so. I believe the ecological, historical, scientific and humane arguments for a basic review of dietary patterns correlate convincingly and compellingly, and must inevitably awaken concern over matters beyond, though inclusive of, dietetic considerations. Our danger is in getting bogged down in petty side issues: How healthy or unhealthy a factory-farmed steak may be; in what proportion prehistoric man was gatherer or hunter; and so forth. It is more important, surely, that we collaborate in envisaging a future whose sanity and sincerity will recognise our obligation to observe the first law of ecology — that our species is as responsible as any other for achieving a balanced and symbiotic relationship with its total environment.

For although we may agree that there is no balance in the present pattern of the so-called civilised world, we are not as yet combining over the real priorities. If we do, we shall not waste time arguing about whether our exploitation of other species is justifiable, but will be discussing when and how a more truly civilised attitude to our environment will take over.

Sadly, even the pages of *The Ecologist* have shared with the establishment press a concern and a satisfaction with those half-answers that do not tamper too severely with our addictions. Meat-eating is such an entrenched aspect of affluent societies that this is not surprising. But we are living in a fool's paradise if we think it enough that we should return to and improve technically a life of organic husbandry, power from natural sources, composting lavatories and the other commendable techniques of self-sufficiency. The concept is admirable but incomplete — a naive Elysianism reminiscent of the shop-steward's dream of "all those cornfields and ballet in the evening" in the film *I'm All Right, Jack*. It is fine as far as it goes, but any realistic return to basics must reject the idea that in the long term we can retain a dietary pattern involving anything so contra-indicated and ecologically irresponsible as the deliberate breeding and consumption of animals.

The humanistic argument for refraining, for *man's* good, from exploitation of other species, is equally strong. By accident rather than design, the adoption of a humane diet is now an ecological priority, at least in the short term. Deindustrialisation cannot make a convenient exception of the vast meat industry. Our dwindling resources demand that man takes his place not only in reduced numbers and, logically, in more suitable climatic areas, but also in his habit and food patterns, as just one of the species that make the world a workable environment for all. I think we are destined (I would *not* say doomed) to return to a dietary pattern more befitting our place among the higher primates.

My own part in this debate is mainly supportive, with the particular task of trying to correlate the factors that make up the total argument for a more responsible diet and that future life style of which it must be an integral part. More specialist knowledge is amply available from others present. I suggest we are not here primarily to discuss the pros and cons of vegetarianism in isolation, but to examine its role in our ecological future. We cannot, I think, avoid accepting that what we are faced with is ultimately an ethical matter where the only real argument may be over degree and timing. The Elysianism of those who think we can return to nature without wholly keeping her rules must, I feel, be seen clearly for the dangers it invites. I understand why people hope that a mere reduction in our use of animals will suffice, but I think it is unrealistic. Even if we tie in future food patterns with the concept of a severely reduced world population, the question is not just one of whether it is feasible for those numbers to continue to live off flesh foods, but whether they should do so. The ethics of diet — or *dietethics* as the study may come to be known — are not just philosophical theorizing. The evidence suggests it is positively inadvisable to compromise with the absolutes of ecologic.

We must, I suggest, weigh up *all* relevant factors. Population, diet, man's optimum geographical locations, resource utilisation, permissible technology, research limitations; power sources and requirements, our environmental obligations, in short the limits to our squandering of the biosphere — these must be seen as interrelated, indivisible aspects of that ecological transformation whose possibilities are beginning, thankfully, to dawn on the young. With their demands for consistency and sincerity, their yearning for a return to Nature and everying that is natural, they are impatient of half-truths and compromise. Perhaps their elders' intellectual concern over ecological matters has produced a generation with actual, if still rudimentary, ecological instincts. Their turning from scientific dogmatism emphasizes a distaste for the narrow and blinkered view of life. I am therefore hopeful about the future, for I think the young may see to it that any return to Nature will be on Nature's terms — consistent and eco-logical.

Hopefully, we can learn not only from the sometimes wiser young, but from history. What lies ahead in man's evolution is beyond knowledge, but we can conclude from experience that, if the life we know is to survive even in a materially improved form (never mind about spiritual growth), we must not only

make the right decisions, but must make them for the right reasons and without missing any of the ladders on the way up. Those reasons, even discounting ethical judgements, must be logical and informed to the full extent of what we *know*; not to the extent only of what we would like to believe.

The distinction is subtle but vital. If we can see our obligations as no less relevant than our rights, we can also accept the implications of the fact that we have for too long tried to hoodwink our environment and live outside the disciplines our nature and true needs should have imposed upon us. We can no longer afford to play the game of life by keeping just some of the ecological rules. Our only hope of avoiding a terminal calamity for our species and for the world it inhabits lies in our keeping them all. They include that return to a vegetarian diet that I hope this debate will prove is an inescapable part of our progress towards a truly Ecological Society.

Chairman: Michael Allaby, Associate Editor of *The Ecologist*, a journalist and the author of many books including *The Survival Handbook*, will now open the case for the opposition.

Michael Allaby

It's very nice of Mr. Wynne-Tyson to concede at the beginning that, while I may be permitted to devour him, he is debarred from doing so much to me. I want to start by conceding certain points because, as he said himself, what we're discussing is not some great fundamental difference, it is rather a matter of degree, a matter of emphasis. If you say to me that the intensive indoor rearing of livestock is wrong, I would agree with you for aesthetic reasons, for ethical reasons, but most of all for economic reasons. If you say to me that it makes very little economic sense to feed to livestock grains that are, or could be, suitable for human consumption, then I would say that by and large I agree with you — no this doesn't make any kind of long-term economic sense. I'm not suggesting that it would be in any way undesirable to effect a considerable reduction in levels of meat consumption. However, when we come into the actual world and the way actual trade in food works, we find two things. First and most obvious is that you have to match effective demand with what the farmer can produce, and farmers don't work within a vacuum. They are not motivated primarily, in hard every-day terms, by ethics or aesthetics; they will grow crops that they are pretty well sure they can sell. They have to, it's the only way it can possibly work. They will produce the food that people want to buy. Now it is possible, I suppose, to conceive of a situation in a country where you could guide the choice of consumers in particular directions. It is, I believe, quite impossible to extrapolate that into the world as a whole. You cannot tell the world what it will eat; and we can in fact measure this. It is measured as income elasticities of demand. This means, simply, what a consumer will do when he's got more money.

I agree with Mr. Wynne-Tyson that there isn't actually a world food problem at all, in the sense that the world is incapable of producing sufficient food for the population that the world has (or probably the population that the world is likely to have), so long as we are reasonable about this. There are problems of distribution and every time the problem comes back to poverty. The majority of the people who are hungry are hungry, not because there isn't food or there couldn't be food, but because they don't have the money to buy food. If they had the money they would demand food. If they had the money to buy the food and demanded it, farmers would be able to grow it because they could sell it. There is quite a long way we could go to resolve this problem; it's a social, an economic and a political problem very much more than it's an agricultural one. But as income elasticities of demand have been measured, they show, not surprisingly, that the world falls broadly into two categories: the developed and 'developing'.

In the developed countries the income elasticity of demand for cereals is negative. In the developing countries the income elasticity of demand for cereals is slightly positive. In both groups income elasticities of demand for all animal produce is very strongly positive. What this means is that in this country, for example, if people earn money, then, probably in so far as that increase in money affects their diet, it will affect it by persuading them to consume less cereal and more animal produce. In developing countries there still is a demand for more cereal produce, but you don't have to go very far before you satisfy this and then the demand is for meat. And we've reached a point in the economic evolution of the world if you like, where a whole range of countries are either just across or just approaching this economic threshold where a demand starts to be expressed for meat. The most obvious example that everyone quotes is Japan; it's happening now in the U.S.S.R.; it will happen almost certainly in the Arab Oil States — it's probably beginning to happen now. There are a range of other countries behind them. It's sometimes said, for example, that India is the one case that proves the contrary, in that in India one acquires status by being a vegetarian rather than by eating meat. This may be so, but I don't think it contradicts the general rule, because exactly the same thing was said of Japan. In fact, give the people the money and that prejudice, if that's what it is, breaks down. It does seem that people want to buy meat.

Meat is, of course, produced in two ways. It's either produced by feeding grain to livestock, no one disputes very inefficiently, or it's produced by feeding animals on grass. Feeding animals on grass is, in fact, fairly efficient because we

can't eat grass ourselves very easily. It's not impossible for us to eat grass, but it's not very easy. The land that grows the grass is very often not capable of growing anything else. It worries me considerably that if we remove livestock from immense areas of the world, that are at the moment on very poor grazing land that will support a sparse population of cattle and a sparse population of people looking after the cattle and deriving their income from these cattle, that if we remove those, there may be pressure either to go in for cropping this land, which could be ecologically disastrous, or these people will simply be left without any kind of economic support.

This brings us again to the relationship between developing and developed countries, and the controversies about things like cash cropping. This is very necessary, in developing countries, if they are to develop, in order to obtain the income to create the demand for the food they need. It's a very complex business, but in fact the growing of cash crops is economically quite essential. If countries are pressured into not growing them, economically this is a considerable disadvantage to them. So to a large extent they depend more or less on this trade. To what extent do we depend on them? Again, this is something of a myth. I'm not going to bore you with a lot of figures, but we don't import food from developing countries. The only substantial exceptions are sugar (and if anybody is saying we could cut out sugar I would go along with that), and oil cake and meals and vegetable oils. The vegetable oils are brought in very largely for human consumption; the oil cake is used as a cattle feed: it's an inevitable by-product of the pressing of the oil seeds for their oil. It's a product that's not easily edible by humans. My final point relates not to edible animal products at all but to the non-edible products, the fibres, hides, hooves and horns and so on. If we remove livestock from the scene (if we have livestock there at all), then they are going to have to be slaughtered because they will produce a surplus, and so, if we're talking about moving to an entirely vegetarian diet, we're talking about annihilating livestock entirely. It will be a bit of a carnage for a little while. But if we're planning to do without the non-edible products, then what alternatives do we propose? There is no animal product, so far as I know, to which there is not an adequate synthetic alternative, but look at what the alternatives are. Your alternative for wool is man-made fibre. It's not a natural fibre, it's not linen, it's not cotton because they occupy the land you can't spare. You can't grow cotton in this country and anyway cotton and linen are not really substitutes for wool; they're different kinds of fibre for a different purpose. No, you're talking about man-made fibres. Your alternative to hide, to leather, is plastic. You're now into heavy petro-chemical engineering. It's possible to do it. It's economically feasible, but ecologically it's not the nicest thing one can think of, and in the long term I would submit it's expensive. So my argument is that, in the real world in which we live, people actually do demand meat and animal products to eat, that there is no way of preventing them from doing so, that so long as they do so that demand will be met, that it will fluctuate because it will adjust itself. The absurd levels of grains that are fed to livestock now is bound to go down. The question is not whether it will happen, only when. Intensive livestock farming, I believe, is bound to come to an end; the question again is not *whether*, only *when*. We must maintain trade relationships with developing countries and aim to improve them to the advantage of developing countries and not, perhaps, prevent them from cash cropping but just pay them a hell of a lot more for their cash crops. We don't take food from them to any significant extent. We have no ecologically really acceptable alternative to the non-edible animal products.

Finally, there is the big problem of this huge area of the earth's land surface that is suitable for growing rather poor grass and herbs rather sparsely to support sparse populations of animals and equally sparse populations of people dependent upon the animals. It is very difficult, I think, to conceive of an alternative management system for those areas of land. Mr. Wynne-Tyson mentioned sylviculture, the idea of growing tree crops that produce an edible food. This is possible. It's early days, and I don't think that anybody can say very confidently yet whether it will work, but it looks good at the moment. But even if that happens, if we're going to be ecologically sensible about it, you would hope to improve the land by growing grass beneath the trees if you possibly can. If you grow grass beneath the trees, then you would probably graze animals on it, and so in this way you would start to establish a better soil and the environment would improve; I suspect that if you did it, it wouldn't stop just at trees. I hope it wouldn't. I believe, then, that if sylviculture works, it is not an alternative to a mixed farming system that includes animals, it is a very useful adjunct to it.

Chairman: Now I call on Peter Roberts, Honorary Secretary of Compassion in World Farming, and an authority on textured vegetable protein, to second the motion.

Peter Roberts

Times change. Fifty or even thirty years ago, this debate would not have been considered, for at that time the ecologists and vegetarians were lumped together into a subspecies which was reserved for the harmless but slightly mad members of our race. Since then both ecology and food reform have made giant strides, and we are all expressing concern for the environment. We even have an appropriate — or should I say *inappropriate* — Ministry for the Protection of the Environment.

Briefly I must tell you that I am not a life-long vegetarian. Up to 1957 I not only enjoyed eating meat, but as a practical farmer in Hampshire, I helped to produce it. That came to an end when my wife and I recognised the unnecessary cruelty involved in the rearing, transport and slaughter of livestock.

I want to speak as a farmer, conversant with the ways of farming, and as a parent, concerned about the sort of world that my daughters will hand on to *their* children. I have seen the so-called husbandry of livestock turn into undisputed exploitation — a change which is having a profound effect upon society.

Economic pressures have turned the farm animal into an animal-machine. Let us face facts — *we cannot reverse that change.* We cannot go back to feeding the population of the world by free range farming. We can only go forwards, and that means replacing the animal in the food chain altogether. Such progress will yield a very welcome increase in efficiency. The alternative is that we shall go further and further into the process of factory farming, subjecting the animals ever more profoundly and at the same time subjecting ourselves to a debasing situation. There must be no self deception about this. We cannot go back to the old days. We can only go forward or rot.

Let's look at the evolution of man as an omnivore. It is generally accepted that we have evolved from the vegetarian higher apes. But there is a gap in our knowledge until a later time, when man is to be found living in caves. At this stage, it seems, that when he got hungry he would go out into the inhospitable world, club a passing animal to death, drag it back to the cave and give it to the little woman. She would gut it, skin it, trim it, bone it and cut it up into chunks which she would then cook, leaving her lord and master free to draw pictures on the walls of the cave. This gave rise to two interesting customs called housekeeping and graffiti respectively.

Our adaptability allowed us to resort to flesh-eating and so to survive the ice-ages. We should not, however, assume that because of this that we can continue the habit of eating livestock. We have changed the carnivorous customs of the cave and have developed the controlled grazing of livestock, and more recently the landless rearing of farm animals. The battery cage is no longer reserved for the hapless chicken; all manner of livestock are now subjected to it. In Ireland a profitable bacon-battery unit is operating in which pigs are reared in cages from birth, right up to slaughter weight, in all some five or six months. To support all this factory farming, we are turning the once varied British countryside into a vast barley field. The Home Grown Cereals Authority recently said, with misplaced pride, that the amount of grain fed to British livestock will increase next year from 13 million tons to 18 million tons. In addition to this we have to import 8 million tons of that, at the moment.

On a wider scale 370 million tons of the world's harvest is now fed to livestock, enough to meet the total combined needs of the populations of China and India. All this grain has to be balanced with protein meal, chiefly soya from the U.S. and fish meal from Peru, and as our last speaker told you we also import oilseeds from India. In the current year we shall import something in the region of 200,000 tons of it in the form of groundnuts, (the basis of famine relief foods) — this is no by-product, but a staple which, according to the Central Institute of Food Technology in Madras, would have provided the protein requirement of no less than 16 million Indian children. We have agreed that there is no shortage of food in the world. There is starvation because of poverty and because of greed and because we devote the major part of the world's food resources and its expertise (don't forget that) to the feeding of animals instead of children. If we continue along these lines famine will increase on a scale never before seen. As I think most of us here realise, this must be followed by the collapse of order and finally in war. The answer is plain. We *must* get rid of the farm animal in the food-chain. It has become the cuckoo in the human nest.

When this is achieved the food production capacity thereby released must be distributed among the

world's population more equitably than it was in the past. It is not in our mandate to decide how this will be done. Perhaps the concept of aid as charity has to go first. Aid should be distributed by the World Health Authority and perhaps it should be financed by an International tax on each country's Gross National Product.

So much for economics. Two things are left. Ethics and Practicality. As far as ethics go (not as far as humans go) an ecological society should not be a violent society. There is violence in nature, it is true, but we are the superior species and it is not our part to imitate, or to assume for ourselves the conduct of a pack of wolves. The motivation of the carnivore is not ours. In man there is a quality which is unique. It is the desire for justice. It may be said to be the nucleus around which our intelligence has developed, the quality on which we have built civilisation after civilisation. We are constantly extending the boundaries of justice; who will be so narrow in his thinking as to say that our livestock and our wildlife are to be excluded? Basically we know that when we condone injustice we are fighting against ourselves.

Now we come to the practicalities. When we consider the question of re-aligning agriculture towards vegetarianism there are two old chestnuts to crack. First, that meat is necessary to health. We tell our children "Eat it up Johnny. It will make you big and strong". A strange idea when one considers how unsuited meat is to human nutrition, with its excess protein, its lack of vitamin C, its lack of calcium (unless you eat the bones as well), and its toxic uric acid. Add to these shortcomings the modern vogue for rearing animals in a state of subclinical anaemia, and giving the male animals oestrogens to prevent sexual maturity (which must also retard the sexual activity of the male consumer) and add to that the prophylactic use of antibiotics which render the pathogens in the meat immune to medical drugs, and you reach a situation where meat certainly doesn't make Johnny big and strong. It is more likely to turn him into an anaemic eunuch and probably one with chronic diarrhoea.

The other chestnut that we have got to get rid of is that farmyard manure is necessary for the fertility of the soil. In reality the soil just needs the wastes returned to it; it doesn't matter whether these are direct plant waste, animal waste or human waste. At the present time we pour human waste into the sea. We work fifty weeks of the year for the pleasure of bathing in it during the remaining two weeks. If all these human wastes were returned to the land the loss of farm-animal waste would be made good.

Having got rid of these fallacies, we can see that the present barley acreage, under a system which I would like to call 'space-farming', since it treats land spatially rather than as linear hectares — such a system could support a population many times that which we could possibly tolerate. I used to think that the solution lay in a compromise, with the best cultivatable land growing food for direct human consumption, and ruminants such as cattle, deer and sheep grazing the marginal land. Maybe that is how it will happen at first, but later, other factors will make such an arrangement short-lived. The prohibitive cost of producing animal meat and the housewife's rebellion against the drudgery of the ritual Sunday roast, will leave the remnants of today's farm animals to fulfill their new role in the ecology of the upland pleasure parks, no doubt to the delight of holiday makers. I can see no reason why such marginal areas should be used for food production at all, even for a sylvan type of agriculture, when the same principles of space farming of the lowland areas can produce all that is needed — more in fact than we can possibly need, even for a considerably larger population than we have today.

Omnivorism was a temporary diet for an emergency now gone. Man, in an ecological society, must be vegetarian and non-violent. We *can* change, and such a change will be forced upon us, I believe, sooner rather than later. The rat, by the way, which is by its nature a grain eater, and like ourselves, became carnivorous to survive the ice-age, has delayed a return to its natural diet for too long, and again like man, suffers the penalty in degenerative diseases like cancer. But unlike the rat, we have the intelligence to change. Let us be warned. There is only one primate apart from ourselves which persists in meat-eating and that is the baboon, and look what nature has done to him with his nasty characteristics, his truculent behaviour towards his spouse and to add the final humiliation, his purple bottom.

Chairman: Next we have John Seymour, an organic farmer, who is very well known for his books *The Fat of the Land* and *Self-Sufficiency*. His latest book, *The Complete Book of Self-Sufficiency* has just been published.

John Seymour:

Now there is one thing we must get straight right from the start and that is that we cannot keep animals at all, as part of our husbandry, unless we are prepared to kill some of them occasionally. This may be disturbing, but it is absolutely inevitable.

John Seymour

It is a matter of the simplest mathematics. Either some predator controls the number of some species — or that species builds up to the limits of the food supply and individuals die of disease or hunger, and that is deplorable.

In the wild there are predators, and unless Man has interfered, there are *always* predators, except in the case of some of the larger predators themselves, such as lions, in which case there is the limiting factor that these animals do not breed very prolifically when the food supply is short. Therefore they impose a check upon themselves. But with domestic animals there are no predators excepting Man himself. What would happen, in practice, if everybody in these islands decided they would never kill another animal? What would I do with my pigs, for example? Or my cows? If I had to keep them all until they died of old age — without letting them breed of course — I would be bankrupt after a year. Could I then shove them out on the road and let them go? Well it's just conceivable that this country — or any country — could survive by letting all their domestic animals die out in this fashion (keeping a few in zoos I suppose), and that after this time, after say twenty or thirty years, because some animals live for quite a long time, we would never have the 'problem' of animals again and that this would produce a truly vegan country. But would it be a *better* country? What would the animals themselves think about it, assuming they thought anything about it at all? Or, of course, there is the other way, even more ruthless, of slaughtering the lot of them — even the last one — and becoming a vegan country that way.

Of course it's too obvious to need saying that you can't have the benefit of some animal products without killing animals. You cannot have milk without cows, but nearly all the bull calves and at least half the heifer calves are surplus to requirements for replacing stock. You cannot have eggs without rearing replacement pullets — and every other chick hatched is a cock. What do you do — feed them 'till they die of old age? I met a vegetarian farmer the other day who keeps a herd of Jersey cows. I asked him what he does with his bull calves and he said "I shoot them with a .22 the moment they are born". Well what else *could* he do with them? He won't let them go for meat, so he kills the poor little things as soon as they are born and buries them and leaves them to rot. What sort of ecological sanity is that? Herbivores, just like carnivores or omnivores, and the plants that nurture them, all have their part to play in the dance of nature. Man no less than the others. To kill a calf and leave it to rot seems to me to be very close to obscene. And yet what else can the man do with it, and stick to his principles? I have another friend who *was* a vegetarian and who keeps goats. He had some feeling that goats are different somehow — many vegetarians have this illusion. They are not — they are just the same as any other livestock. The first billy goat was a triumph for vegetarianism. My friend managed to get him a job as a lawn mower of a surburban lawn in a nearby city. Alas, he smelt, and didn't keep this job for long. He ended up in a Bangladeshi restaurant, and in spite of all his efforts, my friend failed to place any more of his billy goats in such a position; so, to avoid having the farm completely over-run with them, he had to compromise by selling them to someone who eventually slaughtered them.

Well we all owe God a death. There does not seem to me to be anything particularly wrong about killing an herbivorous animal and putting its body back into the natural cycle of life. We all die — my body will be eaten by bacteria unless some fool burns it, and my substance will go back into the cycle of life again, and I am glad. I would even prefer immolation on the 'Towers of Silence' of the Parsees, where ones body is exposed to the vultures and thus goes right through the cycle properly. That would suit me better.

From a *farming* point of view there is simply no argument about it. Animals have a place on the holding just as surely as vegetables have, and the one kingdom — the animal kingdom — is not really happy and complete without the other, the vegetable kingdom, and vice versa. I know you *can* make compost without animal products, but there is nothing to beat compost made *with* animal products, which is what old fashioned farmers call muck or farmyard manure. Muck has gone out of fashion these days, replaced by chemical fertilisers. The animals have been divorced from the land, and put into Belsen-type houses, and their excreta, one cannot call it by the noble world *muck*, is an embarrassment and costs a lot to get rid of, like our own excreta which has to be dumped, at enormous expense, into the sea. But this is an argument against factory farming methods. It is not an argument against the keeping of livestock in their proper environment on the land or in the fields.

After all what right has Man to cut out and exclude a whole great stratum of the biotic pyramid from the world? To say that man is O.K., plants are O.K., bacteria, protozoa and viruses — they are all O.K. but mammals and birds, and presumably fish, just have no place in our farming at all, is ecologically quite unsound. Plants and animals have evolved together, they are complementary to each other — they even inhale and exhale different gases — plants feed animals and animals feed plants. We can replace animal manure on our farms with oil-derived chemicals, and in fact most western farmers do this now; but we must plan for a future which may not have many oil-derived chemicals in it, and then we will *have* to go forward to balanced husbandry — in which the whole of life plays its part. Then we will be faced with the fact of the existence of animals on our farms again, and we will have to overcome the city-bred squeamishness that makes the idea of ending the life of an animal,

before it dies of disease or old age, so abhorrent.

The great pioneers of high farming in England, who eventually taught good farming to the whole world, based their whole practice on the beneficial interactions between animals and plants. Coke of Norfolk's motto was: "a full bullock yard makes a full stackyard!" He didn't worry about how much protein a bullock takes to convert into a kilogram of beef, he was chiefly interested in the great tonnages of beautifully composted wheat straw that those bullocks made under their feet. He raised the fertility of his fifty thousand acres of light land in North Norfolk so that it produced two tons of wheat to the acre, where before such a figure would have been unbelievable. That was all done by the manure of bullocks and the treading and dunging of folded sheep — what he called the "golden hoof".

When agricultural economists discuss yield per acre of wheat (which we may well take as typical of other crops) they generally base their considerations on figures from the between the wars period when British agriculture was in the depth of a depression and when yields were as low as a ton per acre, compared with the post war figures published by the Ministry of Agriculture for example: 1948 20 cwt; 1964 33.8 cwt; 1968 28.2 cwt; 1973 34.8 cwt — but against this must be considered the colossal in-put of artificial nitrogen that started rising during the Second World War and has continued to rise ever since. Thus in 1939 the input per acre was 60 units of nitrogen, by 1968 it had risen to 748 units. Nitrogen is fixed from the air by power — roughly it takes a ton of coal-equivalent to produce one ton of sulphate of ammonia. It is surely obvious that this colossal input cannot be maintained for ever: even now the price of fixed nitrogen is causing many farmers to cut their input with consequent dramatic drop in yield of wheat. Now in Thomas Coke's day, and Cobbett's day and Arthur Young's day, yields of two tons of wheat per acre were constantly noted — Cobbett frequently mentioned them as being a *good* yield, but by no means wonderful — and that was with *no artificial fertiliser whatever.* These yields were achieved with muck and muck only and it was known then, as it is known now, that high stocking of animals always results in an increase in land fertility and increased crop yields.

It may be of some significance that the disparity between input of artificial nitrogen and output of wheat per acre (thus in 1939, 60 units of nitrogen produced a ton an acre, while in 1968, 748 units produced 28.2 cwt — a miserable increase considering the enormously increased input) was accompanied by an enormous increase in straw burning. In 1973, of nine and a half million tons of straw produced, over four million tons were burned. In a sound mixed agricultural economy *all* that straw would either have been fed to animals or turned into farmyard manure by them, to be returned to the land in its most useful form.

Nor is it enough to say that composting will save us. If you try (as *I* have tried) to see how much compost material you can produce from the vegetation grown on an acre of land you will find that you have produced nothing like enough to give a good dressing to an acre. Nothing but the magic of passage through an animal's guts will enable a piece of land to 'pull itself up by its own shoelaces'. You will find that all compost enthusiasts, and I am one, bring composting material from outside to add to that which they can produce on their own holding.

Farming without animals inevitably leads to chemical-based farming. It can never be anything but ecologically *unsound.* We must embrace the whole of Creation in our husbandry, and not shrink, out of squeamishness, our duty and responsibility to be true husbandmen of our planet.

Chairman: Dr. Alan Long will conclude the case for the Vegetarians. He is a Research Consultant and Adviser to the Vegetarian Society.

Dr. Alan Long

Slaughter and butchery are by definition wanton and vicious, they must be alien to anybody who loves life and the beauty of life. They must therefore be alien to ecologists

Dr. Alan Long

and those who call themselves friends of the earth. Nature certainly provides examples of callousness, but in his enduring philosophies and religions man has esteemed the gentler aspects. He has shunned cannibalism and adopted mating patterns and social systems with apparent advantages over many of those obtaining in nature. An ecologist must explore man's arrogant depredations both of his own kind and of every other species. He must recognise that compassion embraces all living things.

Man is arrogant and obsessed with cleverness. 'Silly', an adjective describing a state of simple blessedness, has become a derogatory epithet. During a recent fracas among the members of the *Mensa* society (an association of undoubtedly clever people) a delegate sounded a note of truth when he appealed to them to use 'common sense and mature judgement'. Modern man's appropriation of 'his' dominion has eroded the numinous that prompted his primitive forbears to beg forgiveness before they so much as felled a tree. Relics of such prayers do remain, albeit in ghastly circumstances, in the ritual methods (Muslim and Jewish) for slaughtering livestock.

I contend therefore that ecologists must favour gentle systems, avoiding exploitation and cruelty to sentient forms of life, and that vegetarianism is a desirable objective. We must prove its practicability.

Economic considerations — and thrift is an estimable ecological virtue — are determining reductions

in the consumption of butcher's meat in the West. The Vegetarian Society's 'Green Plan' spells out future policies under the slogan *Grow Food not Feed*, but does not decree a state of absolute meatlessness: hunting would still be possible for deer and other feral animals; barren cows and scraggy sheep could be slaughtered for their tough and exiguous meat. Eating our own dead would also be feasible on *economic* grounds.

Although we are led to believe that humane killing, stunning and so forth, eliminate suffering in the slaughterhouse, slaughtermen, to use their own euphemism, know that a half-ton beast does not 'die easily', and killing in the field or on the farm no longer reaches modern standards of hygiene (though these are not pitched very high). The closer the attachment to the animal, the more odious the slaughtering becomes. Idyllic pictures of the house-cow knee deep in buttercups, blink the facts of alien drovers and slaughtermen into whose hands the aged and barren cow is delivered when her usefulness to her owners runs out.

The 'Green Plan' accepts a transition stage in which cows would produce milk from our grasslands. Without cereals and concentrates the milk yield would decline and the dairy herd would produce little meat. Meat eaters are curiously faddy. They relish the flesh of cattle, sheep and poultry; some eschew pig-meat, others flinch at rabbit or horse-meat, and most would certainly demur at the prospect of slitting Fido's throat, bleeding him out, and having him for dinner. We have callously exempted some species from the small kindnesses we bestow on others. The emasculation, transport and slaughter of farm stock is allowed in conditions illegal for other species. There are rest homes for working horses, but none for the old cow, barren after continual pregnancies and lactations. Ecologists must shed sentimentality of this sort.

The transition under the 'Green Plan' will demand the exercise of self-discipline. China has managed to avoid famine at the price of totalitarianism. India enjoys some semblance of democracy, but has paid the price in starvation. In the forties of the last century the Irish potato crop failed (incidentally there is a lesson here too, about the dangers of the single-cropping system), and as a result of that failure and the famine that followed, many Irish went to America and founded the New York police force. The tragedy of those years and all the bitterness associated with it, lives on in the rancour between the English and the Irish today. In spite of what Mr. Allaby has told you, if we in the West do not act by curbing our disastrous demands on the world's food resources, we shall be creating a bitterness for the future, when nations now starving, most of them with coloured populations, blame us for our fecklessness and greed. Accordingly we must reduce our imports now, and we must change our own policy to grow cereals for humans not for livestock. Vegan farming is certainly feasible. Certain crops are already being grown in increasing quantities. One that has done very well is oil seed rape, a very colourful crop which can provide oil for unsaturated margarine, thus reducing our dependence on imported oil products. But I want to make it quite clear that it is essential to bring the consumer and the farmer together to evolve a new policy for agriculture. It's no good upbraiding the farmer for producing the goods the consumer is demanding.

The ecology of the whole of earth will suffer in a world riven by bitterness and famine. The vegetarian example now could sow the seeds of harmony for our successors to harvest. There is no reason why this should not become reality. The world, as we have all agreed, can produce enough food and to spare, for all her people, provided that it is wisely used and distributed. Britain can feed herself, and can even export such things as malting barley, so that we can still trade and widen the variety of our fare. But as in other Western countries, British farming has today become an animal-feeding industry to dispose of surpluses of grain. Arable farming is conditioned by the beef barons. A vegetarian policy would relieve farming of the evils of this situation. We would afforest more of our marginal land and allow ourselves, too, more space — for we show the same signs of stress and the same vices that afflict livestock kept in 'factory farm' conditions.

In the world today cereals and pulses furnish 70 per cent of the intake of protein; meat and dairy produce provide 25 per cent and fish 5 per cent. Most of the human race is near to vegetarianism. Western nations, with their obsession with animal protein as a pre-requisite of the meretriciously high standard of living we expect, have adapted, albeit uneasily, to a diet heavy in animal protein and fat. The average Briton (and we are not the worst offender among affluent nations) now derives 62 per cent of his protein from animal sources and 38 per cent directly from plants.

Nutrition is not an exact science. Even now experts adjust values for recommended intakes of nutrients, which are always biased to the Western norm, a misleading guide. For example average weights are clearly too high and Western man should aim at a lower-than-average weight. Over the last century the average life expectancy for a British man aged 50 has hardly changed from the Biblical three score years and ten. It is only now beginning to dawn on Western man that he is suffering from malnutrition just as much as those in countries bedevilled by deficiency diseases.

Our systems can adapt remarkably well, as our assimilation of cereals during the 10,000 years of the Agricultural Revolution testifies. Modern human society, at least in the affluent countries, not wishing to be like the animals, no longer feeds its babies at the mother's breast, but gives it a bottle containing cow's milk, yet our young, like the mismothered and fostered of other species, can only adapt imperfectly to this early nutritional insult. In the West even the adults do not wean themselves from cow's milk, and yet we know that nearly every other species loses its ability to digest milk shortly after the obvious age for weaning. We have seen that the West maintains a prolific herd of 'sacred cows' but vegetables contain well balanced protein. We've disparaged beans, but beans are an excellent food. We can have bean feasts even now when the world is short of food. And in the Vegetarian Society we are also starting a

campaign for *real* bread. In spite of all our experts in the nutritional field we have a nation where one in three of our adults have none of their own teeth. In a recent issue of *The Sunday Times* The Minister of State for the Department of Health was arguing that we should learn some do-it-yourself medication. In other words he was saying what vegetarians have been saying for years, that we should attend to our diet and then we could take the load off the health services. It is no good the Minister of Agriculture giving huge subsidies to farmers to produce foods, the ill effects of which begger his colleagues in the Department of Health and Social Security. Veganism, even in Britain with its emphasis on beef and dairy farming, is not a wild nutritional gamble. Research on modern vegans shows that they gain by renouncing dairy produce and animal fats. As might be expected they differ from the norm in several ways, none of them with obvious adverse effects; indeed these differences may stand to their nutritional credit. It is possible that vegans living on refined 'hygenic' foods, in a city, might go short of vitamin B_{12}; they might also be deplete in vitamin D and iodine, but it is easy to correct such deficiencies (modern dairy foods are supplemented intentionally or inadvertantly with vitamins A and D and iodine). Like the absorption of iron, the assimilation of B_{12} still puzzles nutritionists. Man produces an abundance in the lower gut, beyond the point of absorption, so it is voided in the faeces. Accordingly sewage is a good source of B_{12}, and millions of people in the world have probably adapted to contaminated water and food as sources of their requirements, which are tiny. Other monogastric species cope in various ways. Rabbits eat an occasional dropping; horses and elephants are vegans with splendidly baggy guts, able to sustain themselves without exogenous supplies of vitamin B_{12}. They may derive some of what they need from grazing, through ingested earth. Certainly earth eating (geophagy) is common in some races and it occurs in our own community at times of nutrional stress (e.g. pregnancy). However it does seem that modern vegans are adapting successfully. Being ecologically minded they tend to grow their own food and to use detergents sparingly, so they may derive their vitamin B_{12} from earth and bacterial sources, and even from the occasional maggot unwittingly consumed. Vegan foods such as yeast extract and plant milks are fortified with vitamin B_{12}. In Eastern countries, delicacies such as bean-curd, wheat koji, tofu, miso, sufu, tempeh and ontjom, which are made by fermenting pulses and cereals, provide B_{12} through benign moulds and bacteria. The well-being of the inhabitants of the small Japanese city of Noda has been attributed to one of the benisons of its industrial activity, for the Kikkoman Company have fermented their shoyu sauce there since 1764.

I must say a word about clothing. Vegetarians avoid animal products in their attire, although with recourse to man-made fibres and plastics. We can also grow flax and cotton, and we can recover hair and wool from feral animals, or from animals dying naturally. Fortunately there is no need to bleed-out animals for their hair or skins. If we return to the simple life we should adapt by growing more of our own hair, for use rather than decoration.

I submit that we can all embark confidently on the change to vegetarianism, and the sooner the better. I contend that this is both desirable and feasible. Ecologists with the will to express their reverence for all life, and the humility that such an awe entails, must espouse vegetarianism. Man need not kill to live. Just as the reformers of the last century renounced slavery, it is now essential that those of this century abandon the depredations involved in butch-farming and agro-culture. Live and let live is a motto for vegetarians and ecologists.

Chairman: Finally we have Colin Blythe, a Consultant to Friends of The Earth, who is now doing a major study, with Michael Allaby, on integrated foods and nutrition policies in the U.K.

Colin Blythe:

In my comments this evening I shall confine myself to discussing three propositions commonly put forward by vegetarians.

Colin Blythe

1. That human dentition and other features reveal our ancestors to have been frugivores who may also have eaten some vegetables.
2. That since we were, allegedly, once frugivorous, fruit and vegetables are a) what we were designed to eat and b) remain our ideal diet.
3. That the converse of 2. is true i.e. that since meat is not what we were 'designed' to eat, it is an unnatural food and actively harms us. (As a side aspect of this argument I shall also discuss the evidence for suggesting that meat-eating results in aggressive behaviour.)

Proposition 1: That Homo sapiens has 'provably frugivorous anatomical characteristics.

In Mr. Wynne-Tyson's book, *Food for a Future,* these characteristics are chiefly aspects of dentition and the human digestive tract. (I am afraid that lack of time will prevent me from going further than the question of dentition, but many of the reasoning processes I shall use could be equally applied to the digestive system.)

For some animals, mainly the higher predators, it is obvious that their teeth, in conjunction with other features such as great speed, agility, retractable claws, etc., do clearly indicate their carnivorous natures. Equally the herbivorous animals show fairly obvious adaptations to pulling or nipping off and grinding grass or leaves. But for a *vast* range of animals one can make no clear judgements on the 'design' of their dentition and its relation to their diets and habits.

Frugivorous animals are found in many animal classes and orders. There are frugivorous mammals, reptiles and birds. Many of these

resemble one another's and some, birds, do not have teeth at all. Now, because frugivores in different classes or even orders may have different types and arrangements of teeth does not prove that there is no such thing as 'frugivorous dentition'. There is no reason why any number of orders should not have evolved its own type and arrangement of teeth suitable for dealing with fruit. If such a thing exists at all, then there is no theoretical problem in envisaging twenty different types of frugivorous teeth. The problem comes when you find animals within the same order *and with the same dentition* eating radically different things. Take the order *Rodentia:* there are fruit eating rodents, bark and shoot eating rodents, insectivorous, scavenging and occasionally carnivorous rodents; all with virtually indistinguishable teeth. Or compare the teeth of a fruit eating bat with those of an insectivorous bat; the small differences do not outweigh the great similarities. The same thing can be said of most primates. Therefore, you cannot say that human teeth are those of frugivores, because you cannot *prove* that such and such a dentition is exclusive to frugivores. Indeed, to extend the argument, I would say that it is exceedingly difficult to characterise 'frugivorous' teeth and that even if you could, can you prove that teeth equipped for dealing with fruit and vegetables are no good for anything else?

Proposition 2: The ancestors of Homo sapiens once lived in trees, ate fruit and vegetables and that, therefore, we ought still to eat fruit and vegetables. (Proposition 2. does not state that we ought also to return to the trees.)

My first question is: when we did live in trees, did we eat fruit? Since the almost complete absence of soft-tissue remains is a fact which bedevils primate paleontology, I wonder how we *know* what *was* eaten and what was *not*. Question two is: even if we did eat fruit and vegetables, was that the right food for us at that time? *Prove* that our ancestors didn't get as ill from eating fruit and vegetables, in just the same way as it is now alleged we get ill from eating meat. Because we once lived in trees does not mean that it was, even then, the best way of living for us. Perhaps we were scavengers and insectivores, driven into tree canopy by fierce predators on the forest floor and driven to eating what was available? On the evidence available, no one can prove this was not the case, or that it was.

It is a mistake to think that the forest canopy stage of our evolution was a climax stage, with all the specialisation that implies. If the definition of a climax species is one which is specialised to take advantage of a particular niche in the ecosystem, and which suffers if that niche is destroyed (or, alternatively that the system itself is materially affected by the removal of that species), then we know that this definition certainly does not apply to the human species. But if the human species is not a climax species then, by definition also, we know that it has not finished evolving and, moreover, *that its future evolution may take any direction* (including going up a cul-de-sac to extinction, as Mr. Wynne-Tyson darkly suggests in his book). That evolution may involve adapting in a perfectly natural way to the eating of meat, and that adaptation may be going on at this moment; we cannot prove it, either way. Adducing from the supposed fact that our primate forbears were frugivores, some sort of necessity for getting back to their diet causes difficulties on other counts. For years there has been furious debate, which continues still, about the so called 'cradle of mankind'. But wherever the cradle or cradles may have been located, one thing we do know is that the climate and the vegetation will have changed several times since. The world has seen ice-ages, the advance of jungle and savannah conditions into what is now Europe, and temperate species flourishing in what is now the Sahara. *Nothing* remains as it was. So how do we *know* what fruit and vegetables our forbears might have eaten and whether, if they were different, the fruits and vegetables we now have at our disposal exactly suit us? After all, just as there may be twenty different types of frugivorous teeth, each appropriate to its order or species, so there may be as many or more fructo-vegetarian diets, each appropriate to a particular species but not to any other. To take an extreme case: we know that the panda and the koala are both herbivores — but feed a panda on eucalyptus and a koala on bamboo shoots and you have a dead panda and a dead koala. Clearly, since Homo sapiens is not a climax species and does not have the same degree of specialisation as the panda or the koala, we know that such acute constraints are not placed upon our diet (quite apart, that is, from what common sense observation tells us!) The point I wish to make is that the range of fruit and vegetables we have available today *may* bear no relation to what our forbears ate and may in certain respects be inappropriate to our needs. Is there any evidence to show that this might be the case? Let us consider for a moment the question of food allergy.

Food allergy is seldom a threat to life and although some allergies can give cause for alarm, these are in a minority. But as a source of low-grade, chronic illness, food allergy is of primary importance. Now, let us look at the ten most important causes of food allergy (by frequency of occurrence in the

population, not severity of reaction). (These are based on American figures and certain items occur more frequently in the American diet than they do in ours, so the order may not be quite the same in the UK.)

In descending order of importance, the chief food allergens are: 1. milk, 2. chocolate, 3. maize and maize products, 4. eggs, 5. the pea family, of which peanuts are the worst offenders, 6. citrus fruits, 7. tomatoes, 8. wheat and other grains, 9. cinammon, and — it will not surprise you — 10. artificial food colourings. Numbers 3, 5 and 8 on that list are maize legumes, and other members of the family *Graminae* such as wheat, rice, barley, oats, wild rice, millet and rye. (Of those, incidentally, rye is the least allergenic, and buckwheat — which is not a grass at all, but a member of the rhubarb family [*Polygonaceae*] — is a non-allergenic substitute for wheat.) What do we notice about this list? Only that many of the items on it are among the most important vegetable staple foods in the world, while two — citrus fruits and tomatoes — are among the most important fruits!

Allergenic reactions, however, are not at all rare; on the contrary, they are all too widespread. Let us look at some of the ways in which food allergies can present. Milk may cause virtually any allergic reaction — diarrhoea (often alternating with constipation), diffuse abdominal pains and nasal and bronchial congestion with excessive production of mucus. Sensitivity to maize and other cereals can present as irritability, insomnia migraine, asthma, vague aches and pains and a whole range of complaints which the average GP is likely to view as evidence of mild neurosis and see you out of the surgery with a prescription for valium. Citrus fruits and tomatoes are an important source of allergenic asthma and both may potentiate mouth ulcers/thrush, even though the *cause* of the condition is the herpes simplex virus. When we add the known bad effects of certain vegetables and vegetable products to the known bad effects of meat and meat products — or at any rate, their known bad effects on *certain people* — it will readily be seen that it becomes harder and harder to pontificate about what is, or is not our 'ideal' diet. But that (pontificate) is just what vegetarians and vegans do, and in particular Mr. Wynne-Tyson, who not only believes that the only long-term answer for Homo sapiens is a fructo-vegetarian diet, but that the present 'aberration' of meat eating is positively harmful and may even be driving us towards extinction.

That there is one aberration is clear — and it is the one which beyond any doubt causes disease on a massive scale in the affluent societies. The aberration lies in the sheer quantities in which food is eaten in the West. Merely listing the titles and authors of literature on the relationship between diet and coronary heart disease would fill a book, as would a list of the literature on obesity and its sequelae. Few doctors, these days, need persuading that cutting down on saturated fats, sugar and alcohol (and smoking — but that's another issue) are among the most hopeful routes to the reduction of obesity, and a whole range of associated conditions — major and minor — which arise from overeating in general, and the overeating of these items in particular. And certain it is that one of the chief offenders, saturated fats, are almost entirely derived from animal products. But reducing the intake of food, even substantially, is not the same thing as eliminating that food from our diet. You will have realised that I have now moved on to Proposition 3: That meat is an unnatural food and does us positive harm, besides making us aggressive. I should like, as it happens, to devote most of the rest of my talk to discussing the specific point that meat-eating is associated with aggressive behaviour; not only because it is an exceedingly interesting area but because the empirical experience of several thousand years would suggest that the vegetarians, in this respect, have a rather good case. (Actually I *really* want to discuss it because it serves as yet another example of the impossibility of sustaining *any* dogmatic position with regard to diet!) It *may* be (I don't say it is) possible to show from epidemiological surveys that meat-eating is associated with aggression. I don't know if any rigorous work has been done — the problem of even defining what is meant by aggression seems to me to be a philosophical mine-field worth avoiding — but if no work has been done, then it might be instructive to look at the diet and lifestyle of the Jains of India, a sect which has been strictly vegetarian for two and a half thousand years. Although Jains eat milk and milk products, as practitioners of *ahimsa* — non-injury to all living things — they kill neither cow nor the calves produced. Thus we have a clear association of vegetarianism with a non-violent way of life, though of course we cannot say whether the philosophy produced the vegetarianism, or the vegetarianism the philosophy.

As it happens there are some experimental grounds for suggesting that a high-protein diet may affect the higher mental functions and emotions in ways not entirely desirable. (On this subject I recommend *Food and the Mind* by Prof. Jean Mauron, Nestle Research News 1973.) However, a word of caution is appropriate. As we know from the example of many diseases with multifactorial chains of causation it is impossible to say that any one factor such as smoking, saturated fats, lack of exercise etc. *causes* the disease and equally it is extremely difficult to give a weighting to any risk factor, i.e. to say that lack of exercise is twice as important as smoking or that both together are not as important as eating too much fat; and finally we cannot even say with certainty that some of these risk factors would operate at all, were it not for the presence of some other factor which potentiates it. In short, even if meat-eating *can* be shown to be associated with aggressive behaviour one cannot prove that it *causes* aggressive behaviour. Incidentally, on purely logical grounds, to prove that meat-eating causes aggression you would also have to prove; a) that there are no large groups of non-aggressive meat-eaters, and b) that there are no large groups of aggressive vegetarians. In respect of b) you would straightway be in difficulties. It would be hard to find a nation with a more continuously violent history (nor, incidentally a people with a more original creative spirit and abiding sense of natural beauty) than the Japanese. Yet, until the edicts which followed the Meiji Restoration

of 1867, meat was almost completely absent from the Japanese diet. However, it was felt that the energy, initiative, inventiveness and — above all — the coveted large stature of the occidentals, was in some measure due to their diet and, in particular, their consumption of meat. So Japanese would eat meat forthwith! Interestingly, the only example of Japanese cuisine universally known outside Japan — sukiyaki — is not a traditional Japanese dish at all, but was devised as a way of rendering meat palatable to the Japanese, so unfamiliar were they with this item. Nor could one get round this by suggesting that fish consumption compensated for lack of meat. Because even if one could show that fish-eating induces the same murderous propensities as meat is alleged to do, the fact is that large sections of the population in the interior did not eat much fish, except small quantities of carp and other fresh-water fish raised in ponds.

So we cannot derive any support for the meat-eating/aggression link from epidemiology. What we can say, and what is important is that it is not so much *what* you eat, as *how much* of it you eat that matters. In practice a high proportion of our protein in the West is derived from animal products, though if you look at the nutritional contribution of various food groups in the National Food Survey, you will find that 'total meat' contributes around 28 per cent of our average daily intake, and 'total cereals' contributes around 25 per cent, so there is not much in it. But we already know that we eat *too much* meat and animal products and so there is no resistance from this side to the idea of lowering consumption of animal products — by 20, 25, even by 30 per cent perhaps. Nowadays, when medical and nutritional experts seem to come forward almost daily with news of food or a diet which carries some kind of hazard, the despairing cry is often raised: 'Well, what can we safely eat?' The simple answer is that, provided you don't choose rhubarb leaves or ill prepared fugu fish, you can eat anything! Anything that is, in *moderation*, if you are in normal health, but with some additional precautions if you are at risk from a particular disease or if you show allergenic reaction to a particular food.

The truth is that the omnivorous, opportunist, highly-adaptive, non-climax species which is Homo sapiens, has a wide tolerance and can — without going to extremes — eat almost anything. The proponents of vegetarianism or veganism dispute this but, since it is they who would have the status quo altered, the onus of proof is on them to show that the omnivorous diet, if governed by knowledge and moderation, is actively bad for us. I do not believe they can do this.

Chairman: That ends the first part of our debate. Now I am going to ask Jon Wynne-Tyson to take up some of the points made by the meat-eaters, which seem to be very considerable, and he will be followed by Michael Allaby.

Discussion

Jon Wynne-Tyson: Well it's very complimentary of Colin Blythe to have centred his remarks on my book, but I think this is getting things out of context. If I took him up on all the points he has made it would become an argument between an author, defending his baby, and the critic, which is not what we're here for. However one or two general points arise. Colin says that vegetarians pontificate on this, that and the other thing, by which he means I do, because he's having a go at my book. It isn't a question of pontificating. The arguments we have put up are not something peculiar to vegetarians, but those that we believe are relevant world-wide to many of today's pressing *ecological* problems. We must try to see the total picture and the long term picture. We're in great danger, I think, at this sort of meeting, of getting bogged down in minutiae; the little things like whether meat makes you more aggressive; whether primitive man did or did not eat meat; whether the fact that the dental structure of the meat-eating bat is the same as that of the fruit-eating bat proves that a primate might therefore eat meat. These are really red herrings which take us away from the central subject, which is, to my mind, that we should not dismiss the needs of the future because we wish to preserve the status quo for ourselves. This is really what most of the argument boils down to: the defence of habit. We are living in a society that is entirely sold on exploiting animals, not only for food but for all sorts of purposes. Society is unwilling to give up its habits. We have them and we cling to them for as long as we can. But now there are ecological pressures on us to change, in particular our eating habits. I believe that this change has got to come. As we have heard from Colin, we are an evolving species; if we evolve we must accept the possibility of change and we must try to envisage what will be the effects, ecologically, for all species throughout the world, and not just in the short term and for Homo sapiens.

Michael Allaby: What I thought I'd do is to sum up the case that my team tried to present. We are all agreed that people in industrial societies generally eat far too much. No-one is opposing the idea that we should eat less, and probably in particular less meat or less animal produce; nobody's disagreeing with that. Nor are we disagreeing with the proposition that we should feed less grain to livestock. John Seymour developed, I thought very convincingly, what seems to me to be the inevitable implication of moving toward a vegetarian or vegan kind of agriculture. I don't believe this type of agriculture is viable and I think we must accept what John suggested, that what we're talking about is either immediately or eventually the virtual annihilation of animal species that are currently domesticated. Secondly I don't think Colin was being in any way irrelevant, because he was attacking the fundamental basis of the vegetarian case, which is that man was adapted to be a vegetarian. He has totally demolished that. Man may or may not have been adapted to be a vegetarian but it is *unprovable*. Now there are two myths I'd like to look at. The first is the myth that if people in the industrial West stopped eating meat this would contribute to the amount of food available to developing countries. In fact it wouldn't make a ha'p'orth of difference. This surprised me at first, but it's true. If it happened in Britain it would have no effect whatever, because we are such a small country in terms of what we buy and sell and in terms of world markets it *is* insignificant. It would make absolutely no difference if we released grain on to the world market. As a surplus it would go mainly to feed livestock in the U.S.S.R. and Japan and the Gulf. The second myth is about factory farming: that the intensive raising of livestock fed on grain is a wicked aberration brought about by capitalism. It's not. It's a perfectly natural process and a temporary one. Non-ruminant livestock have always been used to mop up grain surpluses. Through the whole of the 1950s and 1960s the world had immense surpluses of grain, so the non-ruminant livestock population was allowed to grow. It reached such a size that entirely new management systems had to be devised to handle it, that's all that happened. It is a perfectly traditional processs, except on the scale on which it happened. No, I don't like it, and in fact it will go soon because there are no longer grain surpluses, but there was no *wickedness* involved in the inventing of it.

Chairman: Peter Roberts would you like to come in now.

Peter Roberts: Well all I can say is my god-fathers, because you've thrown so many spanners in the works in those last few remarks. Certainly the case that man is ideally a vegetarian rather than a carnivore or omnivore has not been demolished. There are all sorts of things that we have not gone into, but I agree with out leader that we should stick to absolute basics. Michael Allaby has said that if we gave up eating meat it would not help the poor and the hungry in the Third World one iota. Well, with respect, this is absolute rot. In America when the price of beef really went sky high there was consumer resistance to it, and that consumer resistance led to a stock piling of beef and it went back all along the line and through a multitude of individual decisions; a lot of grain was released for aid programmes. Basically it seems that we are agreed that factory farming must be got rid of. But we cannot return, we cannot *go back*, to free range farming.

John Seymour: I would like to ask why Peter thinks we can't return to pastoral farming? Or if we cannot return, why we cannot go forward to it? I am a pastoral farmer; there is no reason why anybody shouldn't be. There is not the slightest reason why we should be factory farmers. Many people are revolted by it, I am, but I don't think it's necessary. You don't have to be a vegetarian to believe that. Another point that no-one has raised is the charge that is always being made that the use of animals is inefficient. But on a farm *nothing* is wasted that goes into an animal. The vegetation that goes into

an animal is never wasted because when it goes through an animal's gut it takes only 24 hours to produce compost, which is better than even Lawrence Hills can do, and its damned good compost. Finally I'd like to say that I'm 63, I can walk 53 miles a day and my teeth are perfect. And I've eaten meat all my life.

Chairman: Alan Long?

Alan Long: Well of course there are exceptions, and this is always so, but we must interpret statistics broadly. I'd like to take up the points made by Colin Blythe in relation to allergens. Of course you find these figures in the most commonly consumed foods just because they *are* the most common. You wont find figures for avacado pears because they are not one of the main food crops of the world.

Another argument that has been discussed is the question of man's equipment for dealing with a meat diet; well as I said man is infinitely adaptable, and an example of this is the bottle fed baby, but in the long run these nutritional insults do begin to tell. Over the last century cardiac disease and varicose veins and piles have increased. So although we can adapt very well we cannot do so entirely.

What if we are motivated by ideals? In this case vegetarianism can be shown to be feasible, practicable and useful. And I must emphasise once again that vegan farming does *not* mean, as the other side has suggested, the annihilation of all animals; we will not slaughter them. Domestic animals should be phased out; but we want to see a return to feral animals. The modern farm animal is a travesty; many of them are immasculated. Only a few months ago the Institute of Meat said, about the immasculation of boars, that it was a barbaric process, and they are recommending that entire pigs should be raised. So that will be a little delicacy for the future — you will be offered pig's testes on toast (voice: *Very nice too. Jolly good*).

The last point I want to make is that the idea that what we do here, in Britain, will make no difference in the world is not true, because what we do here is very important. We can set an example if we refuse to eat meat, or if we refuse to eat meat that has been fed on grain. By eating grain-fed stock we help to drive up the world price of cereals. What has happened in Russia is very instructive. In the sixties when their grain harvest failed they reduced their production of meat. But in the seventies when the grain crop failed they did a very uncomradely thing — they bought from the US and outbid the poorer nations, so that they had grain for their livestock. What we do as a nation can be important, and we *can* set an example.

Colin Blythe: When I said I was for the drastic reduction of meat eating I meant it. The subject I know most about is the relationship between diet and coronary heart disease, and I want to see meat-eating reduced to improve the nation's health. I'd like to finish with one small quotation if I may: "It is common knowledge that Athens' contribution to Greek community and civilization is astonishing and that Athens from 480 - 380 B.C. was undoubtedly one of the most civilized societies that has ever existed. Naturally the pre-eminence of Greek culture cannot be attributed simply to nutrition or climate or race, but the Greek diet, as a whole, cannot be ignored. The Greek of the classic period was always frugal, eating sparingly of barley, wheat, olives, oil, wine, some fish, some meat, dairy foods, vegetables and fruits of many kinds. It was a largely vegetarian, but extremely well-balanced diet. It is interesting to note that the Greeks said we must never forget the body in training the mind. We must train the whole man by means of gymnasia and diet. Equilibrium and frugality in eating appear to have been considered a prerequisite for higher intellectual endeavour in most ancient cultures in East and West" — and I submit that what we're really talking about is exercising moderation, and the answer is somewhere down the middle.

Chairman: Thank you Colin. Now we'd like to hear from members of the audience. First Lawrence Hills, who is too well known for his work in the Henry Doubleday Research Association to need an introduction from me. We are all pleased that he is in our audience.

Lawrence Hills

Lawrence Hills: I would like to say that what strikes me is how much we've left out. Firstly a lot of the talk about the diet of man is dated. Nobody's heard of Olduvai Gorge; nobody's heard of Robert Ardrey. I do suggest that the Vegetarian Society, as a matter of research, reads not Robert Ardrey, because he can be very much criticised, but at least takes up his references.

Man was a hunter, and would never have survived the ice-ages except on a diet similar to that of the eskimos, but that is no reason why we should follow his example any more than we should go back to stone axes. Men, rats and pigs are omnivorous. That's why they are so damn common today. But the real thing is that in thirty-seven years world population will have doubled, and in another thirty-seven it will have doubled again, so it seems very probable that we shall have to become vegetarians, and we've got to learn to do as well on a vegetarian diet as we can. I'd like to go out with John Seymour and share a Fiar-Isle sheep, but I think it's going to become increasingly difficult. Alan Long touched on the subject of vitamin B_{12} and I would say there is only one plant that's so far known to contain it, and that is comfrey. We are doing a lot of research into this, to get something like real productivity. The soya bean is too low in productivity for us, and in any case when we run out of North Sea Oil we shan't be able to import soya beans. Comfrey can produce two and a half tons of protein, containing vitamin B_{12} to the acre,

compared with the four or five hundredweight per acre of edible protein that you can expect from soya beans. We shall have to learn vegan farming, and this will be different for every country so there is still an immense amount of research and hard work to be done. I think silviculture will also be vitally important, because it brings back into the equation all the dry hillsides of the world. This is much more important than giving the third world airlines and nuclear power stations. We have to work to find out as much as we can about the potential of vegan farming. Man with a weapon in his hand came through the ice-age. We can come through the next crisis, but this time we shall have to do it by research and by using our brains.

I think it was Sir Andrew Aguecheek who said: "I eat a great deal of beef and it does much harm to my mind". Now if you've spoken to audiences of vegetarians, as I have, you'd have seen the moon-faced, slowed-down young people that come along. I think they must be on a macrobiotic diet which is a very bad one. You can't become a vegetarian just by cutting out meat or you'll eat too much carbohydrate which results in a slowing down of mental and physical faculties. Vegetarians must develop and put forward new ideas, not the same old arguments that I heard when I was eighteen, which was a very long time ago. They need to improve the diet. I'm glad to hear about their Green Plan, but the important thing is that their movement has got to grow, and they need to put in a lot of research. But I'm not a vegetarian and perhaps you will say that I am being too aggressive.

Jeremy Faull (Farmer): It seems to me that a certain amount of the vegetarian case rests, either consciously or unconsciously, on the idea that the butchery of animals is ethically wrong. One can't argue about ethics — they're a personal business — and I don't happen to believe that it is ethically wrong to butcher animals, so I think one has to look at the argument totally disregarding the ethical side. It seems to me that what you are suggesting, and I'd like Mr. Wynne-Tyson to answer this if he will, involves a tremendous change of diet such as could only be brought about by government control, such as we had in this country during the war, with government direction of what crops should be grown, and also through food rationing. Clearly the same think could be brought about if there was sufficient urgency to make such a policy tolerable. Now supposing this were done, forgetting the ethical part of it, would you see any objection to a system of rationing to ensure that the proper crops were grown in the proper quantities, but involving a certain amount of meat being produced on those areas of England that can produce meat, better than they can produce anything else?

J.W-T: Yes, I think this is how it must happen. No one would suggest that there can be a sudden change over from an animal based diet to a vegetarian or vegan diet. Clearly the change will come slowly and it will come not because vegetarians like us are going on at you, but because of the ecological and economic factors. But it will be a very slow phasing out process.

J.F: But I'm not suggesting a phasing out, that's the whole point. I'm suggesting a permanent way of going on producing a certain amount of meat, which we ensure by rationing it, everyone has a share of. I disagree with meat being available only to the rich. What I am suggesting is that by continuing to produce meat in the areas best suited to its production, and through rationing, everyone should be allowed permanently to have a certain amount of meat. There would be no need for phasing out.

J.W-T: Yes, you are in the majority. That is what most people who eat meat are hoping for. There will probably be a compromise. As Colin said, the line is drawn somewhere down the middle. I think eventually what happens will depend far less on economic factors than on ethical factors. If we are an evolving species surely it's only reasonable to suppose that our evolution is not going to be merely a physical one but also a spiritual one. If, through ecology, we have learned in comparatively recent years, something of the symbiosis that exists between all living things, surely the natural progression of this is going to be that we will have an increasing *reverence* for life. Because we can identify with other species we become aware, through science and common sense, that other sentient creatures have rights. I hope this is going to happen and I think we are moving in that direction. The main resistance to change is this awful business of habit, what you might call the stomach-centred attitude to life, to which we all subscribe in one way or another. But I think we need to take the long term view, and I don't think we can settle for a happy compromise, this would be neither scientifically, ecologically nor humanely consistent.

M.A: You can't really have it both ways can you? You can't have a long, slowly evolving situation and at the same time contribute to the present world food shortage. I mean if you are talking of helping the world food situation here and now, you are talking of an abrupt change. I don't believe it would make any difference if we stopped eating meat altogether, but if that is your argument, it must happen *now*, wouldn't you say?

J.W-T: Well I think certainly some adjustments must be made to meet the immediate short term crisis, and one way is to reduce the consumption of meat. I think one of the wickedest things that is happening today is that the rich countries are deliberately encouraging the Third World nations to adopt a meat diet; this is grossly irresponsible. And you made something of this point yourself when you said "the economic point has been reached where many countries now *demand* meat and it is impossible to tell the world what it must eat." But I don't think this is so at all. Certainly many countries are now demanding meat, but why? Because it has been pushed and pushed and pushed by the agri-business interests of the rich countries.

M.A: This may be so although I don't think that these societies are necessarily demanding meat because we push it. I think there is something in man that leads the majority of people to demand meat if they can get it.

J.W-T: I think it's a status symbol, don't you? I think people look at the affluent countries and because they see how much meat is eaten there,

they are persuaded that it is nutritionally superior.

M.A: No I am sure that this is not so.

John Seymour: Do you really think its more humane for us to refuse to take our part in the balance of nature? Do you think its more humane to let animals die of starvation, as cows are allowed to die in India, than to kill them humanely?

J.W-T: No I course I don't John. Your contribution worried me because I think you take what I would call the classic sentimental meat-eaters' attitude. You said we cannot keep animals without killing them. Of course we can't. You then quoted a farmer friend of yours who kills his calves at birth and this horrified you. But for heavens sake, *you* kill them at six months old.

Chairman: I think we should take another question from our audience.

Ken Duxbury (Writer): Mr. Chairman, I would like to go on to a rather open ended point that arose from Dr. Long's statement about feral animals. Supposing we do let all these animals roam freely, they're going to breed indiscriminately. How about the balance of nature in this situation? Are we going to go back to square one in just one sector? Is this possible?

A.L: I think you have to realise that at present farm animals are artificially raised. Animals in the wild do practice a form of population control. They will not breed as freely as they do now. But we might have to cull them, and this would not be unacceptable. What we find unacceptable is breeding animals deliberately for the purpose of killing them. Of course there will be problems, in the short term.

I would like now if I may to take up one or two points made by Lawrence Hills. We in the Vegetarian Society *are* doing research and our food and cookery section is working now as it has never worked. We are running course after course on vegetarian cookery and the demand for lecturers is so enormous that we simply cannot fulfil it. We have five research students working on our Green Plan and its corollaries. One of them is working on trypsin inhibitors in cow peas which is a crop of great significance to Africa. I must say that I am appalled by the suggestion that vegetarianism should be brought about by government rationing. I think it is most important that it should come about by people exercising their free will. If you look at prohibition in the U.S. you see what happens if restrictions are imposed by government. If you try to abolish hunting, for example, before people are ready for it, you put an unfair strain on the police and we would find much more serious cracks appearing in our social structure. This is why I say that I think it is most important for ecologists and vegetarians to educate people by example, and to be seen to practise what they preach.

Jeremy Faull: May I just make one point. I was not suggesting that rationing should be used to introduce vegetarianism; on the contrary I was suggesting that it be introduced in order to preserve meat-eating.

Peter Roberts: Why on earth should you want to ration something that is already in over supply? We have, in Europe at the moment, a mountain of beef which cannot be sold. What's the point of rationing something you can't sell?

J.F: We have these surpluses because we are not allowing the normal laws of supply and demand to operate.

Chairman: I think we are getting away from the subject.

P.R: There was one other point that I would like to take up, if I may. You said that you wanted to exclude ethics from this argument. But don't you agree that in the final analysis ethics is going to be the only thing that will decide the future? We can provide ample food to feed a world population double what it is at the moment, *provided that we don't feed so many animals.* We pride ourselves on our agriculture in this country, and yet we are at present *importing* half the meat we eat — that is over two million pounds worth a day. We import eight million tons of grain and we're taking oil seeds from India. Now surely it would be far better, rather than introducing rationing, to step up the research into the technology of producing food which we can eat direct from the crop, whether this is dressed up as meat or eaten as nut roast or whatever, this must be the answer, and I submit that this *is* an ethical choice.

John Seymour: Can I come in here? One point that hasn't been convincingly made is the argument that farming can be efficient without animals. Our farming in this country is now based on chemicals, oil derived chemicals, and you can only have vegan farming so long as you have a supply of these oil based chemicals. Cut off these chemicals and you have to return to good husbandry, and good husbandry means the proper interdependence of the animal and vegetable kingdoms. This is not sentimental, this is science. We are all part of the system, and you cannot suddenly cut out one vast stratum of life from your husbandry.

M.A: This is ecologically a sound argument. You can't remove a trophic level and not expect some strange effects.

Colin Blythe. I am going to have to come in on the vegetarian side here. John is right, but they are right too. The Chinese have barely any animals (interjection: *They have pigs*) . . . and along any Chinese country road you will see latrines,

and a peasant will come bounding over the fields to invite passers by to come and use his latrine in order to ensure adequate supplies of this wondrous substance.

J.S: But they also have pigs, and they call their pigs their fertilizer units.

Chairman: I would like to have some more comments from our audience.

Nicholas Hildyard (Journalist): I should like to make the point that there is no society known to anthropologists that is entirely vegetarian. It is true that there are many in which certain cults, castes or whatever, abstain from meat, or where very little meat is eaten, but there are none which *never* eat meat. We are therefore talking about a completely new society — and that in itself is possibly a good reason for supporting the motion, if only to voice a protest against the societies of the ancien regime. Before jumping to any conclusions, however, I think we ought to look at one question that is fundamental to this debate, which has not so far been touched upon; namely the reasons why we choose to eat certain foods and not to eat others. Why, for instance, is horse-meat a standard meal in France, whilst in England the idea of eating horse repels us? Why do Jews not eat pork? Why do we not eat rats or crows or dogs? I submit that what we are really talking about is two different ways of classifying nature — of partitioning it into things that are 'good to eat' and things that are 'bad to eat'. We are really talking about taboos. I submit also that there are no absolute answers that would clinch the argument for either side. All the facts, the figures, the hypotheses about our ancestors' diet are simply rationalisations of taboos; that when it comes to meat-eating versus vegetarianism, nature, as Colin Blythe points out, remains essentially neutral. Interestingly, both sides have used exactly the same arguments to justify their conception of nature as primitive man uses to justify his. They have both resorted to that most threatening, unchallengeable argument — that of the inherent dangers that will be unleashed by nature, if what each considers the 'right' way, is not pursued. The vegetarians warn us that nature will not tolerate meat-eating; she will turn us all into constipated, or was it diarrhoea-ridden, anaemic eunuchs. The meat-eaters (particularly those of the Michael Crawford school) threaten an upsurge in the number of moronic children if they are deprived of the right fatty-acids to ensure full development of the brain. This type of argument is no different from that employed by the tribal chief who warns of pestilence, plague and famine ravaging the land if one fails to observe certain taboos.

If we accept that we are talking about taboos, we really ought to ask why we have them — what are their functions? They are many, but the one that seems most relevant here is that of creating an identity for a group. If one looks at the ancient Israelites one finds that one reason for the taboo on eating pork may have been to differentiate themselves from the surrounding tribes — to emphasise their tribal boundaries. I suggest, rather cynically perhaps, that in the sudden interest in vegetarianism we are seeing an example of a millennial movement seeking to give itself identity; attempting through proselytizing a new creed, to give a semblance of unity to what would otherwise be a very diverse mass of people. I further suggest that were we to have a totally vegetarian society, we would soon find groups on the periphery of that society adopting meat-eating as a means of differentiating themselves.

Chairman: We are now introducing a totally new aspect. We've shown the effect of vegetarianism and meat-eating on biological systems, we've talked about the ecological and ethical aspects, we are now talking about the social implications, which are equally important. I'd like now to hear some more about the possibilities of silviculture. As I understand it there are sixteen million acres of rough grazings in this country and about thirty million acres that is neither arable nor good grazing land.

Peter Roberts: If we are talking of a future of vegan farming I think that when the good arable land which is now given over to growing barley for livestock, is available to grow crops for direct human consumption, there will be no need to go to the expense of cultivating these marginal lands. The uplands will not be an economic proposition for food crops, but they could be used for forestry.

Chairman: At present we import two thousand million pounds-worth of timber a year. That's a hell of a lot of money. What would happen if these sixteen million acres of rough grazings were given over to trees with feral animals running wild and being hunted by those who wanted to eat meat? I am told that 35 per cent of our wood requirements could be satisfied on five million acres, which appears to show that with sixteen million acres we could just about do the entire job. What would be the consequence?

J.S: This seems to play right into the vegetarian camp because all the meat eaters would go into the forest and bump each other off.

Ann Carr (Teacher): I'd like to know what feral animals are going to run wild in these forests? If you suggest that these animals will be running in the new forests laid down by the Forestry Commission, I don't think you'd be very popular. Young trees cannot survive if they are being eaten by wild animals.

Chairman: It depends on the population of the animals. Forests normally have animals in them, but one might have to regulate this at first.

Colin Blythe: May I make one small new point? Since ethics have been introduced, I don't see why aesthetics should not also be introduced. One of the things that we are realising in our study of food nutrition policy is that basically everything comes down to value judgements. Now you may decide to phase out sheep from your diet for an agricultural or economic reason, and what happens is that you will lose the entire Welsh landscape, and you will lose the particular flora and fauna of the downland which has been created by this animal grazing this particular terrain in its own particular manner. Now I don't say that one should necessarily keep the downlands or the Welsh mountains as we know them, but a lot of people would be upset at the thought of losing them. They have after all inspired artists and poets, and if the concensus of society's opinion is that they want to keep them the way they are, then we may have to keep sheep on them.

Chairman: I don't think this is purely a question of aesthetics either. We should judge these things by using ecological criteria to determine which system is the most stable. In this way we find that a forest comes out much better than pasture-land. The rate of soil erosion from pasture is many hundreds of times higher than the rate it is eroded from the forest floor, especially of course from tropical forest. So its not just a question of aesthetics, whether you have downs or forests. In the U.K. we have only 8 per cent of woodland. In Italy it is 20 per cent; in France 22 per cent; in Germany 28 per cent; in Finland 65 per cent, and even Japan, with one hundred million people is 65 per cent woodland. So you see that we are really very very short of trees, and this is very serious from many points of view, not least the question of waste absorption. Eugene Odum, one of the world's leading ecologists considers that every country needs to be at least 50 per cent wooded to absorb pollution and create oxygen.

Alan Long: Could I say one further thing about forestry. Now, as the chairman has said, we spend in Britain £2,000 million a year importing wood primarily for paper. We are hoping in our Green Plan to produce 25 per cent of our requirements which would save £500 million a year. This leads me to the point I wish to make that timber is more labour-intensive than sheep farming. I think this would take people back into the Highlands and we would welcome that. Of course one has to admit that in the present circumstances people are leaving these areas, however, anything we could do to reverse that change would be good.

Summing Up

Chairman: Well I think we have run out of time, so I will try now to give you a summing up.

First of all, we tried to establish whether man is a natural meat eater. Colin Blythe showed very convincingly that animals with very different diets often have a similar dentition. His other argument, that because our ancestors mainly ate vegetables does not mean that man was designed to be a vegetarian, I personally find less convincing. Evolution, after all, is a directive process, and if during most of our evolution we ate vegetables, then this must be regarded as the right diet for us. However, I do not believe that our ancestors did exclusively eat vegetables. As Nicholas Hildyard pointed out, we do not know of any primitive society that did not eat meat — at least occasionally.

We also considered what form of diet is most conducive to health. Colin Blythe pointed out that most human allergies are to vegetables rather than to meat. Alan Long answered that members of our meat-eating society enjoyed a worsening state of health and this he attributed to the practice of meat eating, in my opinion not entirely convincingly.

One thing we forgot to discuss, however, was the important argument put forward by Michael Crawford concerning man's need for long-chain polyunsaturated fats for building up nerve tissue, which are apparently only obtainable from eating meat. I personally do not know how valid this argument is. It has already been debated unconvincingly in the pages of *The Ecologist.*

We also dealt with the question of morality. Here clearly vegetarians appear to be on stronger ground. However, John Seymour's argument that death is a natural thing and that it is not killing that is immoral but causing animals to suffer by making them live in inhuman conditions is a very strong one. We also considered the problem of feeding the massive population in this country from the very small amount of arable land at our disposal. To satisfy this requirement would seem to justify a move towards vegetarianism or at least towards a very considerable reduction in meat eating. Both the vegetarians and the meat eaters agree on this point. They differed simply as to whether meat eating should be altogether banned or simply reduced.

It was also suggested that this would free a very considerable amount of food for aid programmes to the Third World where food is really required. Somewhat paradoxically, Mike Allaby considered that such a policy would not necessarily improve the food situation in the Third World, for supplies of food would only go to those who could afford to pay for it. He also denied that this policy would cut imports of food and feed from the Third World, which he regarded as insignificant in any case. This point was not accepted by Peter Roberts who pointed out that 200,000 tons of ground nuts for animal feeds are imported by us every year, enough to feed 16 million Indians. He could also have mentioned the tea, coffee, jute, cotton, etc. which is produced for export on good agricultural land that could produce real food.

We then looked at the problem from the point of view of the individual farmer. John Seymour pointed out how indispensable is animal manure for the maintenance of soil fertility. A vegan society deprived of manure would, according to him, be very much dependent on all sorts of undesirable agricultural chemicals. This was denied by Alan Long who insisted that vegetable matter, properly composted, would be as effective as animal manure. Besides, Long pointed out, human excreta could replace animal manure. John Seymour did not regard this as sufficient. In addition, he pointed out how necessary are the by-products of animal production — wool, hides, etc. without which we would become even more dependent on man-made fibres and hence the chemical industry.

Another aspect of the problem which was discussed was that of wildlife. Abandonment of meat eating would undoubtedly free vast areas of marginal land, at present used for rough grazing, for forestry and wildlife conservation. This is indeed a very alluring prospect, especially in view of the terrible shortage of trees in this country and the equally unacceptable shortage of nature reserves (little more than 280,000 acres in the UK, most of which are in Scotland). Our meat eaters tended to underestimate this. Seen from the conventional farming point of view, it simply meant a larger amount of land that was not suitable for arable farming, that must, with the abandonment of meat eating, be taken out of production. I must say that here my sympathies lie with the vegetarians.

Finally the problem was looked at

(continued on page 384)

Notebook

How Infallible Can You get?

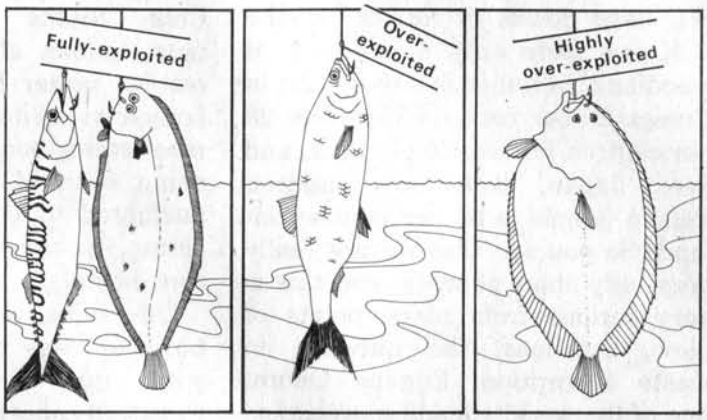
"The presumption that man can't make a system that won't fail . . . is sheer nonsense . . . Whatever the problems, we could learn to master them." This vision of man as a godlike, potentially infallible being comes from T.G. Ayers, President of the Commonwealth Edison Company of Chicago, as quoted in *Critical Mass*, the journal of the Citizens' Movement for Safe and Efficient Energy. Such facile optimism is not uncommon among spokesmen for the nuclear power industry. Yet, as the article from which I borrow the quotation goes on to point out, the *practice* of the industry is a very far cry from this euphoric theory. In June alone, it appears, the Nuclear Regulatory Commission in the U.S.A. recorded 437 "failures or deviations in performance" in American nuclear power plants. On average each reactor suffered 7 breakdowns of one kind or another, and June was in no way atypical. One accident per installation every four days or so seems a rather high score for an industry which boasts about its safety record.

The next line of defence for the nuclear advocates is of course to argue that most of the breakdowns recorded are trivial. Up to a point this is true, if they are measured by the number of serious injuries or deaths of workers, though no one has yet calculated the number of deaths resulting from exposure to high levels of radiation within the nuclear installations over a significant period — say thirty years or so. So far. But one really serious accident (such as that recently rumoured to have occurred in the U.S.S.R. in 1958) could upset these favourable statistics for good. And although most of the sample 437 mishaps were genuinely trivial, a significant number were of kinds which in certain circumstances could have led to catastrophe. For instance, 13 involved penetration of a reactor's "primary containment" by a foreign body, and 23 the release into the environment of radioactive gas or liquid. More alarming still, 46 breakdowns were attributed to "basic design or fabrication errors", which obviously casts doubt on the reliability of reactors in general. If it be true that man is capable of making a system that cannot fail, what is certain is that he has not come close to doing so yet.

Now the Conservation Can Start

As expected, the E.E.C. is to extend its fishing limits to 200 miles from January 1 next year. The arguments within the Community are not over yet: in particular, the British and Irish demands for exclusive 50-mile zones seem unlikely to be met without a hard struggle. The agreement at The Hague is probably a step in the right direction: but the real test will come when the Community begins to deal with the question of conservation.

At present the waters around western Europe look like an object lesson in the squandering of natural resources. An analysis of fish stocks drawn up by the European Commission reveals the extent of the destruction — in the North Sea, for instance, cod and haddock are "over-exploited", herring and sole "highly over-exploited"; in the English Channel sole and mackerel are "fully exploited", herring "over-exploited" and plaice "highly over-exploited". One could go on in the same vein. The Commission's report also demonstrates how impossible it is to consider one



species or one area in isolation. For example, on the continental side of the North Sea large quantities of sand-eels are caught for fish-meal production. But this fishing takes place in the spawning or nursery grounds of other species such as herring, cod and sole, reducing stocks of these more valuable fish which, when mature, would have migrated towards the British coasts. Cases like this indicate how inadequate the "exclusive zone" argument can be.

The first positive effect of the agreement will probably be the phasing out of fishing by "third party" countries such as Norway, Poland and the Soviet Union. But the Commission also envisages "short-term sacrifices from member states" to replenish fish stocks and eventually achieve the maximum sustainable yield. Sacrifices will certainly be needed, especially when one takes into account the return to home waters of fishing fleets excluded from their traditional grounds by the extension of other countries' limits. But without such sacrifices the fishing industries of western Europe will destroy themselves in the next decade. It is therefore essential that the E.E.C. have the will, and the strength, to impose a sensible conservation policy on all member countries.

Not Extinction, Just Controlled Importation

When the Government, at the end of last year, announced its controls on the importing of wild animals and plants into Britain, I criticized them in this column on the grounds that there were serious omissions from the species and products controlled. It now looks as though I need not have bothered: for the "controls" as implemented so far are not worth a tortoiseshell shoe-horn anyway. The Department of the Environment recently published figures for import licences granted from January to July this year — figures which suggest that licences to import endangered species, dead or alive, into Britain are as easy to obtain as dog licences. Here are a few examples:

Special Christmas Offers

IN JANUARY 1977 The Ecologist Subscription goes up to £6.00. per year. (No change in the dollar rate) Members of the Conservation Society, F.o.E., Soil Association, Henry Doubleday Research Association £5.50. Students £5.00.

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About 50,000 skins of wild cats, including 661 leopard, 279 jaguar, and 16,610 ocelot, the rest being of smaller tropical species (all "controlled");

101 polar bear skins (though the polar bear is now a protected animal throughout its range);

Over 40,000 kg of ivory from Kenya and Zambia (import of raw ivory is "controlled": moreover most of this was probably poached in its countries of origin);

200 turtles from Malaysia (unworked tortoiseshell is "controlled" — the turtles concerned are listed in the I.U.C.N.'s Red Data Book of endangered species);

About 2½ *million* reptile skins (mostly monitor lizards, large snakes, and crocodiles or alligators — all "controlled", many listed as endangered);

Over 17,000 tropical orchids (all "controlled", and many of them protected in their country of origin).

These figures, admittedly, represent licences granted, not actual imports (and it is possible that some importers, anticipating tougher controls in the future, have applied for far more licences than they intend to use at once). But they suggest that Government action so far has been a mere sop to the conservationist lobby, and leaves the real situation if anything worse than it was before.

Wetlands — British Contempt and Italian Negligence

International "Years" for this and that seem frequently to herald unprecedented disasters to the causes they espouse. European Wetlands Year is no exception. The contempt the British Government feels for this cause is sufficiently shown by two recent decisions of the Department of the Environment: firstly, the granting of planning permission for an oil refinery on the marshes at Cliffe in Kent, in the teeth of opposition from local authorities and residents, and against the recommendations of the Department's own inspector at two public inquiries; and secondly, the allocating for industrial development of Seal Sands, Teesmouth, a designated site of special scientific interest.

Now from Italy comes news of disaster to a site of European importance. The salt-water lakes around the Sardinian capital, Cagliari, have been renowned for a century as the home of water-birds rare in Europe — avocet, black-winged stilt, gull-billed tern, purple gallinule and flamingo. Until recently the birds seem to have been miraculously unaffected by the encroachments of housing, roads and factories on the shores of the lakes. But this summer thousands of fish died in one of the lakes, Santa Gilla, and tests have revealed that it is heavily polluted with mercury, no doubt contributed by the effluent from nearby chemical factories. It will never be known how many birds received a fatal dose of the slow-acting poison during temporary residence on the lake. The Italian authorities are discussing decontamination plans; but at the same time, in a country which this year has become the ecological disaster area of Europe, they must be wondering uneasily where the next blow will fall.

A Postscript on Elm Wood

A few months ago I commented on the desirability of using the vast quantity of excellent timber provided by the victims of Dutch Elm Disease. I have since learnt that an organization now exists to promote such use. The Elm Marketing Group (25 Savile Row, London W1X 2AY) has been set up jointly by the Forestry Commission and the timber trade. The Group points out that increased demand for elm wood will not merely utilize an otherwise wasted asset: it could actually help to conquer the disease, since it will lead to higher prices for dead elm trees and thus encourage landowners to remove these sources of further infection. The E.M.G's literature is available on request, and includes information on uses of elm and suggestions for individual action.

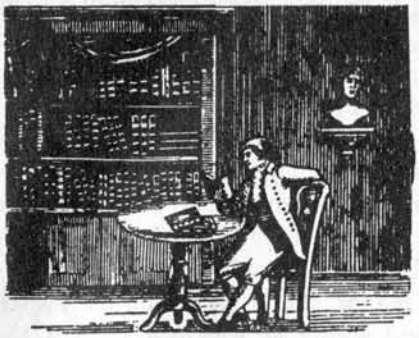
Unnatural Disasters

It must have occurred to most people at some time in recent years that man's current war against nature is not entirely one-sided. Nature is hitting back, increasingly to all appearances, with droughts, floods, earthquakes, hurricanes and other natural disasters. It is also noticeable that these disasters tend to occur precisely where they will do most damage — that is, they strike mainly at the poorest people in the poorest countries.

A team at Bradford University recently investigated this phenomenon, and their findings are discussed in a thought-provoking article in *New Society* (9th September 1976). They concluded that the term "natural disasters" is something of a misnomer: most of these catastrophes occur directly or indirectly as a result of the imposing of Western social, economic and political ideas upon basically pre-industrial societies. This process destroys the traditional controls whereby the impact of natural upheavals was minimized. Its effects are felt in many ways. Land-hunger (caused more by economic pressure in favour of larger farms than by absolute over-population) drives the poorest families to settle in disaster-prone areas. For example, the low-lying coasts of the Bay of Bengal, where over 200,000 people died in the cyclone and floods of 1970, were virtually uninhabited until fairly recent times. Again, modern frontiers can cause disaster by limiting the natural mobility of nomads in time of drought. Peasant communities may lose most of their men to modern industries: the women on their own are then unable to produce enough food to feed their families and keep some in reserve for hard times.

The victims of "natural disasters", it seems, are more often than not the "marginals" — those who have been forced off the land, or onto poor or insufficient land, and who cannot find a permanent job. (Often, too, they are members of a racial or cultural minority.) They provide a reserve of cheap casual labour, the "factory fodder" without which no industrial revolution can succeed in its early stages. And the earthquakes, droughts, floods and famines which afflict them are the 20th century equivalent of the cholera and typhus which were the scourge of the poor in 19th century England. If we dismiss the former as *natural* disasters, we are falling into the same error as middle-class Victorians who regarded the latter as "acts of God". The real culprit is the same in both cases — not Nature, not God, but industrialization.

Nicholas Gould



Books

All You Need to Know

THE COMPLETE BOOK OF SELF-SUFFICIENCY by John Seymour. Faber, £5.50.

As one who has admired John Seymour from afar since *The Fat of the Land* first appeared in 1961, I fell upon *The Complete Book of Self-Sufficiency* with the highest expectations. I am happy to say that I was not disappointed. The first thing that strikes one is that this is a very *beautiful* book, of large format and lavishly illustrated with charming two-tone drawings. Some of these are primarly decorative — idyllic scenes of farmhouse kitchens and cottage gardens and craft workshops — but most serve a practical purpose as well, and are admirably clear and informative.

Obviously, no book on self-sufficiency could ever really be *complete*, in the sense of telling you all you need to know. Any self-supporter who has not been apprenticed to the life from childhood needs a small library of books on specialized topics — gardening, carpentry, brewing, preserving, pig-keeping, cookery, bees, poultry, country crafts . . . But what a single book *can* do, this one does, and it would be a rare and remarkable person who did not learn something from almost every page. Some of the arts of self-sufficiency are basically very simple, like baking bread or growing vegetables; and it is one of Mr. Seymour's virtues that he firmly believes this category is larger than most of us imagine — "Many of the things that we look upon as far too difficult to be done by anybody but a specialist are not difficult at all once we actually come to do them." He is right to urge us to break the monopoly of the "experts" wherever possible.

Some crafts, of course, cannot conceivably be learned from a book. I feel as if I *might*, with this volume in one hand and a knife in the other, so to speak, contrive to skin and gut an ox; but I certainly couldn't make a barrel after reading the page devoted to it here. (In fairness, the author frequently admits of some skill that "you must get somebody who knows how to do it to teach you" — weaving, shoeing a horse, jointing a carcase are examples.) Possibly the weakest section is that on Natural Energy: nine pages is not really enough to do more than touch on the various sources available. Of course, this is not really John Seymour's forte; a fact which he recognizes, perhaps, by giving it a longer Useful Reading list than his other sections. But these are only very minor criticisms. *The Complete Book of Self-Sufficiency* is a book to enjoy, to learn from, and perhaps most of all to be *inspired* by. For all self-supporters, old-established, novice or merely would-be, it will surely prove to be *the* Christmas present of 1976.

Nicholas Gould

Mono-Culture - An Eighteenth Century Tragedy

THE GREAT HUNGER, by Cecil Woodham-Smith, Hamish Hamilton, 1962, Harper and Row (U.S.), 1962.

Famine is very much in the prospect today. Those interested in this problem can gain an historical insight into the subject by reading this book about the great Irish potato famine of the 1840s. The book also holds much of interest for students of international migration. Environmentalists will find a fascinating case study of ecologically unsound development, and those interested in "population problems" will find classic examples. One can also gain insight into the strife seen today in Northern Ireland.

It is uncertain who introduced the potato to Europe in the late 1500s. The crop is of Central American origin and came to be cultivated much more extensively in Ireland than in the rest of the British Isles or on the Continent. The Irish dependence upon the potato was tied up with the system of land tenure, basically one of absentee ownership with plots leased to tenants who in turn sublet them. This process was repeated through several tiers, until the final tenant had no more than several acres of ground to cultivate. It was possible to raise sufficient potatoes on half an acre to feed a family of five or six for a year. Grain was cultivated on the remainder of the plot to pay the rent, completing the subsistence-agriculture scheme. Export of this grain provided the income to the landlords, who by and large lived in England.

There was a general increase in population in Europe during the 1700s, but this was particularly marked in Ireland. About 1780 the population really took off, increasing some 180 per cent over the following 60 years. The Rev. Thomas Malthus' *Essay on Population*, published in 1798, was not produced in a vacuum. There was great interest and concern in Europe during these years with expanding populations. Nor was it an accident that a preacher wrote the tract. The clergy were in daily contact with the misery of people, and saw what was lost on the political leaders at the seat of government. The latter were largely devotees of the mercantilist theory anyway, which extolled the advantages (at least in the short term) of expanding populations to the economy (cheap labour) and country (plentiful soliders).

By the 1840s Ireland's population had increased to some nine million persons. By contrast, its present-day population is three million. Five million of these had become entirely dependent upon the potato as a source of food. The dependence was so great that in whole regions housewives knew how to cook nothing else. The diet of a labouring man was considered to be 14½ lbs. of potatoes per day. Yet even before the potato failed, this dependence upon it often resulted in hunger. The crop stores poorly, and because of its bulk cannot easily be transported. As a result, in the late spring and early summer before the new potatoes came in, hunger, and even short-term starvation, was the normal course of events.

As the Irish population increased,

more and more potatoes were planted. In turn, the ease with which a family could be fed on a small plot of potatoes encouraged further increases in the population. The climate was mild, so shelter needs were minimal, and fuel, in the form of peat, was readily available. The population boomed, the potato mono-culture spread, and the stage was set for the next act in the drama: decimation of the crop by an epidemic of the fungus which causes the potato blight.

The reader will have no difficulty in imagining the sequence of events. The disease had been present in Ireland for several decades, but damage had been localised. In 1845 climatic conditions were ideal for the fungus' growth, and the major portion of the crop was wiped out in several weeks. The same happened in 1846. The next year was a good year, but by this time the people were too weakened to cultivate the land and had consumed most of the seed potatoes anyway. In 1849 the blight was again rampant, sealing the fate of many of the remaining Irishmen.

Paradoxically, grain, the crop that paid the rent, was being exported from Ireland at the time the people were starving. The alternative was eviction for the tenant, the ultimate disaster, for there was nowhere else on the island they could go. Many a landlord switched to the production of grain and cattle, and wholesale evictions of tenants at the height of the famine were carried out to "clear" the estates. The tenant houses were "tumbled" or destroyed to assure that they would move on. Those evicted took to living in ditches or holes dug in the bogs. The situation has its parallel today, for both Bangladesh and Ethiopia are exporting grain (rice and navy beans respectively), in spite of famine, to earn foreign exchange.

Relief efforts were fairly extensive at the outset. Public works were begun in the form of road construction, but these were mismanaged and ended in disaster. Systems of workhouses were established, but these were supported by taxes on the Irish landlords who soon became destitute, because these "Poor Law" taxes escalated and rents could not be collected as the famine progressed. In the wake of the food shortages, one beneficial change took place. The English protective agricultural tariffs, the so-called Corn Laws, were repealed.

Through all this Ireland suffered greatly, but the one thing which mitigated her suffering was the virgin lands of North America. First, food was brought to the people. Large quantities of Indian corn were imported and distributed by the English government, though a financial panic in 1847 put an end to major relief efforts. Second, people were moved to the food. Large numbers of people migrated to the new world. Some of the more humane landlords bought passage for their tenants to America, rather than simply evicting them.

Herein lies the difference between those who starved in the 1840s and those who face starvation today. There is no remaining virgin continent for them to migrate to, and no appreciable food stocks to tide them over. Today's version of the financial panic theme threatens to reduce relief efforts as well.

The trip across the Atlantic took up to 12 weeks, and ship conditions were horrible until the U.S. regulated them. Passengers were overcrowded, underventilated, underfed, and underwatered. As the famine progressed, typhus broke out on the island and was often carried on board the ships. Many died, both at sea and after they landed in quarantine areas in North America.

The trip to England was much shorter and less expensive, and many chose it in lieu of going to North America. Three hundred thousand pauper Irish moved into Liverpool in a period of five months. The city's native population was 250,000. The population's density reached many tens of tousands per square mile. There were no sanitary facilities, no public water supply, and very little food. Typhus and relapsing fever broke out.

Through the medium of unbelievable suffering, a new balance was struck. The Irish population was reduced by two-thirds to a number the land could carry. Agriculture was diversified and dependence on the potato lessened. Southern Ireland subsequently achieved independence and with it reform of the landtenure system. The age of marriage rose drastically, and far fewer people married. Humane birth control (plus emigration) were substituted for an inhumane increase in the death rate as a means of population control. (Even today, one-third of the people who have been born in Ireland live outside the country.)

One of the great debates in the world today is whether or not the less-developed countries, now poised on the brink of an Ireland-like disaster, can make the transition to stable populations and new socio-economic conditions without passing through the furnace of famine. Opinions vary, but the Irish experience would seem to come down on the negative side of the question. In human affairs, major changes often seem to come only after equally major tragedy and sacrifice.

Ironically, the Irish potato famine of 130 years ago helped set the stage for the famines of the 1970s. The strength of the Irish Catholic church in the United States dates to the famine emigration. For decades, the conservative Irish wing of the Catholic church has been the main opponent of the development and adoption of birth control methods and population policies in the United States, and of their inclusion in U.S. assistance programs for the less-developed countries. Had such policies been adopted two decades ago, the crisis we now face in both the less and more developed countries might have been averted, or at least mitigated. These same clerics continue to oppose the major method of birth control used in the world today: abortion. By their action, they help assure that other nations will come to share the Irish heritage of famine.

Woodham-Smith's book reads easily. It is extensively documented and minutely detailed, even burdensomely so at points. But her story is more timely today than when the book was written. As Harry Truman was fond of saying, "The only things new are the history you don't know."

John Tanton

Reprinted from: *Zero Population Growth National Reporter*, April, 1975.

Jus Animalium

THE BEST OF FRIENDS by John Aspinall. MacMillans. £4.95

John Aspinall has devoted twenty years of his life and all the money he could lay his hands on in building up his breeding colonies of threatened species at Howletts in Kent. As this book reveals, his primary concern is with gorillas and tigers. He has done everything to create the best possible conditions for his gorillas. This included building for them a unique 'gorillarium' of about an eighth of an acre, equipped with "80 ropes, brachiating bars or hand walks, a thirty-foot chute, a heated swimming pool, an artificial tree in which they can make nests or take shelter from rain or sun, a massive drum, tubular steel spheres, cable reels and truck tyres."

John Aspinall is not only concerned with animals in captivity. During the last twenty years, he has travelled widely, mainly in Africa and India, visiting the world's remaining wildernesses and observing animals in the wild. He has built up an impressive collection of books on the behaviour of all the great mammals, and, as is clearly revealed in the book, his knowledge of the subject is encyclopedic.

Nor does he hesitate, as do many blinkered ethologists, to point out that man is a social primate and that the basic features of social primate behaviour also characterizes ours. Among them, he cites — and this will not please many of our liberal friends — hierarchy, male dominance, sexual dimorphism and elitism.

One of his greatest achievements, however, is to have established a unique relationship with the animals at Howletts, especially the gorillas and tigers. He regards them as his friends and spends hours with them every day.

As Aspinall writes, "to enter the world of a tiger; to join a wolf pack as a wolf; to be accepted as a member of a gorilla band and to live with them as they grow to maturity: these are some of the experiences which have become the daily routine at Howletts." This is no idle boast. The way he describes the most subtle nuances of the personality of each of his gorilla friends makes this apparent.

He is also keen to point out how unjustified is our fear of wild beasts. Gorillas are the most gentle of souls and tigers have the most excellent character. As he points out, an average of one person a year is killed in Britain by wild animals, usually a keeper, as compared with an average of two killed by dogs, seven by domestic bulls and seven thousand by motor cars. Wolves are particularly gentle, according to Aspinall, and he regards the story of Little Red Riding Hood as a vicious calumny against them. Indeed, there is no record of a wolf ever killing anyone's grandmother. Quite clearly it was that horrible Little Red Riding Hood who killed her grandmother and blamed it on the wolf.

His total faith in the good character of his friends is reflected in the extraordinary photographs in which he is seen playing and wrestling with adult tigers and gorillas, and even more so in one of his baby son in the arms of an adult female gorilla.

To Aspinall, the greatest disaster the world faces today is the systematic extermination of the larger mammals by industrial man. Well before the end of the century gorillas and tigers, among many others, will have been exterminated in the wild.

His committal to wildlife preservation is total, indeed quasi-religious. "Self-elected and self-appointed," he writes, "I feel that I am a spokesman, however inadequate, for wild things and I ask the reader to join me in this role. Let us be the eyes of the blinded, the voice of those whose tongues we have torn out, the ears of those whose drums have been dulled by our crescendo. Wild nature has no vote, no influence, no power, no hope even, unless we range ourselves phalanx-like, at her side, and cordon her last places."

He realises, of course, how hopeless the task is. "That we still have a choice or a chance may itself be an illusion," he writes, but "if one is dying of thirst in a desert even a mirage is welcome. Better to die stumbling forward lured by hallucinations than be wind-buried by the sands of despair."

He ends up with his credo, which is worth printing in full.

"I believe a wildlifer must not expect to be rewarded with recognition or worldly approval. His work will be to him his recompense. Only in his own peace of mind and self-esteem will he find solace.

"I believe in *Jus animalium*, the Rights of Beasts, and *Jus herbarum*, the Rights of Plants. The right to exist as they have always existed, to live and let live. I believe in the Buddhist concept of *Ahimsa* — justice for all animate things. I believe in the greatest happiness for the greatest number of species of fauna and flora that the Earth can sustain without resultant deterioration of habitat and depletion of natural resources.

"I believe in the sanctity of the life systems, not in *the sanctity of human life alone*. The concept of sanctity of human life is the most damaging sophism that philosophy has ever propagated — it has rooted well. Its corollary — a belief in the insanctity of species other than man — is the cause of that damage. The destruction of this idea is a prerequisite for survival.

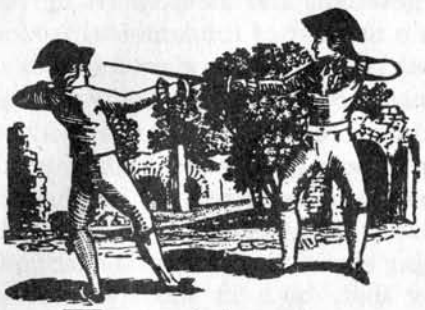
"I believe that wilderness is Earth's greatest treasure. Wilderness is the bank on which all cheques are drawn. I believe our debt to nature is total, our willingness to pay anything back on account barely discernible. I believe that unless we recognise this debt and renegotiate it we write our own epitaph.

"I believe that there is an outside chance to save the earth and most of its tenants. This outside chance must be grasped with gambler's hands.

"I believe that terrible risks must be taken and terrible passions aroused before these ends can hope to be accomplished. If a system is facing extreme pressures, only extreme counter-pressures are relevant, let alone likely to prove effective.

"I believe that all who subscribe to these testaments must act now, stand up and be counted. What friends Nature has, Nature needs."

Edward Goldsmith



Letters

Another View on the Problems of the 'Ecology Movement'

Dear Sir,

I should like to comment on Henryk Skolimowski's article 'The Ecology Movement Re-examined' published in *The Ecologist* in October (Vol. 6 No. 8). Professor Skolimowski has made a useful start to a discussion which I hope will continue for a long time.

Although I recognise that in a short article he could hardly cover such a broad topic, nevertheless Skolimowski's point implying that there is no modern unified approach to the philosophy of ecology can be contested. At least one philosopher has provided recently a review of theological, philosphical and technical literature with just that object in mind: John Passmore's *Man's Responsibility for Nature: Ecological Problems and Western Tradition* (Duckworth, London, 1974). He emphasises that part of our problem is one of making the best choice from often conflicting philosophies.

Passmore's book should have sparked off more discussion in the scientific press than it has. This too represents a problem for more than just ecologists. Elites tend to dominate science and form 'in groups', sometimes presenting remarkable resistance to discovery by individuals outside their group and also engaging in arguments over priority.

The importance of such problems of scientific publication for ecology are exemplified by Stephen Fretwell's article 'The Impact of Robert MacArthur on Ecology' (*Annual Review of Ecology and Systematics* 6: 1-13, 1975). He shows how MacArthur in order to get his more controversial views published had to use the sponsorship of a member of the U.S. National Academy of Science (in the days before the journal had a refereeing system) to bypass the usual referees and editors of ecology journals. While today MacArthur's approaches to ecology are widely accepted, Fretwell raises a disturbing question in his review: "Without the Proceedings of the NAS (National Academy of Science), I wonder how far MacArthur would have gotten?"

The situation is doubly difficult for ecology. There is the necessity to retain scientific rigour and be tolerant of a variety of views. Yet, the ecology movement has been marred by unnecessary feuding between some of its most eminent individuals — e.g. the conflict between Barry Commoner and Paul Ehrlich which takes up much of the May and June 1972 issues of the *Bulletin of Atomic Scientists*, and the recent squabble over E.O. Wilson's *Sociobiology*. While such energy is occupied in these irrelevant conflicts, many examples of political suppression of scientists who criticise effectively various aspects of ecological trauma are ignored. Ecologists in particular should read the papers by Frank Egler.*

The critical problem is that the political implications of the various modern ecology movements are perceived by politicians (and the few scientists who have become, to use a bit of radical rhetoric, 'tools of the military-industrial complex') as threats to the status quo. Ironically, as Skolimowski has pointed out, the threat posed by ecologists may be more imagined than real — and he provides the example of Eldridge Cleaver's transition from *Soul on Ice* to "his revolutionary design in male pants". An example possibly closer to the problems of ecology is provided by the transition of Jerome R. Ravetz who in 1971 had published *Scientific Knowledge and its Social Problems*, which examined elegantly certain scientific and technological factors crucial to human survival. Yet, by 1975 in a talk to students at Middlesex Polytechnic, a talk reproduced widely in student newspapers, Ravetz discusses the 'three revolutions : power/liberation/consciousness' almost exclusively in terms of dropping out into homosexuality, drugs and transcendental meditation!

In contrast to Skolimowski I feel that the ecology movement needs much more than philosophy, however central that is to laying some good foundations. It needs scientific rationality, hard facts — and also the courage and the opportunity to speak out. In particular, it needs awareness of political realities.

Skolimowski has criticised Ivan Illich for being "rather short of positive answers." I have not read Illich's books on educational philosophy, but I certainly do not think that his *Medical Nemesis: The Expropriation of Health* leaves any doubt about the path needed to cure the medical profession. As others have said before Illich, so long as the medical profession's profits are maximised — along with those of the ethical drug companies — by people getting ill, public health measures, the most significant ways of decreasing disease and disability, will receive less governmental attention than they deserve. What Illich did fail to bring out was that, in fairness to the medical profession, many of their members have argued for just such reforms.

There is an urgent need for more people to examine other professions which control the distribution and utilisation of resources in our society. There are some remarkably good studies done by environmental activists, often university students, but this literature is badly scattered, often printed in an ephemeral form, and not placed into the mainstream of scientific citation.

Finally, the problems of the ecology movement will not be solved by Skolimowski's retreat into McLuhanesque jargon: "the software of civilisation". Am I alone in suspecting that there is something rather sinister in equating philosophy and ethics, on one hand, and computer programming, on the other? Oh well, as Orwell allowed his hero to conclude in *1984*, Big Brother was not so bad after all.

Yours faithfully,

Clyde Manwell,

Selby, Yorkshire, England.

* e.g. 'On American problems in the communication of biological knowledge to society', *Biologisch Jaarboek, Dodonaea,* 1962, pp.263-304; and, 'Pesticides in our ecosystem: communication II', *Bioscience* 14: 29-36, 1964, and see the subsequent correspondence in the February 1965 issue of *Bioscience,* pp.158-159 entitled 'Pesticides, petulance, postmortem and pax'.

Energy and Food Production

Dear Sir,

In editing my review of Gerald Leach's book with the above title, I inadvertently cut out an important paragraph, so that what followed did not make sense. The next paragraph began 'How then is this enormous advantage frittered away?'

The enormous advantage is the energy efficiency of our cereal farming, as had been described in the excised lines. I apologise to readers who wasted their time trying to puzzle out what I meant. The point is this: When each worker on a UK cereal farm can produce an output of 3040 MJ/man hour (in terms of nutritive energy 10 MJ is equivalent to 2,400 kcal) with an energy ratio of approximately 3 (for comparison the energy ratio of broiler poultry is as low as .1) how is it that for workers on farms as a whole the productivity drops to 50-170 MJ/man hour and for the food industry as a whole to, at the most, 35 MJ/man hour. These are staggering differences. Pre-industrial farming has outputs of 11-40 MJ/man hour. So what of our industrial progress?

The next paragraph of the review gives Mr. Leach's explanation of how we have frittered away the advantages of progress: by too much animal farming and by our energy-extravagant treatment of food between the farm and the shop. On a global scale such an expenditure of energy to supply people with food (it would account for 40% of global consumption) would be impossible. This energy analysis therefore gives us valuable guide lines to the reform of food production in the West generally.

The hard work that has gone into this small book compels our gratitude and respect.

Yours faithfully,
Robert Waller,
Trunch, Norfolk.

Debate: Summing Up.

(*continued from page 375*)

from the point of view of the market. Mike Allaby considered that meat eating had to be allowed because people wanted to eat meat. It was pointed out that this was not always so. Look at India, for instance. Jon Wynne-Tyson suggested that people in the developing countries only wanted meat because of the prestige associated with eating it. In any case, I might add, what is so holy about the market? Those who have read Karl Polanyi must know that it was with the development of the market economy that our problems started to arise. Why should people be given things, whose real cost they totally ignore, just because they want them? I personally feel that the principle of consumer sovereignty is one that we must explicitly reject.

What is certain is that both vegetarians and meat eaters agreed on a number of fundamental issues. Both condemned modern methods of meat production as morally intolerable, and also leading to the production of poor-quality meat which is undoubtedly damaging to our health. Also, both agreed that we needed to bring about a considerable change to our diet, both in the interests of health and natural self-sufficiency, and that this meant shifting the accent from raising cattle to arable farming.

In fact, the real question at issue seemed to be whether meat eating should be drastically reduced or entirely eliminated — and this, to me, seems to be a minor issue in comparison with those on which agreement was reached.

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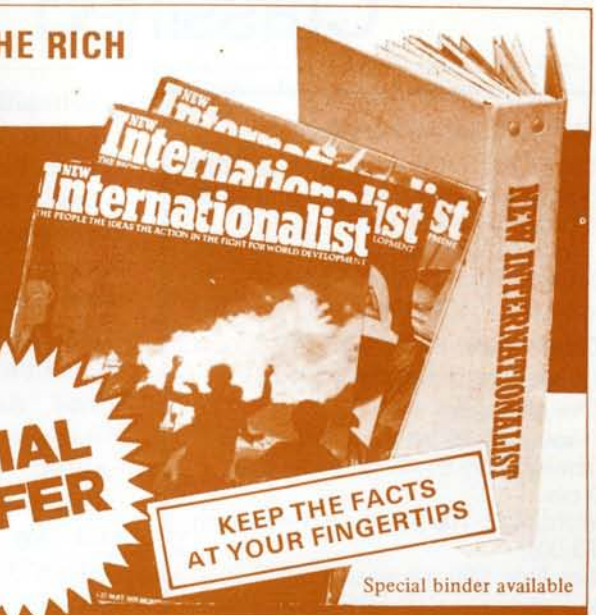

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