The
Ecologist
The Journal of the Post Industrial Age
Vol:4.No.10 December 1974 30p

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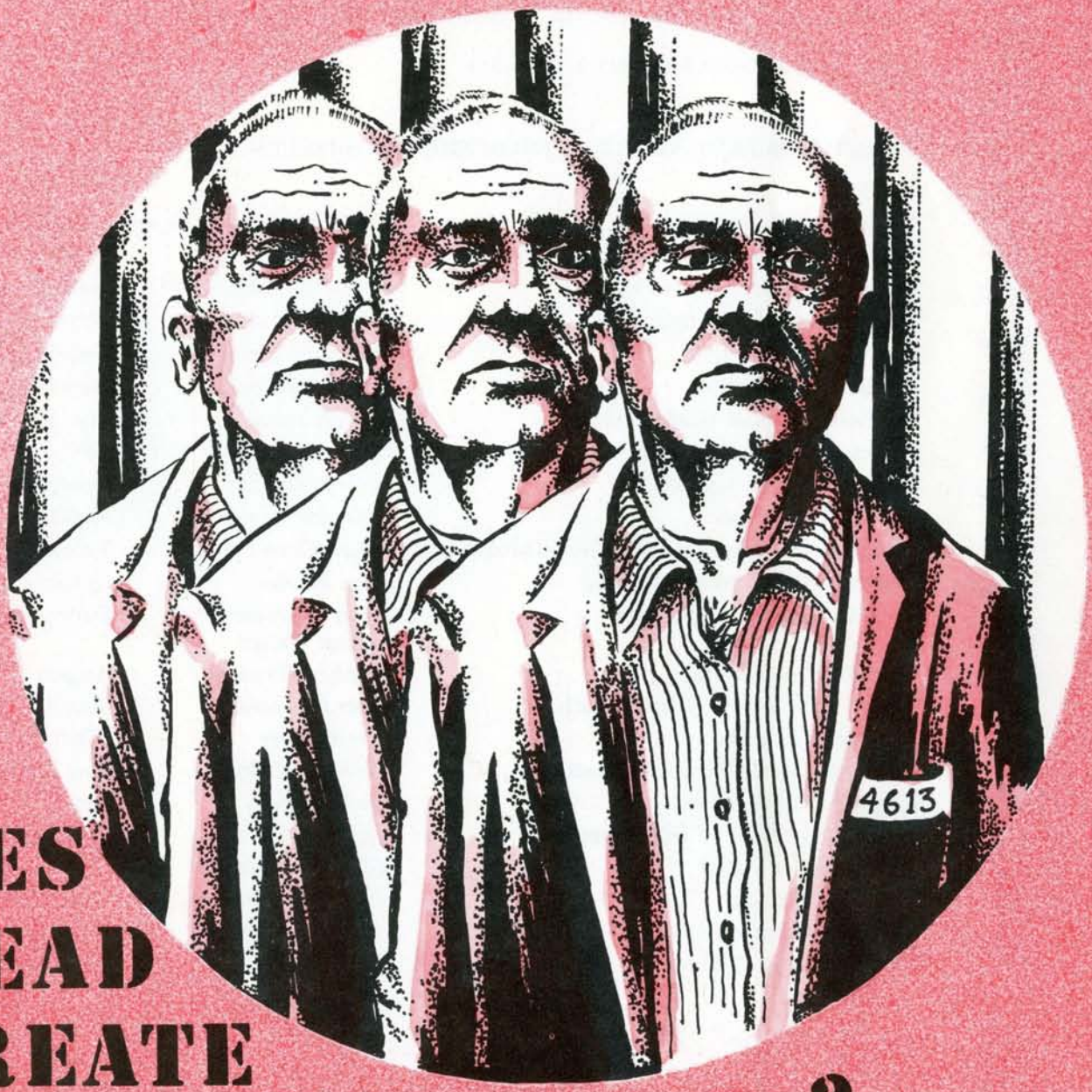

DOES LEAD CREATE CRIMINALS?

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Cover by Diplomat Design.

Design by Mewton, Lees-Barton, Bodmin, Cornwall.

Publisher: Edward Goldsmith; Editors: Edward Goldsmith and Peter Bunyard; Associate Editors: John Davoll, Jimoh Omo-Fadaka, Lawrence D. Hills, Brian Johnson, Andrew MacKillop, John Papworth, Graham Searle, Robert Waller, Richard Willson. All communications should be sent to The Editors, Ecologist, 73 Molesworth Street, Wadebridge, Cornwall PL27 7DS. Telephone Wadebridge 2996/7. Business and Subscription enquiries to: Ruth Lumley-Smith, Editors' assistant. All advertising enquiries to Interpress, 19 Anne Boleyn's Walk, Cheam, Surrey. Telephone 01-642 5826.

Published by Ecosystems Ltd., registered office, 73 Molesworth Street, Wadebridge, Cornwall PL27 7DS. Subscriptions to the Ecologist, 73 Molesworth Street, Wadebridge, Cornwall PL27 7DS.

Printed by Penwell Limited, Parkwood, Callington, Cornwall.

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Editorial

Can We Afford Lead Pollution?

Juvenile delinquency and adult crime rates rise alarmingly; admissions to mental hospitals are higher than ever before; aggressive and irrational behaviour, football hooliganism and muggings increase. The authorities and the public are alarmed and despondent about the situation, and vast amounts of time and money are spent on social welfare and kindred organisations, both public and charitable, in an attempt to get to the root of the problem. But all the thinking on the subject has so far been based on an assumption that the cause is primarily, if not exclusively social. The stresses and strains of life in a highly industrialised society – overcrowding – anxiety – poor conditions at home and at work – are undoubtedly causes of much social disorder, but recent research in to the effects of lead absorption demonstrate convincingly that in a proportion of cases the cause is **not** social, but the result of lead poisoning.

Revelations emerging almost daily in the latter part of 1974 confirm earlier suggestions of a connection between lead absorption and various types of abnormal behaviour. Research carried on by different teams of scientists in complementary fields underpins each others findings, and their significance cannot be doubted.

In this issue of The Ecologist we publish in full a paper by Professor Bryce-Smith and Professor H. A. Waldron, in which they examine and develop the evidence. Since their paper was completed more results have been produced, by Dr. O. David and others, which confirm and extend their findings. A recent report by a team at The National Institute for Occupational Safety and Health, in Cincinatti reveals that workers in the lead industry, observed against carefully matched controls, although showing no conventional symptoms of lead poisoning, are abnormally aggressive and suffer from increased feelings of hostility and depression, compared with the controls working in a non-leaded environment. Studies of mentally defective children and criminals show that at least a proportion of the unfortunates now crowding our prisons and psychiatric hospitals have a high blood/lead content, and that some handicapped children, treated with de-leading therapy have shown improvement.

The toxicity of lead has been known to man for over 2000 years. Most people have a vague idea that there is something in lead paint and lead toys which threatens their children, and yet its use in modern technology continues unabated, and emissions of lead into the atmosphere, the sea, rivers, soil, flora and fauna, continues and increases, while governments and chemists continue to disagree about the damage it does. In a paper presented at the International Congress on Chemical Engineering in 1972, Dr. T. J. Chow made the following observation: ". . . with the continuing discharge of lead compounds in to the air and water the rate of increase of lead concentration in the environment has accelerated in the last fifty years. Today lead concentration of 2–8 ugm^{-3} occur in urban atmospheres; lead in city soils is in the several parts per million range; river water in industrialised regions often contains several micro-grammes of lead per litre; near shore sea-water contains 0.2 $ug\text{-}l^{-1}$ of lead and plants grown near the roadside are often ten times richer in lead than those grown farther away. Human activities have introduced lead into areas as remote as the polar regions."

That such increased levels exist is not in doubt. What remains

controversial is their implications for human health, and what "acceptable" levels mean in human terms. Dr. Chow, in the paper quoted above writes: ". . . lead emitted from automotive exhausts is peculiarly suited for retention by the lung . . ." and Henry Schroeder writing in The Ecologist *(Vol. 1.11 May 1971. Trace Elements in the Human Environment)* claims that lead from motor vehicle exhaust enters the environment in amounts of two pounds per capita per year — ". . . enough lead has been found in vegetation growing beside a secondary highway to abort a cow subsisting on that vegetation." In spite of this Professor R. S. Scorer, Professor of Theoretical Mechanics at Imperial College, writing in his book *"Pollution in the Air" (Routledge Kegan Paul 1973)* makes the following observations: "It has certainly not yet been established that the lead in car exhaust does any harm to human health" (p.102) and "The fact that there is lead everywhere in the air in towns is not necessarily a threat to health" (p.103)

In the light of the evidence now produced, showing that lead, which may be ingested through the lungs, through food and water, and through the skin, is unarguably a contributary cause in some cases of abnormal behaviour, it is to be hoped that Professor Scorer will revise his views which offer to both a doubting public and a complacent authority, a case for further delaying action. There is plenty of evidence of official apathy and worldwide complacency. In 1973, to its shame, The World Health Organisation *increased* the maximum allowable concentration of lead in drinking water from 0.05 to 0.10 mg per litre, with the explanation that it was difficult to reach a lower level in countries using lead piping. (see: C. D. Reed & J. A. Tolley. Ecologist Vol. 3.8 August 1973). Again and again safety margins are modified to accommodate industry or because rigid regulations are uneconomic. With the new information now emerging we may take comfort in the cynical hope that if the authorities cannot be moved on *moral* grounds, they may be spurred to action by the obvious economic advantages of reducing the population of our prisons and hospitals.

Criminals and mental defectives are not only wasteful in human terms, they are an immense financial burden on the state that must support them. If any single cause of abnormal anti-social behaviour can be isolated and eliminated, there is no question but that further research in to that cause must be supported, and the findings must be acted upon, not in the slow and tortuous way of bureaucratic decision making, but immediately. No authority can possibly arrive at any "acceptable" level of poison in the environment on any criteria but that of the long term health and well being of its people. Until recently the suspicions of investigators, that lead poisoning was damaging not only physically, but also mentally, were difficult to substantiate; in this issue of The Ecologist we publish a paper which appears to provide the direct evidence needed. There can be no excuse for further procrastination.

Ruth Lumley-Smith

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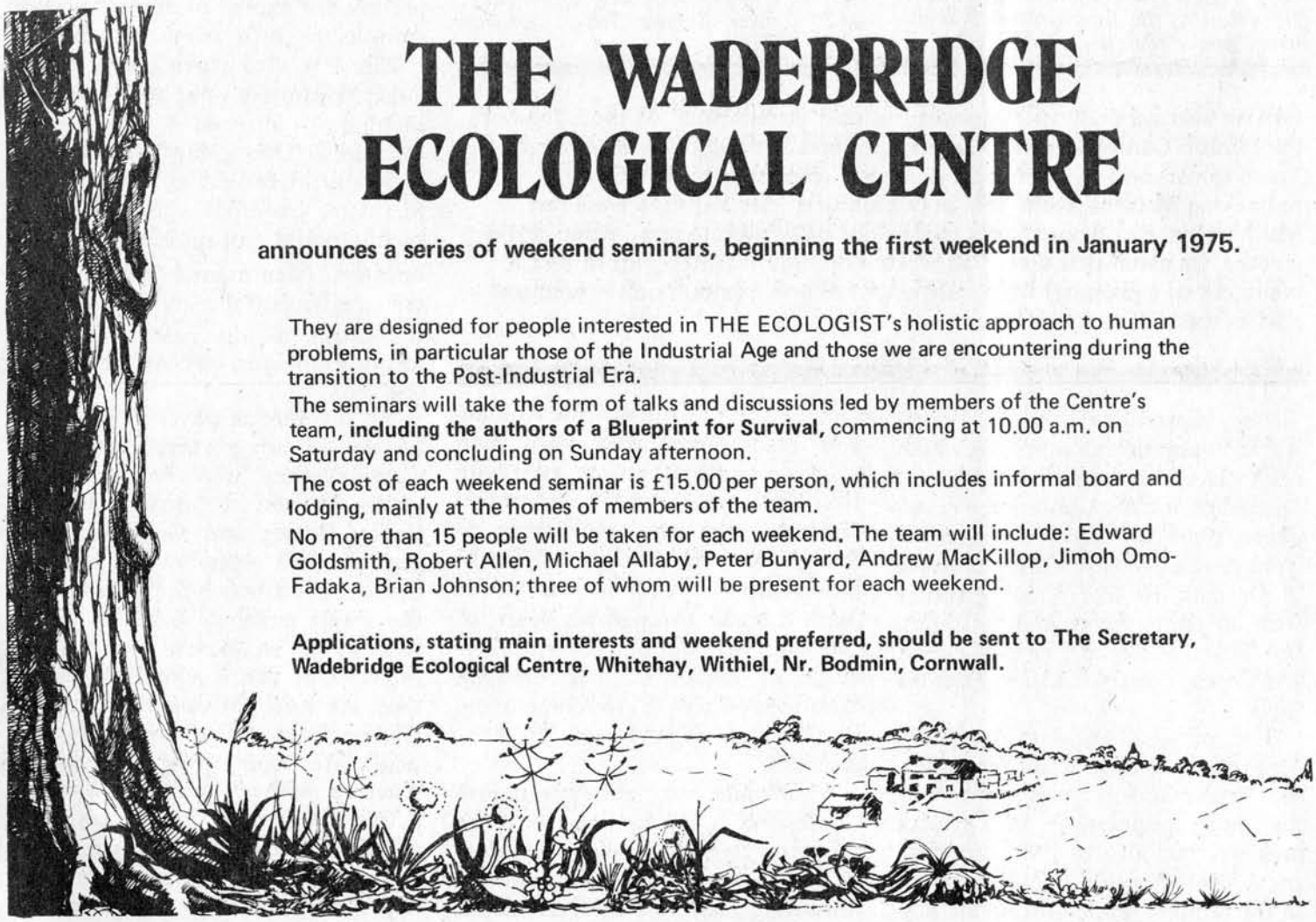
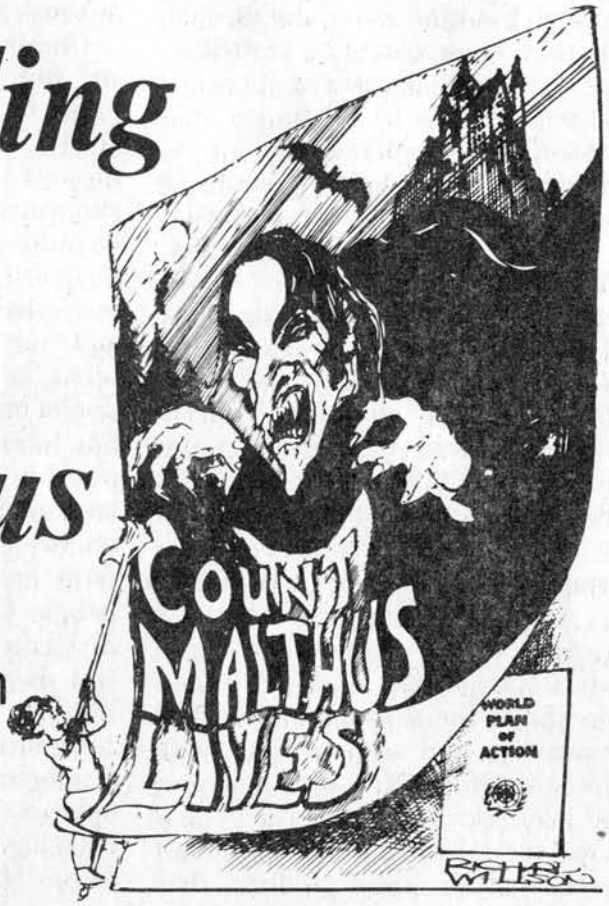


The Recycling of Count Malthus

by Brian Johnson



This cartoon is taken from **Planet**, *the World Population Conference newspaper published by the International Planned Parenthood Federation. Other cartoons and articles from* **Planet** *appear in a special issue of* **People** *obtainable from IPPF, 18-20 Lower Regent Street, London SW1Y 4PW.*

Will we ever agree on what constitutes over-population? At the Bucharest Population Conference last August it looked as though we never could. The Marxists and technological optimists were busy disintering and re-burying Malthus, while the 'populationists' claimed they were not Malthusians. But from all this repetitious haggling one new initiative did emerge. Its catch-title was: The World Population Watch, but in fact it consisted of a proposal for a network of national population — resource — environment future studies.

One morning at the Bucharest World Population Conference, which took place last August, participants opened their daily Conference newspaper, the *Planet* to discover on the front page a Richard Willson drawing of Dracula. He leered at the reader with dripping fangs and evil eyes. But Dracula had on a clerical collar, and the caption read: *Count Malthus Lives.*

The parallel was perceptive. In their struggle to loosen Soviet ties, the Romanians are eager not only for more population and greater prestige, but also for Western currency. They therefore find the legend of the vampire a most useful attraction. At the Conference the Romanians made much play with their Conference tourist guests, even with Dracula's transylvanian mountain fastness, and the monastery at Snagov near Bucharest, where the blood-thirsty aristocrat was buried (with a stake through his heart, of course). No doubt the tourists' tingle of horror at the colourful Count produces a welcome echo in the cash registers of the Carpathians.

Meanwhile, at the population Conference a meek-mannered 18th century English parson, Thomas Robert Malthus, was proving equally rewarding bait. Of course, Count Malthus' memory is disinterred not by those who see over-population as a threat, but rather by those who wish to remind us that Malthus' gloomy predictions still have not come true nearly two hundred years after he wrote (though Malthus sensibly avoided the Meadows trap of offering a doom with a date).

With exploiters of Dracula, the motive for revival is obvious. What are the motives of these revivers of Malthus? The people involved in the recycling of Malthus — his latest resurrection for the purposes of reburial — are less unanimous as to their objectives. For the reassuring cohorts of the industrial establishment these can be taken to be the usual blend of optimism mixed with profit. The prospect of food shortage may suggest the need for population control but it is also valuable in evoking further government subsidy to agri-chemistry and agri-business in an effort to extend green revolutionary activities world-wide. And it seems clear that agri-business now includes the nuclear industry who see in Malthusian re-cycling their strongest pretext for export of nuclear power stations to turn stone into bread.

The left-wing participants in the latest Malthusian wake are, however, divided — at least they were at Bucharest. One group who may be generally identified as the Western Marxists, essentially paralleled the technological optimism of agri-business. Their argument with Western agricultural and industrial capitalism is not really over the means employed but over its organisation.

At the Bucharest *Tribune* (Conference of non-governmental participants) they were led by some young Marxist scientists from the United States and Germany who put all their eggs in the nuclear fusion basket which they claimed as the single universal panacea. Their strategy is to expose the wicked interests of the Rockefeller family who are now shifting their energy empire from oil to the atom, and who are committed to fission reactors, with all the terrible radioactive risks which these imply. The Rockefeller/General Electric/Westinghouse/Atomic Energy Commission conspiracy is determined, this

group claimed, not only to take vast profits at others' risk, but to prevent the channelling of funds to fusion research. Exposure and suppression of this conspiracy, the group insisted, was the essential first step towards channelling vast international resources into a crash programme to produce the fusion torch – the controlled thermonuclear inferno into which ores or waste materials may be fed and whose incredible heat will reduce them instantly and conveniently to their constituent elements for re-use.

The fusion torch, once achieved, would, they believe, finally bury Malthus for all time. The incredible abundance of its hydrogen fuel, and its capacity to produce endless cheap and pollution-free energy could provide for a world population of many times the present size with undreamed-of prosperity. The astonishing effusions of this group, and their pamphlets distributed at Bucharest, made it clear that they aim to be the left-wing Hudson Institute, only lacking the wit and occasional admission of ultimate futility which has kept Herman Kahn and his own Institute afloat.

The other non-Malthusian group came to Bucharest in uneasy alliance with the technomaniacs. But from the start they followed a different line. Their spokesmen were from the OI (Ote Iwakpo) Committee International, composed largely of members of SIPI (Scientists Institute for Public Information) a third World Group – formed at Bucharest – and the African Environmental Association. Their thesis, which was not all far from the theme of the inter-governmental Conference itself, was that it is both wrong and futile to consider the question of population separately from solutions to poverty and the achievement of development.

Some of them appeared to believe, with the Chinese official delegation and others, that there is no such thing as a population problem: today's numbers – and billions more – being easily accommodated on the planet if only we all adopt life-styles similar to the Chinese, or, let us say, the "socialised" peasant. Others stressed the need for more conventional mixtures of industrial and agricultural development, with emphasis on rural health clinics which would provide family health first and only secondarily offer contraceptive information and services.

The common bogeymen of both groups were the family planners, who, they claimed, were fighting a losing battle from an untenable position in trying to reduce population in order to alleviate problems of poverty, when the effort should be precisely reversed.

It is both wrong and futile to consider the question of population separately from solutions to poverty and the achievements of development.

The response of family planning advocates like Joe Stychos of Cornell University, who reminded us that intensive research of Third World attitudes to family size in fact clearly indicates "that most poor people do *not* want large families", (1) and suggestions that population control priorities are overtaking other aid and development objectives are rubbish[2] fell, of course, on deaf ears among the Third World groups.

The "non-Malthusian" response was, however, much more favourable to the thesis of such participants as Jimoh Omo Fadaka of Nigeria, who called for a rejection of Western industrial patterns of development and advocated instead the local and regional adoption of development patterns that were integrated into the cultural life of communities.

The divide between the two left-wing non-Malthusian groups at the *Tribune* came, in fact, over the issue of technology. The European and American leftists, like the optimistic conservative business groups, were still impressed by what they saw as the need to raise living standards around the world to industrial country levels. They remained, therefore, in the intellectual grasp of industrial high technology. This could benefit all, they claimed, if only the social organisation of almost all countries was revolutionised. The Third World "non-Malthusians" on the other hand, almost all of whom referred mainly to African experience, saw the need to break the dependency relationship between rich and poor states, and to curb the disruptive impact of high technology investment by foreign multinational companies. The scientists among them were notably sceptical of the extravagant claims for fusion power by industrialised "non-Malthusians" who overlook the neo-colonial implications of dependence on such technologies. These Third World scientists were also visibly impressed by the dangers of tritium pollution which fusion power would produce, and even more worried at the elite-building and alienating impact of highly centralised and technologised power production for poor agrarian societies. Thermo-dynamic problems of heat production and probably devastating effects of energy-intensive world industrialisation on world climate impressed Third World non-Malthusians much less. This *insouciance* may result partly from their generalised theory of the rich man's knowledge conspiracy; it may also spring from their determination *not* to take a global view; their attitude to the rich industrial states being very much one of 'we don't care how you go about solving your own problems as long as you don't solve them at our expense.'

Both groups of young "non-Malthusians" found their staunchest intellectual allies at Bucharest among the old-guard demographers who have been studying – but not apparently worrying about – population problems since the traumatic days of threatening fertility decline in the depressed industrial states of the West. These venerated senior citizens of the population establishment, men like Alfred Sauvy of France, Frank Notestein of the USA and Erland Hofsten of Sweden all got their shots in against the "Population over-simplifiers" and "alarmists". Indeed, some of them worked hard behind the scenes to protect their placid preserves against recent unwanted intrusions.

Sauvy, for example, the doyen of traditional French demography wrote two articles in *Le Monde* on the eve of the Conference violently attacking the Conference organisers

for allowing themselves to be "managed and directed" by the American "Limits to Growth" school of thought. Erland Hofsten for his part harried the Swedish government through a campaign in the *Dagens Nyheter* the largest circulation Swedish daily newspaper, criticising the Swedish government's temerity in drawing fertility control conclusions from links between population, resource scarcity and environment. One *Nyheter* article went so far as to quote statements of Hitler and Mussolini in relation to Swedish population policy. And the *Nyheter* continuously irritated Swedish officials with claims that Sweden's policy at the Conference was indistinguishable from that of the Americans – fighting talk in anti-American Swedish intellectual circles.

In fact it was left to Sweden to initiate, at the intergovernmental level, the single new initiative of the Conference which could help governments to relate future population levels to the earth's capacity to support them. This was the *Population Watch,* also advocated by Maurice Strong in his speech to the Conference plenary session.

Sweden had hosted a symposium in Stockholm the previous autumn on *Population Resources and the Environment* as one of the four major intellectual inputs to the Population Conference (the others being population and development, population and the family, population and human rights). From this symposium, and a paper contributed by UNESCO,[3] the idea of the *Population Watch* was born. It was conceived as the only possible way to square the vicious political cycle of mutual mistrust that turns countries away from a common view of the effects of population pressure, and makes them reject the global models cooked up in someone else's University.

The *Population Watch* idea was put forward at Bucharest by Sweden, together with Bangladesh, Ecuador, Kenya, Finland and the Netherlands, and adopted in the plenary session. The idea is for a mechanism to be set up within the United Nations to help countries each to develop its own future projections of population growth – or decline – and estimate its impact upon resource use and the environment. Naturally the findings would depend crucially on the range of assumptions adopted regarding choice of technology, social organisation and economic system; and presumably the national future studies would indicate the assumptions adopted regarding these factors. The model of such a scheme could be something like a nation-by-nation compilation of *Blueprints for Survival.* As the assumptions and findings come in, so a picture can be developed in the UN, or elsewhere, of where assumptions are complementary and where they clash: where, for instance, it is obvious that several countries are counting on the same resource for support of their population.

The Bucharest Population Conference, involving about 5,000 people and costing perhaps five million dollars in all, produced almost nothing new.

In essence the concept is almost idiotically simple but it would be almost impossible to carry out *fully* in practice, given prevailing political suspicions – which are often well founded – and international relationships of threat and dependency. Yet if such studies are done for a few Western countries only, to begin with, their demonstration of the remote ecological impact of these countries' resource demands: demands to sustain present – let alone increased – populations, could prove a powerful lever to encourage other states to do the same sort of calculations – at least privately – and to see whether they are really still as keen to ignore the existence of a planetary population problem.

In essence, then, the Bucharest Conference asked the United Nations to help its member states to undertake "environmental impact statements" such as are required of corporations and government departments for new projects by Federal law in its United States.

So far, this *Population Watch* is just the seed of an idea. But at least the seed is sown and it is now up to the international community to make something of it. Already Sweden has established a cabinet secretariat for future studies in the Prime Minister's office, and has published a preliminary report entitled *To Choose a Future.* The Dutch are also working in the same direction, as are the Norwegians. Britain, while assenting to the *Population Watch* initiative said little on the subject at Bucharest. Perhaps our Cabinet Office should look into the Swedish example, and devote a unit of the Think Tank to doing a feasibility study on the scope and nature of such a report. The unit should also work with the FCO's United Nations Department on a suggestion as to how the United Nations "system" and in particular its Fund for Population Activities, its Population Division, and the UN Environment Programme, should address themselves to integrating the *Population Watch* into their statistical and data collection programmes, especially the *Earth Watch Programme* established following the Stockholm Environment Conference.

The Bucharest Population Conference, involving about 5,000 people and costing perhaps five million dollars in all, produced almost nothing new in its carefully balanced calls for research into fertility, mortality, and of course more education and information exchange. If UN agreements must be politically limited to talk and to study, at least let the study be directed in ways which may produce genuine shifts of thought. A country-by-country justification of future population projections would be a stimulating new direction. It might even justify the resource consumption entailed in transporting, supporting and documenting all those thousands who went to Bucharest.

Moreover, if adopted, the arguments that the *Population Watch* would engender are likely to keep old Malthus recycling for a long time to come●

(1) J. Mayone Stychos "Demographic Chic" *Perspectives Magazine* Sept. 1974.

[2] *Only 2.3 per cent of all aid programmes were devoted to population in 1972 and the current estimated total of spending on population limitation programmes world-wide is £160 m* one half *of it only being devoted to developing countries containing two thirds of the world's population.*

[3] *This* paper was subsequently published in the Internation Social Science Journal in the June/July issue (1974) under the title "Population Growth and Environmental Expectations" by Brian Johnson.

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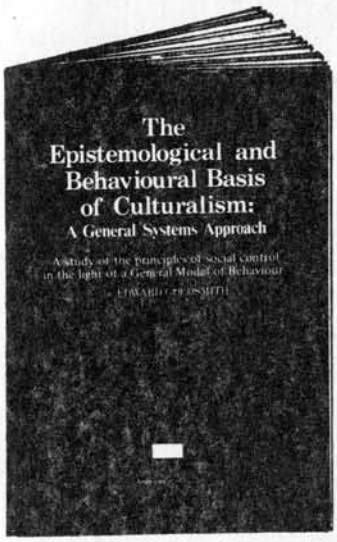

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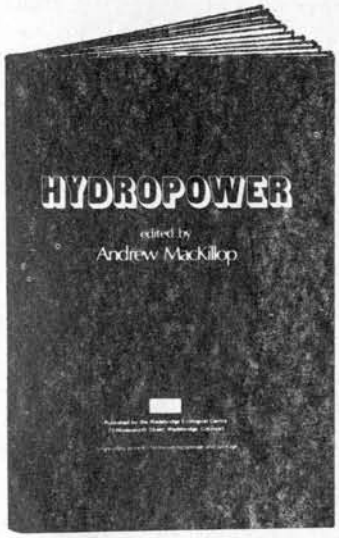

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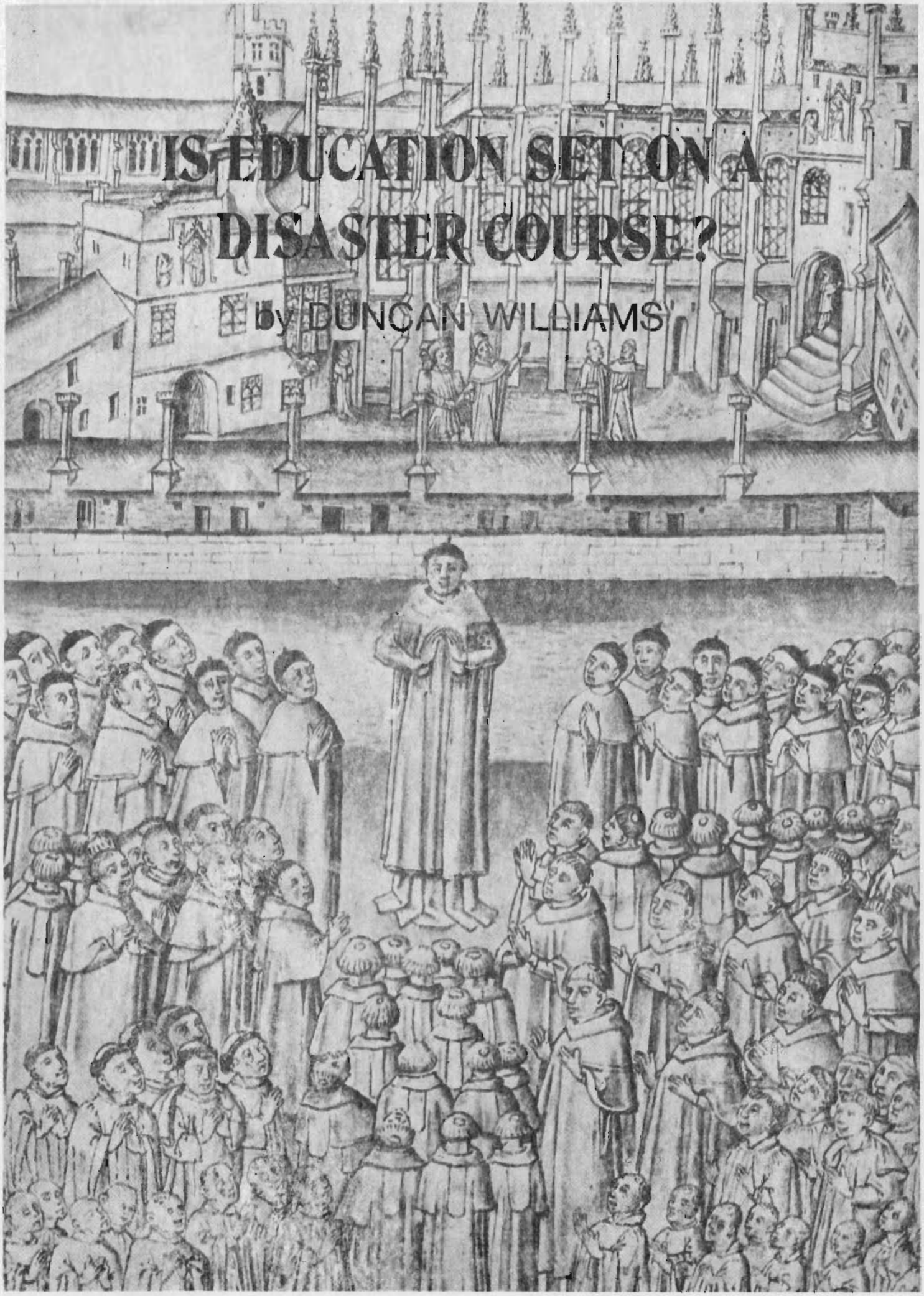

With the growing secularisation of our schools, teacher-training colleges and universities, "cleverness" has become the sole aim and criterion of many teachers. But the history of the twentieth century provides far too many glaring examples of hideous atrocities committed by highly intelligent "devils" for there to be any complacency regarding this present trend.

None but the totally moronic, depraved, insensitive or myopically self-centred individual can contemplate the contemporary scene with anything other than profound anxiety and foreboding. As one looks ahead, one is reminded of the traveller who, having visited Los Angeles, remarked on his return, *"I have seen the future and it doesn't work"*.

Only a few years ago, this would have seemed an eccentric minority view, but far too many eminent men and women are today questioning the basic structure of a society increasingly characterised by wars, civil strife, pollution, urban neurosis, over-population, strikes, gross materialism, exploitation and inflation for those concerned to be designated as "cranks". As a highly intelligent undergraduate remarked to me a year or two ago: *"The past is irrelevant and the future unthinkable."*

Although undoubtedly many of our ills can be attributed to our post-lapsarian condition and to the perennial folly inherent in human nature, yet at the same time educational theory and practice must bear some of the responsibility for the sort of world we are living in and creating for our children. With the growing secularisation of our schools, teacher-training colleges and universities, "cleverness" has become the sole aim and criterion of many teachers. But the history of the twentieth century provides far too many glaring examples of hideous atrocities committed by highly intelligent "devils" for there to be any complacency regarding this present trend. As John Wynne-Tyson expresses it in *The Civilised Alternative:*

What we have not sufficiently woken up to as yet is that while doing away with the ritual and dogma of organised religion, we also deprive ourselves of the essential discipline – and consequently comfort – of those moral guide-lines that have lain hidden like veins and arteries in the all too fleshly body of the established church.

Cardinal Newman defined a truly great intellect as "one which takes a connected view of old and new, past and present, far and near and which has an insight into the influence of all these, one on another." His concept of a university was that of an intellectual institution performing for the mind the same function as a gymnasium does for the body – in other wordss to exercise the *whole* intellect.

No healthy man in his right senses would attend a gymnasium daily for the *sole* purpose of exercising his right arm or his left leg to the absolute neglect of his other limbs. If such a physical programme were followed, he would end up with one limb functioning perfectly, while the others would be hopelessly withered and weak – in short, he would be a cripple. Mentally, over-specialisation, particularly in the physical sciences, has resulted in a similar crippling of our entire society – in a paradoxical, absurd civilisation which has lost direction and meaning because the parts no longer function for the ultimate good of the whole. Moreover, it is one of those tragic ironies of our age that, just at the moment when the problems of the environment are seen to be inextricably related, university specialists (and indeed specialists in all walks of life) are becoming ever more specialised.

Meanwhile, the corpus of technology is indeed terrifyingly cumulative and can be, and is being handed down intact from generation to generation. The wisdom to control this knowledge, however, has to be painfully re-acquired through experience and study by each successive generation; the resulting inbalance has created a society which I have described in *Trousered Apes* as one consisting of "technological giants and moral pygmies".

When the team under the direction of Rutherford split the atom at Cambridge in 1932, it was a superb example of scientific cleverness and ability. Only one totally unacquainted with the horrors of Nagasaki and Hiroshima could claim, however, that mankind was ethically, or morally equipped to handle the seemingly inevitable extension and application of Rutherford's work.

If this was true of the atom bomb, how much more so is it of the myriad discoveries which have taken place in the physical sciences, particularly biology, in the past twenty years. Referring to these, Alvin Toffler, the author of *Future Shock,* writes: "the nature of what can and will be done exceeds anything that man is as yet psychologically or morally prepared to live with."

A short time ago, on a television programme devoted to a discussion on the role of the teacher, an eminent British educationalist declared that the aims of the teacher should be to sow doubts in the minds of his pupils. This is of course simply an extension of scientific empiricism and philosophic scepticism to the field of education, but surely this view (and it is shared by many teachers and educationalists) if carried to its logical conclusion, makes no sense whatsoever. As G. K. Chesterton observed: "The only reason for having an open mind is the same as having an open mouth: so that eventually one can bite on something."

The philosophic theories of the present age tend to assume that "discussion" is by definition a good thing, and therefore the more children can be taught to disagree with previously-held notions, the more

active their brains must be. The classroom, therefore, becomes a more stimulating place, vibrating with intellectual energy. However, as Walter Bagehot observed in the nineteenth century, "an age of discussion" is an age when the "cake of custom, the chief preserving force in a society, has been broken". What we are witnessing today is an age of discussion, a critical period in which loud disputes are accompanied with generally weak conclusions. Diagnosticians abound, but one looks in vain for anyone prepared to *prescribe* for the social, political and educational maladies of which anyone of sensitivity must be only too aware. Instead of the present hiatus which characterises the contemporary scene, I am making bold to suggest that there is a desperate need for some educational theory which will seem to be axiomatic and comparable to a Euclidean theorem in geometry. Something to which all men of goodwill and good sense, will be prepared to give their assent and thereafter their wholehearted effort and allegiance. With this end in view, may I tentatively suggest that the survival of the species is paramount and supersedes, or should supersede, all other factional or priorities. As Yehudi Menuhin recently wrote in a letter:

Any narrowing of the broader motive carries with it the need to act against the particular, in other words against the remainder. If one does not include in some way the whole of living existence on our planet in one's basic attitudes and morality, one finds oneself acting on behalf of one part against another. Perhaps this dilemma can be resolved by learning to accept oneself as the first and final material to be conquered, not "they", or "it", "him" or "her", but "us" above all "myself". To improve the dreams and to raise the sights of all of us, including myself, this would seem to be one of the avenues of redemption. There is today no lack of people ready to discipline themselves and sacrifice themselves, but the mistake is that this eternal capacity for self-immolation (along with the immolation of others) is held at the service of partisan causes exclusively, fought with enormous dedication and courage, but almost never on behalf of the enemy or of life in general. The desire to improve oneself materially, and the false spiritual justification employed, seem almost always tied up with the compulsion to destroy others, and the same goes hand in hand with the desire to enjoy, to assert or to castigate. Man can no longer afford to act so blindly today, without bringing desolation on the whole planet. Therefore we must learn to fight for total life and total survival, and against all immediate baser and partisan ends.

What we are witnessing today is an age of discussion, a critical period in which loud disputes are accompanied with generally weak conclusions.

If through our folly, we continue on our present Gadarene-like march towards self-extermination, then man will have no-one but himself to blame and it will not matter very much who presides over the final extermination of mankind – fascist, communist, Black Panther, Weatherman, IRA – for there will be no-one left to record it and the ultimate Pyrrhic victory by man over man will have been achieved.

What I am proposing, therefore, is firstly the total de-politicisation of our educational system. Politics is, as presently conceived and executed, devoid of any moral of ethical dimension, the poor man's philosophy, and as it largely consists of the art of promising and occasionally providing, the populace at large with more and more *materialistic* benefits, thereby creating ever-increasing pollution and other depredations of our already battered planet, it should be repudiated; for anyone with a logical mind can see clearly that a *finite* world cannot go on meeting the demands of often artificially-fanned *infinite* aspirations. Today's luxuries become tomorrow's "necessities" and such is the nature of man that no sooner has one ambition been gratified than he has to invent some further object on which to fasten his want.

In other words, "want" is a constant but its projections vary from a bowl of rice to a Velasquez. The present-day inhabitant of a council house enjoys a higher standard of living in terms of heating, lighting, sanitation and other materialistic goods than did a Tudor monarch. Mr. Escot, a character in Peacock's novel *Headlong Hall* (1816) summarised the whole dreary process of unalloyed materialism when he spoke as follows:

These improvements, as you call them, appear to me only so many links in the great chain of corruption. which will soon fetter the whole human race in irreparable slavery and incurable wretchedness.

Your improvements proceed in a simple ratio, while the factitious wants and unnatural appetites they engender proceed in a compound one; and thus one generation acquires 50 wants, and 50 means of supplying them are invented, which in turn engenders two new ones; so that the next generation has 100, the next 200, the next 400 till every human being becomes such a help-

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less compound of perverted inclinations that he is altogether at the mercy of external circumstances, loses all independence and singleness of character and degenerates so rapidly from the primitive dignity of his sylvan origin, that it is scarcely possible to indulge in any other expectation than that the whole species must at length be exterminated by its own infinite imbecility and vileness.

Eventually, if we are to escape from the materialistic slavery envisioned in the foregoing, then educationally we must attempt to produce a generation whose aims are *cultural* rather than physical and in order to do so; it is necessary that teachers at all levels be agreed on this as a primary and common goal. No doubt certain objections will be raised against such a proposal and those who advocate it will undoubtedly be accused of authoritarianism and an attempt to brainwash. To such allegations I would reply as follows: firstly, as I have already suggested, the aim of our educational system for the past half-century has been increasingly to *provoke* the individual mind into thought, to foment discussion of, and indeed dissent from, previously held doctrines and dogmas. At the same time, every educated mind is convinced that *harmony* between nations is today the indispensable pre-requisite for man's continued existence on this planet. However, the supra-individualism of our educational goals scarcely coincides with the social consensus which we demand on a global scale. In other words, it seems that, logically, such a consensus must be obtained, or else we drift in helpless "discussion" towards the inevitable destruction of the entire eco-system. Secondly, World War Two, in addition to the hideous slaughter and mass destruction of much that was precious, left an additional cruel legacy which has paralysed much of Western thought. Because the Nazi regime was authoritarian, an increasing rejection of *all* authority has resulted and anyone accused of exercising control is facilely, but damagingly, accused of being a fascist. However, as Edmund Burke wrote in 1791:

Men are qualified for civil liberty in exact proportion to their disposition to put moral chains upon their own appetites . . . Society cannot exist unless a controlling power upon will and appetite be placed somewhere, and the less of it there is within, the more there is without. It is ordained in the eternal consituation of things that men of intemperate minds cannot be free. Their passions forge their chains.

Because the Nazi regime was authoritarian, an increasing rejection of *all* authority has resulted, and anyone exercising control is facilely, but damagingly, accused of being a fascist.

Moreover, such is the appetitive nature of man, that, if left to his own devices, he will undoubtedly demand more and more. Again, therefore, it would seem that if we are to survive, *someone* at *some time* must attempt the diversion to cultural goals which I have outlined above, and if this is not done by individual self-control (and such self-control can only come as a result of educating people to the full implications of their actions) then it will either be done through a form of benevolent despotism or, if left too late, by a malevolent one.

As Ruskin wrote:

Education is not so much a matter of teaching a pupil to know what he did not previously know; rather it is a matter of teaching him to behave as he did not previously behave.

Given the above premises, it is curious that we have never sufficiently investigated the possibilities of *rediscovery* in our educational programmes as an adequate substitute for discovery, and as a possible source of intellectual satisfaction.

As a teacher of seventeenth- and eighteenth-century literature (and consequently of the philosophy, history and theology of those periods), I am constantly gratified and amazed at the reactions of today's undergraduates to the religious and philosophical theories expounded in Milton's *Paradise Lost* and Pope's *Essay on Man,* to cite just two examples. It is as if a new planet had suddenly entered their vision, and their intellectual excitement at such a "novel" cosmic and socialsview is both stimulating and encouraging. (I am particularly interested in their reactions to the belief commonly held in the past, in the value of collective and cumulative, as opposed to individual wisdom. This is so contrary to the contemporary cult of "doing your own thing" that it affords an opportunity to indicate, from an environmental viewpoint, the social irresponsibility and cant of the current slogan). To those who would question the relevance of such studies, I would suggest that nothing is more vital to our frenzied, open-nerved culture than to recapture something of that golden mean, with emphasis upon modern ambitions (together with the insistence that man's overweening pride was at the root of most of his

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problems) which the writers, theologians and philosophers of the eighteenth century both preached and seriously attempted to practice.

Furthermore, the past has a great deal to offer both in terms of beauty and as a necessary intellectual foil to the present. Contemporary ideas need to be weighed not against others of the same period but against those of the past and it is here that the average modern student is defenceless. He is, as I think most teachers would agree, rooted in what one might call "temporal provincialism", his interests and leisure confined almost totally to contemporary film makers, television pundits, writers and thinkers.

Could not courses in chemistry, physics, biology and mathematics be structured to emphasise their historical and philosophical backgrounds – to subject some of their basic assumptions to a vigorous, critical scrutiny in the context of environmental catastrophe?

The fact that such an approach has not yet been attempted (except at St. John's College, Maryland) should not prevent a serious examination of the proposal. If adopted, it should certainly curtail, if not extinguish, the suicidal specialisation which currently passes for education in most countries. The practical results of this may be symbolised by Dr. Pau. Ehrlich's stressing the absolute necessity for population control *now*, while simultaneously organ transplanters in various parts of the world "strive officiously to keep alive" (with the ultimate hope, presumably, of conferring immortality upon) ever-growing numbers without apparently the least concern for the long-range effects of such experiments on the race between population and food, population and human dignity. (Marshall McLuhan's definition of a specialist is both provocative and pertinent: "one who never makes small mistakes while moving towards the grand fallacy").

Education is not so much a matter of teaching a pupil to know what he did not previously know; rather it is a matter of teaching him to behave as he did not previously behave.
Ruskin

Parts of the foregoing will draw angry rebukes from critics right and left. The former will allege that such an educational programme would result in shallowness. To this I would simply reply that we cannot as a species afford to go on producing educated men who have every grace except the gift for survival. Moreover, educational standards need not suffer if teachers inculcate a rigorous spirit of scholarship and attainment in pupils towards these suggested interdisciplinary studies. In other words, there is a vital need to construct a syllabus which would indicate the inter-relationship of all knowledge, so that students of all ages grow up in a world which has meaning and significance for them individually and collectively●

Extract from *To Be Or Not To Be* by Duncan Williams

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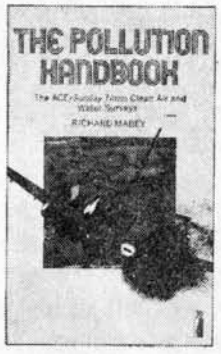

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"Don't fling me in the Briar patch"

SHEILA S. THOMPSON

That's what Brer Rabbit is reputed to have cried in the Uncle Remus stories, but what about us? Quite unknowingly we seem to be existing in a Briar patch with no boundaries and no escape. In view of all the Isotopes and rays used these days on Cancer and other kindred diseases, how many radioactive bodies do you think are casually disposed of in our crematoriums, or buried in unlined caskets in this country every year? Not so very long ago officials of a hospital in America refused to allow a woman to be cremated because her radioactive level was so high that the fall-out at the crematorium would have constituted a public danger. She had been receiving treatments with Iodine 131, which emits Beta and Gamma rays. (Used for treatment of diseases of the Thyroid gland).

Despite the fact that her bereaved husband was hopelessly in debt from the monstrous hospital and doctors bills, the hospital authorities decreed that the body would have to be buried in a lead-lined coffin. Dutifully, the poor (in more ways than one) man complied with all the stipulations – adding debt to debt – only to be told after it was all over that the whole thing was a mistake, the authorities had erred, (and admitted it? How unbelievable can things get?) and it would have been all right to have gone ahead with the cremation after all. "So sorry, old chap. Now you're bankrupt as well as heart-broken, but that's life, isn't it?"

When one considers the timing involved here it is rather easy to come to the conclusion that the hospital performed a pretty neat trick in getting the body disposed of safely and properly and then, quickly pulled the curtain down against the possibility of public panic involving similar cases in the future, by pleading error and apologizing. Not paying, of course, just pleading computer error. If it's medical it's always someone else's error, the medical profession never errs. It seems to me I am always reading about pollution, about hormones being fed to chicken to enlarge them, to the danger of children that eat chicken, one hears about mutations in cattle caused by sprays to destroy small rodents and kill flies, no one can hide rivers full of dead fish killed by factory waste – these things we are told, but what else goes on? It is certainly a very strange world we live in if, to prolong the lives of the suffering terminal dying (often against their own will since the treatment is as painful as the illness, if not more so) we are shortening the lives of the living and – at the same time – being treated as if we were too immature to comprehend the dangers.

I'm beginning to think Brer Rabbit wasn't fooling when he said "Hang me, drown me, barbecue me, but don't sling me in that Briar patch." I'd like to get out too.

Illustration by D. MEWTON

LEAD, AND

by
D. BRYCE-SMITH and
H. A. WALDRON

The subject of human behaviour is central in human affairs, and provides a meeting ground for numerous disciplines including psychology, psychiatry, neurology, biochemistry, sociology, theology and many others. Nevertheless, there has been a tendency to approach the subject from the standpoint of the separate disciplines without adequate consideration of the complex interplay of factors which determines the overall behaviour of an individual. The purpose of this article is to focus attention on the important role of biochemical factors in general, and of the neurotoxic element lead in particular.

In a sense, all disease states can produce changes in behaviour, but these are usually secondary effects. Although the causation of much mental illness is not yet well understood, primary effects on behaviour can certainly be produced (i) as symptoms in diseases, infective, degenerative and malignant, which directly involve the brain, (ii) by physical injury to the brain, (iii) as a symptom of certain nutritional and metabolic disorders such as zinc or magnesium deficiency and phenylketonuria respectively, and (iv) by exposure to neurotoxic substances such as carbon disulphide, trichloroethylene, manganese, mercury, and lead.

BEHAVIOUR CRIMINALITY

The fact that chemical substances can affect behaviour has been apparent since the discovery of alcoholic fermentation, and has been emphasised in recent times by the therapeutic use and non-medical abuse of psychotropic, hallucinogenic and psychotomimetic drugs such as LSD.* Behavioural abnormalities which can result from dietary deficiencies of such elements as copper, magnesium and zinc have recently been reviewed.[1]

In general, it appears that substances causing damage to the nerves (neurotoxins) tend to give rise to behavioural disorders at levels of exposure well below those associated with the declaration of overt clinical symptoms.[2] The newly developing subject of *behavioural toxicology* is concerned with the investigation of these matters.[3-9] Evidence from behavioural studies is now beginning to appear which will require a major downwards revision of present threshold limit values for neurotoxic substances such as trichloroethylene[10] and carbon disulphide.[11] Since several neurotoxic substances are common environmental pollutants, it becomes necessary to consider whether exposure to these, singly or together, may be associated with behavioural abnormalities. On the basis of their innate toxicity and ubiquity, the most serious neurotoxic pollutants appear to be organochlorine compounds (*e.g.* DDT), mercury, and lead. Of these, lead appears to constitute the greatest hazard because the average levels which have now accumulated in man approach closer to the threshold of potential clinical poisoning than do those of any other toxic chemical pollutant.[12]

**The latter are mostly complex organic molecules, but there is also an impressive list of simple inorganic cations which can powerfully influence behaviour, for example, Ca^{2+}, Hg^{2+}, Li^{+}, Mg^{2+}, Mn^{2+} and Pb^{2+}.*

Neurotoxicity of Lead

The most characteristic pathological lesion in the nervous system is segmental demyelination,[13-15] and this is associated with reduced conduction velocity in peripheral nerves.[16] Axonal degeneration may also occur. Although neuropathy was formerly considered as a late manifestation of lead poisoning, the recent use of more sensitive techniques has shown that it can occur as one of the earliest signs in adults[17] and children,[18] even in the absence of clinical symptoms. Lead encephalopathy (inflamation of the brain) is a serious late manifestation in adults it seems to be a particular risk in America amongst the drinkers of moonshine whisky.[19] Alcohol has been shown to enhance the levels of lead in soft tissues, including the brain,[20] and this effect may explain the unusually high occurence in this group of patients. In children encephalopathy can present at an early stage in the disease: this important aspect is discussed further below.

Biochemical Aspects of Lead Neurotoxicity

Most environmental lead is in the inorganic form (Pb^{2+}), but a proportion is in organolead forms, *e.g.* tetra-ethyl lead (TEL), which have a greater affinity for nerve tissue. Most of the toxic effects of tetra-alkyl lead compounds are believed to be due to the tri-alkyl lead ion (R_3Pb^{+}) produced in the liver, and in a strict sense, the organic and inorganic forms are toxicologically distinct. For convenience, we shall consider them together.

Many workers have demonstrated that lead interferes with many parameters of physiology and pharmacology of brain cells. Glucose metabolism in brain slices is inhibited by both inorganic lead[21] and by the di-ethyl, tri-ethyl and tri-methyl compounds.[22-24] It has also been

suggested that TEL has this effect *in vivo* in the rat.[25] Ingestion of inorganic lead by newborn rats has little effect on the concentration of RNA, DNA and protein until the animals are about three weeks of age when a reduction of about 1–20% in the DNA content of the cerebellum is noted. This change is associated with a 15–20% deficit in the number of cells in the area, suggesting a failure of cell multiplication.[26]

Organic lead has been found to inhibit the synthesis and metabolism of some neurotransmitters. Thus TEL inhibits monoamine oxidase activity in rabbits[27] and the incubation of brain slices with this compoumd results in a build-up of serotonin (5-hydroxytryptamine).[28] * It is interesting to note that the administration of LSD to rats also induces changes in the metabolism of serotonin and noradrenaline[31] and that innate differences in behaviour observed in different strains of mice can be correlated with differing levels of noradrenaline in the brain.[32]

The activity of some enzymes in the brain not concerned with neurotransmitter synthesis is also affected by lead. Brun and Brunk, for example, found that alkaline phosphatase activity in blood vessels was diminished in lead poisoned rats although conversely, acid phosphatase activity was slightly increased as the result of neuronal damage.[33] In lead poisoned rabbits the activity of both haem synthetase and δ-aminolaevulinic acid dehydrase (ALA-d) is decreased.[34] ALA-d activity has also been shown to be diminished by 80–90% in suckling rats when their mothers received lead in the diet.[35] The inhibition of this enzyme could result in levels of δ-aminolaevulinic acid (ALA) being increased in the brain and this may be of significance in relation to the secondary effects of lead on behaviour which are discussed below.

Primary and Secondary Neurotoxic Effects

Although many effects of lead on metabolism can be attributed to primary inhibition by lead of enzymes involved in biochemical processes, there is evidence that abnormal metabolites (or normal metabolites in abnormal quantities) which arise from such blocking reactions may themselves produce secondary toxic effects. Thus Cole and Lynam[36] have reported that the serum from lead poisoned patients and experimental animals can produce major degenerative changes in the myelin sheaths of nerve cells in tissue culture, but the magnitude of the effects did not correlate with the serum lead concentration. Further, the brain lead levels reported for children fatally poisoned by lead are often only modestly elevated relative to levels in other soft tissues, and may be lower than in other soft tissues, even though the brain is the major target organ.[37]

An important secondary effect of lead on behaviour may be related to the increased levels of ALA which are present as the result of the inhibition of ALA-d. McGillion *et al*[38] have shown that ALA can produce hyperactivity in mice following an initial phase of depression. Although the concern of these authors was to explain the psychiatric abnormalities found in acute intermittant porphyria (AIP) their argument that ALA must be considered as an aetiological factor in the production of symptoms in this disease can obviously be extended to lead poisoning.

Other pharmacological effects attributable to ALA are also important for these considerations. It has been shown that ALA can inhibit the $(Na^+ + K^+)$-dependent ATP-ase in rabbit and human brain[39] and this could result in defective nerve conduction. Since ALA has been found in the plasma of children with lead poisoning in levels which overlap those found in AIP[40] and since ALA in similar concentrations is now known to cross the blood-brain barrier and to be readily taken up by brain tissue,[41] these factors are clearly important to any discussion on the causation of lead encephalopathy.*

Mechanism of Action

The means whereby lead brings about dysfunction in the nervous system must relate in some way to the metabolic disturbances discussed in the previous sections, but the following additional possible mechanism involving pyruvate has not hitherto been described. Many children with lead poisoning have raised pyruvate levels,[44] and there are a number of reports that pyruvate metabolism is deranged in other conditions associated with neurological damage and behavioural disturbances. Thus pyruvate levels are raised in Leigh's necrotising encephalomyelopathy[45] because of reduced activity of an enzyme (or enzymes) concerned with pyruvate metabolism, pyruvate decarboxylase or pyruvate carboxylase, for example. Significant inhibition of pyruvate decarboxylase has been demonstrated in phenylketonuria and has indeed been proposed as the underlying biochemical lesion in this disorder.[46]

The importance of the pyruvate system to the oxygen metabolism of the brain has been stressed by Peters[47] and interference with the degradation of pyruvate through the citric acid cycle would seriously impair the energy supply to brain cells. In young children this would

**Sauerhoff and Michaelson[29] have reported that dopamine synthesis was inhibited in suckling rats when their mothers were fed inorganic lead in the diet but that noradrenaline levels were normal. Further investigation, however, suggests that noradrenaline levels can be increased and thats the noradrenaline has a faster turnover and a shorter half-life than dopamine, relative to the values for control animals.[30]*

**It appears relevant that the activity of $(Na^+ + K^+)$ ATP-ase has been shown to be significantly depressed at blood-lead levels commonly found in urban populations.[42] A possible relationship between this enzyme and mania is suggested by the observation[43] that treatment of manic patients with lithium causes significant elevation of erythrocyte $(Na^+ + K^+)$ ATP-ase levels, although various other biochemical parameters were unchanged: see also ref. 83 below.*

assume particular significance because, up to the age of four, the oxygen demand of the brain is greater than in adults.[48]

There is also evidence that lactate, which is formed by reduction of pyruvate, is associated in some way with the precipitation of acute anxiety states in patients and also in some control subjects.[49] The effect produced by lactate has been attributed to its ability to render calcium less available, and the simultaneous administration of calcium prevents the appearance of symptoms. If calcium-binding were solely responsible for this effect it might be supposed that its would be even more marked following the administration of more strongly calcium-binding agents such as EDTA. Since some of the lactate will be oxidised to pyruvate in the body it may be that the effects on pyruvate levels supplement those resulting from the decreased availability of calcium. The relationship between calcium and psychiatric illness[50] is of considerable interest to the present discussion bearing in mind that lead and calcium seem to behave competitively at many sites of action in the body.

A reduced ability to metabolise pyruvate would also result in less acetyl coenzyme-A being available for the synthesis of fatty acids and cholesterol which are precursors of myelin. Defects in myelin synthesis during the development and maturation of the nervous system could have grave consequences.

Evidence for Behavioural Modifications Induced by Lead

(i) In animals

Rats exposed to sub-lethal doses of TEL become irritable and start to fight amongst themselves[51] although their performance in a maze test is scarcely affected and memory performances seem generally unaffected by TEL or inorganic lead.[52,53] About 10% of the atmospheric lead content in cities is in the organic form[54] but possible effects on behaviour at these levels have not been examined.

Gusev has made an intensive study of the effects produced by the inhalation of lead oxide aerosols on conditioned reflexes in adult rats and rabbits.[55,56] An exposure period of six hours a day with off-days was chosen to approximate to industrial working conditions. After about two months exposure to atmospheric levels of 11 μgm^{-3} disturbed responses were apparent and these became successively more severe as exposure was prolonged to a total of about 150 days. When exposure ceased the responses returned to normal within about three weeks but morphological changes were observed in the brain. This restricted exposure is quantitatively equivalent to continuous exposure of 2.75 μgm^{-3}, *a level which is commonly exceeded in British cities:*[57,58] the Russian maximum of 0.7 μgm^{-3} for ambient air allows a threefold margin. It should be noted that the United States Government Environmental Protection Agency wrote in 1972 that concentrations of airborne lead above μgm^{-3} averaged over a period of three months or longer 'are associated with a sufficient risk of adverse physiological effects to constitute endangerment of public health.'[59] Industrial exposure of up to 200 μgm^{-3} for medically supervised adults has been permitted in Britain, seemingly on the basis of conventional criteria of clinical poisoning: this should be compared with the Russian industrial maximums of 10 μgm^{-3} which is based on the studies with experimental animals.[55,56] *The high level of industrial exposure permitted in Britain and the United States appears to take no account of possible adverse behavioural effects takes no account of the adverse behavioural effects now found in adult lead workers.*[125a] It has often been cited to justify unconcern with the lower levels found in city air even though the has often been cited to justify unconcern with the lower levels found in city air even though the frequency of lead poisoning and undue lead exposure has been found to be twice as high amongst children living close to major highways as in children living further away.[60]

Changes in reflex behaviour have also been noted in goldfish when lead was present in their water in a concentration of 0.07 parts per million (ppm),[61] a concentration which is about 1/850th of the LC_1. Average Glasgow tap water contains more than twice this concentration.[62]

The addition of lead to the diet of female mice[63] and rats[29] causes them to secrete lead in their milk. Neonatal animals suckling these mothers have been shown to exhibit hyperactive behaviour in the absence of signs of acute intoxication. In the study of Sauerhoff and Michaelson[29] this effect was correlated with abnormalities in the concentration of serotonin in the brain, and later with alterations in noradrenaline metabolism.[30] It seems highly significant that lead-induced hyperactivity in mice shows the same paradoxical pattern of response to a group of drugs as is exhibited by children hyperactive for no known conventional cause.[64] All these findings provide experimental support for a causative association between lead absorption and hyperactive behaviour in children (see below).

A report that chronic lead ingestion produced no change in the behavioural pattern of rhesus monkeys was published under the auspices of the research arm of the lead and zinc industry,[36] but the great weight of experimental evidence favours the view that lead does induce behavioural abnormalities in animals and, more importantly, in man. Moreover, man appears to be more sensitive than rats and mice to lead.

(ii) Human adults

It is commonly accepted that psychiatric symptoms associated with encephalopathy are an early manifestation of organic lead absorption in adults, most cases reported in the literature referring to the use of petrol as a solvent or cleaning fluid, or to the use of TEL in industry.[65-77] The symptoms are varied and may include excitement, restlessness and agitation, insomnia, nightmares, sexual impotence, hallucinations, impairment of memory, and loss of concentration. The condition may mimic other psychotic disorders and the true cause may be very difficult to diagnose.[78,79] In view of the public exposure to TEL in city air, it is unfortunate that no information is available concerning effects on child-

ren (who may be more sensitive than adults) or even young experimental animals.*

Ssychiatric symptoms are less prominent in most cases of mild inorganic lead poisoning in adults although such symptoms were frequently reported by writers in the last century and the early part of the present century when industrial lead encephalopathy was more common.[80,81] Depression has been noted in inorganic lead poisoning[82] and it is of possible aetiological significance that Stern[83] has found increased ALA excretion in patients with manic-depressive psychosis (*cf.* refs. [42,43]). More recently Hanninen and Parland[84] **have found that seemingly non-poisoned workers in the lead industry exhibit intellectual disturbances, personality changes and an impaired performance in psychometric tests,** some parameters of which are even more markedly impaired than in workers exposed to carbon disulphide.[11] It may be of relevance to these findings that Seppalainen and Hernberg[17] have demonstrated the presence of subclinical nerve damage in industrial lead workers who were showing no clinical neurological symptoms.

Blumer[85] has reported success in the treatment of depressive patients using calcium-EDTA (*cf.* ref. [83]): in one series,[86] using calcium-EDTA in combination with vitamins C and B, only 13% of patients were said to be no better after treatment. These results are of interest in relation to the possible role of lead, and perhaps other heavy metals, in the aetiology of the disease. It would be highly desirable to confirm Blumer's findings in a double-blind trial, particularly since an analysis of the United Kingdom health statistics has indicated that first admission rates for depressive psychoses and personality and behavioural disorders requiring medical institutional treatment have increased markedly during recent years, especially among the younger age-groups.[87]

**Since TEL is the main toxic agent in petrol it is necessary to warn that petrol should not be used for domestic purposes. Petrol vapour should never be inhaled, especially by children or persons liable to mental disturbance. Several cases of severe mental illness from this cause have come to the authors attention.*

HYPERACTIVITY & CRIMINALITY

Hyperactivity or hyperkiuesis is a behaviour disturbance which is particularly common among children. Boys are affected about 5 times more commonly than girls. Recent surveys in London have shown that very high proportions of children, perhaps over 50% in some inner city areas, may be classified as hyperactive and/or disturbed.* The term 'hyperactivity' implies over-activity, but the behaviour syndrome is in fact rather more complex. It appears to result from an abnormally high level of motor activity. A hyperactive child may appear restless and impatient, with difficulty in maintaining concentration for any length of time, and there may also be poor tolerance of frustration, emotional immaturity, and a tendency towards violent, destructive, and overimpulsive actions. The intelligence is low in some cases, and in the normal range in others, especially when measured by verbally oriented tests, but the behaviour disturbance can produce secondary educational difficulties. However, some hyperactive children also have primary specific learning difficulties (dyslexia and dysgraphia), and the resulting stress at school may exacerbate the hyperactivity. The intensity of the symptoms in a given child may vary according to the environmental stress.

It has been suspected for some time that hyperactivity is a result of damage to, or malfunction of, the brain, and the term 'minimal brain dysfunction' is sometimes used. At least three types of hyperactivity can be recognised, (i) that sometimes but not invariably associated with certain congenital malformations, e.g. Down's syndrome (mongolism), (ii) that resulting from brain injury at birth or brain damage following certain infectious diseases, e.g. meningitis, and (iii) 'pure' hyperactivity, or 'hyperactivity of unknown cause'. This last type is most common, and is the one for which there is now evidence for lead as a causative factor. Cerebral palsy and epilepsy can also lend to hyperactivity: so it is interesting that at least one form of childhood epilepsy has recently been shown to be caused by lead and to be improved by 'de-leading therapy.'[3]

'Pure' hyperactivity tends to abate or transform during adolescence, but the condition is certainly found among adults. In a certain U.K. prison for medium-term offenders which one of us (D.B.S.) has been visiting for discussions, nearly all the inmates are classified as hyperactive. The characteristics of the hyperactivity syndrome are obviously such as to predispose some individuals towards delinquency, particularly criminal acts involving violence and impulsiveness. It is interesting and perhaps significant, that the incidence of crimes of violence in Britain has been increasing greatly in recent years relative to that of other types of crime.

Tredgold[4] records that following the epidemic of encephalitis lethargica which appeared in England in 1918, a number of those infected subsequently developed antisocial characteristics as a result of brain damage caused by the disease and committed crimes for which they were convicted and imprisoned. There is nothing fundamentally novel about the discovery that certain types of brain damage can induce criminal behaviour, and it is evident that victims have sometimes been mistakenly punished as offenders.

Another disturbing trend in recent crime statistics has been the increased involvement of young children and adolescents. Such common offences as vandalism,

assault, and football match hooliganism are those one would expect to be associated with hyperactivity. If our conclusions are correct, offenders of this type would be better treated with penicillamine than prison. (The ineffectiveness of the latter treatment in most cases is well known).[5]

A few words of caution are required. Just as we have emphasised that lead is by no means the only important factor in behaviour disorders, so do we also emphasise that hyperactivity is not the only factor in criminality. Many criminals are not hyperactive, or only moderately so, and character defects ranging from simple laziness and selfishness to severe moral subnormality appear to be major factors. Such persons may appear to act as better vehicles for evil than good; but any discussion of the relative importance of spiritual and physiological or biochemical factors in their condition would unfortunately take us beyond the present frontiers of knowledge. Even so, moral deficiency has been recognised as a distinct clinical entity by some authorities. Cases are known where it has appeared following an attack of encephalitis;[4] so physiological and/or biochemical abnormalities are evidently also factors in this condition, and the distinction between victim and offender in some morality disorders as well as in anti-social hyperactive behaviour may well be less sharply defined than the law now assumes.

By D. Bryce Smith and H.A. Waldron

**Professor M. Rutter has recently reported a comparative study of children from the Isle of Wight and an inner-London Borough.[1] Rates of behavioural deviance (19.1%) and psychiatric disorder (8%) were about twice as high in the London children. In another group of children from inner London, 30.1% were rated as 'disturbed' and 40% as hyperactive.[2]*

1. M. Rutter, *Proc. Roy. Soc. Med.*, 1973, *66*, 1221.
2. R. G. Lansdown *et al*, *Lancet*, 1974, i, 538: for critical comments see *ibid*, pp. 866, 1166, 1167, and ii, 44.
3. N. Fejerman, E. R. Gimenez, N. E. Vallejo, and C. S. Medina, *Pediatrics*, 1973, *52*, 227.
4. A. F. Tredgold, 'Mental Deficiency', 7th Edn. Bailliere, Tindall and Cox, London, 1947.
5. A useful account of the symptoms of hyperactivity is given in an anonymous editorial article, *Brit. Med. J.*, 1973, *1*, 305.

(iii) In children

Children are accepted as being at greater risk from neurological damage by lead than adults: encephalopathy, for example, is often an early manifestation in children, whereas it usually has a late onset in adults. The risk appears to be in inverse relation to age: the younger the child, the greater the risk.[88] It is likely that lead encephalopathy in children is underdiagnosed since it is notoriously difficult to incriminate lead as the causative agent without a high degree of suspicion on the part of the clinician. More cases of lead encephalopathy might be diagnosed if all children presenting with an encephalopathy of unknown cause had radiographs of long bones taken to look for the presence of a lead line.

Permanent neurological damage is a common sequel to lead encephalopathy: pathologically the most extensive neuronal injury is to the cerebellum, but there is diffuse injury to nerve cells throughout the brain.[89] A report of the United States National Academy of Sciences[89] refers to various serious consequences as follows. 'Subtle neurologic deficits and mental impairment are the more common outcomes. These include lack of sensory perception and perseverance despite I.Q. scores of 80–100, or better, on verbally oriented intelligence tests. Form and proportion are distorted. Motor inco-ordination and lack of sensory perception severely impair learning ability. Often the handicap is not recognised until after the child enters school. Such children also have short attention spans and easy distractibility. With respect to behavioural aberration, it is difficult to determine how much is due to organic brain damage and how much represents the response of the affected child to the many facets of his total environmental deprivation. Nevertheless, **many children with documented prior attacks of symptomatic lead poisoning develop hostile aggressive, and destructive behaviour patterns, which, in turn, may precipitate their exclusion from school and a demand for institutionalization.** Although seizure disorder and behavioural abnormalities tend to abate during adolescence, mental incompetence is permanent.'

The American Academy of Pediatrics reports[90] that at least 25% of children with lead encephalopathy will be left with permanent damage to the central nervous system, but this may be a conservative estimate. Perlstein and Attala,[91] for example, found that 82% of children with encephalopathy suffered from various permanent effects, most frequently recurrent fits or mental retardation. Of all the children they followed up who had had lead poisoning, with or without encephalopathy, 39% had some permanent residue of symptoms. In the classic study of Byers and Lord[92] in which they followed the development of 20 children over several years after they had been treated for mild lead poisoning (symptoms of encephalopathy were mild or absent), 19 out of the 20 were exhibiting behavioural and/or educational abnormalities, although all had been considered cured when discharged from hospital. The educational difficulties were analysed in considerable detail and were similar to those found in dyslexia. Some of the children were mentally dull, and difficulties in reading and writing were prominent; others were considered bright by teachers, but were hyperactive, and had short attention spans, so that the usual correlation between I.Q. and educability did not hold. Many of the children had serious behavioural difficulties of the types which result from loss of the normal inhibitory function inthe cortex; thus some were prone to impulsive behaviour and showed a tendency to be violent.

If children who have had lead encephalopathy are re-exposed to lead and suffer a repeat episode, the proportion of those developing permanent severe brain damage increases to almost 100%.[93,94]

It is even more important to our thesis that absorption of lead in amounts insufficient to produce clinical symptoms in children may also cause psychological or neurological impairment. Thus Pueschel *et al*[95] followed up a series of asymptomatic children who had been found to have an increased body burden of lead on routine screening and

were able to detect neurological and motor impairment in over a quarter of the forty-two traced after one-and-a-half years. There was an improvement in I.Q., however, and the children generally performed better during psychological testing than during the first examination when they were still exposed to lead.

A recent study of London children failed to detect any correlation between blood-lead levels and mental functioning, and the authors suggested that behaviour disturbance or delayed mental development in children having blood leads in the range 40–80 μg per 100 ml would be unlikely to be due to lead, and more related to social factors.[96] This work has been criticised by several authors both as to methodology and conclusions[97-99] and appears to have been overtaken by the findings from a more detailed study of children at El Paso, Texas, having a range of blood lead levels similar to those in the London survey.[100] Children having blood lead levels $\geqslant$ 40 ug per 100 ml showed significant impairment of performance I.Q., and similar impairment was found in children even after their blood-lead levels had fallen below 40 μg per 100 ml. Significant hyperactivity differences were not found in comparison with children having blood-lead levels $\leqslant$ 40 μg per 100 ml, possibly because this range is too high to permit discrimination. Thus lead-induced hyperactivity in mice[64] is said to be one of the earliest behavioural effects, and appears to be a trigger phenomenon, the intensity of which is not dose-dependant.

The variability of the response to lead is illustrated by the demonstration of an aetiological link between lead and Lennox's syndrome in five children having blood-leads in the "normal" range of 17–40 μg per 100 ml.[101] The EEG abnormalities disappeared and seizures became less frequent when chelation therapy (de-leading) was instituted. Before and during chelation the children were also treated with benzodiazepines which would also have affected the EEG, but the authors claim that the normalisation of the EEG developed as a specific response to the chelation therapy. Nevertheless, it would be desirable to repeat the study with children not receiving benzodiazepines concurrently with the chelating agent to confirm the effect.

. . . Children may be seriously harmed by lead before birth.

Pica

Pica involves chewing or sucking of toys, soil and other non-food objects and is a behavioural disturbance in children well known to predispose towards lead poisoning. The aetiological significance of the high blood-lead levels found in some mentally sub-normal children[40] has been questioned on the "chicken and egg" grounds that such children may be more prone to pica; but, to the best of our knowledge, no definitive studies have beensconducted which would enable us to say that elevated blood lead levels may be entirely attributable to pica. Although the causes of pica are not well understood, a dietary deficiency of calcium in animals has the dual effect of promoting pica and enhancing the toxic effects of lead. It is interesting that rats on a low calcium diet develop a formsof pica specific for sources rich in lead.[102] Children exhibiting pica also tend to seek out objects rich in lead, perhaps as an instinctive search for a calcium substitute and because some lead compounds taste sweet.

Prenatal Exposure to Lead

The demonstration that post-natal exposure to lead can influence behaviour requires a consideration of the possible effects of human prenatal exposure. Studies on chick embryos have revealed specific damage by lead to the brain as the main target organ at sub-lethal dose-levels.[103] There is certainly evidence that children may be seriously harmed by lead before birth and Hardy[104] has reviewed the evidence that lead can damage the germ cells of both sexes. Male lead workers in Japan were reported to have an abnormally high proportion of marriages which were either sterile or led to pregnancies ending prematurely or in stillbirth.

Inorganic lead readily crosses the placental barrier, and explains the high abortion rate which was noted in female lead workers in the early 1900's.[105] Indeed abortion was so common that regulations now forbid the employment of women in certain parts of the lead industry. Organic lead – in the rat at least – does not pass the placenta until the mother is severely intoxicated.[106]

Cord blood levels correlate well with those in the maternal circulation[107-109] and fetal tissues may be able to concentrate lead up to the sixteenth week of gestation;[110] this is the explanation given for cord blood lead levels being slightly higher than those in thesmaternal blood.[111] Blood of neonates contains lead in concentrations similar to those in cord blood.[112,113] The presence of concentrations of lead in the blood of the fetus which approximate to the maternal levels shows that the fetus has considerable exposure *in utero*. Judging by some of the concentrations of lead recently reported in the skeletal tissues of stillborns, this exposure can be great, and sufficient to damage or kill the fetus.*

The levelssof lead which Lanzola and his colleagues[114] found in stillborns approached to the lowest level of those they found in adults (56.2–137.5 ppm). All workers are agreed that bone lead levels increase progressively with age up to the

fifth or sixth decade and this emphasises the excessive exposure to which the stillborn infants were exposed and which resulted in bone lead concentrations higher by a factor of 12 or more than those found in normal babies.

The evidence *in toto* points clearly towards maternal lead as an important factor in stillbirth: 40 ppm of lead in the bones may represent a lethal fetal dose, whereas 2ppm appears to be consistent with normal survival. It seems highly improbable that levels within the range of 2–40 ppm will be without effect and it is very pertinent to ask what effects on subsequent physiological and mental development may result from the intermediate concentrations (*cf.* ref. 103). An infant born live with a level of, say, 20 ppm could well have suffered damage which would constitute an unrecognised burden throughout life. Such a child would not necessarily be detected by abnormally high blood lead levels in later life as the amount of lead present at birth is soon swamped by lead accumulating from the diet. Possible effects on behaviour can thus only be surmised, but the hazard appears to be real. Unlike effects produced by post-natal over-exposure to lead, any effects of fetal exposure which appear in later life would be unlikely to respond favourably to treatment for lead poisoning, as described below.

Lead Metabolism in Persons with Behavioural Disturbances

Having presented evidence that lead can induce behavioural disorders, we now consider the evidence that behaviourally disturbed persons can have abnormal lead metabolism.

David and his colleagues[118] suggested that hyperactivity in some children may be associated with abnormal tissue lead levels. A group of children with hyperactivity for which no conventional cause could be demonstrated was found to have blood lead concentrations higher than children whose behaviour was normal and hyperactive children in whom a predisposing cause was diagnosed. The group of children with what was called 'pure' hyperactivity (*i.e.* hyperactivity of unknown cause) also had an increased body burden of lead as shown by chelation studies.

It appears of great significance that chelation therapy has been found to cure hyperactive behaviour in children.[119] In a double-blind trial, hyperactive children were treated with penicillamine (1000 mgm/day in divided doses) or a placebo for a total of three months. A total of fifty children (average age about 8 years) was involved. The children with a known cause for their hyperactivity were mostly unchanged in behaviour by the penicillamine therapy but a few deteriorated. In contrast, the children with 'pure' hyperactivity all responded favourably. In every case, the hyperactivity totally disappeared although in some cases there was a short initial period of deterioration. The I.Q. as measured on the Wechsler scale increased from a mean of 88 to 97. Significant improvements in general conduct were also noted. The improvement appeared to be permanent over a one year follow-up period. One hyperactive child who was allergic to penicillin was given calcium-EDTA (50 mgm/kg) intravenously for one day, followed by 500 mgm orally twice daily for five days. After this time another day's intravenous therapy was instituted and oral calcium-EDTA was given for a further three weeks (500 mgm twice daily). In this case, improvements in behaviour were noted after three to four weeks, and after twelve weeks the child was behaving normally. After sixteen weeks his blood lead had stabilised at about 26 ug/100 ml, although during the initial stages of treatment it fell to a lower level and subsequently rebounded. Of the other children in the study, all with 'pure' hyperactivity had a blood lead level greater than 25 µg/100 ml, the mean for the group being of the order of 30 µg/100 ml. As noted above, children with hyperactivity resulting from known brain dysfunction unrelated to lead showed no improvement on chelation therapy. Dr. G. B. Simon (Lea Castle Hospital, Wolverley), informs us that he has also successfully used chelation therapy to produce a marked reduction of overactivity in autistic children, following the observation that some of these children have raised blood lead levels.

It is reasonable to suppose in the light of the animal studies referred to above[29,30] that 'pure' hyperactivity in children could be connected with disturbances in neurotransmitter metabolism as the result of their high tissue lead levels and that this returns to normal following a de-leading regime.

Stern's finding[83] that manic-

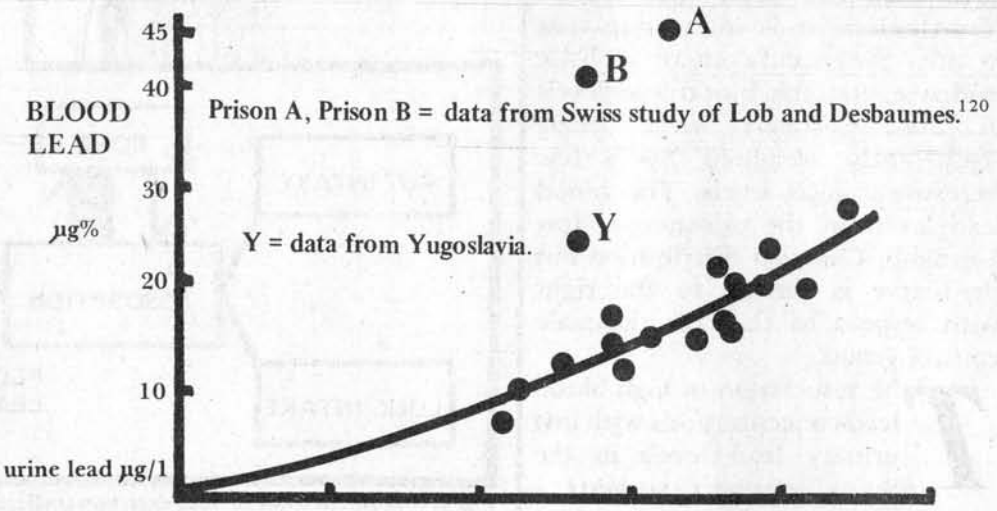

Fig. 1 – Relationship between blood and urine lead concentrations from Goldwater and Hoover[123]

**Thus Lanzola et al[114] found mean lead levels in the vertebrae of 46 neonates, stillborn or dying in the first twenty days of life, which ranged from 43.7 ppm ash in 1967 to 52.5 ppm ash in 1968. All the mean values for other years lie between these values. Our preliminary studies of stillbirths from the Birmingham area show similar high levels. These values are strikingly different from those reported by Barry and Mossman[115] who found a mean bone lead in (presumably normal) infants and young children of about 1 ppm on a wet weight basis (approximately 2–3 ppm on an ash basis). Barry[116] reported more recently a mean lead level (ash basis) in rib samples of six children aged sixteen and under of 7.82 ppm (range 3.50–12.00). Values obtained from other bones were of a similar order. Schroeder and Tipton[117] found values of 1–12 ppm (ash basis) in subjects aged 0–19 years.*

depressive patients have increased ALA excretion is relevant also, although his investigations were carried out with only a small number of patients and clearly need repeating on a larger scale.

Two other groups of workers have provided fortuitous evidence for abnormal metabolism in adults with disturbed behaviour. Both groups were studying prison populations to assess 'normal' concentrations of blood and urine lead and urinary ALA excretion in the general population.

The first study[120] reported blood lead concentrations in two prison populations in Switzerland. These were much higher (means 43.5 µg% and 40.5 µg%) than for two normal Swiss male populations (means 22.4 µg% for blood donors and 21.7 µg% for policemen).[121] The urine lead concentrations of the prisoners on the other hand were lower than expected. We refer to this point again below.

In the second study, Barnes *et al*[122] found that although the mean urine lead concentration in the American prisoners they examined was lower than normal, ALA excretion was higher, suggesting greater impairment of haem synthesis than in the normal population. Unfortunately, blood lead concentrations were not reported for these groups, but in view of the ALA findings it is reasonable to suppose that the prisoners had higher blood leads than the normal population.

Because of the heterogeneous nature of the prison population these studies should not be interpreted to mean that all delinquents have abnormal lead metabolism. Nevertheless, it is interesting that in the Swiss data there is little evidence that the blood lead levels in the prisoners were being significantly weighted by a few excessively high levels. The blood lead levels in the prisoners follow a roughly Gaussian distribution but the curve is shifted to the right with respect to that for the male control group.

The association of high blood lead concentrations with low urinary lead levels in the Swiss prisoners suggests a mechanism by which environmental

fig:2

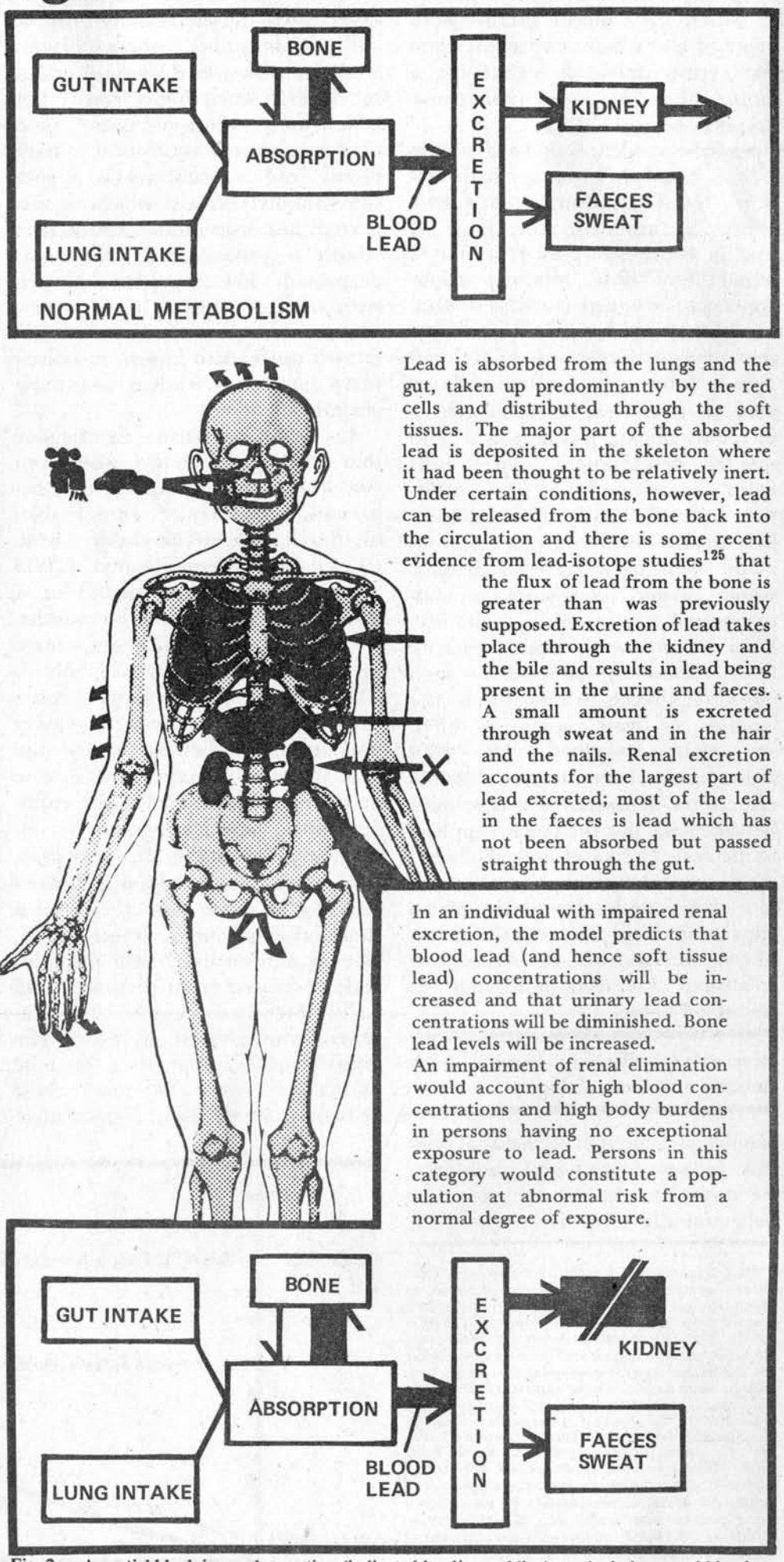

Fig. 2. – A partial block in renal excretion (indicated by diagonal line) results in increased blood lead with lowered urine lead.

TABLE 1

Population	Urine lead µg/1	Blood lead µg%	
		Found	Predicted
A	35·5	43·3	22·2
B	28·8	40·5	20·4

Blood and urine lead values for the Swiss prison populations together with blood lead values predicted from regression equation.

exposure could produce abnormally high soft tissue lead levels in certain predisposed individuals.

A world wide study of normal blood and urine lead levels[123] shows a highly significant correlation between the two ($r = 0.94$, $P < 0.001$). The regression equation for predicting blood lead from urine lead has the form

blood lead = −7.20 + 0.67 urine lead

(This relationship probably does not hold for blood lead at the elevated levels common in industry because there is evidence that prolonged industrial exposure can produce effects on the kidney which impair its ability to excrete lead.[124] This contrasts with the nephrotoxic effect of cadmium which eventually causes increased excretion of this element).

If a graph is constructed from the world-wide results of Goldwater and Hoover[123] (fig. 1), the addition of the data for the Swiss prisoners shows that their mean blood lead concentration is much higher than would be predicted from the urinary lead concentration (Table 1). It should be emphasised that the relationship between blood and urine lead shown in fig. 1 is based on a carefully planned survey in which samples were obtained from groups of persons in a wide range of countries and analysed in a single laboratory so as to minimise the analytical errors which are normally so common in this type of work. The extent to which the results for an individual depart from the relationship provides a measure of the degree to which his kidney function is normal for the excretion of lead, abnormally high blood leads being explained in terms of a partial impairment of renal function. The situation is illustrated in a simple schematic model (fig. 2).

An impairment of renal elimination would account for high blood lead concentrations and high body burdens in persons having no exceptional exposure to lead. Persons in this category would constitute a population sub group at abnormal risk from a normal degree of exposure.

The case for casual relationship between lead and some types of criminality is further strengthened by a recent detailed study of psychological defects among industrial lead workers which concluded 'on the average the psychological impact of working in a leaded environment is one of increased hostility, depression and general dysphoria.'[125a]

Conclusions

The evidence for an association between lead absorption and behavioural disturbances falls into six main categories: *a*, the abnormally high incidence of educational and behavioural disturbances such as hyperactivity following clinical lead poisoning in childhood; *b*, the finding that clinically asymptomatic children having blood lead levels only modestly above normal ($\geqslant 40$ µg per 100 ml, or even lower) have impairment in a broad range of psychological functions, especially fine motor and perceptual skills; *c*, the evidence that children hyperactive 'for no known cause' have elevated lead burdens relative to controls; *d*, the finding that children having blood lead levels > 22 µg per 100 ml who are hyperactive for no known cause can be completely cured of their hyperactivity and improved in their general conduct by treatment with penicillamine or calcium-EDTA; *e*, the demonstration that lead-induced hyperactivity in mice shows a pattern of drug response identical with that of children hyperactive for no known cause; and *f*, the indications that delinquent populations tend to have abnormal lead metabolism.

The weight of this evidence from numerous sources appears to require a fundamental reassessment of present medical, psychiatric, educational, sociological, and criminological attitudes towards the causation and treatment of certain common types of behaviour disorder. Indeed, the prospect for new approaches to the prevention and treatment of certain currently intractable disorders seems particularly attractive. Further research is required into lead burdens and lead metabolism in behaviourally abnormal groups, *e.g.* delinquents, manic depressives. The relationship between behaviour and ALA levels and other biochemical indices of disturbed metabolism needs further investigation, as do the synergistic effects on behaviour produced by lead in conjunction with other biochemical and social stresses.* But the need for further research should not be used as an excuse to delay effective action for control of future lead pollution and to remedy the present consequences of that which has been permitted to occur in the past.

The expression of behaviour is the response of an organism to its total environment. The emphasis placed on lead in this paper should not be taken to imply that social interactions and genetic factors[126] are regarded as unimportant. But it is now difficult to avoid the conclusion that biochemical stress from lead is an important factor, hither to largely unrecognised, which doubtless in conjunction with social and other stresses can and does adversely influence certain key aspects of human behaviour.

This conclusion has been reached on scientific grounds, but it has widespread political, economic, and legal implications which should not

**For example, mercury, cadmium, arsenic, alcohol, carbon monoxide, organochlorine compounds, calcium and magnesium deficiencies, pregnancy, psychological or physical trauma, abnormal family relationships, infectious illness, overcrowding.*

be ignored. Those industrialists and others who in the past have principally appreciated the seductive technical utility and economic value of lead and its compounds and have opposed the introduction of stricter controls may need to reappraise their attitudes; and indeed their behaviour.

We wish to thank Dr. O. David for permission to refer to the unpublished results of his work on the treatment of hyperactivity by chelating agents.

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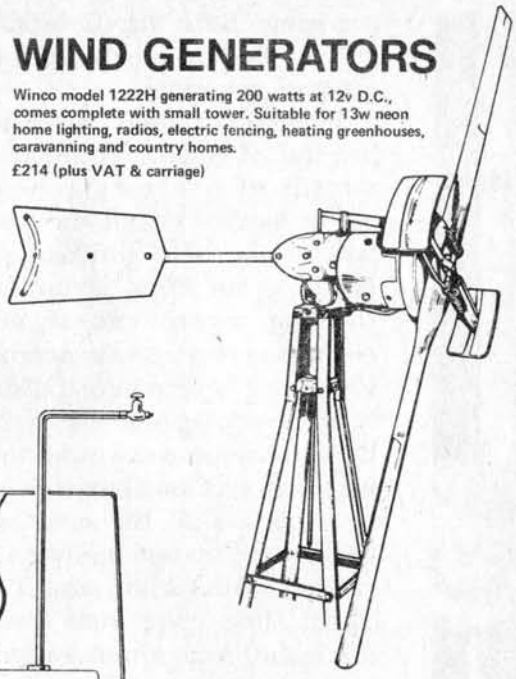

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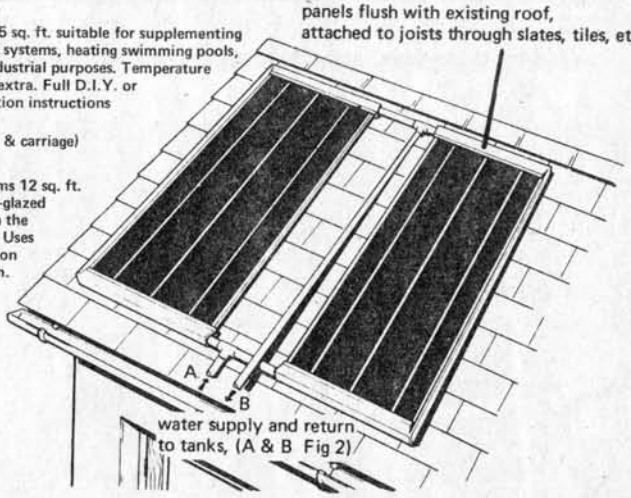

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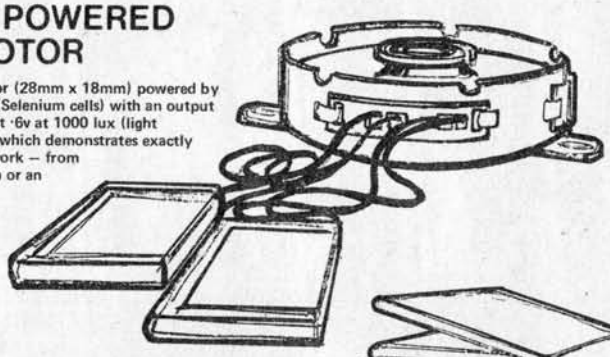

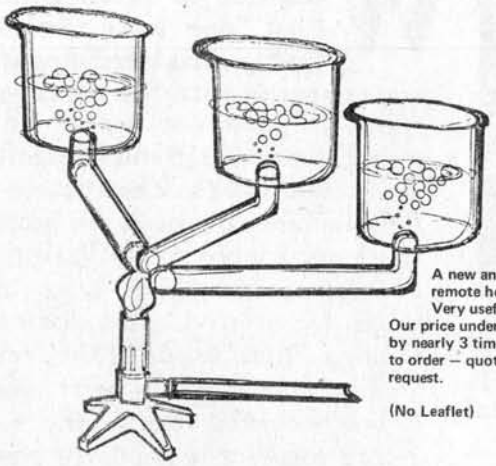

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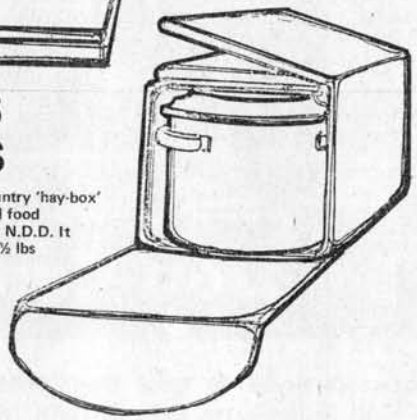

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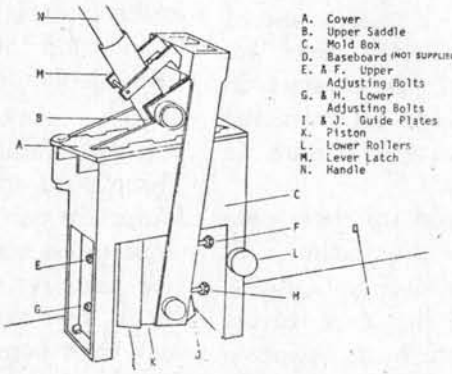

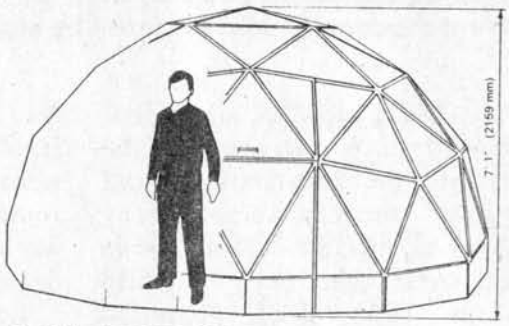

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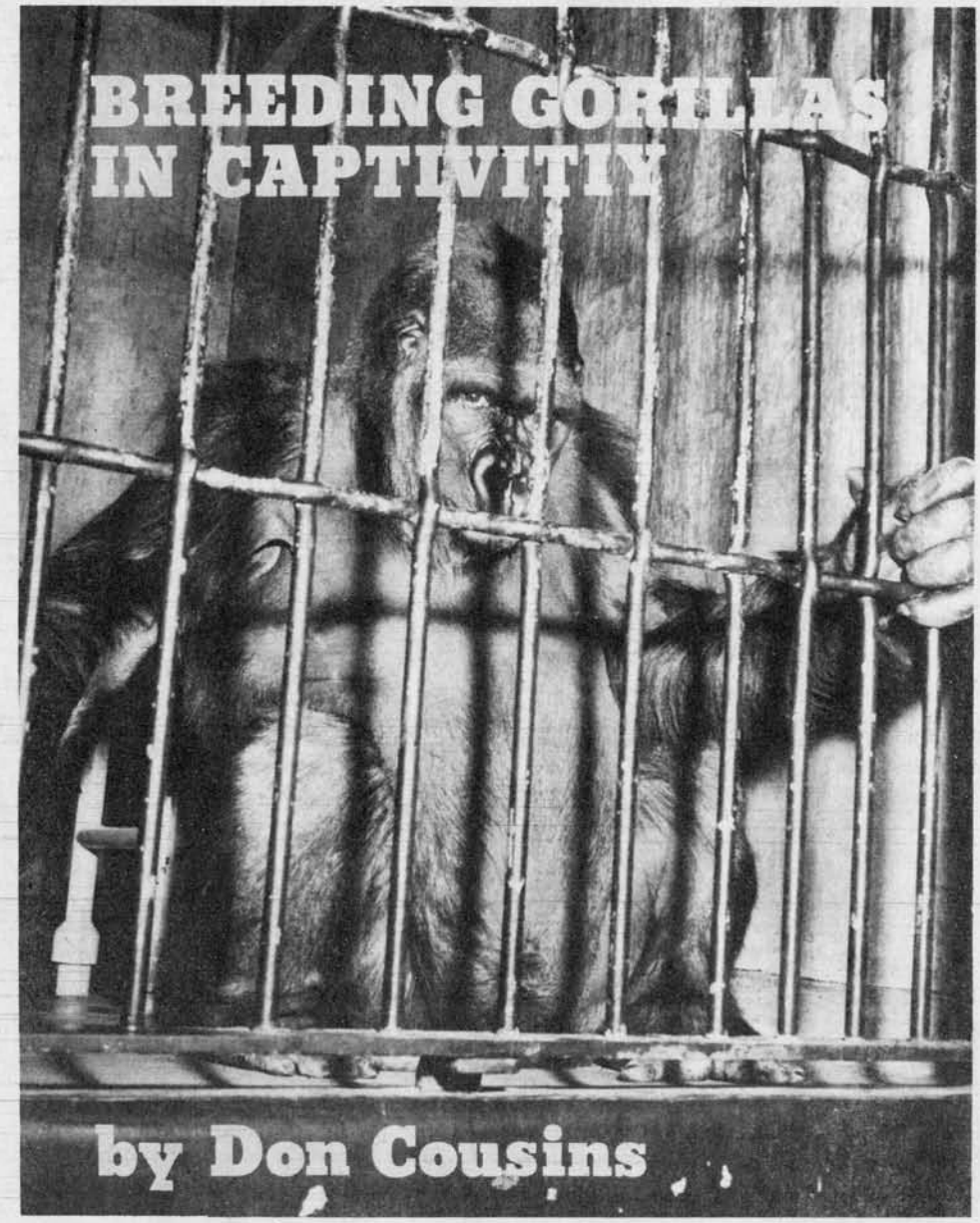


BREEDING GORILLAS IN CAPTIVITY

by Don Cousins

If zoos continue to take their present toll from wild gorilla populations they will contribute substantially to its decline. It is essential, therefore, that zoos co-operate to build up a self-perpetuating population of gorillas where introduction of wild stock can be kept to a minimum.

Since living gorillas were first introduced into Europe in the middle of the last century, and later into American zoos, literally hundreds of specimens have died in transit. After the Second World War, in 1953, Prof. Bernhard Grzimek made a census of gorillas in the world's zoos, and he listed 12 animals (8 males and 4 females) in Europe and 44 (27 males and 17 females) in America. In 1960 Honegger and Menichini reviewed the position and listed 28 (15 males and 13 females) gorillas in Europe, 72 (38 males and 34 females) in America, and 3 (2 males and 1 female) in Asia. Today there are wells over 300 of these apes in zoological collections all over the world and still zoos continue to deplete wild stocks.

For zoos to build up their own self-perpetuating population of gorillas they must first be successful in breeding them, and rearing the infants that are born. Approximately 55 gorillas have been born alive in 20 zoological collections, and about 41 are alive today.* Out of these 20 zoos four are European, 44 are in America, and the other two in Asia. Basle and Cincinnati zoos have been particularly successful, both collections having bred six gorillas, all of which are still surviving. Both the Columbus zoo and the Basle zoo have bred second-generation gorillas.

In spite of these successes in a handful of collections however, the records of too many zoos are dismally barren. Of all the European zoos that exhibit gorillas, four with breeding successes is not an outstanding record and it must be obvious to every one concerned that something is very wrong. Admittedly a percentage of the gorillas in these zoos are too young to breed, while in a very small percentage they have gorillas of the same sex, but these same factors apply to American zoos with gorillas (about 46) and 14 of their collections have been successful. Asia cannot be compared because it is only in recent times that zoos in that continent began to exhibit gorillas, and two successful births is a high quota in relation to the small percentage that stock gorillas.

Why do so many zoos find it difficult to breed gorillas? First, one must remember that gorillas were slow starters compared with the other great apes. Chimpanzees have bred in captivity since 1915 and orang-utans since about 1925. The reasons for the reluctance of gorillas to breed in captivity appear to be varied but I believe that there is a basic single factor to account for many failures – the attitude of the female.

A number of gorilla pairs develop a brother-sister relationship when reared together in captivity. Such a relationship can only be described, anthropomorphically perhaps, as one of platonic affection, each animal finding obvious enjoyment in each other's company while being sexually oblivious of one another. Three pairs of gorillas at Cheyenne Mountain zoo formed such relationships and it was decided to integrate two pairs for three hours every day for a few weeks. This procedure met with some success, one of the females eventually becoming pregnant. Basle zoo's prolific female "Achilla" had been in captivity for six years before she was introduced to "Steffi" while "Albert" had lived in the San Diego zoo for nearly fifteen years before he sired an offspring, although during that time he was housed with two female

N.B. From 1956 to the middle of 1974 at least 106 gorillas were born in 19 American zoos, 8 European zoos and 2 Asian zoos. Of these 106 births, 89 were born alive but only 62 are living today.

gorillas. The introduction of a seven-year-old female did something for "Albert" that the other two females apparently could not. In Bristol zoo "Samson" was reared with the female "Delilah", but another female, "Caroline", was introduced to this pair after about two years and "Samson" succeeded in making both females pregnant. The female "Makula" was in Frankfurt zoo for eighteen months before being joined by the male "Abraham" and they eventually bred. After he died she was introduced to "Solomon", a male from Oklahoma City zoo, and this resulted in another pregnancy.

On the other side of the coin, "Christina" and "Baron" in Columbus zoo were housed together from the word go but this did not prevent them from becoming the first gorillas to breed in captivity. "Moka" and "Nikumba" were also brought up together in captivity and they bred successfully.

It has been suggested that lack of successful breeding could be explained by a dietary deficiency, but this is not so. In many zoos, in this country at least, the basic diet of certain animals is identical from one zoo to another and Bristol zoo, for instance, has no secret ingredient in its diet sheets. Neither do housing conditions seem to have any bearing on the subject. Compared with Chester zoo's spacious ape islands, for example, Bristol zoo's gorilla house is positively claustrophobic but Bristol have bred gorillas and Chester have not. Even John Aspinall's colony of adult and sub-adult gorillas living in almost ideal conditions has had only one pregnancy, an aborted foetus in May 1969. Although these animals, as with gorillas in a number of other zoos, have been observed copulating.* Many unsuccessful couplings can be accounted for by copulations out of oestrus and also through lack of full penetration by the male. Some may simply be symbolic thrusts.

In chimpanzees the female develops a prominent sexual anal swelling when she is in oestrus, communicating to the male that she is in season. The sight of this protuberance, together with the scent that exudes, excites the male sexually and provides him with the incentive to mate. The female gorilla lacks this anal decoration, but in two observations made by Schaller of wild gorillas mating it was the female who played the prominent part in the decision to copulate by making

advances to the male of her choice and presenting to him. This has been observed with many of the captive females that have mated successfully. With captive females of breeding age that live alone or are sexually uninterested in their cage-mate, advances and presentations to human attendants have been noted. With an animal like the gorilla, who shows no physical signs of being in oestrus, it is reasonable to expect the female to take the initiative when she is in season.

A number of zoos obstinately continue to keep pairs of gorillas together that show no signs of wanting to mate in the forlorn hope that they might eventually copulate successfully. It seldom seems to occur to zoos in this position to get together and form a breeding programme. This might be done, and on an international scale, if zoos are to establish their own breeding stock, and they must breed their own stock to cut back on the importation of wild-caught gorillas and thus help in the only practical way they can the conservation of the gorilla. In this country alone, for instance, there are pairs of gorillas of breeding age in four zoos – London, Chester, Manchester, and Twycross – that show no signs of ever breeding. Until recently there was another pair in Dudley zoo, but the male died, leaving a lone female of breeding age. A breeding programme could easily be planned and operated by these zoos, and they could possibly bring in Bristol zoo's breeding pair as a booster. Chester zoo, particularly, have a pair of the rare eastern lowland gorilla (Gorilla g. Graueri) doing absolutely nothing for the procreation of the sub-species. Only five other zoos outside Africa possess specimens of this race. Oklahoma City zoo has set up a breeding programme of the sub-species and Tel Aviv and Bronx zoos have contributed by lending their eastern female gorillas to join up with Oklahoma's male. The only eastern lowland gorilla born in a zoo to date was the female born in Antwerp in 1968, but breeding successes could possibly be greatly enhanced if Chester and Antwerp could co-operate in a breeding programme.

Apart froms the experiment in Oklahoma city zoo, the only other gorilla breeding programmes that have been attempted are by the Henry Doorly zoo and Como zoo, which was successful, and between the Jersey and Basle zoos, which is well on its way to proving a success.* These zoos have proved that this sort of programme can work, but the few zoos that are participating at present are but a tiny percentage, and if zoos intend to do more than just pay lip service to conservation issues then a great deal more co-operation between them is required.

Conservation of the gorilla means also conservation of its habitat and everything vital to its ecology. This can only be achieved by the governments of the African states where gorillas live; the future of the great ape is ultimately in their hands.

A great deal is said about re-introducing captive animals into the wild and this can be done with certain species, provided of course that the habitat remains. But what

Since this article was written Howletts has acquired on loan from Lincoln Park Zoo, Chicago, a proven breeding male "Kisoro" who copulates regularly with all 4 adult females.

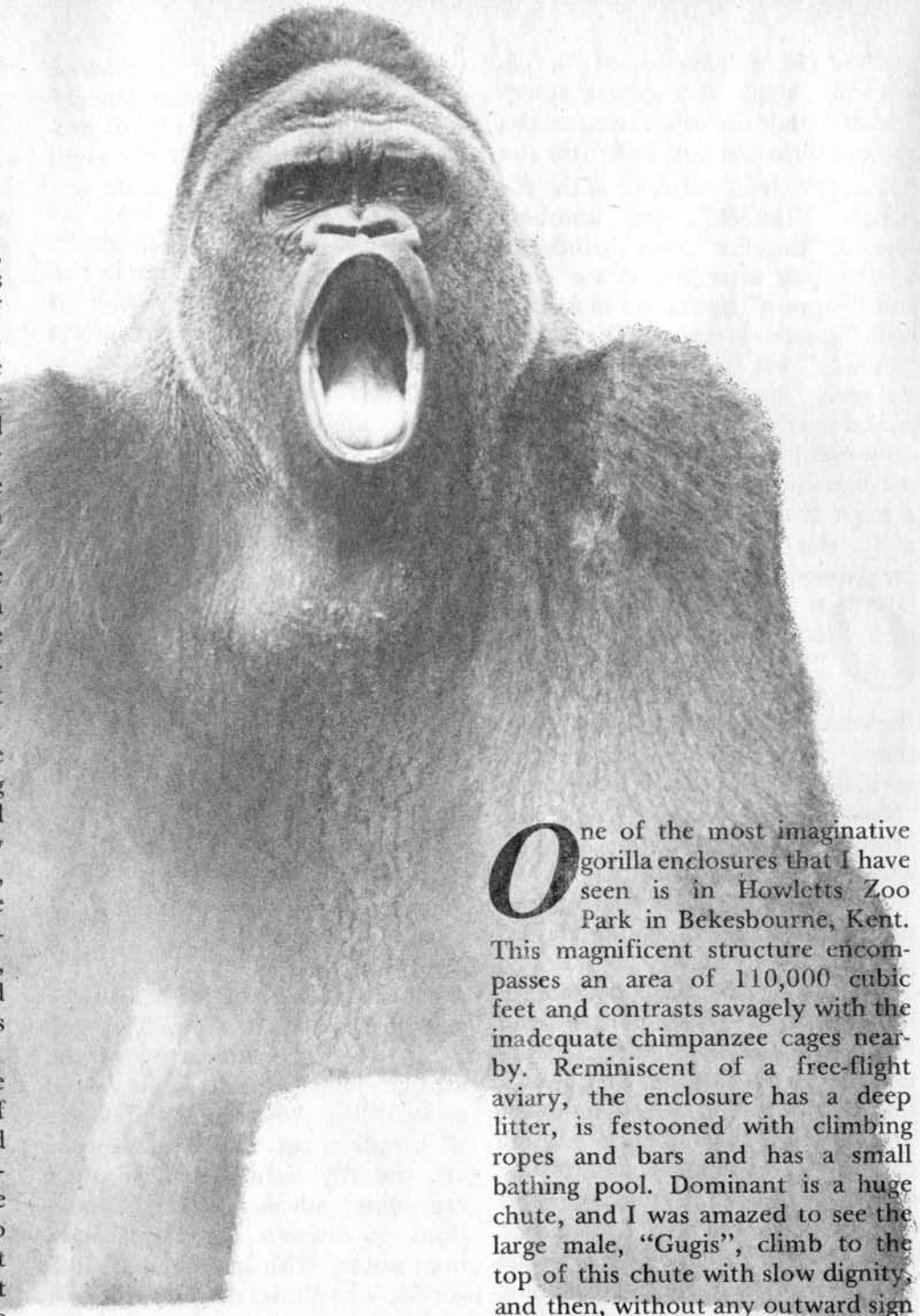
Since this article was written Jersey Zoo has bred 2 gorillas both fathered by a male on loan from Basle Zoo.

about apes? It must be remembered that much of the behaviour of apes is learned, the young and inexperienced being taught by the old and experienced. What can an ex-captive ape teach its young about wild behaviour? It can be argued, of course, that captured orang-utans are being 'educated' in the ways of the wild by the Harrissons in Borneo so that they can eventually be released, and twelve captive chimpanzees were liberated on the island of Rubondo, Lake Victoria, by Prof. Grzimek. The orangs have the advantage of being taught at an early age and soon after capture. Also, they never leave their native home. The chimpanzees present a different case. Although it is true to say that they have been re-introduced into Africa, it cannot in all honesty be called a re-introduction into the wild. The island, 24 miles long and averaging 5 miles wide, was totally uninhabited and has been stocked with a variety of species, including rhinoceroses, and the whole island is little more than an open floating zoo. Nevertheless, it is a significant beginning, and already the chimps have started to breed. One factor however, has forcibly been brought home.

It is well known that captive animals lose their natural fear of man because contact is close and constant; a classic example of familiarity breeding contempt. The chimpanzees released on Rubondo had no fear of humans at all, a fact that became apparent when an adult male chimp invaded the game warden's camp and created chaos. When the warden, Ulrich Kade, went to chase the animal off he was bitten in the hand. In 1968 another male chimpanzee broke into game warden Lucas Seremunda's camp and bit him in both hands. Six days later this same chimp attacked another warden, savaging him badly before being shot.

What about the gorilla? Could he be re-introduced? I think not. Personally I believe the chimpanzee to be far more adaptable and less conservative in habits than the gorilla. Also, and this is of even greater importance, the chimpanzee is a born opportunist. This is proved by its feeding habits and its utilisation of a diverse range of habitat. Besides, if the gorilla becomes extinct in the wild its numbers will decrease with the destruction of its habitat and there will be nowhere to re-introduce captive specimens to; gorillas are far more dependent on the dense equatorial forests than are chimpanzees.

The only valid excuse for keeping gorillas and other apes captive is that of education, and zoos have a duty to the public and the apes they keep to exhibit their apes to the best possible advantage.



One of the most imaginative gorilla enclosures that I have seen is in Howletts Zoo Park in Bekesbourne, Kent. This magnificent structure encompasses an area of 110,000 cubic feet and contrasts savagely with the inadequate chimpanzee cages nearby. Reminiscent of a free-flight aviary, the enclosure has a deep litter, is festooned with climbing ropes and bars and has a small bathing pool. Dominant is a huge chute, and I was amazed to see the large male, "Gugis", climb to the top of this chute with slow dignity, and then, without any outward sign of pleasure, slide sedately down the entire length of the chute to thud into the deep litter.

If a private zoo like Howletts can give its gorillas this kind of housing I can see no reason why the larger zoos cannot do the same.

Not only are these animals kept naturally occupied, but visitors have the advantage of being able to see the various species at their best. Not least, scientists and students will have unique opportunities of observing and studying the behaviour of these primates in a near-natural environment.

N.B. From 1956 to the middle of 1974 at least 106 gorillas were born in 19 American zoos, and 2 Asian zoos. Of these 106 births, 89 were born alive but only 62 are living today.

Reports

THE PECKHAM EXPERIMENT

The experts show us our world and the prima donnas among them are produced by the media. The spectacle which they report is built on assumptions. Behind the assumptions the lives of people go on – for better or for worse. In fact we know relatively little about them, despite the scenario of the experts. It is extraordinary that the life history of human populations occupying the habitats that cities afford should be a unique study. So far as I am aware, although there have been innumerable sociological and economic studies, only The Peckham Experiment has been concerned with the biology of the family in the city.

The method which The Peckham Experiment used to study the biology of families in a great city is perhaps surprising. The directors put the material to be observed in a large glass box. This kind of thing was not new to them. As research scientists they had done it with axolotls – reptiles which under the influence of thyroid gland may turn into salamanders.

The definitive Peckham Experiment was launched in 1935 when ecology was little known. Since the population of the precise habitat – an area marked out on a street map was reviewed, the Peckham study was essentially ecological. The designated area contained about five thousand families and in the course of a decade about a quarter of these provided a sample. What I have referred to as a glass box was a Family Health Club which in those days cost £38,000 to build. The central full-size swimming bath had glass walls; at one end of it there was a theatre, at the other a gymnasium, each of which had one wall of glass. On one side of the swimming bath was a cafeteria; on the other, space for social activities – all on the open plan. Upstairs, one half was shut off for consulting rooms and a laboratory; the rest provided further open space for social activities. The grounds provided play room for children.

Four conditions governed the entry of families into the "box". The family must live within the designated area. It was required to pay a subscription of one shilling per week. The third condition was both interesting and important. If one member of a family wished to join the Centre, the whole family must do so; membership was by family and the individual could not join without his or her family. Finally all member families were required to submit themselves to periodic medical overhaul.

Two methods of observation were open to the directors and their staff. They were able to watch families as they made use of the facilities which the club provided, and they had recourse to the material provided by the medical examinations of every member and the family consultations which accompanied these. They laid bare a great deal of intimate information about the condition of families and made it possible to correlate what was learnt in the consulting room with what was seen on the social floor. Since the enquiry was biological in intention – with medical findings a subsidiary interest – it was directed to the development of people and of families, disorder and disease being an incidental finding.

Family membership was insisted upon because by and large health is grown and it is best observed in the course of growth. One has, of course, to start from a base line and the initial medical overhaul of families in this sample indicated what the environment of families in cities – the whole social web which encompasses them – does to their physical condition. The sample was carefully picked as representative – a fair cross section of the populace. The overhaul showed slightly less than one in ten of some 1600 people examined in the first two years, to be free from disorder and disease. Today, hospital waiting lists and the seige of doctors' surgeries suggest little change since 1935 – except that today no one any longer enquires.

In the observation of the leisure activities of families it is important that the pattern should not be affected by the observer and such rules as he may see fit to improvise. Accordingly, beyond the conditions of membership, there were no rules in the Pioneer Health Centre at Peckham. Not only did the directors refrain from organising the social activities of their families, they also endeavoured to suppress the inclination which some individual members displayed to organise the lives of others. The attempt was made to keep all the facilities provided available to all. This in itself was an interesting study. The members were told that they could do what they liked and organise their affairs as they saw fit. When in May 1935 the Centre opened its doors and began to recruit neighbouring families, the first response to this dictum was hysterical. Children, fresh from the attempted discipline of the schoolroom, tended to run riot but in the course of six months, in this mixed community of all ages, a dramatic internal order grew up. The Family Health Club was devised to provide member families with leisure-time facilities which they could use as their spontaneous inclination dictated. Meanwhile the seven ages of man pursued their way. Not only were the directors able to observe; what they observed was, on every significant occasion, discussed with the families, in family consultation.

The stages of development are, of course, normally watched by the medical profession; there are birth control clinics, ante-natal clinics, maternity homes, pediatric departments and so on and so on. 'Peckham' not only turned the point of observation upside down, it also integrated many systems into one. Medical observation normally concerns itself with what is wrong and waits until the patient attends or complains. 'Peckham' was attempting to spot the character of the normal – the pathway towards the

optimum — the road to health. The emphasis fell on what went right; what was wrong was attended to incidentally.

The Peckham Experiment was a dramatic success although the outbreak of war required the temporary closing of its doors. It issued its famous report in 1942 and the book sold fifty thousand copies. After the war the centre reopened its doors and visitors poured in from every part of the world. The great virtue of the experiment was that it allowed the normal life of a neighbourhood to spill over into the new environment which the health club provided; to keep its own structure and shape; and to develop according to its inner impulse. In this anatomy, the cell was the intimate life of the family, and the consulting room kept the condition of the constituent cells under continuous review.

The 'Peckham' doctors held the view that bodily disorder tends to hold people back from activity. If a person ceased from his usual activities they looked for disorder. Much of the disorder which medical overhaul revealed was of a serious nature, specified in their reports. On the other hand many maladies were incipient or what the profession considers to be minor. Certainly 'Peckham' disclosed a vast reservoir of untreated disease. Minor maladies presented the directors with a serious problem. The Centre doctors did not themselves treat disorders but depended on the usual sickness service for this, but they had considerable difficulty in getting sickness doctors to take minor maladies seriously and to devote time and attention to them.

The great truth which the Peckham Experiment displayed was that if, in a satisfactory environment, families are left alone to develop by their own spontaneous disposition, they tend to realise order. Within this order, personal development is nurtured; the coherence of families is promoted and the life of families is integrated into their local community. This was demonstrated in the decade of 'Peckham' — when, in this one place, the nurture of children and the cultivation of families was a central preoccupation. Our affluent Western societies are so organised that the control and management of the outer environment continuously spreads its tentacles deeper into the home. The media, the schools and the government all have this effect. The school illustrates it well. It is no longer the agent of the home and the family. It devotes itself to vocational training and sets out to realise the standardised human equipment which an industrial society can employ. It happens that the material which it seeks to shape in this way is often recalcitrant, a state of refusal which is reinforced when the shape of the wider industrial world can be seen to have little relvance to the biology, not only of man, but of other species.

The whole philosophy of our times is in confusion over the biology of families. In our society there is not only extensive disease and disorder there is also extensive deprivation. It has become a cliché to talk of the deprived. The conventional remedy is to feed deprivation with things and services although an essential feature of deprivation is an inability to use what is available and a disinclination to face the social relationships which the proffered service implies. All this can be observed in many places, not least in slum clearance where the employment of considerable resources only leaves the family isolated within what should be its family. In a situation of this kind every agency is called in to remake broken people — except the one agency which is endowed with the capacity for making people — the family.

Towards the end of the last war and in the years immediately following, the future of the British medical services was under review. 'Peckham'

This months authors

Brian Johnson M.A., M.I.A. is Director of the Institute for the study of International Organisation at Sussex University. At Bucharect he was a member of the Planning and Management Committee of the Population Tribune, and Consultant to the Planned Parenthood Federation.

Duncan Williams M.A. is Professor of English Literature at Rockford College, Illinois, and Director of Research at The Farmington Trust Research Unit at Oxford. Author of Trousered Apes (Churchill Books 1971) and To Be of Not to Be (Davis-Poynter 1974).

D. Bryce-Smith B.Sc. Ph.D. D.Sc. F.R.I.C., Professor of Chemistry at Reading University, Chairman of The European Chemical Association and Vice-Chairman of the U.K. Solar Energy Society. His academic interests include all aspects of the applied sciences on society. His special interest in lead stems from an academic study of tetraethyl lead at King's College London twenty years ago, and subsequent consultancy to U.S.A. companies engaged in the lead industry. He has published over a hundred papers in scientific journals.

H. A. Waldron B.Sc. M.B. ChB., Professor of Social Medicine at the University of Birmingham. Previously he worked in industry and supervised the health of lead workers. His concern with lead poisoning originated at that time has now extended to all aspects of environmental pollution with lead. He had published a number of papers on the toxicological and historical aspects of lead poisoning and is co-author of Sub-Clinical Lead Poisoning (Academic Press 1974).

Kenneth Barlow is a Consultant Radiologist at the Ipswich Group of Hospitals with a special interest in and knowledge of radiation and community health. He was a founder member of The Soil Association. His book The Discipline of Truth — first published in 1942 and re-issued by Charles Knight in 1972, was far ahead of its time.

was internationally famous and it was my expectation and the expectation of the directors of the Pioneer Health Centre, that this experiment in health would be repeated elsewhere. I proposed to launch a second experiment in Coventry; a third was projected at Dronfield in Yorkshire. In the circumstances, Nye Bevan, when planning the future of British medicine, had to look at the path to health as 'Peckham' mapped it out. He did so and on the advice of the trustees of the Nuffield Foundation he decided that he would have nothing to do with it. He invented a National 'Health' Service which committed all the resources of the nation to sickness – as distinct from health. He was told by Beveridge that if he funded sickness services, cure would result and that as cure resulted, the cost of sickness would get less. Beveridge made a naive error. A man who has been cured of a fever, of a psychological symptom, even of cancer, does not necessarily thereby become healthy. Actually cures by the dozen were invented along with the new services. Penicillin, streptomycin, antibiotics dropped one by one into the laps of the doctors, but with the new "cures" came new diseases. The so called National 'Health' Service – now spending something like twenty times its original budget finds itself, and is generally agreed to be, short of funds.

When the directors of the Peckham Experiment and I planned a second experiment we sought a habitat suited to the potential health of the families who would occupy it. To this end we recruited several hundred wage-earning families who communally bought three hundred and fifty acres of land. We then told the city of Coventry that this association of families proposed to build a neighbourhood to accommodate two thousand families – on that land. This community would have had, as its pivotal point, a Family Health Club on the 'Peckham' lines; it would also have had the usual facilities which a community enjoys, shops, pubs and so on. The property developers behind this project were ordinary working class people. In the search for health our families were looking for a habitat for which they would be responsible and which would respond to their biological needs. If I were to say that the City Fathers of Coventry were horrified by our Family Health Club proposals, I should be overstating the case. Some of them, notably Alderman Stringer, favoured a local initiative of families but in the case of Pearl Hyde, later Mayoress, and Bryn Jones, our proposals produced a real sense of horror. They explained to me that if it were done for one, it should be done for all; that if it had been right they, (through the Labour Party), would already have done it, and so on. The City Council of Coventry was against the proposal; it saw itself as the trustee of the deprived. By inference, any body of families which was not deprived was suspect. To promote lack of deprivation, (health really does descend into terms of this kind), is unfair to those who are deprived. It is contrary to social justice as defined by these exponents.

But in biological terms, deprivation results from the frustration of development; it relates to the inability to use what is available in the environment. It has relatively little to do with possession, since people with great possessions, showing little ability in their use, are from the biological standpoint deprived. Today we concentrate our resources on dealing with the sick and deprived. How we get a people which is less sick and less deprived is no part of our philosophy. The course of events which would secure this is seen as the pathway of privilege and frowned upon. Only 'Peckham' has seriously studied the nature of health, and 'Peckham' was rejected●

Kenneth Barlow

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POPULATION GROWTH AND CONTROL

HUMAN REPRODUCTION AND SOCIETY, Derek Llewellyn-Jones. Faber & Faber, 1974. 547pp. £5.25

WORLD POPULATION, Michael Palmer. Batsford, 1974. 96pp. £1.50

The first of these books is a difficult one to review: it is big and broad and bitty; it is very good in places, indifferent or even bad in others.

Derek Llewellyn-Jones is a Professor of Obstetrics and Gynaecology in Sydney. He has written text books on the fundamentals of these subjects which have been well reviewed in the medical press. But he is far from being the pompous, self-interested, obscurantist reactionary one has come to regard as typical of the upper reaches of the medical establishment.s His virtues include humility – "attitudes to the delivery of health care need drastic revision. The 'god-doctor' of the past must be replaced . . ." – a wide social concern for a world populating itself into disaster, a warmth and respect for people, particularly women, which comes through his writing even at its most technical, and he even has a sense of humour – "The instruction to the patient should be 'Put your diaphragm in when you clean your teeth each evening.' In Australia and Britain where dental health is deplorable the slogan is even more brief, 'Put your diaphragm in when you take out your teeth.'"

By far the best part of his book is where he covers the whole question of contraception and abortion, their medical details, history, technology, effectiveness and side effects. At times perhaps the language is too technical for anyone but the specialist but that is a minor criticism. The information is all there, cogently presented, with diagrams and statistics. Above all there is no moralising or attitudinising. And there is never a feeling that he is talking of anything but living people.

His proposals for the introduction of birth control on a large scale are wise and practical. He emphasises the need to recognise the differences between societies and their social customs.s And he emphasises that the best way of reducing the need for abortion is not through pretending there is no problem or introducing legislation against it but in the provision of education and practical help in the matter of contraception. For all this his book is worth reading.

In our Aug/Sept issue we reviewed THE EVOLUTION OF MELANISM by Bernard Kettlewell. Unfortunately the book was wrongly ascribed to Richard Kettlewell. We apologise to Dr H. B. D. Kettlewell, to our reviewer and our readers for this error.

For the rest, perhaps he attempts too much. He deals with the methodologies of population dynamics, the drawing up of age-composition data, tables of mortality and standardised death rates and much more, in far too much detail.

Where Professor Llewellyn-Jones is at his best is when he is closest to the reproductive process itself. There his wisdom and his knowledge shine through: it is a pity he allowed them to be clouded by all the rest he has crammed into his book.

World Population by Michael Palmer is a very much simpler work. It is a pleasantly illustrated book of popular demography which covers the history of population growth, present trends, the possibilities of controlling that growth by contraception and abortion. Much of it is the same ground as covered in the other book, but much more simply written. It would be possible to recommend it as a useful addition to the school library if it were not for an outrageously uncritical acceptance of the most optimistic view of future food production possibilities: "It is now generally accepted that the capacity of the earth to produce food has been underestimated. Shortage of food is unlikely to be a constraint on population during the present phase of population growth . . . for an American style diet . . . the world could support a population of 47,000 million people. If on the other hand the world population was to subsist on the basic diet mainly of cereals common in Asia today the maximum figure would be closer to 470,000 million." This is nonsense, of course: energy constraints are already restricting the expansion of food production, to mention just one factor ignored in this analysis.

It is not only nonsense it is dangerous nonsense. If the figures have a familiar ring to some of us the recommended reading list gives the game away because it includes Colin Clarke's 'Population Growth and Land Use.' The baleful influence of this man – who incidentally was a member of the Pope's advisory commission when he was preparing the notorious Humanae Vitae encyclical against contraception – is frighteningly pervasive. It is an interesting reflection on our society that we have to sign forms to allow our children to be taught the fundamentals of human reproduction; that they are taught nothing about how to control that process; but that this kind of book is admitted unchallenged intos their curriculum.

Gerald Foley

THE PLANNING DILEMMA

PUBLIC PLANNING: THE INTER-CORPORATE DIMENSION, J. K. Friend, J. M. Power and C. J. L. Yewlett, Tavistock Publications, 1974, 534pp. £6.25.

Most human activities whether evolved at an individual or at a group level, from the running of a small household to the management of a big company, involve a certain degree of planning and decision making. In a way each one of us has

to become a planner and a decision maker in order to survive in today's world. When it comes to thinking of the needs and problems of a whole community the planning practice becomes a nightmare of complex decision making and an arena for competition between the corporate and private interests. Planning is a continuous process resulting from the interaction of many professional disciplines, public bodies and private interests and does not depend only upon policies pursued by a single corporate agency Quite rightly the authors point out that corporate planning is not enough. Indeed this conviction is elaborated further and becomes a dominant feature of their book.

Public planning cannot however be viewed only from the position which the authors have chosen. If we are to improve the quality of life at an urban and rural level there is need for more radical solutions, concerned with a grass-root community participation and careful evaluation of ecological factors in a long-term perspective. The book fails to take into account these two areas about which modern planners have become increasingly worried.

It is a pity that the skills, abilities and scholarship of the authors have not been used in a better way to produce something simpler, shorter and more readable. The book as it stands will benefit mostly the few planning students who are in sympathy with O.R. methods and not the average "corporate" employee and local authority planner who should try and develop more the intercorporate dimension in their work. Nevertheless the book comes as valuable addition to planning theory containing an original set of ideas and many, clear and well conceived diagrams.

Costis Stambolis

FRIENDS OF THE EARTH CAMPAIGN MANUAL. 90pp. plus 62p index of pressure groups etc. £1.25 (incl. p & p)

The Friends of the Earth should need no introduction here; it is more a surprise to be reminded that they have not been with us so very long: founded in America in 1969 and in the U.K. in 1970, their tireless campaigning has made the name seem long familiar. It is also surprising to discover how loose is the association between the various local groups and the nationals office in Poland Street. Only three limitations are placed on the use of the name "Friends of the Earth" – stick to the law (". . . if you want to throw a brick do it on your own behalf.") don't pocket the cash, and keep out of party politics. In return F.O.E. provides an information network, contacts, and copy for the back page of the monthly news-sheet "Spaceship Earth" which is printed centrally with each group's local issues on the front page. They also run a payroll service for groups employing staff.

BLACK ALERT

A fearful new ecological menace has been discovered by the Public Records Office. Researchers there are now warned not to sharpen their pencils in the search rooms in case the pencil dust settles about the place and destroys the ancient manuscripts.

from Peterborough Daily Telegraph 25th November, 1974

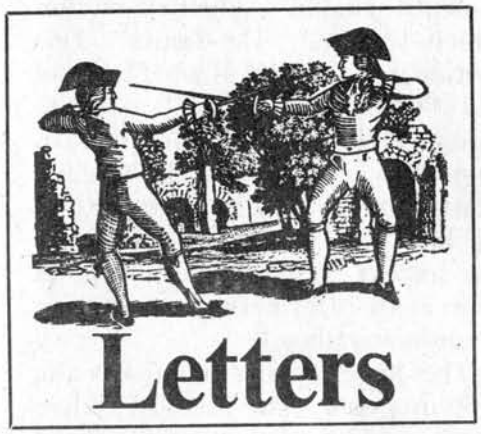
So the choice of issues, campaigns, and the responsibilities are left to the individual groups, and judging by the campaign histories outlined, they have been slogging hard and purposefully, and to no little avail. But there are plenty of pitfalls waiting for the well-meaning innocent who dreams of starting a group and joining "the fight for survival" and this Campaign Manual has been written to pass on the hard-won pearls of wisdom.

It is just what a manual should be: plain fare in a ring-bound folder and so *sensible* as to beggar that word of meaning. The original intention, before "costs got out of hand" was to include "extensive in-depth articles" in the first section which is called "The Issues". This section now consists of what I would call "quick run-downs" on Packaging, Pollution, Wildlife, etc. In some ways they serve the manual better than would a long exposition; by merely pin-pointing each issue the impact is sharpened and good sources of information are anyway given in a reading list.

The heart of the manual is the section called "The Method". Here the would-be campaigners is given plenty of friendly advice on how to organise a group and conduct a campaign. The hazy doubts most people have about such proceedures as lobbying M.P.s are cleared up and all the necessary guidelines laid out: the legal status of groups, research, public speaking, insurance . . . just about everything is covered in detail. The snags are pointed out and there is no glossing over the need for long hours of boring work or patient persuading. The advice on fund-raising and money is the least comprehensive, and perhaps for good reason – it ends with the words "So much for money – good luck, it's a jungle." This comes after some good information on how much money is needed and how to handle it when you've got it, but rather sketchy instructions for conjuring it up.

F.O.E. have always based their campaigns on thorough research, reasoned arguments, good behaviour and good manners. It is a pity the good manners are not extended to women; the writers reveal an astonishingly exploitative and patronising attitude and I quote with feeling: "If the campaign is against the pollution of a local river, tell the local press that twenty of your bikini-clad female members intend to swim in it, so that when they get out everybody will see just how filthy it is" and even worse: "If you are speaking to a wholly female audience it is wise to use examples from everyday life when discussing a subject. For example, if your subject is 'Natural Resources', it is of little use to a female audience to discuss the scarcity of mercury or uranium, when using oil or water would result in a far more personal appraisal."

Charlotte Nessim



Letters

NUCLEAR POWERS

Dear Sir,

the dangers from long lived radioactive wastes

Recent debates about the choice of reactor system in the development of a nuclear power programme has obscured the problems posed by the production of dangerous long lived radioactive wastes which have to be kept away from the living environment, some for hundreds, and some for many thousands of years.

We are concerned that production of electricity by any nuclear power plant is inescapably coupled with the production of hazardous radioactive materials and that all known methods of storing the waste require constant surveillance. The problem of disposing of them safely has not been solved despite some thirty years of nuclear technology. The conversion of liquid wastes into stable solids merely makes storage easier. It does not remove their dangerous properties. Each reactor continually produces waste for disposal and only stops when it is closed down. Apart from these wastes, the commitment to fission involves the containment of vast amounts of radioactive materials in reactors and in processing plants and in transit between plant and storage points at all times.

We have noted the Government's decision not to order the American designed light water reactors but instead to adopt the British SGHWR for its next programme of nuclear power stations and that this programme is a reduction in size on the original proposals. We were pleased when the Government announced in April this year, that the Royal Commission on Environmental Pollution was to conduct an urgent enquiry into the safety of the storage and disposal of all radioactive waste from nuclear power stations. The Government has not, however, waited for any report of these enquiries before making its decision to proceed with the nuclear power programme.

We do not think thatsany society or its Government can guarantee safety to future generations from these deadly materials for one hundred years, let alone the thousands that are involved. We cannot guarantee them against the foreseeable dangers – we know that the best intentioned men are fallible and can make mistakes; we know that men with bad intentions indulge in acts of sabotage, theft and terrorism and we also know that plutonium is the raw materials of atom bombs. Unforeseeable dangers no doubt also exist. If we continue with the nuclear power programme we shall be gaining our presen comfort by putting the safety of the future generations and their environment at risk. This is immoral and we should not allows the situation to continue.

We are convinced that there are other ways of tackling our energy problems by the development of non-polluting sustainable energy sources such as solar, geothermal, tidal, wind and methane gas. Major research and development should be concentrated in these areas.

We are opposed to the building of any more nuclear power stations while there is no absolutely safe method of disposing of the long lived radioactive wastes. We intend to give publicity to the matters so thats many more people are aware of the dangers. We shall ask the Government to pay serious attention to their responsibilities, not just for the next few years, but with full regard to their moral obligations to posterity in which all our descendants are involved.

We invite all those who share our concern to write to: Mrs. Jane Pink, 42 Vineyard Hill Road, London SW19.

KROPOTKIN ON VIOLENCE

Dear Sir,

Nicholas Gould's article on Kropotkin (August/September 1974) suffers from a partial reading of Kropotkin's works. He makes use of only three books, all written in England for an English-speaking audience and all printed by commercial magazines and publishers – *Memoirs of a Revolutionist; Fields, Factories and Workshops;* and *Mutual Aid.* As a result he overemphasises the moderate side of Kropotkin's thought – going so far as to suggest in the introductory paragraph that Kropotkin "abhorred violence".

A reading of the works Kropotkin wrote for anarchist magazines, especially across the Channel, would redress the balance and give a less misleading impression. *Words of a Rebel* and *The Conquest of Bread,* which are collections of such articles, insist on the necessity of violent insurrection to bring about the social revolution which alone can make possible an anarchist society, and Kropotkin continued to follow this line until his death.

By all means let us remember the constructive ideas of this neglected thinker but let us also remember the way in which he himself expected them to be put in to practice.

Nicholas Walter,
134 Northumberland Road,
Harrow,
Middx.

Mr. Walter does me an injustice. My emphasis in the article was deliberately upon Kropotkin's constructive ideas – his precise views on revolution are unlikely to be of great interest to most readers of *The Ecologist.* But Kropotkin's own emphasis was much the same: for example, in *The Conquest of Bread* I can find nothing about "the necessity of violent insurrection" beyond a few vague references to barricades. Kropotkin's temperament and interests fitted him to be a theoritician of *post-revolutionary* society and economics, not a revolutionary. He assumed, like almost every left wing thinker of his time, that the social revolution would involve *some* violence; but he did not dwell on the idea of violence for its own sake, as some of his professed disciples nowadays seem to do.

Nicholas Gould.

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(1) Supervise and co-ordinate on a day to day basis all of the Centre's research projects with special emphasis on maximising the output of the Centre's small scientific and technical staff and its laboratory facilities within the framework of the Centre's research objectives and available resources and in collaboration with other research bodies.

(2) Participate fully with the Founders, Trustees, Director and scientific colleagues in the development of the Centre's research programme and the expansion of its facilities.

(3) Design and operate a new research project concerned with increasing the quantity, range and biological availability of essential nutrients in staple farm produce. Initially, such a project would probably be concentrated on iron metabolism in collaboration with other research institutes.

Salary is negotiable. There is a contributory staff pension fund. Applications should be sent to the Director at the above address. Closing date 31st December, 1974.

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RAYMOND STREET,
MEIRION MILL,
DINAS MAWDDWY,
MACHYNLLETH, POWYS
SY20 9LS

THE SUE RYDER FOUNDATION
Experienced Site Supervisors and Skilled Tradesmen (bricklayers, carpenters, plumbers, electricians, decorators, floor layers/screeders) required for work in U.K. and Europe, erecting homes and hospitals for sick and disabled, and renovating older buildings. Serious, preferably single, applicants. Insurance and maintenance provided. Remuneration by arrangement. Please apply to Appointments Secretary, Sue Ryder Foundation, Cavendish, Suffolk.

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We are especially interested in engineers who are already self-employed and we would like to work with small companies or partnerships of exceptional talent wishing to be associated with a rational and novel approach to energy and resource consumption.

Contact: **Hugh Sharman**
Low Impact Technology Ltd.,
4 Lonsdale Road,
London SW13.
Tel: 01-748 2233

The Centre d'Etudes Industrielles (CEI)

ENVIRONMENTAL MANAGEMENT SEMINAR

JANUARY 27–31, 1975

This seminar was conceived by Maurice Strong, Executive Director of the United Nations Environment Programme and member of the CEI Foundation Board, and is the result of a year's concerted effort with Professor W. H. Matthews of MIT and with CEI faculty members. Environmental Management is part of the CEI's overall concept of international management education. Activities in this field are jointly funded by the Edna McConnell Clark Foundation and the CEI. Specific areas covered in this seminar will be:

- balancing economic and ecologic needs
- impact of industrial activities and products
- techniques for assessing environmental impact
- satisfying conflicting needs, e.g. those of public interest groups environmental management strategies

This seminar will be of interest to all those closely involved in environmental issues in industry, government and international organisations, in particular to:

- environmental coordinators
- project managers, development managers, planners
- national and international civil servants
- union officials
- conservationists

The seminar is organised by the CEI and will be held in its Geneva facilities. Dr. Michael Royston is the Program Coordinator. For additional information on this program please write to:

The E. A. Secretary,
Centre d'Etudes Industrielles (CEI),
4 Chemin de Conches,
CH–1211 Conches-Geneve, Switzerland

The Polytechnic, Queensgate, Huddersfield.

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Full details from The Registrar, The Polytechnic, Queensgate, Huddersfield, HD1 3DH

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Please apply with stamp for full details to:–
John S. Butter, N.D.H., Cowley Wood Conservation Centre, Parracombe, N. Devon.

LONDON SCHOOL OF NONVIOLENCE
Evening lectures and courses on the ecological, political, and spiritual aspects of life. Mondays and Wednesdays 7–9 p.m. Crypt of St. Martin-in-the-Fields, Trafalgar Square. For programme write c/o Christian Action, 104 Newgate St., London EC1.

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The Arica training system is based on the recognition that the universe works according to natural laws, as specific as the law of gravity, and that these laws operate also in each human being.
Self-realisation, in our experience, comes when we understand these laws and learn how to live in harmony with them. Before we can begin to live naturally, see the world clearly, be our essential selves, we have to clear our bodies of the tensions which keep them from moving freely and expressively. We have to remove the emotional blocks which prevent us from communicating easily with each other and clean our minds of the layers of anxiety and prejudice that cloud our perceptions of reality.
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SUNSHINE FOR SALE. We can tell you the weeks throughout 1975 when the sun should shine the most. Send S.A.E. and 30p for your list of sunny weeks. Full fee refunded if not satisfied. Apollo Weather Bureau (T.E.), 11 Aylands Road, Taunton, TA1 5BA.

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AVAILABLE SHORTLY – three acres with fantastic sea, mountain views; ideal homesite for fisherman/smallholder. One mile from sea, three from town. Planning permission for house on wooded knoll. Water, electricity, phone available. Extra land might be rented. Details from P.O. BOX 2, Westport, Ireland.

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COMMUNES

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SOME FRIENDS COMMUNITY is a community of about 10 people started by London Quaker Action Group. We are aiming for a non-violent, simpler lifestyle in the city and need 2 or 3 others to join us. Write: 128 Bethnal Green Rd., London E26 EG.

ORGANIC FARMING COMMUNITY aiming self-sufficiency now able take new members. Write: Barn House, Brockweir, Mon. Tintern 365.

SOCIETIES

GURDJIEFF, OUSPENSKY, NICOLL. If you have a real wish to participate in an established Group, write BOX NO. PD47.

ALTERNATIVE SOCIETY
provides a communication centre for all those who in many different fields are working to create the cells of a new society.
There are at every level of society individuals and groups experimenting, reaching out towards new forms of social organisation, new forms of education, new forms of political structure and new kinds of community. Alternative Society organises weekend meetings, Summer Schools and Summer Camps.
For further details contact Stan Windass, 9 Morton Ave., Kidlington, Oxford. Tel: Kidlington (08675) 3413.

CLAP. Have you paid your clap tax? CLAP, the Community Levy for Alternative Projects, is a tax on up to 4% of your gross income – minimum £1 every two months – and up to 100% of your unearned income, inheritances, windfalls et al. If you have any kind of income, please do not avoid paying this alternative tax. How else are we going to help build up and sustain a network of alternative structures for the sane transformation of society? Send 14½p in stamps for the CLAP Handbook which is a good read in its own right – if you wish, you then choose which of the projects described to support. Or does your project need money? If it's community-based, imaginative, evolutionary or whatever, send for details of how to apply Deadline for next pay-out: December 23rd CLAP Pay-out No. 3 came to £1,577. CLAP c/o BIT Free Information & Help Service, 146 Great Western Road, London W11. (Tel: 01-229 8219).

TRANSPORT ACTION GROUP exists to promote alternatives to the present mad transport system. 45 Lowerhouse Lane, Burnley, Lancs.

PUBLICATIONS

BREAD: How bad for you is white, sliced, packaged bread really? Read BREAD the book that rattles the skeletons in Britain's bread bin – from the Technology Assessment Consumerism Centre (TACC); additives (are they poisonous?); fibre (does lack of fibre give you cancer?); structure of the industry (three firms control 70% of the market); what the government should do; why wholemeal is better; how Britain could export more. Send £1.25 to P.O. Box 6, Kettering, Northants, or write to Intermediate Publishing Ltd., at 6 Calcott Street, London W8.

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CARN. A link between the Celtic nations. Quarterly periodical in English and Celtic languages published by the Celtic League £1.50 per year, from 9 Br Cnoc Sion, Ath Cliath 4, Eire.

GUIDE TO RESOURCES IN ENVIRONMENTAL EDUCATION by Peter S. Berry published by The Conservation Society (12 London Street, Chertsey, Surrey) July 1974, 20p. This is an annual guide designed for use in schools. It includes books and periodical articles, games and study kits, visual aids, etc.

TOWARDS SELF-SUFFICIENCY
Send 29p for 'First Hand: First Rate' recipe booklet for complete, well balanced, truly economical diet based on home grown, largely garden, food plants. Vegan Society, Dept. R, 47 Highlands Road, Leatherhead, Surrey.

FOR SALE

GET YOUR MINI ROCKING IN A MINI ROCKER! Childs barrel rocking chair made from small recycled oak cask. Bright cotton cushion cover. Suit ages 2–6½ years. £12 VAT, packaging and carriage inclusive. Also 6 gallon sweet casks for self-sufficiencers. £6.75 VAT and carriage inclusive. Orders to Kilderkin Workshop, Old Palace Theatre, Wells, Somerset.

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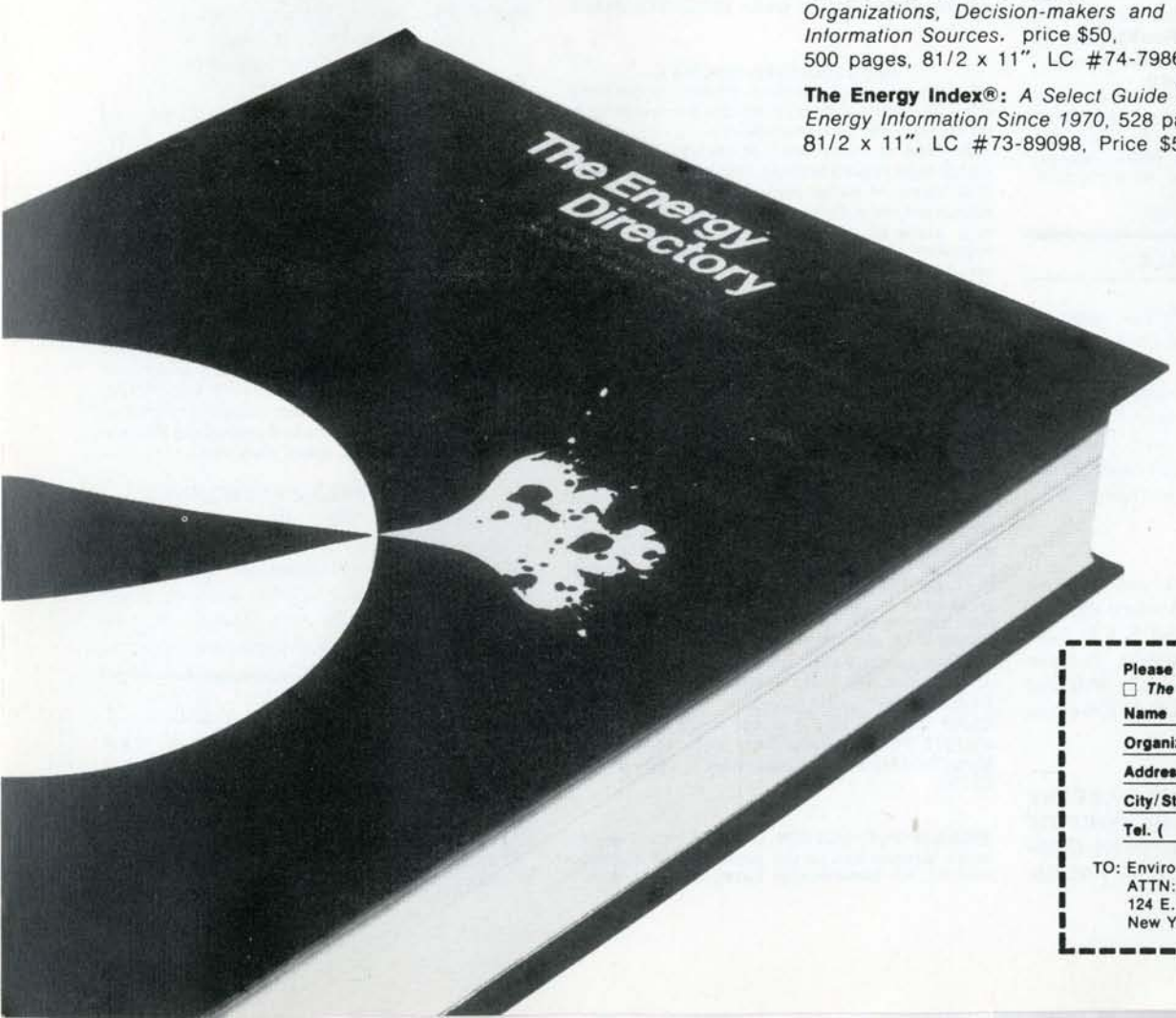

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