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Options for The Ecology Movement



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Dr. E. F. SCHUMACHER

The death of Dr. Schumacher on September 4th this year is a great loss to the whole Ecology Movement of which he was one of the best known and most distinguished spokesmen. His words were respected not only by people already convinced of the need for balanced development, but also by governments.

Canvassing in the Presidential primaries last year, Jimmy Brown, Governor of California, told reporters that his policies were those of Dr. Schumacher's most famous book *Small is Beautiful*; a title that has become a familiar catch-phrase throughout the English-speaking world and beyond. President Carter, whom he met at the White House earlier this year, told him: "The hope for the future lies in your book." And British politiicians, asked to list the publications that had most influenced their thinking rated *Small is Beautiful* the third most influential book. Early this year when he toured the United States an estimated sixty thousand people came to hear him speak on 'The right size for the right society'.

One reason for Dr. Schumacher's impact was that his critique of economic growth and overdevelopment was never sterile. His thesis was that economic prosperity could be achieved through ecological balance, and this he presented in such a way that people were inspired to make changes in their own lifestyles and at their places of work.

He more than anyone else gave the Ecology Movement a philosophical base. Together with Leopold Kohr and John Papworth he founded Resurgence magazine in which he started to develop the economic theory of small is beautiful, while his friend and colleague Dr. Kohr was developing the political theory of the benefits of small states. "Right size must be followed by right values" he said and he questioned the value of a high standard of living. In 'Buddhist Economics' which appeared in an early issue of *Resurgence* he developed the theme that we should adopt a conscious culture of poverty; by which he meant a culture



of simple living, otherwise the blind growth philosophy of the materialistic West would lead to catastrophe.

As an economist he was one of the first observers to propose that conventional industrial development would not benefit the developing countries, and following theory with practice he founded the Intermediate Technology Development Group of which he was President. He believed profoundly in developing the soft technologies that could liberate people from drudgery and misery and provide a good life not dominated by the demands of perpetual growth. He travelled widely and established Intermediate Technology Development Centres in Tanzania, Zambia, Nigeria, India, Pakistan, Indonesia and Australia and Canada.

His love of farming developed during the second world war when he was sent to work on the land, and observed for himself the rightness of organic growing. To the end of his life he worked in his own large garden, growing all the vegetables for his family. He ground his own wheat in a stone grinding mill and baked all the household bread. He was President of the Soil Association and gave the farmers and gardeners of the world a new principle of TLC (Tender Loving Care) "TLC", he said, "Is the missing element in modern farming."

In the 1950s Dr. Schumacher predicted in some detail the coming energy crisis and warned of limited oil reserves. He counselled the careful use of existing coal resources.

A witty, urbane and eminently approachable man, Dr. Schumacher was at his best perhaps when lecturing or talking to young people. He was on a lecture tour in Switzerland when he collapsed and died. He gave much of himself to the world; now his body has gone but his message will remain with us forever. He leaves a widow and four young children, and four grown up children from his first marriage.



In October 1972 The Ecologist published John Powles's remarkable paper 'The Medicine of Industrial Man', which revealed that modern technological medicine, contrary to what we had been led, almost religiously, to believe, was not really contributing to our health. In spite of the massive amount of money invested in health services, industrial man is increasingly unhealthy. The reason is that modern medicine is based on the 'engineering approach' to the human organism which tends to be looked at as a machine from which bits can be removed and to which bits can be added with total impunity. Powles showed that this must be replaced by the 'ecological approach', in terms of which the human organism is regarded as a natural system. In his latest paper John Powles shows that the decline in mortaility that has been going on for many decades is rapidly coming to an end, especially among middle aged males. The reason for this is the rapid growth in the incidence of cancer and aeschemic heart disease which is attributable to conditions that are intimately associated with an urbanised and industrialised society. In view of the impotence of modern medicine to deal effectively with these diseases Powles shows that their incidence can only be reduced by a radical change in the conditions that produce them.

here has been a rapid and generally increasing rise in expenditure on health services over the last two or three decades. But more medicine does not appear to have been sufficient to produce more health. This article seeks to clarify the general problem of declining cost-effectiveness in health services by examining it within a limited field. Firstly, I shall be concerned with those health service activities that are aimed at reducing the effects of potentially lethal illness. These will be referred to as disease control measures to distinguish them from the "caring" activities of health services. Secondly, I shall be assessing the effectiveness of disease control measures only in relation to mortality in working age males. This group was selected because it now carries the heaviest burden of avoidable mortality below age 65. While the benefits of reducing mortality below age 65 are unquestioned, the value of extending life at the upper ages is disputed. Hence, the exclusion from this discussion of ages over 65.

Although the argument will be limited in these two ways, it will be extended in another respect in order to compare the effects of disease control on mortality, with those of social and economic influences. McKeown and his colleagues have shown that socio-economic factors have generally predominated in determining past mortality trends¹, and their exclusion from this analysis would increase the risk of misinterpretation. I shall start with an examination of modern trends in adult male mortality.

Modern Trends in Adult Male Mortality

The decline in mortality that has occurred over the past two to three centuries in the countries now industrialised have been largely comprised of a decline in deaths from infection in early life. The increase in life expectancy at birth has been much greater than the increase at age 45, where recent improvement has been slight, especially for males. This is illustrated in the trends for England and Wales shown in Figure 1. The stagnation since the 1930s in mortality decline in middle-aged males has occurred in spite of an accelerating decline in deaths from infective causes such as tuberculosis and pneumonia. It follows that non-infective causes must have increased. This process of substitution is shown in Figure 2. The main causes to have increased sharply in recent decades are ischaemic heart disease and lung cancer.

When the experience of successive cohorts is examined it can be seen that the age from which the rise of non-infective causes effectively neutralises the decline of infective causes has become younger for each successive cohort. Figure 3 shows the death rates for U.S. white males born in the first half of each decade from the 1900s to the 1940s. It will be seen that those born in the second decade experienced an advantage over their predecessors until they reached their fifties: those born in the third decade lost their relative advantage in their forties, those born during the depression had lost their advantage by their early thirties, and those born during the second world war had lost their advantage by their mid-twenties. The children of the post-war 'baby boom' have since the early 1960s experienced rising death rates at ages 15-25 (not shown on graph). Thus although the reduction in infective causes of death has produced a significant net decline in mortality in the earlier years of the working age range, this overall decline has now stopped, even at these ages.

In the case of U.S. non-white males, the picture is even less encouraging (Figure 4). The rise in non-infective causes. especially since 1960, appears to have more than offset the decline in infection so as to tilt the recent death rates of each cohort clear above those experienced at the same ages by their predecessors. This process has been more marked in the earlier half of the working age range. On the death rates prevailing in 1971, U.S. non-white males would have only a slightly better than fifty per cent chance of surviving from 15 to 65. (The actual figure is $53\%.^2$)

In England and Wales mortality decline at ages 55 plus since the 1930s appears to have been largely confined to professional, technical and managerial occupations (Figure 5). In Chicago substantial differences in white death rates between the wealthier and poorer areas have not shown any signs of reduction since 1930.³ The problem of mortality in the working ages is clearly more severe in less advantaged groups. We shall return to this point later.

Non-infective Mortality and the Modern Economy

In Table 1 are listed some of the leading causes of death in all U.S. males aged 15 to 65 in 1971. Any such ranking depends to some extent on the set of categories employed. Inclusive groupings such as "all other accidents" and "malignant neoplasms" have been avoided in this list. It is apparent that the major causes of adult male mortality are largely man-made. This is also shown by the recent increase in causes such as ischaemic . heart disease and lung cancer that was noted above. In those cases where evidence of a recent increase is lacking other evidence suggests a connection to the modern way of life.

The best means of assessing whether a non-infective cause of death is a part of genetically controlled senescence, or is largely a function of the way people live, is to check for difference in incidence in different cultures. The ideal reference group are hunter-gatherers for theirs is the way of life that members of the genus Homo have followed for at least 95% of their evolutionary history. Studies of blood pressure and blood fats by age in huntergatherers make it clear that the vast majority of degenerative cardiovascular disorder has been produced by deviation from our evolutionary niche.4

There is no reliable evidence on the frequency of cancer in huntergatherers, but other evidence strongly suggests that a majority of the cancers occurring in industrial countries are also associated with what Boyden has called *evodeviance*.⁵ Lung cancer is mainly caused by cigarette smoking. Colon cancer, and the hormone dependent cancers, of which the most frequent in males is cancer of the prostate, appear to be linked to a high energy diet, rich in animal fat.⁶

Thus, in industrial economies, many substances enter the human organism that would not have done



so under primaeval conditions. The inhalation of tobacco repeated smoke, the ingestion of energy rich foods (especially saturated animal fats), the adding of salt to food and the ingestion of alcohol are the most important. Together with low levels of energy expenditure their influence forms the material basis of much excess mortality during the working ages. The role of social and behavioural disturbance is also apparent in causes such as motor vehicle accidents, homicide and suicide.

It would be wrong to conclude, however, that an industrial economy inevitably produces high mortality from non-infective causes. The mortality experience of high income groups in many countries and the national record of Sweden make it clear that life in an industrial economy can be compatible with reasonably low death rates, providing other factors are favourable. On the other hand, the very low death rates in areas such as rural Greece8 demonstrate that increased income is hardly a prerequisite for lower mortality from non-infective causes.

The Effect of Clinical Measures on Mortality in Adult Males

If a high energy diet, rich in animal fats, is characteristic of an industrial economy, so too is the deployment of a vast array of disease control measures. We shall look in turn at clinical measures (those applied to individuals) and public health measures (those applied to populations).

Expenditure on all forms of medical care has increased rapidly in the post-war period, and now approximates 8 per cent of Gross National Product in the U.S.A. The increase in expenditure per person does not appear to have been mainly due to an increasing frequency of medical encounters. Visits to physicians and days of short term hospital care have been relatively stable in relation to population.9 The main explanation lies in the increasingly intensive use of resources for each medical encounter. This is most apparent in the hospital where workforce sector. the increased at an average annual rate of 4.5 per cent in the U.S. between 1965 and 1973. This was more than

twice the 2.1 per cent average yearly increase in the total workforce. The number of hospital workers per bed increased at an average yearly rate of nearly 6 per cent from 1.15 in 1965 to 1.80 in 1973.¹⁰ Some of this increase will have been directed towards improvements in amenity for long stay patients, but most of it reflects an intensification of attempts to control disease in sick individuals. According to Knowles:

Technical development, along with an increasing demand for surgery in cancer and in the correction of injuries and deformities of all parts of the body, have transformed the urban general hospital into a highly technical, high-cost, acute curative institution in which perhaps as much as 70 per cent of the facilities and personnel are today related to the care of surgical patients.¹¹

As working age males will have been sharing this intensification of medical care, we may now ask what effect these trends might have had on excess mortality in this group.

From Table 1 it may be noted that degenerative cardio vascular disease has recently accounted for more than a third of all deaths in working age males. The main clinical measures directed against these diseases have been the chemical control of blood pressure and hospital treatment of heart attacks.

The ganglion blocking hypotensive drugs were introduced in 1949 but side effects limited their use to the more severely affected. The main advances came with effective oral diuretics in the late 1950s and methyldopa in the early 1960s.12 In U.S. white males ageadjusted death rates for cerebrovascular disease at all ages fell by 19 per cent between 1950 and 1969.13 The fall was equivalent to 1.75 per cent of the death rate from all causes in 1950. There have also been declines in male deaths attributed to this cause in Britain.12 Declines in hypertensive heart disease have been more marked, but this is considerably less common as a certified cause of death.¹² 13

Anti-hypertensive therapy may have contributed to the stabilization and subsequent slight decline in ischaemic heart disease mortality observed in several countries since the mid-1960s, but as yet there appears to be no convincing evidence that such therapy does reduce coronary mortality.¹⁴

The contribution of anti-hypertensive therapy to apparent declines in mortality related to hypertension cannot be clearly defined, but other influences are also likely to have been at work, for example, a secular decline in some infective causes of kidney damage.¹⁴

The most conspicuous of the clinical attempts to control degenerative cardiovascular disease has been the treatment of heart attack in specialized coronary care units. The rapid spread of these units, particularly in the U.S., will have added significantly to the inflation of hospital costs. Knowles estimated that the cost of treating a heart attack in the Massachusetts General Hospital in 1970 was \$3500.¹⁶

The most reliable method for assessing the effectiveness of therapeutic regimes is to do a random controlled trial. Mather and others randomly allocated 31 per cent of their sample of 1.895 British men suffering acute myocardial infarction to either home care under a primary physician or to a hospital regime including a spell in a coronary care unit.17 Of the random patients who were treated at home 88 per cent were still alive at 28 days, compared to 86 per cent of those treated in hospital. For men over 60 without low blood pressure on first assessment the advantage of home care reached statistical significance. These results need to be confirmed by a second trial in a different setting and further attempts should also be made to identify any sub-groups who may benefit from hospital care, for example, younger cases with initial hypertension. In the meantime, we can note a recent editorial in the British Medical Journal:

"Mortality from coronary heart disease has not been noticeably influenced by the expenditure of time, money and manpower on coronorary ambulances, coronary care, coronary surgery and rehabilitation."¹⁸

To summarise: the main effect of clinical intervention on mortality from degenerative cardiovascular disease is likely to have come from anti-hypertensive therapy. This effect cannot be accurately assessed, but it is likely to have been small relative to the overall scale of mortality from these causes.

The U.S. National Cancer Institute's Report Number 4 End Results in Cancer¹⁹ provides evidence on trends in survival rates in several U.S. centres for cancers diagnosed from the period 1940-49 to 1965-69 (see Table 2). The general picture for the most common cancers is of a moderate improvement in survival rates from the 1940s to the 1950s, with only small improvements since.

For all cancers diagnosed during 1955-1964 (excluding non-melanotic skin cancer and 'carcinoma in situ' of the cervix) the median survival time was only 1.6 years. The effect of clinical intervention on overall cancer mortality remains limited. There is no evidence of substantial benefit from the intensification of hospital medicine since the 1950s.²⁰

Of the common causes of death in working age males, injuries, including suicidal and homicidal injuries, represent a large group where the benefits of clinical advance, especially since the beginning of World War II, are likely to have been substantial. Thus. although death rates of this group as a whole have not declined in the U.S. since 1950, an increased capacity to repair the human organism has at last succeeded in minimising the effects of an increased tendency to destroy it.

In summary, the effects of clinical measures on adult male mortality in the period since World War II will have varied according to the conditions involved. Clinical measures deserve credit for an acceleration of the pre-existing decline in infective causes such as tuberculosis and pneumonia²¹ They have succeeded in partially offsetting the effects of a rising incidence of injuries, and they have probably contributed significantly to the decline in mortality related to hypertension. There is unlikely to have been any substantial effect on the leading cause of death - ischaemic heart disease. In the case of cancer, early gains from the 1940s to the 1950s have not been sustained except for some less frequent cancers. Conditions such as cirrhosis of the liver, chronic respiratory disease and mature onset diabetes are unlikely to have benefited significantly.

The Effectiveness of Public Health Measures

The effects of public health measures on mortality are more difficult to assess. By far the most important in relation to non-infective causes has been the anti-smoking campaign.

Although there has been no substantial reduction in estimated cigarette consumption per adult in either Britain or the U.S. since 1950, the trend for the average weight of tobacco consumed per adult, has been definitely downward. In the U.S. the decline was 22 per cent between 1950 and 1973.22 This, combined with the effects of cigarette filters and lower tar content cigarettes may be producing a significant reduction in the load of tobacco tar delivered to smokers' lungs. Given that, in Britain, it took 50 years for cigarette smoking in men to reach its peak of acceptability at the end of the Second World War, and noting also the vastly superior resources of those promoting tobacco, it might seem unreasonable to expect the habit to rapidly disappear. Smoking does appear to be becoming unfashionable among the middle classes. If this trend gathers momentum the mortality sparing effects during the working ages are likely to be greater than those hitherto resulting from all the efforts of clinical medicine.²³

In the U.S. and the U.K. health education does not appear to have produced any significant movement towards the kind of prudent, low energy, low fat diet that might be expected to lower cardiovascular and cancer mortality. Estimated energy and fat consumption continued upward in the U.S. from the mid 1950s with an estimated average energy intake of 3350 Kcal in 1974. This was 17 per cent above a recent estimate of 2785 Kcal for Sweden, where the trend in energy consumption has been downwards since the late 1950s.²⁴ Sweden may be the first country to have reversed the historic tendency for energy and fat consumption to rise with income.

	Numbo		Par Cant	1.	cancer patients	diagnose	d in 1940-	49 to 1965	5-69.+
Degeneartive Cardiovascular disease:	Ivanioe		<u> </u>	Primary	Per cent of all	3 yr. rela accordin	ative surviv g to calend	al rates* (lar period	%) of diagnosis
- ischaemic heart disease	127,710	31.2		Site	male cancers x	1940-9	1950-9	1960-4	1965-9
- hypertensive and cerebrovascular disease	22,434	5.5	36.7	Lung	17.2	5	9	10	10
			Color Sec	Prostate	12.4	49	59	64	66
Motor vehicle accidents	30,502		7.5	Colon	7.1	33	47	49	50
Lung cancer	27,988		6.8	Rectum	5.7	32	45	45	47
Cirrhosis of the liver	15,733		3.8	Bladder	6.7	47	59	61	63
Homicide	13,620		3.3	Stomach	5.7	11	15	14	14
Suicide	13,441		3.3	Hodgkins D	isease 1.3	32	40	49	59
Bronchitis, emphysema, asthma	6,761		1.7				11-12-12-12-12-12-12-12-12-12-12-12-12-1		1.11
Diabetes mellitis	5,605		1.4	+ Based on a	results from the Ca	alifornian	, Connectio	cut and Ma	assachusetts
Cancer of colon	5,540		1.4	cancer reg	istries and six co-c	operating	hospitals.		
			65.7	* The relative the expected similar to the period of ob-	ve survival rate is t d rate for a group e patient group w oservation.	he ratio o of people ith respec	f the obser in the gen t to age, se	rved surviv eral popula x and cale	al rate to ation ndar
All causes	409,624	1011140	100.00	x diamosed	1955-64				
Source: Vital Statistics of the United States Part A, National Center for Health Statistic:	<u>, 1971, Ve</u> s, Rockvill	ol. II, Ma e, 1975,	ortality Table 5.2.	Source: End Cutler, S.J. Institutes of Maryland, 1	<i>Results in Cancel</i> and Myers, M.H.) Health, Publication 972.	r, <i>Report</i> National on Numbe	<u>No. 4</u> . (edi Cancer Ins er (NIH) 7.	ted by Ax i. National 3-272, Bet	tell, L.M., hesda,

We may conclude that while public health measures have the potential to exert an influence on mortality greater than that of clinical measures this potential is only just beginning to be realised in relation to smoking and any significant effect on diet appears limited to Scandinavia.

Relative Effect of Social and Economic Influence on Mortality

It remains to place the effects of formal disease control measures on mortality in perspective by comparing them with the observed effects of social and economic conditions.

The existence of higher death rates among the less advantaged was noted earlier. Kitagawa and Hauser showed that substantially lower mortality is experienced by high income and well educated groups in comparison to low income and less educated groups. There were strong independent effects of both income and education on mortality in U.S. white males in 1960.²⁵ Age standardised mortality ratios for various income levels are shown in Table 3.

In Table 4 the age-specific death rates of several groups are compared with those of U.S. whites. The difference in mortality rates are of a greater order of magnitude than the kinds of differences that might be expected from the differential application of disease control measures to otherwise similar populations. There is no reason to suppose that genetic factors are contributing substantially to these differences.

Californian Seventh Day Adventist males of working ages have death rates about half those of fellow Californians. Their estimated life expectancy at age-35 exceeds that of other Californians by 6 years.²⁶ The Seventh Day Adventists have similar occupational and ethnic composition to other Californians, but are more highly educated.27 Because mortality differences by occupation and by education appear to be lower among Seventh Day Adventists²⁸ the relative mortality advantage would appear to be greater still for Seventh Day Adventist manual workers in comparison to other manual workers. Adventist mortality is low, not only for causes known to be related to alcohol and

tobacco, but also for other causes. Low meat and animal fat consumption may provide part of the explanation for cancer mortality rates which are 50 to 70 per cent of the rates of other Californians for sites not associated with alcohol and tobacco.²⁸ Death rates from all causes and from cancer are also low in Mormons, who are apparently less inclined to avoid meat.²⁹

One may seek to explain these marked differences in death rates in terms of material influences, for example, diet, smoking, alcohol and exercise: but these material factors only become operative in the context of the normative structures, by means of which human groups order their existence. The restrictive diet of the Seventh Day Adventists, for example, could only be sustained within a wider social environment of affluence and over indulgence, by a strong sense of group identity, a clearly ordered view of the world and an explicit set of moral values.30

Marriage is one of the most basic elements of the social order. Those who suspect that order is important to health will not be surprised to find that the unmarried state is associated with a greatly elevated mortality risk (Table 5). Kraus and Lilienfeld's investigation of the very high rates of the young widowed group suggests that selection of the fitter into marriage is only a partial explanation.³¹

Ever has noted the effects of "labour market entry stress" on mortality.32 In pre-industrial economies (for example early 19th century Sweden) mortality rates increase steadily from their life-time low during adolescence. With the operation of a free labour market and limited employment opportunities, a "labour market entry emerges on the hump'' male mortality curve. This is exhibited for example by the U.S. 1920-24 birth cohort (shown on Figure 3), which entered the adverse labour market of the later 1930s. It is also exhibited by the large post-war birth cohort that have experienced deteriorating labour market conditions since the early 1960s. In the U.S., teenage unemployment has recently approached 20 per cent, marriage rates have declined and the proportion of young people

living alone has increased sharply. ³³ In the light of facts such as these it would be rash to assume that the large post-war cohort will experience lower death rates through life than did their parents who benefited from the favourable labour market of the 1940s and 50s.

We noted earlier the finding that the modern decline in infection owes far more to social and economic change than it does to measures intended to control disease. It is also apparent that social and economic factors currently predominate in determining the level of noninfective mortality in working age males. The combination that appears to be most destructive of the health of middle class males is employment stress, social disorganisation and a general milieu encouraging overindulgence in food, alcohol and tobacco.

Implications for Health Services

Modern medicine relies mainly on a strategy of direct technical intervention to improve health. This was illustrated in the sphere of public health by the nineteenth century sanitary reformers' preoccupations with drains and water supply. In clinical medicine workers like Paul Ehrlich searched for synthetic chemicals that would act like "magic bullets'' to destroy pathogens. The promise of this approach was subsequently realised with the developments of sulphonamides and antibiotics. However, although there have been continuing improvements in the effectiveness of direct measures of disease control, the task now facing medicine is intrinsically more difficult than that of reducing mortality from infective causes. There is usually little opportunity for decisive technical intervention in the disease processes now underlying adult male mortality. And yet, despite the relative ineffectiveness of this "engineering" approach to the improvement of health, it is being pursued with an increased intensity. More and more resources are being mobilised to satisfy the apparently insatiable appetite of high technology hospital medicine.

Attempts are being made to 'conquer' cancer by clinical means, while the more promising path of dietary modification remains poorly investigated and inadequately Table 3: Age standardised mortality ratios by income group, U.S. white male family members aged 25 to 64, May to August, 1960.

Family Income	Mortality Ratio	Population Distribution %
All family members	100	and states and
\$2,000	151	6.3
\$2,000 -	120	12.8
\$4,000 -	99	23.9
\$6,000 -	88	22.6
\$8,000 -	93	14.2
\$10,000 -	84	20.2

Source: <u>End Results in Cancer, Report No. 4</u>, (edited by Axtell, L.M., Cutler, S.J. and Myers, M.H.) National Cancer Inst. National Institutes of Health, Publication Number (NIH) 73-272, Bethesda, Maryland, 1972.

Table 4: Ratios of age-specific male death rates in selected populations to those of U.S. white males in 1971.

the second second second second second	AGE			12	
	15-24	25-34	34-44	45-54	55-64
U.S. Non-whites, 1971	182	306	258	183	139
U.S. Whites, 1971	100	100	100	100	100
Sweden, 1971	64	71	75	64	66
Greece (urban), 1970	35	59	50	52	64
Seventh Day Adventists,			- 1	10	
California, 1958-62	-	-	51	43	51

Source: U.S. rates from <u>Vital Statistics of the U.S. 1972, Vol. II, Mortality Part A</u>, Table 1.3. Swedish rates from <u>World Health Statistics Annual 1971</u>, W.H.O. Geneva, 1974, Table 5.1. Greek rates from Valaoras, V. <u>Urban-Rural Population Dynamics of Greece</u>, 1950-55, National Statistical Service of Greece and Center of Planning and Economic Research, Athens, 1974 (in this data attempts have been made to correct for the known defects of the raw official statistics in Greece — See also Ref. 7.) Seventh Day Adventists rates are from Lemon, F.R. and Walden, R.T. Death from respiratory system disease among Seventh Day Adventist Men, <u>J. Am. med. Ass</u>, 198, 137-146, 1966.

Table 5: Ratios of the death rates in unmarried to married white men aged 25 to 64, U.S.A. 1959-61*

	a: 1		
Married	Single	Widowed	Divorced
100	195	264	339
100	200	501	475
100	136	350	363
·100	145	224	307
100	329	461	884
100	269	246	432
100	107	91	128
	Married 100 100 100 100 100 100 100	Married Single 100 195 100 200 100 136 '100 145 100 329 100 269 100 107	MarriedSingleWidowed100195264100200501100136350'10014522410032946110026924610010791

* Average of age-specific ratios between 25 and 65

Source: Gove, W.R. Sex, Marital Status and Mortality, <u>American Journal of Sociology</u>, 79, 45-67, 1973.

applied. In 1974 the U.S. National Cancer Institute was only spending about \$3 million on nutritional research, while spending on virology exceeding \$50 million.³⁴

Because of a preoccupation with elaborate technical intervention in sick individuals and a predilection for individualist social and political doctrines, doctors are poorly equipped to understand the social origins of their patients' diseases. Eyer has commented that:-

the irony of treating stress pathology by destroying the capacity of the organs to respond to the stress, or removing them, is lost on much of the medical profession, which sees only its duty to the individual.³⁵

It may be noted finally, that a commitment to the continuing expansion of expensive high technology hospital medicine will tend to make doctors advocates of the further economic expansion needed to pay for it. In as much as such growth depletes non-renewable resources and makes the world more dependent on nuclear power, it is likely to undermine the health prospects of the generations yet unborn. While civilisation will not come to an end if we fail to build more hospitals, it may do so if we keep on building nuclear power plants.³⁶ Medicine has joined industrialism on a selfdefeating course.

Conclusion

Man-made mortality in working age males is the most substantial and intractable health problem in industrial societies. It is most marked where the effects of employment stress and social disorganisation operate within an economic system geared to stimulating consumption. The effects of disease control measures of either a public health or clinical kind on this mortality have hitherto been small compared to those of socio-economic factors. There are prospects, however, of substantial gains from a stepping-up of the anti-smoking campaign, and more extensive promotion of the "prudent diet" would be inexpensive and possibly rewarding. The intensification of hospital medicine will be increasingly subject to financial constraint. It is in any case not a very promising strategy for reducing mortality in working age males.

A substantial improvement in adult male mortality would seem to require an increase in the stability of basic social institutions and a

re-ordering of economic life. The main requirements are for more secure employment, better quality jobs and, at a more general level, the supersession of those economic institutions that depend on the encouragement of over-consumption.

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by Garrison Wilkes



Traditional societies had at their disposal a very large number of different food plants. We have eliminated all those that are not economic to grow in the present world market economy. As a result, the human species is now sustained by a very small number of food plants — a very precarious situation indeed. What is more the accent has been on increasing the cultivation of cereals to the detriment of legumes, with serious nutritional implications, once more because it is economic to do so. Can we continue in this direction for very much longer?



The change in the world food situation has been rapid, drastic and still unappreciated by the human population which has not seen hunger first hand. Given the current agricultural production and maldistribution of food, the human population world wide is not adequately fed.

The food stuff in shortest supply is protein, either from animal products or directly from plants. The function of consumed protein is to manufacture body tissue and take part in the chemical regulation of the body. Proteins can also be used as fuels (calories) but this is a role that carbohydrates and fats can fulfill at lower economic and environmental cost.

The growing trend world wide has been the shift from growing crops for household use to growing crops for sale. The result of this trend has been the dropping of many legume crops (20 - 35% protein) which have been classic plant protein sources in the human diet for more fertilizer/ water-vield responsive cereals (7 - 14% protein). The current condition is a rapid reversal of eight millenia of in situ evolution where the cultivators ate the crops they cultivated.

Each of the major centers where agricultural systems have evolved have domesticated plant resources rich in proteins. These proteins can either be in storage organs such as fruits and seeds or in the actively growing tissues of plants such as the leaves of vegetables. Notable as sources of plant proteins have been the fruits of grasses, the cereals, the seeds of legumes, or pea family, and certain leafy vegetables and many nuts.

To supply the basic human requirement of 60 grams protein/ day the following amounts of these single food stuffs would have to be consumed:

> 11.3kgs. Cassava 3.6kgs. Potatoes

907 gms. Rice 804 gms. Maize 566 gms. Wheat 170 gms. Soybeans

The superiority of legumes over starchy root crops is immediately apparent and their greater concentration of protein over cereals (3X) is significant. For adequate human nutrition there exists a balance between proteins and calories and it is not accidental that classically many native agricultures/ household cooking styles evolved to maximize the available protein sources. Suddenly in the 70s this is rapidly disappearing in the shift of food for household use to food for sale. This is regrettable not only because of the decreased plant protein available but also because we have spent so little time studying many of these lesser known plant protein sources.

Through thousands of years of experience various civilizations have selected from the vegetation for domestication a relatively meager collection of plants upon which the world's food production is now based. Ten thousand years ago, and pre-agriculture, the world's human population is estimated to have been about 5 million. We were huntergatherers, there being about 25 sq. km./person, existing on an estimated 5,000 food plants world-wide. Today our numbers exceed 4,000 million with a density of 25 persons/ sq. km. and a portfolio of less than 150 food plants that enter world commerce (this excludes, spices, medicinal and industrial plants). An even more concentrated investment exists because only about 15 food plants really account for our caloric or basic energy requirements. These plants are five cereals: rice, wheat, corn, sorghum (include millets), and barley; three legumes: common bean, soybean and peanut (to this short list could be added chick peas in India and cowpeas in Africa); three root crops; white potato, sweet potato and cassava; two sugar crops: sugar cane and sugar beet and two tree crops: coconuts and banana.

Many fruits and vegetables are important for vitamins, minerals and fruity acids necessary for adequate nutrition but these plants in general are not calorie sources in the diet. Therefore, the list is very short for the plants that yield 75% of the human dietary calories from plants.

The change in the earth's carrying capacity for humans has been made possible by the development of agriculture, which in turn has been dependent on the domestication of plants. Many of the plants that once existed wild in our forage territory and from which we gathered our subsistence food now exist only in carefully tended fields and gardens. These domesticated food plants are the product of a long selection process by which we have produced a plant that is totally

TAI	BLE I				
Distribution of acreage and calories for major crops (based on USDA estimates), of world Total					
Сгор	Acreage	Food Calories			
wheat	22	20			
rice	13	22			
corn	11	5 1/2			
sorghum and millets	10	4			
barley	7	1 ½			
oats	5	grown primarily for animals			
rye	3	1 1/2			
legumes:	5	8 1/2			
oilseeds (soybeans & peanuts – legumes included here)	7	12			
roots and tubers (potato & cassava)	5	8			
sugar cane and beet	2	9			
fruits and vegetables	4	7			
beverage crops (coffee & tea) non-food crops (such as fibers, cotton, flax,	1	1			
tobacco and drugs)	5	non-food			

dependent on our care for survival. We call this selection process domestication and in some cases the plants have been so genetically altered that they can no longer sow their own seed or compete in a natural plant community.

In the process of domestication, cultivated plants have quite literally crossed a threshold. Their survival is keyed to human preparation of the ground, to decreased competition with other plants, and sowing of the seed in the proper season, to protection of the plants during their growth, and finally the collection of their seed. The process of domestication has made these plants our captives, but the human population has increased to such numbers that we could not possibly meet our food needs with wild plants and so we are held captive - that is dependent on the high yields of our cultivated plants.

There is a second aspect of this symbiotic relationship with our cultivated food plants and that is the natural selection for a balanced nutritional intake in any system where the cultivator eats and depends on what he grows. Classically, over the millenia if the nutrition was balanced the cultivator was healthy and had the energy to tend the plants and maximize the yield. This natural selection promoted the cultivation of complementary protein plants such as corn (deficient in lysine and methionine) and beans (deficient in cystine) in Mexico, of wheat (deficient in lysine and typtophan) and curded milk in the Near East, of cooking styles that maximized the amount of digestible protein in the final product, baked beans, quick fried vegetables; the development of fermented or partially digested plant products such as beers from sorghum in Africa and soybean curds in the Far East; and the supplementation of cultivated carbohydrate rich crops with trace nutrients from wild collected pot herbs for gruels and soups.

The overall strategy objective of agricultural systems is to replace a pre-existing (natural) community with a cultivator-made community consistent with three aims:

- operate at a maximal profit (labor/yield)
- 2. minimize year to year insta-

3. operate so as to prevent longterm degradation of the production capacity of the agricultural system.

A *fourth* aim exists in indigenous agriculture where the crops are consumed and not sold and that is nutritional adequacy.

It is absolutely appalling that we know so little about the mechanism that promotes nutrient adequacy and balance in these indigenous agricultures. The last chance we will have to study them is now, because they are rapidly disappearing. In addition to the nutrition aspect there is an even more serious reason to lament the genetic erosion of these indigenous agricultures which have been the gene source areas for plant breeders of most of our basic food plants (Wilkes, 1977). Suddenly in the 1970s we are discovering that Mexican farmers are planting hybrid corn seed from an American mid-western seed firm, that Tibetan farmers are planting barley from a Scandinavian plant breeding station, and that Turkish farmers are planting wheat from the Mexican wheat Program. Each of these classic areas of crop specific genetic diversity is rapidly becoming an area of genetic uniformity with the rest of the world.

The reason for alarm and concern about the loss of native strains is that this genetic wealth is irreplaceable. Genes can only be stored in living systems. either living branches, such as the bud wood of apple trees, or the living embryo in a kernel of corn or wheat. The native varieties can become extinct once they are dropped in favor of introduced seed. Besides undergoing the slow process of genetic erosion. they have also been known to disappear in a single year, and for this the term "genetic wipeout" has been used (Harlan, 1975). The extinction can take place in a single year, if the seeds are cooked and eaten instead of saved as seed stock. Quite literally, the genetic heritage of a millenium in a particular region can disappear in a single bowl of porridge.

Unlike so many other events we experience, biological extinction is non-reversible. The only place genes can be held is in living systems and once these systems are dead the genes they possessed can



no longer be retrieved. Many of the native land races of indigenous agriculture possess, by industrial agricultural standards, a tremendous amount of genetic diversity. I think we have been rather glib in claiming that some of the selection practices of native cultivators were capricious and therefore allowed for wide diversity in the crop because they were "lazy" or non-observant and did not practice rigorous selection. In fact, the increased genetic buffering of environment stress (frost & drought), predators (fungi and insect attacks) and the improved nutritional package of land races would run contrary to the above argument.

The extent of our hard knowledge of nutrition in native agriculture is limited, so my comments here are to be considered speculative. On the other hand, the suggestive evidence is there. I work with the hybridization of maize and its closest relative, teosinte, in the fields of native cultivators in Mexico and Guatemala. Repeatedly and in different locations. I have talked with cultivators that recognize that one. of the several types of maize they grow gives them "more power" and, in fact, these corns have a better protein to carbohydrate ratio. Similarly, many times I have found in the common bean a smaller bean in mixed plantings and again the cultivators claim it is to be more "tasty". My colleague, Lawrence Kaplan, has shown these beans to be of higher protein content on a per volume basis.

These are limited and personal observations but they suggest we should know more about selection practices in native agriculture that indirectly affect nutritional quality. Traits that come to mind are proliferation of color, especially in the desirable food structures, the intensification of plant color, selection for smaller fruit, selection for prolonged growth so that fruit production is not synchronized with

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excessive nutrient demand peaks in the soil and mother plant, and lastly the presence of bitter and or/toxic substances in some foods.

What is even more amazing than the natural selection for nutritional quality in native agriculture is that these agricultures have only originated where there existed a native, high-quality and concentrated plant protein in the local flora. These regions of origin are called Vavilov Centers after the Russian plant breeder and geneticist, N.I. Vavilov, who first studied these centers of origin, and in some cases. secondary centers where the crop has undergone rapid evolution following migration from one area of cultivation to another. Because of migration and early communication between these areas of ancient civilization, the centers overlap for a large number of our crops but as Vavilov clearly established, the relationship between centers and ancient civilization is a fact. When plotted on a world map, nine major and three minor centers can be identified which account for a vast amount of our cultivated plant diversity.

These centers are located in mountainous regions along the belt of the two tropics (Cancer and Capricorn) which are populated lated but isolated by steep terrain, arid regions or other natural barriers. In the 1920s Vavilov found these areas to be essentially untouched by the changing world and still supporting ancient agricultural customs. These centers of diversity have been the reservoirs from which many of the strains and valuable genes used by plant breeders in the last 75 years have come. Each of the regions has been tapped for useful genes which intensified or changed some plant characteristic, conveyed increased resistance to fungal disease, or insect attacks, or improved the durability or nutritional qualities of the harvest for Each of the major centers has developed both cereal and legume plant protein sources that have been the nutritional package for the civilization that developed and flourished *in situ*.

The legumes contain 20 to 35% protein (dry weight) while the cereals do not have high protein content (7 to 14%) but considering the ease with which they store and the large quantity in the diet they are a major protein source.

About a quarter (25%) of the protein in the human diet world wide comes from food legumes; in the developing nations more than half of the dietary protein comes from legumes. The importance of legumes would be increased if the animal feed of sovbean concentrates and alfalfa in the industrialized nations were considered. In the more affluent nations more animal and animal product protein than food legume protein enters the daily intake while for the rest of the world cereals and food legumes are the primary protein source. Europe now supplies a large portion of its dietary protein from meat, eggs and milk products and the importance of legumes is more prominent in animal feed stocks than in human consumption. On a per-capita basis the world's leading importers of plant protein are Denmark. Israel. the Netherlands, and Belgium; while the world's two largest legume food (feed stocks) importers are West Germany and the United States.

The seeds of the legumes are the most important daily protein source in many tropical countries where the primarily population consume starchy roots (cassava) and tubers, starchy banana (plantain) or grain sorghum. Legumes have about twice to three times the protein content of cereals (sovbeans are 40% protein for example) and are most often lacking in the amino acids cystine and methionine, while cereals are mainly deficient in lysine. Therefore, a balanced diet involves the mixing of cereals and legumes for complementary proteins. This is exactly what has happened in each of the centers.

Certainly the Indian Center would not have been able to develop a national vegetarian diet were it not for the wealth of legumes under cultivation. The current dependence on legumes makes doubly tragic their displacement by the green revolution wheats. Two decades ago and before the Green Revolution, in India the acreage in chick peas (23 million) almost equaled that of wheat (29 million) but today there is twice the acreage in wheat over chickpeas.

In China, high protein vegetables and a quick-fry cooking style have evolved to minimize the role of more expensive and less available animal proteins. In Aztec Mexico, the only domesticated animals were the Turkey and the duck so beans were a major component in the diet. Even in the Middle-Ages in Europe. legumes were more central in the diet where turnips (prior to the introduction of potatoes from the New World) and peas were the staples. Europe was in fact helped through the food for subsistence to food for sale transition of the industrial revolution by the plant wealth of new plants, notably the common bean, introduced with the discovery of the New World. Even the agricultural abundance of the United States is based on a legume rotation crop for corn (an 8 billion dollar crop), the soybean (a 4 billion dollar and second most important crop in American agriculture).

This change to larger yields at the expense of high protein content crops has not always been by the displacement of legumes from the diet. Other high-protein food sources have been displaced by more yield (by weight) responsive cereals. In Mexico, grain amaranths have been replaced by maize, in the Andean highlands. wheat. barley and imported corn and potatoes are displacing quinoa. A recent discovery in Ethiopia is a good example of the effect of nutritional selection within the genetic diversity of sorghum. Recently a grain sorghum has been discovered with nearly twice the protein content (16 - 17%) of the usual varieties among a nature people who consume the plant in the green state. The potential to use this plant in future plant breeding is enormous.

The extension of crops for sale instead of subsistence is now spreading to the developing nations of the world, with the subsequent loss of the stabilizing selection for a nutritional balance and the dropping of many less productive food plants. A simple review of yields indicates that the input of fertilizers and irrigation so spectacular with the cereals has had little effect on the legumes.

The economic returns for planting beans do not match those for planting cereals, especially high yielding strains of the green revolution. In many places the adoption of the Green Revolution wheats has been at the expense of the local legume crops. Wheat is presently grown on 60 million hectares in the developing countries. In the decade between 1961-65 (pre Green Revolution) and 1971-73, wheat production in these countries rose by more than 8% a year, improved high yielding varieties accounted for half (4.7%)this increase. The rest of the increased production was new land under cultivation and displacement of other crops, notably legumes by wheat. In 1971, the five most important legume crops (oilseed, peanuts and soybeans excluded): common bean, chick peas, pigeon peas, cowpeas, and broad beans were planted on 36 million hectares in the developing countries of the world. This acreage accounts for 3/4's of world's total food legume the production and is a decline from the previous decade. This decrease is

TABLE II	
Cereal	Legume
wheat barley teff	cowpea peas
rice sorghums	chick pea pig eon pea various grams
wheat oats	broad beans chick pea pea
rice millets	soybeans adzuki beans
wheat barley rye oats	lentil pea
maize	common bean lima bean tepary bean
wheat barley	lentil pea
maize Pscudo-Cereal	common bean peanut (Brazilian region)
	TABLE II Cereal wheat barley teff rice sorghums wheat oats rice millets wheat barley rye oats maize wheat barley maize

Ave	erage Yields by Cou	ntry 1972 – 73 Kg/h	a
	Rice	Wheat	Bean
Iapan	5703	-	1308
United States	5117	2205	1386
Mexico	2515	2960	513
India	1716	1314	245
World Average	2312	1650	487
Source FAO Production	n Yearbook 1973		- Internation
			1 TANK PROP



not because there was less dietary need for vegetable protein sources but less profit.

Clearly this deterioration of the diet with the dropping of legume cultivation was not foreseen by the architects of the Green Revolution but it is recognized now. Quoting from a 1976 working paper of the Rockefeller Foundation (Ralph W. Cummings, Jr., Food Crops in Low-Income Countries: The State of Present and Expected Agricultural Research and Technology) "Recent higher levels of production for some of the major cereal crops have not been accompanied by a corresponding advance in legume production; this has resulted in a decrease in the area sown to some of the food legumes. While the protein contribution of increased cereal yields is probably great enough to offset protein losses resulting from the reduced production of pulses; there is critical need for rapid progress in the technology and level of production obtainable on an economical basis with these crops (principal food legumes), so that they can regain their competitive place in the production systems and can be produced economically by farmers in order to provide high-quality/protein sources to balance out the dietary needs of the population." (page 40-41).

In the first round of the Green Revolution, the complexity of the multiple relationships were not as well understood as they are now. It is hoped in the developing International Agricultural Institute Network that proper attention will be paid to legumes. Not only do legumes have a complementary role to cereals in the diet but they also possess nitrogen fixing potential through the symbiotic relationship they possess in their roots with bacteria capable of nitrogen fixation. A return to agriculture systems using legume rotation would help alleviate the demand for fossil fuel



based nitrogen fertilizers. It is hoped that the International Institute of Agriculture (IITA) in Tropical Nigeria with responsibility both for farming systems and the legumes: cowpeas, lima beans and soybeans; the International Center of Tropical Agriculture (CIAT) in Columbia with responsibility for the common bean, and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in India with responsibility for peanuts, chick peas and pigeon peas will be able to make the breakthrough necessary to bring legumes back into the diet. Agricultural development is a total picture and as we have learned the introduction of a superior genotype of one crop plant can displace other crops that play a key role in the nutrition of an indigenous people.

Because 75% of the world's food legumes are grown and consumed in developing nations we in the industrial nations have tended to ignore them as insignificant crop plants. Common beans are grown on approximately 17 million hectares in the developing world, 8 million hectares in the Far East and 6 million hectares in Latin America. Chick peas are grown on almost 10 million hectares, with India the largest producer. Cowpeas are grown on 5 million hectares, mainly in Africa. Pigeon peas are grown on 3 million hectares, again mostly in India. The developing countries grow about 4 million hectares of soybeans and although they grow 16 million hectares of peanuts, a large percentage of this is destined for export as a cash crop. Breakthroughs are not going to come with these crops until we know more about their total genetic variation, breeding structure and especially the physiology of these plants with their symbiotic relationships to Rhizobium bacteria that function in the nitrogen-fixing system in the legume root system.

A second aspect of the Green

Revolution economy on the nutrition of the world is that suddenly farmers are changing from growing all their own food to growing just a single cereal crop and having to buy their vegetables and legumes. Previously these farmers had thought of their agricultural surplus (after their own food needs) as money for cloth, tools or other hard goods. Now that it has become more profitable to specialize in one crop for sale, made necessary by the intensive investment of improved seeds of the Green Revolution requiring both high inputs of fertilizers and water, these farmers are still thinking in terms of money for consumer goods: cloth, tools, and transistor radios, and not in terms of nutrition for the household. Money for food simply isn't a tradition with these farmers. Even though the Green Revolution is increasing the number of food calories available, it has not in general improved the nutritional balance in the countryside. Conclusion:

A remarkably small number of basic food plants feed the human species. The population has put its caloric margin between survival and starvation on rice, wheat, corn, sorghum, barley, potatoes, sugar cane, sugar beet, cassava, bananas, coconuts, peanuts, beans and soybeans. The world-wide human diet is even more specialized than this implies. Over 60% of the human intake from plants is caloric attributed to the cereals. Of those five, rice leads with half of the world's human population depending on rice for half of their daily energy needs. Symbolically, rice accounts for one quarter of the human caloric intake world wide or 6 hours of energy for all humans alive.

This extreme dependence on such a small number of plants has occurred essentially since the industrial revolution and has accelerated rapidly with the application of modern technology to agriculture since the mid 50s. Not only has our dependence on a decreasing number of basic food plants increased, but the nutritional stabilizing influence of agricultural activity for crops to eat has changed to crops to sell. Many minor food plants, but nutritionally important longer exist in the native agriculture. The acreage in legume crops has dwindled as cereal acreage has increased. Never before in human history have there been so many people not producing and controlling their own food supply. Instead, the diet is being influenced by the labor/ yield economic equation and not the labor/nutritional balance equation. The full implication of this loss in protein and nutritional balance in indigenous agriculture is just now becoming widely appreciated.

If we take seriously the goal of eliminating hunger and malnutrition before the end of this century, food production will have to increase at least threefold in view of the current maldistribution of food supplies and projected population increases. To reach this goal we are actively promoting agricultural technology in developing nations without really knowing or assessing the system our technology is replacing. In many cases these indigenous systems produce a better nutritional package than the more carbohydrate productive systems that are being introduced. What further compounds this situation is the fact that the carbohydrate-rich plants of the new technology completely replace the native crops and a nutritional folk wisdom of 8 millenia is lost without our knowledge of how it worked.

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Options for the Ecology Movement

by

Henryk Skolimowski

"The ecology movement cannot be a matter of mere philosophy. It must be translated into the tactics for living. It must also be seen in the context of our natural resources which must be viewed in a proper economic context..... it must also be translated into

politics ''

I have argued in an earlier article under the title "The Ecology Movement Re-examined" (The Ecologist, October 1976) that the Ecology Movement is in trouble. The reactions to this article, both those published in The Ecologist and other correspondence I have received, only confirm my contention. The nervousness with which some have reacted to my critique, including the defensiveness of the editor of The Ecologist, has persuaded me that the various groups of the Movement are more concerned with the defence of their individual favourite views than with the refashioning of the overall view. It would seem that they are more concerned with holding to a little enclave they have carved for themselves than with the selfless reeducation to meet new demands of an everchanging world.

What has also struck me is that the

Establishment is constantly learning and adjusting itself, often incorporating views of the ecology people, while the ecology people on their part can be quite rigid in their positions - especially be failing to realise that the Movement is not about small tactical gains here and there, but about remaking the unjust, parasitic, overexploited and shrinking world. The principal concerns of the Ecology Movement cannot be understood, let alone carried out, without a comprehensive philosophy, or a comprehensive conceptual framework. This article examines these frameworks. I shall outline some options for the Movement while responding to my critics.

Before I go into specifics, let me make a general point about decentralisation which has become one of the unwarranted myths of the Ecology Movement. Decentralisation is not a *Deus ex Machina* invention which will save the world. Decentralisation is a philosophy of life: unless it is seen within a larger conceptual framework, it may become a crippling, one-sided form of living or a conceptual intoxication with a groovy rustic life which has no reality behind it at all. I will have more to say on the subject at another time.

I would now like to take a panoramic view of the scene, and map (very schematically) existing sub-movements in the Ecology Movement. Various critics (John Dernbach, in particular) have pointed out that there is quite a variety of submovements, each with a semi-distinctive conceptual framework, or a world view. We need to look at these sub-movements in order to know what they are, in order to realise why these movements are often at odds with each other, and above all, in order to see what unites them in spite

of their differences.

We can single out at least four distinctive components or sub-movements, which I will discuss in contrasting pairs. There is the decentralisation movement, with its insistence on simplicity, selfreliance, individual redemption (do it yourself), as exemplified by The Mother Earth News. There is, on the other hand, the New Left Movement (for lack of a better term) as exemplified by Radical Technology, by Jerry Ravetz's Scientific Knowledge and Its Social Problems, which insists on changing the parasitic economic system, and which recommends the development of non-parasitic decentralised technologies. Its road to salvation is social (via change of the existing sociopolitical-economic system), while the road to salvation of the decentralisation movement, in the manner of The Mother Earth News, is individual. The New Left Movement is ideological in character (sometimes it appears to be too intoxicated with its ideology which seems to take precedence over creation of an ecologically sound and humane society), whereas the decentralisation movement is more existential in character. They sometimes quarrel with each other, explicitly and implicitly. But there is a great deal that unites them: the disapproval of present wasteful, parasitic ways of life and in particular of wasteful ways of production and consumption. These two sub-movements are also committed to a similar set of values, although they do not clearly articulate these values. We can present the two movements by means of two overlapping circles.

The other pair is the environmental movement (in the narrower sense), on the one hand, and the quality of life movement on the other. The environmental movement, as exemplified by the Conservation Society in Britain and the Whole Earth Catalogue in the U.S.A., insists on the priority of the Ecological Habitat, on the necessity of keeping our (physical) environment and its resources intact; for if this is not obtained, nothing else will be. In its proselytising zeal (to save the physical environments) its zealots sometimes go to extremes and seem to forget what the whole thing is about, so that the environmental impact statements become ultimate things in themselves and so that the protection of a given piece of ecological habitat, or a given endangered species becomes the highest priority.



The other member of the pair, the quality of life movement, insists on the primacy of human values as the key to it all, insists on the irreducible worth of the human being and the sacredness of the human being, and also insists that nature and other beings partake in the sacredness of which man is an aspect. In its religious and semi-religious manifestations, the quality of life movement seems to be forgetting about socioeconomic constraints, and also about the precariousness of our environmental position.

Again there is a common bond that

unites the quality of life people and environmentalists; it is the condemnation of present waste, both of human beings and of physical resources. But the emphasis is different in each case: on the paramount importance of natural resources, on the one hand, and on the paramount importance of the human person, on the other.

If the four sub-movements were to be condensed to their ultimate essences, then they might be characterised as calling for: (1) the simplicity revolution; (2) the socio-political revolution; (3) the resources revolution; (4) the spiritual revolution. Still shorter: (1) = simplicity; (2) = politics; (3) = environment; (4) = transcendence. Their mutual interdependencies could be presented as follows :

This pictorial representation helps me to illustrate where I disagree most strongly with my critics. The most articulate and most vocal of the critics, not only in this discussion but also in other similar ones. so often want to articulate the fringes. Let us chip away the system in small. piecemeal ways, and if we chip away long enough, the system will change. No, the system will not change in this way, for it is extremely resilient to such cosmetic operations. Or, let us take care of our resources first, establish proper controls and initiate appropriate legislation concerning our natural resources, and realise what unites us in positive

terms. Then create a solid foundation upon which we can build and which and *then* we shall address ourselves to other issues. My reply is again: no, for the system is strong and resilient, it can stand, and in its own quiet and stubborn way, defy those little legal tinkerings for a long, long time; perhaps too long a time for our good.

My reply is suggested by the diagram: we must start from the core, from our visions of man and of society. Then see the Ecology movement, now known as sub-movements.

So with regard to Clyde Manwell's criticisms, I wish to say that, true enough, at least one philosopher has treated seriously, in a philosophical manner, the problems of man vis-à-vis nature. However, John Passmore (Man's Responsibility for Nature, 1974) has not provided any

comprehensive basis for the Ecology Movement. He provided rather a historicophilosophical analysis of the variety of man's relationships with nature. This was no doubt a considerable accomplishment. namely, to show that our ecological problems have long historical and philosophical roots. We must bear in mind, however, that Passmore is an heir to the tradition of British empiricism. His bias in favour of classical empiricism, including the endorsement of Material Progress, is too obvious in Man's Responsibility for Nature to enable this treatise to become a conceptual foundation for the Ecology Movement which, in a fundamental sense, goes against the ideology of empiricism.

I hasten to add that Passmore's recent thinking converges more and more with the tenets of the ecology people, as he has written: "Philosophy . . . gave its



blessing to technology. It can now contribute to clearing up the mess technology has created by re-examining the larger concepts, the wider principles, on which our culture depends. And more than a few philosophers are now engaged on that very task. It is no longer quite ridiculous, as it might have seemed to be but a decade ago, to look to philosophers, not indeed for instruction, but certainly for guidance."¹

Yes, I quite agree with Manwell that "the ecology movement has been marred by unnecessary feuding between some of its most eminent individuals." My map of sub-movements suggests how we could come together. We must be aware, however, that for some, the allegiance to their ideology is more important than the overall purpose of the ecology movement: to transform the world into an ecologically sound, socially sane and humanly enhancing world. Those who are so attached to their ideology (whatever its name or brand) that they cannot see the priority of the overall goal, might perhaps consider leaving the movement altogether, because in the long run they may be causing more harm than good. Our strength is in our unity.

But I profoundly disagree with Manwell when he says that instead of more philosophy, "however central that is to laying some good foundations" – his words – the ecology movement "needs scientific rationality." God save us from *scientific* rationality. It has done us enough harm already. Since I have written on the subject previously, I shall not go into details.²

Irene Coates of the Conservation Soceity has pointed out to me that she appreciates my view "that the ecological movement lacks a comprehensive philosophy, but I think," she continued, "one has to arrive at such a philosophy rather than begin with one. To me it is a sign of health that ecologists have started chipping away at the industrial/exploitive attitudes in practical and piecemeal fashion. Perhaps, by the time we have been able to put our philosophy into words, we are already fair game for the next wave of perceptives who will intuitively realise our inadequacies." This is to me an expression of wishful thinking. What has disturbed me over the last three years or so, and what prompted me to write my original piece ("The Ecology Movement Re-examined") was an awareness that exactly the opposite process is occurring, namely that as time goes on the ecology movement is more and more dissipated, and that it needs a

There is so much with which I agree in John Dernbach's analysis that it would be simply gratuitous on my part to harp on some small details. There is one important point, however, with which I cannot agree, namely that many submovements of the ecology movement "have a fairly complete world view." I think Dernbach gives them too much credit. In my opinion, their world views are fairly incomplete, often confused and sometimes contradictory. Novel elements and alternatives are often wrapped and submerged into the tissue of the world view they wish to transcend and liberate themselves from; hence, incongruities, tensions and bewilderment; and sometimes a despain that new alternatives do not work. Let us remember that world views are pretty complex things. They are not arrived at by a slapdash rearrangement of some concepts and categories. Let us bear in mind that to reassemble the pieces of which a civilisation is made is not a mean task. To reassemble these pieces will require, as I said, much more than a reshuffling of the present categories of knowledge. What we are confronted with is not a little puzzle that can be easily resolved within the existing conceptual apparatus, but a major dilemma which will require an alternative set of conceptual structures and even an alternative view of knowledge. I hope it will not be taken as entirely facetious or when I suggest that outlandish philosophers, thinkers, engineers and historians will have to go back to school in order to rethink the present predicament. But not to our present schools or academia, for those can only fortify bad mental habits and enhance our present conceptual aberrations; but to schools in which alternative ways of viewing reality will be opened up for them. Philosophers, futurologists and all other people who are concerned with the future should be sent to some Indian reservation on which alternative world views are still adhered to, cultivated and incorporated into alternative life styles; should be sent to some oriental societies and cultures in which alternative ways of interpreting the world are still viable and form an alternative basis of knowledge and of life styles.

I am thus suggesting that we may not be able to rethink our predicament on our own, for our system of knowledge is selfreferential. This system permits the existence of only those phenomena which

support the claims of the system. It excludes or minimises phenomena and occurrences which seem to undermine the stability of the system. For this reason it is extremely difficult to justify an alternative with and through the categories and language of the system we wish to transcend, for language and its categories are not indifferent conveyors of thought, but are the harbingers of a given system, are loaded with values specific to a given system, biased in favour of certain forms of perception, comprehension and justification of reality. They are the filters which shape a given "reality" for us. So to arrive at an alternative world view is not an easy task, and one has to be careful when one says that the various sub-movements "have fairly complete world views." We should therefore be aware that our road to the new ecological world view is hampered not only by vested interests of certain groups of people, but also by the established language, and by the accepted modes of thinking.

The Politics of Evolution

The ecology movement cannot be a matter of mere philosophy. It must be a matter of life styles. It must be translated into the tactics for living. It must also be seen in the context of our natural resources, which must be viewed in a proper economic context — so that the prevailing mode of transformation of these resources is congruent with long range goals of humanity. It must also be translated into politics; unless we find appropriate political structures to implement new designs for living, everything else will be null and void.

However, in the final analysis, the politics of the ecology movement must be congruent with the politics of evolution at large. We are the creatures of evolution, we are made of evolution, with evolution, through evolution; and so is nature, and so are eco-habitats. If we do not identify ourselves with the flow of evolution then we are doomed, both conceptually and existentially. Our politics, in short, must coincide with the tactics and strategies of life at large. A clear comprehension of this larger tapestry of evolution must be a part of the politics of the ecology movement. Let us neither assume nor presume that politics is but an arbitrary human invention, an adventurous game for those whose ego is larger than life; politics is the maintenance of the heritage of life: social, cultural and existential through appropriate but short term structures. We need to keep our visions and priorities clear and intact, particularly when we enter the arena of politics where things are so often compromised, blurred, bastardised. Now, some of the visions and priorities of the ecology movement, as rooted in the politics of evolution, are discussed in my monograph, Ecological Humanism.³ Whatever its shortcomings, it attempted to tie a multitude of things into one structure. I shall not go into details, for what is there is there.

But I will insist that unless we realise that our problems are essentially those of values (the area of the overlap of the four sub-movements are the values that join us together), unless we realise that a new reverential attitude is required towards nature, towards other beings and towards ourselves, we shall be empty of works and howling like the blind in the wilderness. Let us be aware that the economisation of existing resources is nothing but an economisation of existing resources; that the simplicity of one's own life style is nothing but an escape unless it is a part of the new tactics for living; that a radical change of the sociopolitical institutions is but a bloody upheaval - unless it is redeemed by ultimate transcendental goals.

The structure of our world view, or of the existing paradigm within which civilisation operates is complex and intricate (as I have already argued). We should not delude ourselves that by changing a corner here or a corner there we can affect the multitude of things. Let me bring to your attention the cosmology of the Tukano (a tribe of aborigines from the Amazon Basin) which beautifully illustrates how subtly complex is the cosmology of even those "very primitive" people. In a fascinating article, appropriately entitled, "Cosmology as Ecological Analysis", G. Reichel-Dolmatoff writes: "I shall try to demonstrate that aboriginal cosmologies and myth structures, together with the ritual behaviour derived from them, represent in all respects a set of ecological principles and that these formulate a system of social and economic rules that have a highly adaptive value in the continuous endeavour to maintain a viable equilibrium between the resources of the environment and the demands of society."4

The point of importance here is that those "very primitive" people have 322 a distinctive structure to their lives, which is governed by an intricate cosmology. We may say that their cosmology and their tactics for living are integral parts of the same paradigm: each part supports and justifies the other. Reichel-Dolmatoff says:

"In Tukano culture, the individual person is conscious that he forms part of a complex network of interactions which include not only society but the entire universe. Within this context of an essential interrelatedness of all things, a person has to fulfil many functions that go far beyond his or her social roles and that are extra-societal extensions of a set of adaptive norms. These rules or norms, then, guide a person's relationships not only with other people - past or present. kin or ally - but also with animals, plants, as a matter of fact with all biotic and non-biotic components of the environment. The rules the individual has to follow refer, above all, to co-operative behaviour aimed at the conservation of ecological balance as the ultimately desirable quality. Thus the relationship between man and his environment is being formulated not only on a cognitive level, but clearly it also constitutes an effective personal relationship in which individual animals and plants are treated with respect and caution . . . This cosmological model of a system which constantly requires rebalancing in the form of inputs of energy retrieved by individual effort, constitutes a religious proposition which is ultimately connected with the social and economic organisation of the group. In this way, the general balance of energy flow becomes a religious objective in which native ecological concepts play a dominant organisational role."5

Now with this conception of the ecological habitat, which is religious in nature, goes an appropriate conception of knowledge, which is ethnobiological knowledge.

"Among the Indians there is usually little interest in new knowledge that might be used for exploiting the environment more effectively and there is little concern for maximising short-term gains or for obtaining more food or raw materials than are actually needed. But there is always a great deal of interest in accumulating more factual knowledge about biological reality and, above all, a' out knowing what the physical world requires from man. This knowledge, the Indians believe, is essential for survival because man must bring himself into conformity with nature if he wants to exist as part of nature's unity, and must fit his demands to nature's availabilities."⁶

The world view would not be complete without an appropriate mythology, which is pregnant with moral consequences. ". . . mythology emphatically tells [the Tukano] of animal species which have become extinct or which were punished or degraded for not obeying certain prescribed rules of adaptive significance. Thus, gluttony, improvidence, aggressiveness and all forms of overindulgence are punished by the superior forces, to serve as examples not only to the animal community, but also to human society. Animals, then, are metaphors for survival. By analysing animal behaviour the Indians try to discover an order in the physical world, a world-order to which human activities can then be adjusted."7

The cosmology of the Tukano is a fascinating subject in itself. Dolmatoff has written a beautiful piece on it. I shall not echo him any further. Instead let me observe that the conception of the cosmos (cosmology), the conception of knowledge (epistemology and methodology), and the code of behaviour (ethics and the tactics for living) are all linked together in one framework in which each element supports and justifies other elements, so that at one point cosmology becomes ecology; and conversely, ecology becomes cosmology. This organic unity of all things is not unique to the "primitive" tribes of the Tukano Indians, but is characteristic, it would seem, of all cultures.

Our culture is no exception. Nor will be the new ecological world view. If the ecological perspective is, in actual fact, a new vision of the world, then by spelling out its characteristics, we are, at least implicitly, spelling out a new cosmology, a new epistemology, and the new tactics for living. This is indeed the central point which I have attempted to make in this essay, in my previous one ("The Ecology Movement Re-examined") and in my monograph, Ecological Humanism, which expressly attempts to spell out a new cosmology and also a value system by which we could live. The new value imperative insists that we behave in such a way as to preserve and enhance the eco-system, which is a necessary condition for our continuing biological and social existence, and also a precondition of further enhancement of our consciousness and of our spirituality. But our new imperative cannot be limited to one level

only - that of the eco-system. It must be simultaneously connected with the larger sphere of which the eco-system is a part; and it also must be translated in tangible human terms or human values. The new imperative extended in two directions reads: behave in such a way as to preserve and enhance the unfolding evolution and all the potential that is contained in it; and secondly, behave in such a way as to preserve and enhance human life which is the vessel in which the most precious achievements of evolution are bestowed; and still further, behave in such a way as to preserve and enhance your own potential and your own spirituality through which you give meaning to your own life, and by which you articulate the endowment of life at large.

There is no redemption for our existential strivings in the production and consumption of material objects. We must identify ourselves with the transcendental heritage of the extra-personal unfoldings of the cosmos within which we reside. Our identification must be compassionate, and based on our best insights of how things are, and which of them are most important. The traditional religion and traditional God have lost their guiding power in informing us about ultimate things. We must find our new transcendental bearings ourselves. Without them we are less than human. All of this is a part of the politics of evolution with which the goals of the ecology movement must be congruent.

It should be transparently clear that my aim here is not to weaken the ecology movement by dwelling on its shortcomings and inconsistencies, but to strengthen it by showing that there is so much that unites us. The *raison d'être* for various sub-movements of the ecology movement is the concern for the world at large. This concern should manifest itself in our own back-yard: by caring for fellowecologists from "other groups". Animosity and squabbling lead to futility and impotence, whereas unity may lead to a radiant future for us all.

What I am calling for is a United Ecology Movement. Ecologists of various brands and denominations, unite, you have nothing to lose but your respective insignificance!

NOTES

- 1. John Passmore, "Philosophy, Technology and the Quality of Life," *The Proceedings* of the Bicentennial Symposium of Philosophy, forthcoming.
- See Henryk Skolimowski, "Technology vs. Nature," *The Ecologist*, February 1973; "The Myth of Progress," *The Ecologist*, August-September 1974; "Knowledge and Values," *The Ecologist*, January 1975.
- Henryk Skolimowski, Ecological Humanism, Gryphon Press, 38 Prince Edwards Road, Lewes, Sussex, 1976.
- G. Reichel-Dolmatoff, "Cosmology as Ecological Analysis: A View from the Rain Forest," *The Ecologist*, January-February 1977, p.5.
- 5. Ibid., p. 6.
- 6. Ibid., p. 6.
- 7. Ibid., p. 7.

THIS MONTH'S AUTHORS

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The turn-of-the-century boating enthusiasts of the Norfolk Broads poled their idyllic way, in the hot pre-war summer days, through weed and lily tangles of great luxuriance. They would be astonished at the turbid waters of the present day from which the underwater plants have largely been lost. Perhaps they would be equally surprised at how the simple Edwardian arrangements between owner and visitor have become the tangle into which Broadland administration now finds itself. Ease of action over the problems is now as rare as clarity of the water.

rivers also has prevented succession of vegetation to alderwood, thus maintaining a diversity of vegetation types and associated animals. particularly butterflies, for which the area is prized. Transport of the reed meant the excavation of dykes connected with the main rivers which together have provided the basis of a thriving holiday boat industry and a commercial link from towns and cities such as Norwich to the estuary of Breydon water and the sea. Man and the Broadland have been happily married for centuries and it is only in the last few decades that the union has foundwas noted that the water had become more turbid the conclusion, that disturbance of sediment by propellers was the cause, was conveniently drawn.

The turbidity, however, has been shown by research in the School of Environmental Sciences at the University of East Anglia, to be caused mostly by large populations of phytoplankton algae suspended in the water. The population sizes reached are around the maximum level supportable by the incident sunlight in these latitudes when a sufficient supply of inorganic nutrients is available. Some turbidity



Rich swards of aquatic plants in one of the few Broads, isolated from the main waterway, where such plants are still luxuriant.

The Broads have always been intimately linked with human activity. Their basins were carved from the peat which lined the valleys of the Rivers Waveney, Yare, Bure, Ant and Thurne in the middle ages, but most were abandoned when changes in ground water level flooded the peat workings in the thirteenth century. Since even before then marsh products such as reed and sedge have been harvested for roofing whilst fish and wildfowl augmented the local diet until the early years of this century. The cutting of the fens which border the broads and some of their connecting

WIEW FROM THIS SIDE

Turbid water, rich in phytoplanktem, but lacking water plants now characterises most of the Broads.

ered.

The numbers of boats licensed for use in the Broads has been steadily increasing, and although the number that are available for hire has remained constant for the last few years, the length of the holiday season has increased. The banks of the rivers show signs of erosion and need expensive repair with wood or metal reinforcements, since the reed which provided protection for the banks is broken by wash and by boats mooring at the edges. Particularly the rather squat, to some eyes ugly, boats available for hire are obvious scapegoats, so that when it



Dense phytoplankte crops from the enriched Broads. Cells of *Prymnesium* (the four cells grouped in a line) secrete a powerful fish toxin and have increased so much in recent years in the River Thurne area that fish kills occur now almost annually.

is caused by the normal water flow and tidal movements, but although boats do locally disturb sediment, it is clear that this readily sinks again and does not contribute to the sustained turbidity.

A major effect of the increased turbidity has been the widespread demise of submerged water plants (aquatic macrophytes) such as pondweeds, naiads, starworts and stoneworts for which the Broads were famous. The invertebrate fauna has also changed from a diverse one of molluscs, crustaceans, and many kinds of insect larvae, to one dominated by chironomid larvae and oligo-

Norfolk Broads

chaete worms, where it persists at all. There seems to have been an increase in avian botulism, a disease associated with the hatching, in decaying algae, from resting spores of an anaerobic bacterium (Clostridium botulinum type C), and anecdotal evidence implies a decline in the quality of the fishing. All of this points to the well known syndrome of enrichment or eutrophication, now recognised all over the world. Direct proof of enrichment in the Broads is to be had from the chemistry of sediment cores and their diatom fossils and from comparisons of the water chemistry of

litre is sufficient. Such a population contains about 40 µg per litre of phosphorus and under such conditions almost all of the phosphorus in the water is contained within the plankton; the only dissolved phosphate detectable is in the process of being taken up rapidly by the phytoplankton after release by zooplankton excretion.

Understanding of how the production of phytoplankton in freshwaters is controlled by the phosphate supply has advanced rapidly in recent years, particularly as a result of Canadian research. Phosphorus is a generally insoluble

drawing on a usually large reservoir of nutrients in the sediment are largely independent of supplies in the overlying water.

The effective phosphorus concentration, which sets the mean phytoplankton crop and hence the degree to which light is absorbed in the water, is determined by several factors, whose effects are quantitatively predictable through recently developed mathematical models. An appropriate one for the Broads system as a whole is that of R.A. Vollenweider, which relates the mean phosphorus concentration directly to the loading rate, the



A large pike, killed by a bloom of Prymnesium.

A badly eroded bank; on either side of the tree some two metres (6 feet) of the bank have been washed away.

the enriched Broads with those few, isolated from the main waterway. that retain their clear water.

The mechanism by which water weed is replaced by phytoplankton on enrichment is a complex one involving not only shading by phytoplankton but shading also by the community of algae attached to the plants and the filamentous algae which drape over them. Recolonisation by the macrophytes is directly prevented thereafter by phytoplankton shading and a mean summer population of phytoplankton, measured as its chlorophyll a content, of about 40 µg per element which is proportionately rarer in rocks, soils and drainage water than any other element required by the phytoplankton. It also lacks an atmospheric reservoir such as those possessed by carbon (as carbon dioxide) and nitrogen. In temperate regions, at least, the mean crop of phytoplankton is determined by the phosphorus available; the next scarcest element. nitrogen, can be brought into the ecosystem by nitrogen fixation, though this may not be necessary until very high phytoplankton crops have been stimulated by phosphate enrichment. The macrophytes.

amount supplied per unit area of lake or river per unit time, and inversely to the product of mean depth and the sum of two coefficients. These are the flushing coefficient, the rate at which the water mass is replaced, and the sedimentation coefficient, or the fraction of the load which is locked into the sediments per unit time. If the flushing coefficient is large, the sedimentation coefficient, with its maximum value of 1, becomes negligible. From this formula, if the physical and hydrological parameters of the system and the loading rates of the various sources of phosphate are

known, the contributions which each source of loading makes to the phosphorus concentration in the water can be predicted.

The Broadland is situated in East Anglia, where some 20% of the annual U.K. consumption of fertilizer is applied. Agriculture is thus an obvious source of enrichment of the Broads. However, phosphorus is rather immobile in soils and previous pressure from environmentalists has stimulated much measurement, by soil scientists and ecologists, of the rates of removal of phosphorus from various kinds of farmland. Much of this phosphorus is removed in particulate, unavailable form and even when generous estimates of the amount of phosphorus washed out are used, it seems that the phosphorus concentration from this source could not exceed 30-40 µg per litre in the Broadland waterways. This would be insufficient per se to cause decline of the macrophytes and accords well with the persistence of water plants in Broads isolated among farmland from the main waterway, in ponds amid ploughed fields and in the dykes which drain the arable and pasture land. The phosphorus concentration in water from natural vegetation is only less than that in agricultural leachate by a factor of less than two or so in the absence of stock pollution. This means that the only way that serious enrichment could occur from this source would be by an increase in loading rate due to an increase in volume of the inflowing water. This would be counteracted by an increase in flushing rate and the phosphorus concentration in the lake would be little affected.

Effluent from sewage, on the other hand, is at least a thousand times more concentrated in soluble phosphorus than land drainage water. A small volume can therefore greatly enrich a lake without appreciably altering the flushing rate. At least fifteen significant effluent outfalls drain into the main Broadland waterway and some are substantial. They are supplemented by smaller outfalls in the upper reaches of the rivers above the Broadland region. They cope with the 0.5 kg phosphorus provided by the domestic activities and excretion of the average individual in this country

each year from a population of around 450,000. The Vollenweider equation predicts a mean phosphorus concentration of about 140 µg per litre from such a loading in the main waterway and by itself this would be sufficient to exclude aquatic macrophytes. The predicted overall phosphorus concentration. from agricultural and effluent sources combined, agrees well with direct measurements.

One part of Broadland at first sight appears to pose problems for the above analysis. Hickling Broad has a catchment area with neither sewage works nor sufficient septic tank drainage from lakeside dwellings to explain its more than 150 µg per litre total phosphorus concentration in summer. Nor does the water flowing into the broad carry sufficient phosphorus to explain the levels found either. However excretory phosphate need not come only from human populations. At Wintergreen Lake in Michigan and at Rostherne Mere in Cheshire, migratory birds provide sufficient phosphorus markedly to enrich these lakes. Extremely large populations of black-headed gulls roosted on Hickling Broad in autumn 1976 and, if records show, as we suspect, that major increases in these migratory populations are a relatively recent phenomenon, the enrichment that has occurred there within the 1970s will be explained.

The consequences of eutrophication of the Broads are not only aesthetic. National Nature Reserves recognised also internationally under the RAMSAR convention and several Sites of Special Scientific Importance, some of them owned by the Norfolk Naturalists' Trust, have suffered loss of features for which they were so designated. A civilised country maintains its natural resources just as it supports its orchestras, art collections and architectural heritage, but all such categories do not receive extensive populist support. Reversal of the eutrophication over most of Broadland must entail removal of a high proportion of the phosphate in sewage effluent by the Anglian Water Authority. The technology for this is well known, particularly in North America, and entails its major costs in chemicals (iron, calcium or aluminium salts) to precipitate the phosphate in processes referred to in North America as tertiary treatment. The charge for this, if not realisable by internal financial reorganisation, would come from the raising of water rates. This would not be popular and although the Water Authority is under pressure from conservation interests, the economic effects of eutrophication may prove to be a more compelling argument.

One of these effects is the movement of sediment downriver. In Barton Broad the sedimentation rate has increased nearly tenfold to over a centimetre a vear because aquatic macrophytes no longer anchor the sediment in the river above the Broad. This is likely to be a feature in all the Broads close to the main rivers and must mean that maintenance of navigation channels will become more expensive. A second effect is damage to the reed and water lily fringes by boats, which, now unassailed by propeller-tangling weed have much freer access to the margins than formerly. Particularly in the rivers this has meant accelerated bank erosion and damage and a consequent heavy investment in piling.

The costs of bank maintenance accrue to the Water Authority, but dredging of navigation channels is paid for by the River Commissioners. The costs of tertiary treatment and channel maintenance need not therefore be met by a single organisation. It seems clear therefore that the most sensible course for the future management of Broadland would be to bring together the diverse responsibilities under a single authority. The National Park proposal for Broadland, recently mooted by the Countryside Commission could result in such an organisation. Current National Park legislation, however, does not embrace flowing waters and would need to be revised. The idea of an overall authority has been proposed previously by the River Commissioners and currently the issue is being debated again. Unfortunately, however, the political structure of Broadland is so complex and there are so many associated non-statutory interest groups that it seems unlikely that any firm leadership in support of the National Park proposal will emerge from within the region.

REPORT

How the Swedish Government is Facing the Problem of Nuclear Power

When the Swedish Centre party formed a coalition government last autumn, everyone regarded it as a major blow against nuclear power; some people were even claiming that consequently all Sweden's nuclear power stations would be closed, even though they were in operation at the time. Hence when little outstanding happened and those nuclear power stations in operation continued to operate and those being built continued to be built, reaction set in, and we read in our papers in Britain that the Centre party had failed in its mission to bring nuclear power to a halt. Indeed we were led to believe that the governing of a modern industrial country and a commitment to environmental policies were in unreconcilable opposition to each other.

Recently I spoke to Pär Granstedt, a Centre Party MP and a member of the delegation for energy research under a newly formed Energy Commission, and of the Central Board of Environmental Protection. From him I gleaned a rather more optimistic picture; the Centre Party had certainly not reneged on its original commitment to environmental policies.

In 1973 a committee made up of members of the state hydroelectric board and of private electricity generating companies concluded that 23 reactors should be constructed by 1990. But soon after a moratorium was imposed, and it was agreed that no more nuclear plants would be built until after further investigation. Then in 1975 Palme's Social Democrats decided that 13 reactors would be installed by 1985. The Centre Party voted against that decision and since coming to office has managed to delay any decision about nuclear power until 1978. And despite constant battles with the other two members of the coalition (the Conservatives and Liberals), the Centre Party has now succeeded in limiting nuclear power to those reactors that are in operation or are in the process of being built, work on them having started before last autumn. In fact Sweden now has six 800 MW light water reactors operating at four sites and four more reactors being built at the same sites.

One of the key issues in the nuclear debate in Sweden is the dumping of long term radioactive waste. Indeed the Centre party has passed a new law that no more reactors can be planned until a satisfactory solution is found for radioactive waste disposal. As it happens Sweden has insufficient reactors of its own to justify a reprocessing plant, and the present policy is that all Sweden's spent fuel should go to United Reprocessors (BNFL at Windscale), in line with existing contracts.

Rank opposition to nuclear power is obviously insufficient. As we know from the public enquiry debate over Windscale there must be viable alternatives, and consequently the government has set up an Energy Commission to prepare different alternaAt the same time the government has given funds for research and already two large-scale prototype windmills have been constructed, one of which has been going for six months. It is also preparing a new research programme with the emphasis on conservation and alternatives.

In fact an intensive conservation programme was started by the last government. Since as much as one half of all Sweden's energy consumption goes into heating houses, it is obvious that a first line of attack in reducing overall consumption must be in the domestic sector. Thus the previous government made available favourable loans and grants for those who wanted to insulate their houses. Those grants still exist: the householder just has to fill in a form and the building inspector checks to see that the work is done properly. Meanwhile tough new building regulations have come in force from July, and as a consequence all new houses in Sweden should need one half as much energy for heating as the old ones. Grants are also to be given to factories which make use of more energy effective processes.

The government is also preparing a new law to regulate the use of electricity for heating. "In urbanised areas", Granstedt told me, "we want people to use district heating. In fact we want each commune to work out for itself efficient heating systems, and we are giving loans to facilitate co-generation in industry. Thus the waste heat should go either into district heating schemes or for generating electricity."

In tackling such problems the government has extensive plans to prevent unemployment. Thus it has made it difficult for firms to sack staff and it has created grants for re-education. But its main message has been that people in Sweden must not expect the standard of living to go on rising at the rate of 5 or 6 per cent as it did in the past: they must expect a levelling out. It is a courageous message when people are feeling dissatisfied, and have no clear idea what they want.

This autumn Granstedt told me, his government is setting up a committee to look at Sweden's environmental resources. "We hope something concrete will come out before the next elections. We also have plans to debureaucratize society by giving more power to local communes. We want to make relations less formal between government and governed. The trouble is that not much can be achieved in three years."

With less than a year in office the Centre Party has clearly made headway with its original policies. In many respects it is a good time for a party with an environmental approach to take over, for it is evident that traditional polices based on industrial growth are failing. Moreover Sweden, with one of the highest standards of living in the world, now has the chance to show the world that growth is not the panacea for economic problems. It remains to be seen whether the Swedish people will follow the lead set by its government.

TED BACK~ FEED BACK~FEED BACK

The March of Science

The Chill Can Manufacturing Corporation in Oklahoma plans to make a soft drink that cools itself. It will be in a double-walled can, and when the tab to open is pulled the cartridge of Freon will be released in the space between the walls providing instant refrigeration and if this does not slake your thirst for technological advance Modern Packaging announces the invention of a "quick-opening plastic soda can that carries its own cup." The plastic can is inserted into the plastic cup: when the tab on its aluminium top is pulled the cup drops off, ready to use.

Environment vol. 15. no. 9.

Air Pollution in London

Since the 1956 Clean Air Act. smoke from domestic coal fires and industry has been practically eliminated in London. The vehicles on the road, however, create so much smoke that levels measured on busy London streets will exceed limits recommended by the World Health Organisation. According to a report by David Ball of the G.L.C.'s Scientific Branch, on average 75% of 'dark' smoke in London comes from motor vehicles, and during pollution incidents. when levels are particularly high, the proportion may be as great as 90%. G.L.C. street side levels average 80 microgrammes to the cubic metre - twice the W.H.O. limit. As yet control of pollution by cars is practically nonexistent.

New Scientist 21.7.77.

Food Poisoning

Environmental Health reports an alarming increase in the number of notified food poisoning incidents in Britain. In 1975, there were 50% more cases than in 1974, bringing the total figure up to over 10,000 cases. Among the explanations put forward to explain this is the increased number of animals and poultry now being raised intensively, which has resulted in more cross infection. Contaminated feeds also add to the hazards by introducing new types of salmonella to our environment.

Environmental Health, February 1977

Small Firms Best hope for Jobless

Faced with the high unemployment in Merseyside and the North East, the National Enterprise Board has come out firmly in favour of small manufacturing companies as the best means of creating new jobs. Investment in big firms, they say, is likely to reduce rather than increase employment. Times

Public Against Growth?

A Harris survey in May found the US public wary of the supposed benefits of growth, faster travel, and high technology. 79 per cent preferred 'teaching people how to live more with basic essentials' rather than 'reaching higher standards of living.' 59 per cent stressed 'putting real effort into avoiding doing things that caused pollution' over 'finding ways to clean up the environment as the economy expands.'

ZPG May/June 1977

Power of Words

The belief that laws can change prejudices willy nilly seems to have reached down under. The New South Wales Parliament abolished the term 'illegitimate' for children born out of wedlock and replaced it by that of 'exnuptial'. 'The smear of illegitimacy is ended so far as the law is concerned' said Mr. Peter Walker. the NSW attorney general. Times 2.7.77

Civic Pride and Vandalism

'It is very seldom that sociologists can get any kind of statistical glimpse of the economic value of such a nebulous factor as people's morale. But somebody kept a finger on the pulse of Sunderland's productivity in 1973 when their team won the F.A. Cup final. Shortly afterwards the magazine Industrial Management devoted four pages to the effect of this success on productivity in the area. Factory after factory reported that production was up, industrial

relations had improved, and even that vandalism in the town had decreased."

Elaine Morgan, Falling Apart.

Dying Cypresses

Stricken by a canker that is spreading throughout Italy, the Italian cypress seems likely to follow the elm on to the endangered list. The disease first appeared in 1951, and it seems that the culprit in spreading it from the U.S. was international mobility. The tiny spores of the fungus are so hardy that any air traveller could have carried them in the dust on his shoes. Alternatively, some suggest that the canker was brought to Italy when nurserymen ordered cypresses from Arizona and California, some of which were infected. "If we don't do something," warns the Director of the Florence Observatory for Plant Diseases, "we will lose all our cypresses within a few years." Time, 1.8.77.

Eco Terrorists

The inevitable has happened: an organisation calling itself the 'Action Committee against the Atomic Mob' claimed it had planted a bomb outside the apartment of Marcel Boiteux. Director General of Electricité de France. The bomb caused extensive damage but there were no casualties. How long before they get plutonium? New Scientist 14.7.77

Bartering Back in Business

U.S. News and World Report has discovered a growing interest in an old age form of trade: bartering. People are swapping everything from cars to cooking lessons and home repairs, and companies are exchanging excess inventories for such things as legal services, accounting advice and advertising. Although much of this trade is conducted informally, a number of formal set-ups are cropping up around the U.S. In the Chicago suburb of Evanston, a group of more than 30,000 people have enrolled in a programme that embraces an

area from Milwaukee to Northern Indiana. Only the Internal Revenue Service seems upset. Killjoys to a man, they are arguing that goods acquired by barter should be accounted for at their full market value.

US News and World Report 21.3.77.

Merde Mer

French local authorities have just published figures for 777 beaches showing just how polluted they were in 1975-76. The figures show that following French guidelines, one beach in four should have been closed to bathers on occasion - and one beach in twenty should have been permanently banned. The cost of the survey is said to have been in the region of one million pounds. According to the latest official guidelines, the champion of the polluted plages was Arromanches on the Channel coast between Cherbourg and Deauville. Tests carried out showed 4,600,000 Escherichia and a mere 11,000 faecal streptococci per 100 millilitres. This compares with the recommended safe maximum of 2.000 and 1.000 respectively - and. incidentally, French guidelines are less stringent than international standards. Not surprisingly at Cherbourg the authorities deemed it necessary to lay on a coach service to take bathers to another beach six miles away. One wonders what the situation is like around the 148 seaside towns in Britain which shoot their sewage straight into the sea. New Scientist 28.7.77

The City is Dead - Official

A landmark report to the U.S. Congress by the General Accounting Office dispels the dream that New York or any other troubled city can retrieve its affluent past just by straightening up its books, behaving properly and meanwhile living off government loans. The sickness GAO finds is fundamental, and stems from the inexorable flight of industries and able citizens from the cities in the North-East and mid-West. GAO throws cold water on any attempts to reverse this trend. J.L. Johnson of the University of South Carolina endorses this; 'When will we realise that what is lost is lost, however beautiful it was, and what is dead is dead.' As for solutions, representative Henry Royce says 'What emerges from the studies of our sub-committee on the city is that small is beautiful.' Pretty strong stuff.

U.S. News and World Report 8.8.77.

Eco Mayor

Since he came into office six years ago the socialist mayor of La Rochelle has proved himself to be something of an eco-activist. He has filled the town with bright yellow municipal bicycles that anyone can borrow free of charge. He has introduced a solar energy system that provides hot water to municipal flats; stopped high building; and banished traffic from a large part of the old town and instituted a municipal recycling scheme. One of the new sights of the old Hugenot town is dustmen wrangling over which bits of rubbish can. or cannot. be recycled. Someone should tell our own authorities - maybe they could pick up a few tricks.

Evening Standard 6.7.77

Working for Welfare

The idea that able bodied people should actually work for their welfare money is spreading rapidly across the U.S. One such 'workfare' programme is working smoothly in Utah. In several respects the Utah plan is unique. It is sterner and goes further than most other programmes and what is more it is mandatory and does not only train people for future jobs it actually gives them work whilst they are still drawing welfare payments. If private employment cannot be found people are put to work for public agencies: they serve as teachers' aids or plant trees in public parks for example. Success so far has been somewhat limited if one only looks at the statistics. From July to December 1976, 782 people were assigned to the programme but 311 had to be removed because they did not perform as required — and only 11 were hired by their original sponsors. Yet as one young mother, who had been on welfare for 13 years, said after getting a job 'even though I was getting welfare I felt that I was working for it. Now I am in a job I can barely make ends meet, but I feel great because I am making it on my own.'

U.S. News and World Report 18.7.77.

Abstaining from Asbestos?

Dr. Julian Peto, of the Cancer Epidemiology and Clinical Trials Unit, Oxford, has warned that Britain's asbestos safety limits are totally inadequate. As they stand there should be no more than 2 asbestos fibres in each cubic centimetre of air in a workplace. According to a 1968 study, if exposed to that level for fifty years, only one man in a hundred would develop signs of lung damage. Using Dr. Peto's method of analysis, one finds that one man in five would be affected - a twenty-fold increase in risk. As if to underline this warning, the day the report came out The Guardian carried a story about a worker in an asbestos factory at Hebden Bridge, Yorkshire, who vomited a ball of asbestos after repeated blow-backs from dust extractors.

Times 28.6.77 Guardian 28.6.77

Plant a Tree a Month

Under the provisions of a new and somewhat unusual act President Marcos of the Phillipines will be compelled to resign and will lose most of his rights as a citizen unless he plants a tree every month for the next five years. The decree is designed to arrest the country's receding forest reserves (just under 3,500,000 acres of forest have been destroyed in logging operations bringing the danger of erosion, flash floods and the silting up of dams). Every able bodied man, woman and child over the age of ten will be expected to follow the President's lead. Those who violate the decree face the loss of their citizen's rights and privileges. If the plan works the Phillipines will gain an extra 360 million trees a year.

Times 1.7.77



Can we Prevent History from Repeating Itself?

THE MEDIEVAL MACHINE — THE INDUSTRIAL REVOLUTION OF THE MIDDLE AGES by Jean Gimpel. Gollancz. £7.50.

ENEMIES OF SOCIETY by Paul Johnson, Weidenfeld & Nicholson, £5.95.

Both these books attempt to predict the future by drawing conclusions from the past. Jean Gimpel in a most remarkable book shows how we have underestimated the inventiveness and productivity of the Middle Ages. It is a curious fact that we have become more aware of this as our own industrial revolution has begun to lose its impetus. Using wind and water as the motive power for highly geared machines, the medieval inventors made a more efficient use of human labour than any preceding Western civilisation. They also laid the foundations for the future industrial revolution by constructing the astronomical clock. the experimental attitude to research and a belief in progress. The clock divided into twenty-four equal hours gave the west its sense that 'time is money' and led to the 'time and motion' studies of today. The ageold sense of living in eternity with nature and the seasons was sacrificed. As an Indian sage said to a Swiss watchmaker "You have clocks, we have time." The clock came too late in the Middle Ages to be integrated into its outlook, just as the computer may have come too late in ours.

The invention of the horse collar enabled the medieval farmer to use large iron ploughs pulled by a team of horses or oxen. Together with the three course rotation and the milling machine the output of food and its distribution rose dramatically; this, as usual, was accompanied by a rise in population that exceeded the increase in the production of food and goods. Consequently bad harvests (apparently coinciding with a change for the worse in the climate in Europe) preceded the terrible Black Death that brought the industrial revolution to an end. Like many other historians of the period, Jean Gimpel believes that this only hastened the decline that had already set in; the psychological impetus was waning. Gimpel believes that civilisations have cycles of growth, maturity and decline and he has traced forty-eight factors from the broad spectrum of human activity common to the growth and decline cycles of medieval France and modern America. On the basis of this parallel he predicts that Western civilisation is going into a decline that may last a thousand years. The Americans he says have lost faith in technology: they no longer care about creating the biggest of everything as fast as possible. Their leaders play golf instead. They are even decadent enough to prefer beauty to profit. It is the French at the moment who behave like the Americans are supposed to, but their resurgence of the progressive spirit will not last because they will be dragged down by the general Western loss of psychological drive. The Chinese, on the other hand, he says, may be entering a thousand year cycle of growth, maturity and decline.

It may be that Gimpel is right; but if so he is right for the wrong reasons. The West is not going into an inevitable decline, if by decline we mean a loss of civilised values. It is faced with collapse because it is undermining its life support systems and has created a managerial order that is so complex it is beyond human control. Neither of these two 'enemies' are inevitable; by integrating technology with ecology, we might still save Western civilisation and maintain a reasonable prosperity.

Thus the decline in the birth rate, the desire for beauty and a greater conservation of nature, and the loss of interest in productivity for its own sake (i.e. for profit alone) are not symptoms of a civilisation in inevitable decline but signs of hope of recovery. A stable civilisation with a high technological base has never vet been attempted. The entrepreneur (that is individual or international business corporation or government department) which is allowed to go ahead and produce irrespective of the effects on the environment and society, provided growth is increased, is no longer morally acceptable or indeed possible for much longer. The frontiers of expansion open to the Middle Ages and the 19th century have closed in. It is this, not the loss of psychological drive, that is slowing down the exuberance of growth; but the 'drive' can be transformed and turned into deeper and profounder energies. If we look upon this slowing down as a calamity and retreat into ourselves on the assumption that Western civilisation is at an end, then we are committing suicide. Our future lies in our capacity to adapt our science and technology to the new situation. human and environmental. We might then create a civilisation not known before.

I am therefore not fatalistic like Jean Gimpel. The other dangerous attitude is to believe that we can only save ourselves by a renewal of the beliefs 'that made us great'. This is what Paul Johnson does in Enemies of Society. I therefore accuse him of being an enemy of society himself. Certainly Paul Johnson is no fatalist. His tract for the times is a trumpet blast ('if the trumpet makes an uncertain sound who shall prepare for the battle?' he asks, quoting St. Paul) calling us for a crusade against those who would lead us into losing our faith in science, technology, reason, the middle classes, industrial investment and our trading system. We must pledge ourselves to absolute moral values. This St. Paul's lance is extremely tilted against the eco lobby who are to blame for the recent recession which was a conspiracy on their part to seduce the Arabs into raising the price of oil and restricting its output. The knavish tricks of this lobby have weakened our psychological drive and undermined our economic growth.

Johnson's book is a witness to the principle that lame thinkers shouldn't jump to conclusions. There doesn't seem to be an epoch in history (in which he roams like a nouveau riche in an antique shop) from which he has not instantly drawn a false conclusion. The reason for this is that he has written the summing up before examining the evidence. Everything must prove that the critics of reason, science and economic progress are enemies of society. Even the critics of Christianity are in trouble - not because Johnson has any understanding of religion - although he has written a history of Christianity - but because Christianity is the best support for his materialist middle class society. God help Christianity if he is right.

Readers of *The New Statesman* will at least be able to understand why that weird journal was so full of contradictions between 1965-70: the editor was, in secret, a puritanical, laissez-faire capitalist (in favour of moral absolutes provided they do not interfere with economic growth). His secret life is as remarkable in its way as Kim Philby's.

Robert Waller

Undeniable Rights

THE MORAL STATUS OF ANIMALS by Stephen R.L. Clark, Clarendon Press: Oxford University Press, £5.95.

Here is another eloquent condemnation of mankind's depraved treatment of animals but 'one that may well lead to more conversion in the academic world than most of its predecessors. An Episcopalian as well as a moral philosopher, Dr. Clark violently attacks the brutal exploitation of non-human life, especially by modern science; his attack springs, if not directly from Christianity, at least from the heart as well as the head and thus points indirectly towards the religious-spiritual ethic that can no longer be overlooked. He calls himself, however, a crank and a zoophile who, with this "consciously outrageous publication" is out to wage war on the orthodox; yet his basic demand for "the immediate rejection of all flesh-foods and most biomedical research" as unnecessary human greed is neither cranky nor outrageous: it is splendid. Nor is his demand for recognition of the undeniable rights of the nonhuman constituents of the biosphere picked lightly out of thin air. It is the logical conclusion of an elaborate synthesis of relevant philosophical argument which is strengthened throughout by acknowledgment of the enormous power of man's suppressed feelings of love and affection for his non-human kin. Ecologically, "it is more likely that the earth will be healed by our released tenderness than by any more technology of the modern kind." This is certainly an intuitive truth that transcends reason.

Dr. Clark puts his finger upon a seminal idea. "It is," he says, "in our unreasoning intuition, not our painstaking rationality, that we are most God-like." And in honouring the beasts because they see and act naturally and well without "thinking things through," he contends that we are only one among many species of animal life, without any claim to uniqueness or extra standing in the world. Let us, he pleads, destroy the barriers we have placed between them and us, let us admit that we are an indistinguishable part of the living world, let us recognize that because we are warm-blooded mammals, we display care, pity, and self-sacrifice. Let us admit with Aristotle that "our sense of justice arises from such family and clan relationships," since only a few men "are truly moral beings, autonomously choosing by the standards of intuited right: we and our kin live as we find ourselves."

Yet it is the very existence of these few which provides an alternative argument for bettering the humananimal relation. It is these few who have demonstrated that the human potential transcends that of animals and that man is thus spiritually unique, being able to attain knowledge of good and evil which is both intuitive and super-rational and thus different in kind from the intuitive, sub-rational knowledge of the beasts. To realize his spiritual potential, man, it seems, must first utilize rational powers which animals lack (or possess only to a rudimentary degree) and then pass beyond them to intuitive recognition of the divine ethic.

Dr. Clark disparages the "transcendental humanists" who are primarily concerned with man's attainment of ever higher levels of spiritual enlightenment, and he wrongly believes that they have no eyes for the plight of the nonhuman. On the contrary, many of them have seen that because man is unique and apart from the animals, his sense of compassion, justice, and tenderness must become an increasingly important ethical duty. The spiritual man must help animals to realize *their* potentials. *Noblesse oblige!*

Let us therefore appreciate and commend The Moral Status of Anias - an admirable mals philosophical attempt to better the plight of the non-human and the moral integrity of man, and let us hope it succeeds far beyond the author's modest expectations; but let us at the same time remember that there are other ways to achieve these evolutionary ends. A theocentric humanism in the platonic sense seems to me better to ensure the attainment of justice and harmony between man and beast.

Catherine Roberts

The Dismal Science

ECONOMICS AND THE CRISIS OF ECOLOGY by Narindar Singh. Oxford University Press. £4.75. ECOLOGY AND THE POLITICS OF SCARCITY by William Ophuls. W.H. Freeman. £10.40 [soft cover £5.10].

You might imagine that since the threat of impending resource shortages caused by depletion and the recent perturbations within world trading and monetary systems caught them completely by surprise, our economists would have vanished into dark corners to hide their shame and confusion. Of course, they have not vanished at all, far from it. They continue, confident as ever, to make forecasts that are contradictory mutually but separately difficult to fault as expositions of what ought to happen. Their internal logic is impeccable. The gap between that which happens and that which ought to happen may be due to over-emphasis on this internal logic that has led theoretical economists into ever greater abstraction.

That, at least, is the view of Dr.

Singh, who picks away gleefully at the classical economists until their entire edifice totters alarmingly and he has to reassure us that in spite of everything, the study of economics is still possible.

Modern science owes much to Newton whose vision, he said, was due to his having stood on the shoulders of giants. Dr. Singh argues that the fathers of economics stood on those same shoulders and looked in the same direction. Thus they arrived at a view of human societies that is as mechanistic as the view of the universe that prevailed among scientists until fairly recently. Since human societies are not bound by the laws of Newtonian mechanics, economists found themselves constructing models of increasing abstraction and ignoring the realities around them. Trivialities were analysed in loving detail. essentials were overlooked, and concepts emerged that, like other metaphysical concepts, have a habit of rolling out of every argument on their own circularity. Today, an eminent economist has as remarked, "Economics as the study of economies" is a revolutionary statement.

It would be bad enough if economists were shown to be irrelevant to the actual economic and ecological problems of the modern world, but the truth is worse. They support the status quo, and this makes them part of the problem, rather than contributors of solutions. If, with Dr. Singh, you reason that the accumulation of capital is essential within a capitalist economy, it follows that the capital must be invested in production to make it grow, so production like capital must expand indefinitely and the system will favour those with the greatest capacity for consumption — the rich. This must lead to economic injustice and a prodigious, but unavoidable and irreversible, waste of resources. A conserving society, therefore, cannot be a capitalist one, and "capitalism" in this sense must embrace the centrally planned state capitalist economies as well

Dr. Singh's analysis is sharp and his rejection of the more facile environmentalist arguments deserves careful consideration. Unhappily, his suggested solutions are no less facile and based on concepts no less metaphysical than those he rejects: egalitarianism, world government, the universal socialist brotherhood of man.

Dr. Ophuls, on the other hand, takes us much closer to a plausible Utopia. Like Dr. Singh, he believes world government is essential and future societies that must he egalitarian (a word that is never defined). Also like Dr. Singh, he insists that our survival must stem from "metanoia", a transformation of our world view. His "steady state" would be based on the Taoist virtues of gentleness, frugality and humility. It would be communalistic rather than individualistic, and probably it would be authoritarian, political power being vested in those Jeffersonian paragons who are "fittest to rule" - an idea which, he admits, leaves one or two questions unanswered!

If his proposals are more advanced than Dr. Singh's, his appreciation of the problems they are meant to solve is far more naive. Indeed, his book is spoiled by a tedious and uncritical recital of all the ancient prophecies of ecodoom that takes no account of the great deal of study and thought that has refined our perception of the world and our role in it over the past five years or so.

Perhaps Drs. Ophuls and Singh should meet, since each seems to possess what the other lacks. Certainly their books stand to be read in conjunction.

Michael Allaby

Rational Agriculture

THE FAMINE BUSINESS by Colin Tudge. Faber. £3.95.

Many books have been written about the world food situation. Most of them have been tedious and some just silly. I know, because over the years I have read more than my fair share. Colin Tudge has avoided all the traps. His is the shortest book on the subject that I have read, and in my opinion it is the best. If you wish to understand the principles underlying the obesity and hunger that exist side by side in the world we have made, then I urge you to invest in this book.

Mr. Tudge will not bury you beneath a mass of statistics of

dubious parentage. He cuts directly to the heart of the problem to show that such as it is, the world foodcum-population crisis exists for two main reasons. The rudimentary state of nutritional knowledge led agronomists to over-estimate the amount of protein the human body needs by something like three hundred per cent. It is this that led them to frame heroic policies designed to deal with a truly prodigious demand. They set about their task by seeking to adapt and export the agricultural technologies that seemed to have succeeded so well in Europe and America. Since those technologies no longer appear so appropriate as they did even in the industrialised west, what chance can they have elsewhere?

So far, the book says nothing very new, although the precision with which Mr. Tudge dissects the food industry to show how solutions are sent into the world to seek problems, and how consumer behaviour is — ever so gently — manipulated, is masterful. The customer is always right, so long as he does as he is told.

The new element enters as the solution is presented - although the word "solution" seems hardly apt when the problem is so ill defined. Rather, Mr. Tudge proposes what he calls a "rational agriculture" and he proposes it, in the first instance, for Britain. Its aim is to provide people with a diet that is nutritionally adequate which also means it is varied and appetizing, for this is necessary to nutritional adequacy - from the resources available to us now. There are no gimmicks, no novel proteins made from oil fractions. The diet is based on cereals, potatoes and beans of all kinds, made more interesting by the addition of modest amounts of meat and as much vegetables and fruit as is desired. These are to be grown by entirely conventional means. As much of the diet as possible is to be consumed fresh and. where appropriate, in season, and the variety will be achieved in the cooking. (This book will delight gourmets, which is saying something for a book that deals principally with the causes of famine!) The food will not be grown by fifty million souls each digging his or her square metre, but by an immensely complex



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11. Energy: The Solar Prospect. Denis Hayes.

A major energy transition of some kind is now inevitable. Oil-based societies of the industrial world cannot be sustained and cannot be replicated. Until recently poor countries looked forward to a time when they too could be industrialised with the help of cheap oil, a dream that ended with the huge increases in oil prices in 1973. Thus both rich and poor now seek alternative sources of energy. In this paper Denis Hayes discusses the global possibilities of solar heating and cooling, electricity from the sun, wind and water power, plant power and waste conversion technologies. He concludes that of the possible worlds we might choose to build a solar-powered one appears most inviting.

12. Filling the Family Planning Gap. Bruce Stokes. Bruce Stokes assesses the shortfall in the delivery of family planning services and outlines recent attempts to bridge that gap through the involvement of commercial outlets as well as social, political, industrial and religious organisations.

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pattern of farms, most of them small by comparison with the larger of today's farms. Rational agriculture runs directly counter to the EEC's Common Agricultural Policy.

If you imagine that everyone in the world must be fed on steak and ice cream twice a day, then the world food problem is insoluble. If you imagine that everyone will eat traditional, and highly nutritious, foods grown locally, then solutions seem at least feasible.

Of course, changed will ne needed. The industrial west must abandon its claim to "lead the world." Since most of the world cannot adopt its lifestyle, the "leaders" can have very few "followers". However, the changes are more radical than this. Mr. Tudge shows that just as our present agriculture is the product of the capitalist economic system in which it operates, so his rational agriculture is impossible within that system. The system must change and what emerges will probably be based on some interpretation of Marxism - which does not mean that Britain will become a carbon copy of Russia or, for that matter, of China.

Our attitude to science and technology must change, too. Unless a scientist is doing work of clear social value, there is no reason why he should receive more encouragement than, say, a painter or an actor or a gymnast. This does not imply a rejection of science and technology — far from it — but only a plea that these activities be made more responsive to the needs of the community. Again, the economic system needs to change.

The book is short, as I said. You could read it in a few hours. It is written simply and with a passion that never degenerates into rhetoric or allows judgements to be clouded. If the first session of the next meeting of European agricultural ministers were devoted to a formal and thorough reading of this book, we might see some policies emerge that are more in tune with the realities of life in the late twentieth century. That, of course, is my wishful thinking!

Michael Allaby

Enthusiastic, Erudite and Down-to-Earth

ORGANIC GARDENING, by Lawrence D. Hills, Penguin Books, 1977. 90p.

Lawrence D. Hills needs, as they say, no introduction. Most readers of The Ecologist will remember his, numerous contributions to this magazine: they will know him as a leading authority on pest-control without poisons and fertility without chemicals: they will be aware that he is the founder and director of the Henry Doubleday Research Association, perhaps the most lively and original organic gardening organization in the world: they will have heard of his current efforts to establish an International Tree Farming Institute and an International Vegetable Seed Library. All of which makes any review of this book almost superfluous. But a few comments may whet your appetite before you rush out to buy a copy.

Far too many gardening books give the impression of having been produced by scissors-and-paste methods from their predecessors. (This is particularly true of books about herbs, many of which continue to retail the sillier fancies of the Elizabethan herbalists.) Lawrence Hills, on the other hand, is a writer with mud on his boots. He is a practical gardener first and foremost, with 40 years' experience behind every statement he makes. His organic principles are hard-headed. not mere faddism. He keeps one eye on the future, for he knows that "the land will go on feeding us through the sunlit centuries when motoring is but a memory." But he is not too idealistic to point out that one of the best reasons for the organic approach is the immediate financial one - "it is easy even at today's vegetable prices to spend more on chemicals than you can save when growing your own food."

Organic Gardening begins with general principles, passes on to a survey of the various fertilizers available (with detailed instructions on compost making, necessary because "so many people make bad compost"), and discusses the most important vegetables and soft fruit crop by crop. There are sections on obtaining land, by garden-sharing or by wringing allotments from reluctant local authorities; on the correction of deficiencies and diseases; and on the control of pests (with some interesting pages on the encouragement for this purpose of birds, hoverflies and hedgehogs).

The last item has the distinctive Lawrence Hills flavour. This book like all his writing, is full of the best sort of originality - the sort that seems obvious when someone has pointed it out to you. The ideas spill out all the time: amusing asides "Many a barber has won prizes at village vegetable shows from the slow fertility added every time he sweeps out the shop"). comments on storage, cooking and nutrition, and above all practical tips for the ordinary gardener. Most of us tend to discard last year's left-over seeds automatically 'to be on the safe side'': Mr. Hills tells us how long the different sorts will keep (information which, for obvious reasons, is not given on the packet). That knowledge alone should save most gardeners the cost of the book in one season. Recycling fanatics will find many appealing notions: plastic bags as cloches, old nylon tights to store onions, colour supplements to make a frost-shield round young tomato plants . . . Organic Gardening is more readable than most practical gardening books, and more practical than most readable ones. Above all, it bears on every page the unmistakable stamp of Lawrence D. Hills himself — that enthusiastic, erudite, idiosyncratic yet down-to-earth one-man campaign for sanity in the garden and the world.

Nicholas Gould



The last act . .

Dear Sir,

In your article Deindustrialising Society you say: ''In a self-regulating system, behaviour which satisfied the needs of the parts will also satisfy the needs of the whole.'' Agreed. The inference is also unmistakeable that the converse is not true. The quality of 'the parts' is the beginning and the end. Any other operations on a larger scale are thus to be judged by their effect on the parts.

When, however, does a part get to the stage that it begins to suffer from the limitations of being bigger than a part? Wherein lies the evil genius of scale and how do we recognise it?

As anthropology is our witness, a community is a structured association of families, the structure deriving originally from the traditions of the tribe and clan. But then, as Mumford has shown, the community is turned into the State by the invention of the megamachine, i.e. an organised force of men designed and commanded to do the bidding of a single leader. The force usually has two parts, one military and the other religious — to ensure effective simultaneous control over the minds and bodies of all members of the community.

Because we are social animals we are obliged to invest the community with sacred qualities in order to ensure its coherence, order and future and these qualities are expressed in rituals. Thus the religious celebrations through which we identify ourselves and our aspirations. As Henryk Skolimowski has put it (writing about the play Equus): "If you worship nothing you are nothing."

Religion of this order springs naturally from the community. But when the State, the priest-king, appoints and sustains a special body of segregated men whose ultimate mandate is a mixture of physical force and arbitrary dogma the natural divinity of the community is lost and we are into pseudo-divinity, monotheistic (on the model of king-ship) and imposed. Thus the dark side of civilisation. In the twentieth century, after a history of some ten thousand years, we are in on the tail end of the last act.

It is our century that has seen the megamachine reach its grossest proportions and religion its ultimate degradation. The bloated body was fatally pricked at Hiroshima. Its collapse is real and its members are terrified that we might find out about it. We face the last taboo — on the real significance of the military in our society. The supposed East/West struggle (which can only be an act, unless mass suicide is seriously intended) is slowly bleeding us to political and financial death. The historic significance of the Bomb is that it has rendered war impossible between the industrialised states. All possible conflicts in and around Europe and America are nipped in the bud within a week — consider the stories of Berlin, Budapest, China, Prague, Suez and Cyprus — and if a war is to be fought it will be fought vicariously with conventional weapons in the Third World, as in Vietnam, Israel and Angola.

In this country the civil part of the megamachine, Westminster and Whitehall, is helpless and worse. It compounds the offence. The 'system' is all of a piece. Politicians and civil servants alike have implicit faith in things as they are. In their view the military provides the only means of defence and defence is the main single prop of the economy. We are now told, for instance, that the main contract to which our whole aero-space industry looks forward is for the Tornado fighter. Each one will cost us poor taxpayers about £10m, they will provide 'work' for 36,000 people and after ten years they will be thrown on the scrap heap without having ever fired a shot in anger. It has been the same old story since 1945. Why can't we see it?

The situation is even worse, if that is possible, in the Soviet Union where consumer industries are comparatively weak. Their society is militarised from top to bottom in the name of 'peace.' Fantastic quantities of men, money and materials are being poured into an attack that they have no intention of making and into defence against an assault that will never be launched.

All of us, East and West alike, are today in the grip of the greatest confidence trick that the world has ever known. There is nothing we can do about any of our major problems until we face this one. The answer is for us all to join hands across the Iron Curtain in such ways as defeat the governments of *both* sides. This today is the only 'defence' that makes sense. The main trouble is within ourselves — in our wilful ignorance, our willingness to be duped and our appalling lack of imagination.

We shall only have the self-regulating system you suggest when we have split England up into sovereign regions for political purposes, i.e. the raising and spending of taxes. That, in conjunction with a new kind of Europeanism that extends from the Atlantic to the Urals, will give us a regional-international balance that will work. The expendable thing is the nation-state.

Yours faithfully, *Peter Cadogan*, Hampstead Hill Gardens, London.

Peter Cadogan's The Case for an England of Sovereign Regional Republics Extra-Parliamentary Democracy and A New Active Non-Violence of the Centre is now available from: "Direct Democracy," 1 Hampstead Hill Gardens, London NW3, price 30p. First published in 1974 and rewritten in 1975, this booklet expands the thesis contained in his letter.

Editor.

Drink to me only . .

Dear Sir,

Noting Mr. Hardy's problem (Ultimate Destination (The Ecologist Vol. 7, No. 6) I am reminded of the practice of a local farmer's wife who owns a vine. Whenever an old hen dies, she buries it at the foot of the vine, with most satisfactory results.

Provided he erects the greenhouse now and gets the vine going, with its roots outside as usual, it would surely be a satisfactory and ecological plan that his descendants and surviving friends should be able to drink to his memory in wine derived, though indirectly, from Mr. Hardy's remains for a good twenty years at least — if they could face it.

Yours faithfully, A.W. Thomas, Rugby.

Holy GNP

Dear Sir,

Some years ago I was lent your *Blueprint* for Survival.

This crystallised my disquiet at the way the world was going.

Following this, I read *The Limits of Growth*. My reaction was that I must join this ''Club of Rome.'' To my chagrin I found this impossible.

In Britain, at least, it seems to me that no progress has been made over the last few years and that your periodical is a failure.

May I outline a totally different suggested course of action?

1) People are concerned about many things. Preservation of the countryside. the misuse of land and distruction of Flora and Fauna. Over-population. Vanishing unrenewable resources. Pollution. The incompatible twins - automation and full employment, inter alia. No organisation seems to realise that their aims, so worthy in themselves, are only a small facet of the global problem. Something must be done (by you?) to unite these groups into one large federation. They must be brought to realise that, for instance, it is no use to stop otter hunting unless you also back those who try to stop industrial pollution of rivers or object to a new town being built around the other's habitat.

2) Come down to earth. Organise this federation and change your publication into the official organ of this ''New World Society.'' At present it is read by the (very) few converted. The articles are too long and too erudite, full of pseudo scientific jargon. No one, buying it on a station bookstall would ever say ''This is good. I must subscribe to it.'' Use it to report the various endeavours to return to sanity. Support the good. Castigate the supporters of ''Produce and Consume.''

3) Forget politicians for the moment. If there are any who believe in the Blueprint it would be political suicide to admit it. The big parties are like religious sects. They war between themselves, verbally and physically but all bow down and worship one God, the great panacea, Holy GNP.

You do a lot of lecturing; now the time has come when you should train many more speakers to go out and give the bare bones of the global problems about which most people know nothing. You should speak at Young Farmers' Clubs, Rotary and Round Table, W.I.s, anywhere where people gather for meetings. Perhaps you could address the Headmasters' Conference. It is time to make a move. At the age of seventy-one I have two grandchildren. It frightens me to think of the world they may have to live in.

Yours faithfully, *Kenneth Meek*, Penrith, Cumbria.

Running out of steam

Dear Sir,

Mr. Edward Goldsmith, in his editorial (The Ecologist, April 1977) draws attention to the mediocrity of modern day industrial society. One of the causes of this mediocrity is the failure of environmental problems to be considered on a global scale; academic ecologists come in for some severe criticism. Ecological Science is striving to become a truly predictive science, a task perhaps prematurely imposed upon it by those who consider ecology to be the "saviour of the world." Despite a core of theory that may be applied to biological communities, the full implications of some of the more common principles are imperfectly understood, and therefore trivial or irrelevant. The problems of the world cannot be considered without knowing at least the barest minimum about its components.

However, this does not mean that the ecological community is sacrosanct. A recent article in the Bulletin of the British Ecological Society raised the point that the Government, as the major financier of research in this country, should have more control over the direction research should take. The output from universities and research establishments should be more consumer orientated, that the more pressing environmental problems of this country should be at the top of the list for the allocation of research facilities.

This apart, one cannot but feel that Mr. Goldsmith's comments reflect a general feeling of disillusionment which I believe to be prevalent in the conservation movement today. A Blueprint for Survival, undeniably an important and influential document, was published at a time when public concern for the environment was at a peak. If support for organisations concerned with the environment can be used as an indicator of public concern, then the declining membership of some, and the fall in the rate of increase in membership of other organisations can only be taken as a reflection of the failing appeal of the conservation movement. However, at a time when the need for an organised defence of the environment is ever increasing, the public appear not to appreciate the problems. Where are we to look for the answers to the conservation movement's lack of appeal?

Skolimowski (*The Ecologist*, October 1976) called for a unified ecological point of view; and Selman (*The Ecologist*, November 1976) has indicated that the view of society, regarding the landscape simply as an amenity, may inhibit our ability to plan for the future. The resolution of these two problems may enable progress to be made. A key to these questions may be found in the writings of the American conservationist Aldo Leopold, who proposed an ethical concept of the land. As human societies evolved, a

greater proportion of Man's external environment has become subject to ethical concepts, and hence relationships with the environment are modified and controlled. Leopold argues that human societies have rarely, if ever, included the land in their ethical framework, preferring instead to consider it as a commodity to be dealt with in the most expedient manner. The development of this land ethic would promote a realisation of the living characters of the earth we live in and on, and an understanding that the land must be protected and cared for. Taken to its logical conclusion, the Land Ethic would remove the need for a conservation movement as man would then be an integrated part of his environment

The mediocrity of which Mr. Goldsmith complained, is I feel rooted in the apathy which stems from a feeling of alienation from our present day environment. The conservation movement, if it can resolve its present crisis of identity and renew its sense of purpose, is in a position to influence the development of society; and it is an opportunity we cannot afford to lose. The Ecologist magazine, as a major forum for discussion in this country, has an important role to play in the events of the future: but, like the conservation movement as a whole, it has lost impetus. It is time to reaffirm principles, to identify problems, and to formulate a plan of positive action, supported by a unified conservation movement. It is not yet too late, but our problems can only get worse. Cynicism would best be reserved for the last moment.

Yours faithfully, Norman MacLeod, Caergeiliog, Anglesey.

PARLIAMENTARY LOBBY, 16 NOVEMBER

Energy 2000 (Yorkshire) is planning a mass lobby of Parliament to convince the Government that there is a strong body of opinion in this country which is totally opposed to the expansion of nuclear power and in favour of the urgent development of alternative sources of energy.

This will be the first time that the anti-nuclear lobby has shown its strength to Parliament directly, and it is vitally important that the turn-out is impressive. If we are really serious in our opposition to nuclear power, we must make the effort to display it: it is vital that as many people as possible attend the lobby and thus involve as many MPs as possible.

The lobby will take place on Wednesday, 16 November, from 2 p.m. to 6 p.m. in the Grand Committee Room, House of Commons. It is hoped to arrange a march and demonstration prior to the lobby – details will be available later. We have support from Lord Avebury, Robin Cook, MP, Nigel Forman, MP, and Stephen Ross, M.P.

Please return the form below, as early as possible, to: Energy 2000 (Yorkshire), 64 Salisbury Road, Sheffield, S10 1WB, indicating how many people from your group will attend (approximately). If you have any difficulty in arranging transport for the event, please let us know and we will do our best to help.

Remember – every person present reinforces the impact of the lobby, and increases the likelihood of favourable press coverage. We *must* convince Parliament that nuclear power is unacceptable to the people of this country.

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THE INTERNATIONAL ASSOCIATION OF ENVIRONMENTAL COORDINATORS will hold their Autumn meeting in Versailles, France, on Thursday and Friday 24 and 25 November 1977 on the theme: "Risk assessment and risk acceptance." Three invited speakers will give the points of view of industry, controlling authorities and the general public, respectively. The item will then be discussed in "workshop" sessions.

Enquiries about this meeting and about membership of the Association should be directed to the International Association of Environmental Coordinators, Avenue F.D. Roosevelt, 112, Bte 8, 1050 Brussels, Belgium. Tel: Brussels 647.55.04.

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