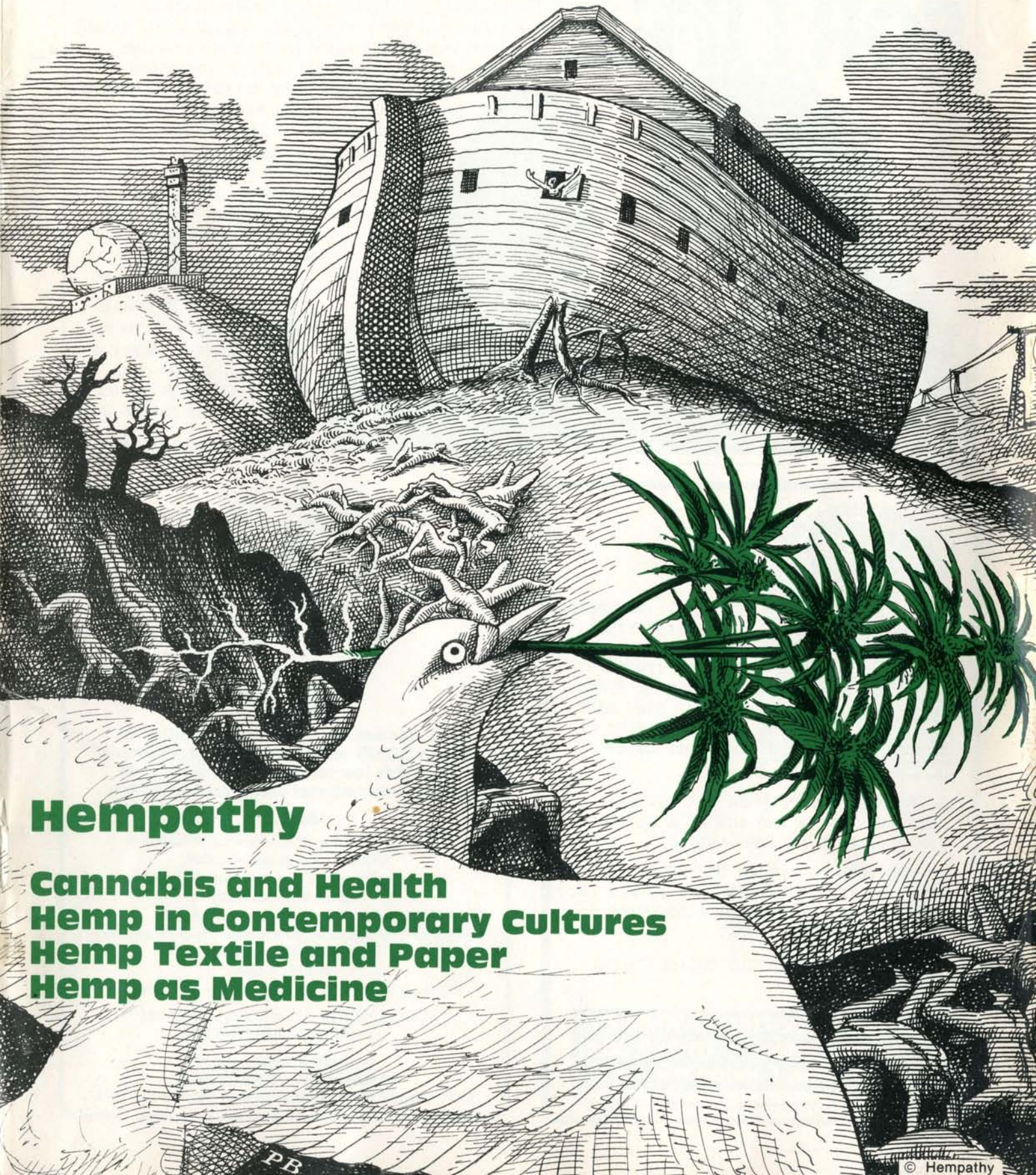


# The Ecologist

Journal of the Post Industrial Age Nos. 8/9 Oct-Nov £1.00



## Hempathy

**Cannabis and Health**  
**Hemp in Contemporary Cultures**  
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# The Cannabis Market Present and Future

By Nicholas Hildyard

H.R.4973 is the title of a new bill recently debated in the Congress of the United States. Introducing the bill, which proposes criminal penalties for officials of companies which knowingly conceal health hazards from employees or the general public, Representative George Miller of California told a congressional committee, "You will find in more cases than you wish to imagine that the very highest corporate leaders of our nation have consciously decided to conceal a workplace hazard or to market an unsafe product because they valued profit over people. And I think that kind of conduct is a crime."

Indeed it is; and, alarmingly, it is a crime which appears to be increasingly widespread. The US Law Enforcement Assistance Administration estimates, for instance, that in 1978 three-quarters of all indictments brought against corporations in the United States were for breaking anti-pollution laws or for flouting health and safety at work regulations. Yet the penalties meted out to those found guilty were derisory; prison sentences were frequently suspended and fines were not only minimal (two hundred dollars being the average for even a serious violation) but also tax-deductible. It is this imbalance in the law which Representative Miller seeks to correct. If passed, his bill will impose a stiff minimum sentence — two years in jail, a fine not less than 50,000 dollars, or both — on those found guilty of deliberately concealing industrial dangers to human health or the environment.

Some, however, argue that even these penalties are not tough enough. They point out that, in some cases, past corporate cover-ups have resulted in deaths; and that in others — particularly those involving cancer-causing chemicals — the balance of probability is that deaths will result in the future. Should not those who perpetrated the cover-up be arraigned for murder? Consider some examples:

□ In 1975, the US Environmental Protection Agency (EPA) received information that the Chicago-based Velsicol Chemical Corporation had suppressed the results of laboratory tests which showed that chlordane and heptachlor, two insecticides manufactured by the company, caused liver cancer in rats. That information resulted in six Velsicol executives being charged in 1977 with conspiracy "to defraud the United States and conceal material facts from the US Environmental Protection Agency." The indictment alleged that Velsicol's management had been told of the pesticide's dangers by its own consultants but had chosen to conceal the findings for three years.

Whether the allegations were true will never be known for the company's lawyer had the case dismissed on procedural grounds. What is certain, however, is that the history of chlordane and heptachlor has always been controversial — and that the quality of tests carried out on the insecticides under contract to Velsicol have been repeatedly challenged as unreliable.

The first indication that chlordane and heptachlor — widely used on corn crops and as household insecticides

— might be carcinogens came in a 1965 study, undertaken by the US Federal Drugs Administration. It was on the basis of this study that the 1969 Commission on Pesticides and their Relationship to the Environment — known as the Mrak Commission after its chairman, Emile Mrak — recommended that the use of both chemicals be severely restricted.

Despite that recommendation, heptachlor and chlordane remained on the market, largely as a result of tests submitted by Velsicol which purported to show that the insecticides were safe. The tests, carried out by the Kettering Laboratories of the University of Cincinnati and the International Research and Development Corporation (IRDC) of Michigan, revealed that both heptachlor and chlordane caused 'nodules' in the livers of laboratory rats but it was denied that these were cancerous. Subsequently, an independent re-examination of the livers by five pathologists (headed by Dr. Melvin Reuber, then a professor at the University of Maryland) concluded that those 'nodules' were in fact malignant tumours and that the incidence of liver cancer amongst the test rats was abnormally high. Moreover, an investigation by the EPA discovered that, during a 1966 study (which Velsicol claimed gave heptachlor a clean bill of health), the Kettering Laboratories had removed "an unknown number of subcutaneous tumours from test animals" without either diagnosing or reporting them.

In 1978, the EPA announced that it had come to an 'agreement' with the principle manufacturers of heptachlor and chlordane to phase out the use of the two insecticides. Since that decision, however, some 35 million pounds of heptachlor and chlordane have been produced in the United States and thousands of people have been exposed to these potent carcinogens. □ The dangers of dibromochloropropane (DBCP) — used against round-worm and mites — were first reported in 1958. Yet it was not until 1977, after workers manufacturing the pesticide were found to be sterile and to have reduced sperm counts, that these dangers were publically acknowledged. The 1958 study showed that DBCP caused severe shrivelling of the testicles in laboratory rats. Shell Chemicals were informed of the findings in a confidential report from researchers at the University of California's school of medicine in 1958. A study by Dow Chemicals yielded similar results. Yet, even after these reports were published in 1961, neither company saw fit to issue a public warning about the dangers of their products.

Confronted with this evidence in 1977, an executive of Occidental Chemicals admitted that he had known about the Dow study, but claimed that the company had been unaware of its significance. "I've talked to two scientists who are familiar with the work," he told an investigator, "and they both say: 'Heck, we just didn't draw the conclusion that there'd be sterility from the fact that the testicles were shrivelling up.'"

Much of the research on DBCP has been carried out at the University of California. "The professor who directed the research, Dr. Charles Hine, has throughout



his tenure at the University been a paid consultant to Shell," reports Ralph Lightstone, a lawyer for the California Rural Legal Assistance Programme, who testified before the congressional hearings into Miller's Bill. "By his own admission, during those DBCP research years, Shell directed his research priorities. Meanwhile Shell has been making annual 'gifts' to the University for toxicological research. The gifts request that Hine oversees the research."

Shell, who funded the research on DBCP through a series of twenty-seven grants to the University, made no bones about the results they expected. "We are interested," wrote W. E. McCauley, an executive for the company, "in the development of data to support the use of Nemagon Soil Fumigant (DBCP)."

Small wonder that when research in the early sixties revealed that DBCP residues persisted in the leaves of orange trees which had been sprayed with the pesticide, no experiments were undertaken by Hine and his team to see if DBCP was present in the fruit itself. Indeed it was another ten years before that research was undertaken. Alarmed by a 1977 Canadian report that DBCP residues were common in root crops, the Californian Department of Food and Agriculture conducted a series of tests on fruit crops which had been sprayed and found they were similarly contaminated.

"In every crucial respect," Lightstone told the Miller Committee, "the researchers at the University of California failed to carry DBCP testing to its logical conclusion. The one thing that has not failed, however, is the continuous flow of money from the pesticide manufacturers to the University and its researchers."

□ According to company files, Hooker Chemicals knew about the dangers of Love Canal, a chemical waste dump which leaked in 1977 poisoning a whole community and leading to the evacuation of some three hundred people (See *The Ecologist*, December 1979), years before the disaster eventually occurred. It has also been discovered that Hooker's top management knowingly authorized plants elsewhere to ignore pollution laws; that the company falsified test results on factory inspections; and that incriminating data was hidden from the authorities. According to *The New York Times* a Hooker plant in Lathrop, California, let pesticide wastes seep into the ground, knowing that they were polluting local wells: "The plant's chief environmental engineer warned repeatedly that this violated state water quality laws but concluded that it would not be 'wise' to point this out to the State. He salved his conscience by noting this to be an 'omission rather than an outright falsehood'."

On another occasion, a Hooker plant at White Springs, Florida permitted fluoride emissions far above the permissible level. "This was a money-saving move approved by the company's officers despite warnings by the Florida plant manager that pollution regulations would be violated. The plant also changed procedures temporarily to obtain pollution test data showing compliance, then switched back to its dirty ways."

Whilst investigating a compensation claim against a major asbestos manufacturer, Dr. Barry Castleman came across a cardboard box full of letters dating back to the 1930s. The letters — dubbed *The Asbestos Pentagon Papers* — revealed a concerted and deliberate attempt by the asbestos industry to prevent its products being regulated. Representative Miller takes up the story: "By the early 1930s, officials of the asbestos industry had been warned that the inhalation of asbestos dust

could cause asbestosis, a serious lung disease. On October 1st, 1935, the President of Raybestos-Manhattan, one of the nation's largest asbestos producers, wrote to his counterpart at Johns-Manville, and I quote, 'I think the less said about asbestos, the better off we are.' Johns-Manville's President replied: 'I quite agree with you that our interests are best served by having asbestosis receive the minimum publicity.'

Throughout the 1930s and 1940s, numerous medical and scientific journals addressed the health problems caused by asbestos. Death rates from lung cancer amongst asbestos workers were found to be nine times that of the overall population. An asbestos worker who smoked had ninety times the chance of developing the disease as the average non-smoking person. Mesothelioma, a rare lung illness among the general population, occurs with disturbing frequency among asbestos workers.

The asbestos industry would have you believe that its leaders were unaware of these health problems, and also that they took precautions to minimize the risk to employees when they became aware. That simply is not the case. Instead, the asbestos industry rejected many investigations into the relationship between asbestos exposure and illness, and ignored warnings, even from their own medical advisors. In addition they neglected to tell workers and purchasers of the potential hazards which studies had disclosed.

In 1952, the Johns-Manville medical director, Dr. Kenneth Smith, had urged his superiors to place a warning label on asbestos products; his plea was ignored. Four years later, Dr. Smith urged the Asbestos Textiles Institute to undertake a study of the relationship between asbestos exposure and disease: after a year of consideration, the study was rejected, partially because 'there is a certain feeling amongst certain members that such an investigation would stir up a hornet's nest and put the whole industry under suspicion'."

Few political commentators have any illusions that Miller's Bill will ever reach the statute books. That in itself is a sad indictment of the age in which we live. Indeed, it is no coincidence that I have chosen to write an editorial about cover-ups in an issue which deals primarily with the arguments for legalising hemp. For when a society considers a gentle rap over the knuckles to be just punishment for those who deliberately market products they know will cause death or injury to thousands of people (not to speak of massive environmental degradation) then it seems to me that its values are sadly distorted. The more so when that same society metes out jail sentences to those who cultivate a weed which all the evidence suggests is both harmless to humans and beneficial to the environment.

Indeed, as the contributors to the Hemp section of this issue point out, the advantages of legalising hemp are enormous; if grown for paper production, the plant could help cut timber imports into Great Britain by half; as a medicine, cannabis has been proven more effective for certain diseases than synthetic drugs and infinitely less harmful; and the continuing criminal penalties on its use as a recreational drug have not only brought the law into disrespect but also handed organised crime a market on a plate — with disastrous consequences.

Hempathy — the title chosen by the authors of our Hemp section — is not a word I found particularly attractive when I first heard it. Somehow it seemed clumsy. It does, however, conjure up a goal to which most of us in the ecological movement subscribe; that of a more humane society. And certainly I would prefer to see 'hempathy' defined in the Oxford English Dictionary than 'cover-up'.



# An Outline for a U.K. Hemp Strategy

by  
John Hanson

Hemp has played a fundamental part in the histories of many peoples. Indeed, Carl Sagan in the *'Dragons of Eden'* speculates that the cultivation of hemp may well have led to the invention of agriculture, and thereby to civilization.<sup>1</sup>

In earlier times, throughout many civilizations, hemp was an important source of medicine, food, clothing, shelter and communication.<sup>2</sup> Herodotus, Homer, Ovid, Pliny, Virgil, Livy, Martial, Gallien and many other writers all comment on the extensive uses in which hemp was employed.<sup>3</sup> Indeed, until the early 1900s, hemp was the most widely grown and easily cultivated plant, with greatest diversity of use, throughout the world.<sup>4</sup>

1. 'In defence of the Pygmies, perhaps I should note that a friend of mine who has spent time with them says that for such activities as the patient stalking and hunting of mammals and fish they prepare themselves through marijuana intoxication, which helps to make the long waits, boring to anyone further evolved than a Komodo dragon, at least moderately tolerable. Ganja is, he says, their only cultivated crop. It would be wryly interesting if in human history the cultivation of marijuana led generally to the invention of agriculture, and thereby to civilisation. (The marijuana-intoxicated Pygmy, poised patiently for an hour with his fishing-spear aloft, is earnestly burlesqued by the beer-sodden riflemen, protectively camouflaged in red plaid, who, stumbling through the nearby woods, terrorize American suburbs each Thanksgiving.)' Carl Sagan's *The Dragons of Eden*. H & S London 1977.

2, 3. 'Besides the use formerly made of Hemp, for cloth, thread and cordage, it was also the material of great other works, for which there was a very great demand, such as fishing-lines and nets, hunting-nets and gins (Pliny li.xix.c.9) . . . Packthread, girths, ladders, bridges, trowsers, cloaths, helmets, bucklers, armour, urns, baskets, cabling and tackling for ships, etc., as may be seen in Aulus, Gellius, Columella, Cato, Hesychius, Pliny, Titus Livius, Xenophon, Cinegius, Pollux, Catullus, Aetius, Paulus Aeginetus, etc. Since that time, have we not still extremely multiplied the uses of it, by paper and cartoons, the consumption of which is so very great?'

M. Marcandier's *A Treatise on Hemp*. London 1764. All the uses, and others, are in the classical sources mentioned, quoted chapter and verse in this superb work.

4. 'The hemp plant is the most widely diversified and, commercially and industrially, the most important plant in Europe. Hemp fiber is acknowledged to be the standard fiber in the world; and, properly manipulated, it is adapted to a much wider and more diversified use than any other fiber known. The hemp plant is the most simple and the most widely adapted to cultivation in all climates, the most susceptible to the manipulations of chemical and mechanical processes, and the most universally adapted to the production of fine, strong fibers for the widest character of products, from coarse, strong cordage to threads and yarns for the finest linens, lawns and laces . . .'

S.S. Boyce's *Hemp*. New York 1900. Another work of vision.

By this time, the mechanisation and centralisation of the textile and wood-pulp paper industries,<sup>5</sup> coupled with the proscription of the plant by the most powerful trading nation in the world, led to hemp's rapid decline from it's pre-eminent position in human culture and commerce.

The United States of America's Marihuana Tax Act of 1937 was engineered by a powerful clique of vested, self-perpetuating interests ranging from government departments to the alcohol, tobacco, pharmaceutical and wood-pulp lobbies in the U.S. Administration.<sup>6</sup> These baleful interests, now reinforced by international treaties and 'censorship of morality', persist to the present.

5. 'As household industries, hemp and flax were successfully grown, the fibre prepared and spun and woven in the United States up to 1825 to 1850; but from this time these industries languished and gave place to a cheaper, coarser but more readily manipulated product. The cotton-gin, and the greater facility and more ready adaptation of cotton to modern inventions, and improvements of spinning machinery left the older industry of hemp growing and manufacture far behind in the race.' See footnote 4.

'The first patent for the chemical wood-pulping process was granted in 1854 . . . The obvious fibre for America to exploit was wood. Not only was this present in vast quantities but there was also still a need to clear forests for farming. If the clearing process could be a profitable venture in itself, this would be a strong incentive . . . The Library of Congress found that 'while paper in volumes three or four hundred years old is still strong . . . ninety-seven per cent of the books of non-fiction printed between 1900 and 1939 will be useable for less than fifty years.'

Cannabis Research Foundation of Australia 1976.

6. 'By using the Freedom of Information Act, we have discovered that the reefer-madness hysteria of the early 1930's was nothing but a hoax perpetrated on the American people in order to take hemp out of competition with synthetic and other patent industries. During the years 1930 to 1935 four synthetic textile associations sprang into existence. In 1977, as a result, America imported more than 623 million dollars worth of paper and other products once made from home produced hemp.'

G. Galbraith's *Kentucky Marijuana Guild*. Lexington 1979.

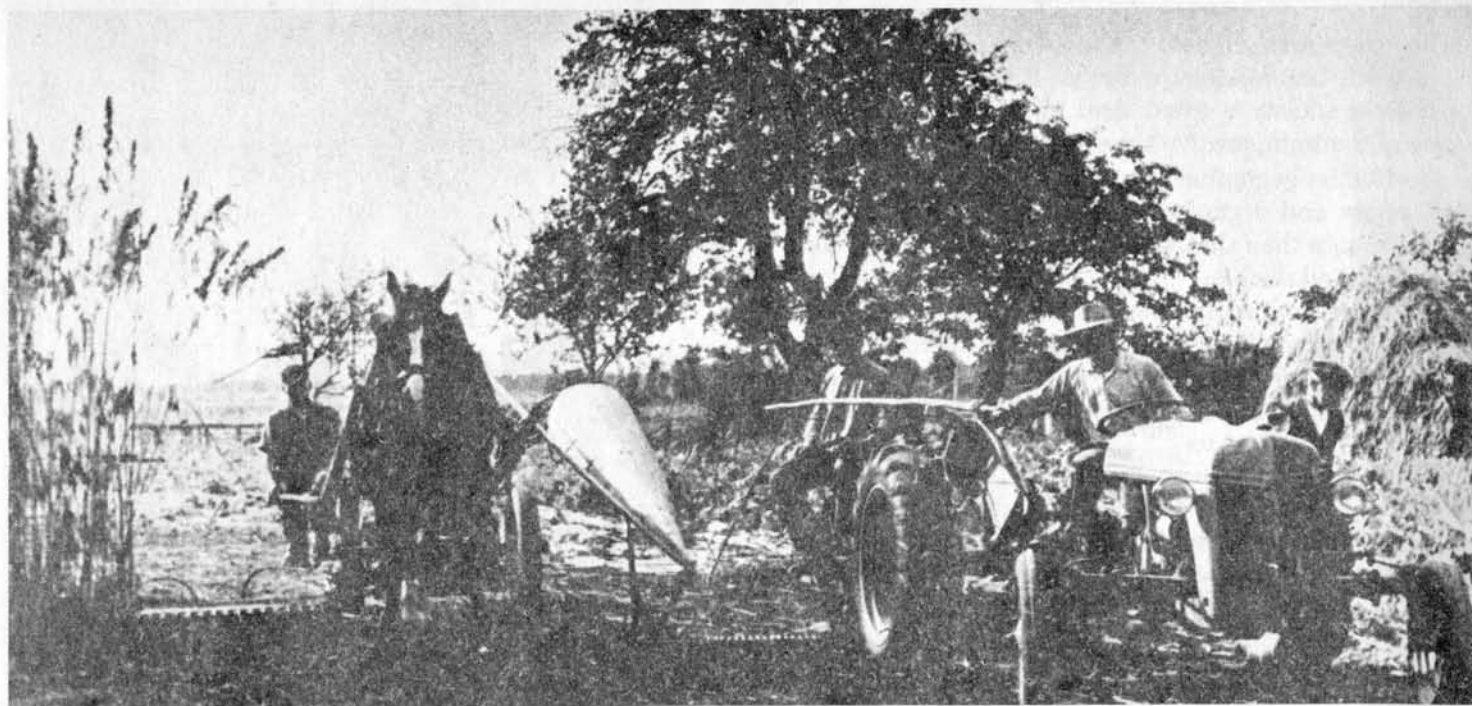
7. 'Such are the political relations of Great Britain, and such is the unjust, as well as unnatural, alliance of the Continental Powers against our country . . . that I beg leave to call the most serious attention to the cultivators of our soil to the growth of hemp . . . Whilst our properties, our lives, and (which ought to be more dear to us) the freedom and glory of our country, depend on the superiority of our navies, this subject should not for a day be neglected.'

Lord Somerville. London 1808.

'Hemp is now a strategic war crop. It is needed for making strong, durable twines and ropes, formerly made of fibers imported from the Philippines and the Netherlands East Indies . . . By growing hemp in 1943, farmers can serve their country and also have good prospects of profit for themselves.'

Farmers Bulletin No. 1935. U.S. Dept. of Agriculture. Washington 1943. (Pearl Harbour temporarily restored the truth)





Hemp Harvest in France circa 1930.

But in times of crisis and unrest,<sup>7</sup> of declining trade and affluence, of increasing unemployment and social entropy, hemp again offers a powerful aid to the re-establishment of individual independence<sup>8</sup> and national survival — a means to increase the quality of life rather than the mindless and obscene gross national product.<sup>9</sup>

In outlining a hemp strategy, the ecological and social aspects, though briefly considered separately, will be found to complement and reinforce the economic argument. The sum of these, as with the strands of a rope, will be even stronger than its separate parts.

### Ecology

At present rates of world consumption timber is likely to disappear before petroleum by the end of this century.<sup>10</sup> Already, the depletion of forest cover, particularly tropical moist forest, could now account for the irretrievable loss of a thousand species of plant, animal

and insect life *each* year, and a growing imbalance in the earth's atmosphere.<sup>11</sup>

The U.K. imports over ninety per cent of its timber requirements, some 40 million cubic yards per year of wood and wood products, equivalent to ten per cent of the world market at a cost of £2,370 million in 1978. Some half of this is in the form of pulp and paper.<sup>12</sup> This in spite of using some 40-50 per cent of recycled material. It is clear therefore that any saving in timber use would have, by example as much as in practice, a steadying effect on forest depletion.<sup>12a</sup>

We also import some 500 thousand tons of mixed textile fibres each year, at a cost of £461 million in 1977.<sup>14</sup> These, include a high percentage of shoddy, non-bio-degradable fibres, produced mainly from fossil fuels. Hemp, possessing the longest, strongest natural fibres, capable of adaptation to a wide and diverse manufacture, could again assist in the conservation of non-renewable resources.

8. 'If the people of the country apply themselves to the cultivation of Hemp, and carry to perfection the methods of preparing it, what resources will they not find, in employments so profitable, and at the same time so easy? For to consider only its most common qualities, it must be acknowledged, that it is a commodity absolutely necessary. The use of it extends to all the purposes of commerce and of life.'

See footnotes 2, 3.

9. Gross and obscene is an understatement in describing the escalating production of armaments, nuclear weapons and technology, that swells our exports to less 'developed' countries. That our Prime Minister should exhort those unemployed to join an arms race that has quadrupled since 1945 is beyond belief.

10. 'If present patterns of exploitation persist in tropical moist forests, much virgin forest is likely to have disappeared by the end of the century, and much of the remainder will have been severely degraded. The tropical moist forests are believed to contain between 2 and 5 million species.'

N. Myers' *The Sinking Ark*. London 1979.

11. 'In 1974 a gathering of scientists concerned with the problem hazarded a guess that the overall extinction rate, whether known to science or not, could now have reached 1000 species per year.'

'A number of scientists believe that widespread clearing of tropical moist forest might affect climatic patterns in temperate

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zones . . . could start to reflect greater solar heat than before (the 'albedo effect'), and lead to changes in global patterns of air circulation, wind currents and convection processes. Secondly, this could contribute to a build-up of carbon dioxide in the earth's atmosphere. The consequence could be severe.'

See footnote 10.

12. 'U.K. consumption is forecast to increase by about 50% by the year 2000 (to 55 million cu. m.), and to 90% by 2025 (to 75 million cu. m.). Pulp, paper and panel products are expected to be the main growth sectors.'

CAS. Strategy for the U.K. Forest Industry. Reading 1980.

12a. By way of rebuttal to the technotic proposition (A Strategy for the U.K. Forest Industry), that planting some five million acres of predominantly conifer plantations would enable the U.K. to become about 26% self-sufficient by 2025 in timber; some three million acres under hemp would immediately provide more than 50% reduction in timber imports plus one and a half million tons of textile fibres. This could amount to import saving in excess of two thousand million pounds alone, each year. The Centre for Agricultural Strategy were unable 'to undertake what would be a comparatively small project in case this jeopardises our ability to undertake a larger project,' when we requested them to undertake a study of hemp earlier this year.

14. Department of Trade. The tonnage is estimated on cost. Wool tops, all yarns or fabrics are not included.



## Social

The exemption of hemp, the plant and its derivatives, from the Misuse of Drugs Act 1971<sup>15</sup> would in itself save society a great deal of misery, alienation, police and administrative time and cost. It would allow us to effectively combat the truly massive problems of hard drugs and organised crime. No law that creates more damage than that which it proscribes is tolerable to fair-minded people.

The staggering social costs and despair beyond belief caused by alcoholism<sup>16</sup> and millions of habit-forming, 'official' tranquillisers are no way to alleviate the dull routine and stultified sense of worth and purpose which grows daily amongst us.

All profitable, small-scale farming, encourages self-sufficiency and decentralisation. Rural re-population — with the means and ability to support small-scale industries and co-operatives, where people have an identity, a sense of place and purpose to create a decent, meaningful life within the integrity of their biological resources — can be more readily achieved, and sustained, if hemp is again included in our agriculture.

## Economic

Though a whole range of circumstances, one might say industrial accidents, have reduced the commercial cultivation of hemp to about one and a half million acres world-wide today,<sup>17</sup> its two principal existing uses, textile fibre and paper, can still, with proper management, provide products of the highest quality and competitive cost.

Hemp rewards diligence, and to achieve the almost exponential increase in value that care and husbandry bring, by the increase in quality and subsequent market price, it follows that small-scale farming and production, under wide-spread co-operatives, is a more individually satisfying, and universally rewarding, method of cultivation and manufacture.

15. Hemp cultivation for industrial purposes is specifically exempted from international control. The 1961 U.N. Single Convention on Narcotic Drugs (Article 28, Section 2), states, 'This convention shall not apply to the cultivation of the cannabis plant exclusively for industrial purposes (fibre and seed) or horticultural purposes.'

Under U.K. law, however, the 1971 Misuse of Drugs Act, no such exemption is included, although the Home Secretary is entitled to issue licences for cultivation. So far the only application, applied for under Sections 6, 7 and 28, has been refused, but several have been given for forensic and research purposes.

16. 'The addiction to drink costs the U.S.A. an estimated 25 billion dollars per year. In Britain, admissions into hospital of alcohol-related cases have increased twenty times in the last 25 years. The spread of alcohol into the Third World has been fast... causing one third of all road fatalities in Zambia, up to two thirds in Venezuela plus half of all cases of rape, 85% all cases of homicide and 13% of child abuse... in Chile 30% of the medical budget... in Yugoslavia half the male admissions into hospital. Excessive drinking can have a special impact where nutrition is poor. It can lower resistance to disease, cause mental retardation if large amounts are consumed during pregnancy, and increase the tendency to suicide. It is related to the degree of exposure to alcohol and not something innate in the individual.'

W.H.O. Report. Guardian. 10.1.79.

17. 'For example the pharmaceutical industry is competitively engaged in the design of drugs euphemistically called tranquillisers. Large sections of the populace are semi-addicted to their regular use. Technological medicine actually sponsors sickness by deliberately



Harvesting by hand in France c. 1930

In both the growing and processing of the crop, particularly into paper products (though also into textiles, ropes and twines,) substantially less land,<sup>18</sup> machinery, energy inputs and capital are required than either timber and the wood-pulp processes,<sup>18a</sup> or the majority of other fibres and their manufactures.<sup>19</sup>

reinforcing an increasing demand, in an already morbid society, for the role of patient.

It is a well-known sick joke among psychiatrists that patients on tranquillisers can be distinguished from others in a hospital waiting room by their appearance. The patients tend to have mask-like faces, their movements are slow, they may walk with a stamping gait, they may dribble and their speech may be retarded. Tranquillisers can also produce a condition called Akithesia, where the patient's body is continually uncomfortable and where it is difficult to keep his limbs still. They may also cause both male and female breasts to lactate, they can create sexual dysfunction and, most serious of all, they can create permanent and untreatable damage to a part of the brain and spinal cord...

Dr. Kit Pedler's *The Quest for Gaia*. London 1979. Essential reading.

17(a). F.A.O. Production Yearbook 1970.

18. 'Every tract of 10,000 acres which is devoted to hemp raising year by year is equivalent to a sustained pulp-producing capacity of 40,500 acres of average pulp-wood lands.' (This calculation is based on raw materials per acre of .55 ton of wood (.37 cord), and 2.5 tons of hemp hurds, per year. Since the current U.K. growth is less than the equivalent of .2 tons per acre per year of wood, and allowing only 2 tons per acre per year of hemp hurds, this proportion would seem to be ten to one in favour of hemp. This might be even higher when one considers the paper yields from each raw material, to say nothing of the textile fibre, quality of end products, reduced environmental impact, worthwhile employment, etc.)

Bulletin No. 404. U.S. Department of Agriculture. Washington 1916.



Crop yields in the U.K., though dependent on seed, soil, aspect and preparation, could average 2.5 tons of air-dried stalks per acre.<sup>20</sup> After harvesting, water-retting,<sup>21</sup> and machine-breaking (the separation of the fibre from the pith, bark and stem), the line fibre will amount to approximately half a ton, and the remaining short and broken fibres, pith, bark and stem, collectively called hurds, approximately 2 tons.

The quality of the long, line fibres, achieved by degree of careful preparation, dressing and treatment, will determine its end-use, i.e. rope, fishing-nets, string, sacking, canvas, linen, lace, voile, etc., and consequently, its market value. This could range from £300 to £1200 or more per ton,<sup>22</sup> according to length, fineness, texture, lightness of colour and strength.

The remaining hurds, containing some 5 to 15 per cent short and broken fibres, provide strong, durable paper and, depending on the type and quality required, will give yields of 30 to 60 per cent to the paper-maker.<sup>23</sup> Its market value, dependent on colour, amount of fibres and, particularly, absence of dirt and foreign matter, is between £60 to £600 per ton.<sup>24</sup> Both line fibre and hurd estimates are based on providing sufficient quantity of 'throughput' to the particular production process,<sup>25</sup> as much as market fluctuations, availability and quality.

The gross profit per acre, not including seed, its oil and cattle-cake potential, or the current E.E.C. subsidy of about £60 per acre,<sup>26</sup> must range between £150 to £1000. The wide estimates reflect not only the degrees of quality which can be obtained, particularly in the line fibre, but also the amount of care and diligence employed. For this reason, a vertical combine of small-

scale farmer and producer interests, joined as a co-operative and capable of sustaining themselves and their local community with useful, interesting work and artefacts of high quality, is the most profitable way to produce hemp.

## Conclusion

By its versatility, diversity and nature hemp provides us with a powerful symbol and practical means to achieve a post industrial renaissance in Great Britain.

Mankind is massively sick. The whole planet is ailing as a result. Hemp embodies both a weapon and a cure — a natural remedy of impressive pedigree — against the cancer of teknosis<sup>27</sup> and the politics of pollution. We must overcome these evils, or perish. To quote John Biram:

"For disastrous consequences, no historical phenomenon has equalled scientific technology supported by governmental or industrial wealth. By its power all normal structures in the human, animal and plant world are being destroyed. Neither has any religious belief — Judaic, Christian or Muslim — nor any philosophical system had so far-reaching an influence as modern scientific theory.

"There is a war now in progress between scientific technology and wealth on the one hand and, on the other, civilization and the biosphere in which technology is currently proving victorious. In the phrase of the geologist E. Suess (1885), 'the collapse of the world is what we are witnessing.'

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18(a). 'These industries are large-scale and capital intensive. They have a great environmental impact in that they consume large amounts of wood, water, energy, chemicals, etc., produce large amounts of pollutants, effluents and solid wastes. They lead to large-scale alterations of eco-systems, forests and waterways.' See footnote 5.

19. 'Since the more complete development of the German textile industry... the spinning of hemp and flax has made rapid strides, and the demands for hemp of a character to take the place of flax, because a fine hemp fiber can be more cheaply and economically prepared than flax, is rapidly increasing. At no time has it been forgotten that the linen fabrics of hemp and flax are the more desirable.' (Cotton needs more working, must be spun, and is coarse in comparison).

'The chemical composition of hemp presents some feature peculiar to the plant. Grown for fiber, there is nothing in the product removed from the hemp of much special value, compared with plants grown for seed. In cotton, corn and other grains the seeds carry away very large quantities of plant food. The tendency of all cultivation is to produce fruit at the expense of weed. For fibers the reverse is the aim.'

'An acre of cotton should give a yield of five hundred pounds of lint... Flax yields but three hundred to four hundred pounds of fiber per acre, while hemp gives 1,500 to 2,000 pounds.' See footnote 4.

20. I am, cautiously, taking only half of the world average rate. (see footnote 17a).

21. 'Like flax and ramie, the two other true fiber-bearing plants, hemp has its fiber in a heavy bark or rind, firmly massed and bound together by a resinous gum of great consistency, not soluble in The Ecologist Vol. 10 Nos. 8/9 Oct/Nov. 1980

water, but readily yielding to putrefactive fermentation and to alkaline and saponaceous solvents, yielding a soft, white, silky fiber adapted to the production of the finest threads, linens, lawns and cambrics. Like the pure fiber of all plants, its natural colour is white, and it is only discoloured by the imperfect practices of cleansing it from its gums and extraneous surroundings.' (called retting).

See footnote 4.

22. Cotton is worth about £1,000 per ton, wool about £2,000, in a similar state.

23. Whilst the yield (ratio of dry raw material to finished paper) was only 30% for 'a No. 1 machine-finish printing paper', one could expect double this return for most newsprint. Wood-pulp gives about a 40% yield. (see footnote 18).

24. Though French hemp-farmers are currently selling whole, unretted hemp stalks at the equivalent of £45 ton, a British cigarette-paper mill is paying £600/£700 for cleaned, high fibre content, hurds.

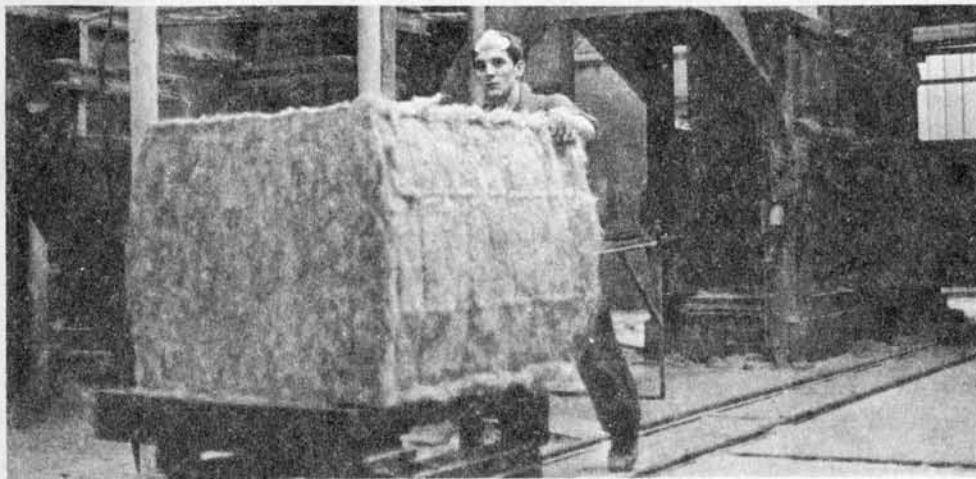
25. Carried out widely, but on a small-scale, the cultivation and processing into textiles and papers of hemp will ensure a higher quality of products, less environmental damage and a greater benefit for all. Some adaptation of machinery, and reduction in scale, perhaps a recycling of earlier, now dormant plant, is feasible. In both paper and textiles, less mechanical processes are required.

26. Who needs a subsidy? Particularly from the E.E.C. when a French co-operative claims hemp is five to seven times more profitable than corn! (see footnote 24).

27. John Biram, Teknosis, London 1978.



# FRENCH HEMP CULTIVATION



Hemp low fibre for paper mills — France 1980.

Hemp, *Cannabis sativa*, has long been a crucial fibre crop in France. During the last part of the 19th century French farmers were cultivating 176,000 hectares for the production of cloth, both fine and coarse, as well as rope. The commercial hemp trade was however nearly destroyed in France as in other countries by the development of artificial fibres, importation of cheap vegetable fibres (jute, sisal, cotton) and the impact of the criminal law.

The trade has recently taken a new turn, with the exceptionally strong hemp fibre being used to produce high quality paper, in particular cigarette papers. In 1968, for instance, France produced 233 hectares of hemp for textile fibre and 3181 for paper. No hemp is grown commercially for textile fibre now in France, but in 1978 10575 hectares were being cultivated for paper and seed. (We have heard that some small farmers are still cultivating for their own fibre use in at least one French area.) Job Cigarette Papers, one of the world's largest manufacturers, use large quantities of hemp, as do Robert Fletcher and Sons, a Manchester cigarette paper mill owned by the Imperial Tobacco group. Robert Fletcher and Sons used to recycle hemp cloth for some of their fibre requirements and bought up large quantities of hempen German concentration camp uniforms after the 2nd World War for this purpose. They now import their hemp ready processed from a large farming and processing hemp co-operative in Bar-sur-Aube, South of Paris, which had 2300 hectares under cultivation in 1978 and has increased production since then.

In order to grow hemp, farmers must obtain their seeds from the National Federation of Hemp Growers, which has developed seeds low in THC content, and they must inform the Ministry of Health and

Agriculture. They are also required to obtain a contract from the processing mill which separates the long strands of fibre on the outside of the stalk from the woody interior. Apart from the co-operative of relatively rich 'agrobusiness' farmers mentioned above, only one such mill exists in France, which is owned by de Mauduit, a subsidiary of the US multinational Kimberley Clark. This factory is able, with expensive machinery, to process huge tonnages of hemp for their own paper mills and those belonging to other companies. They thus effectively control the market, paying farmers a paltry 435 francs a ton for their baled stalks and reselling this material for up to 2500 francs a ton. It is therefore hardly surprising that both Kimberley Clark and the Bar-sur-Aube co-operative guard their processing secrets well. When we requested to look around the mill, permission was refused. The Bar-sur-

Aube co-operative manager stated explicitly in his refusal that he was concerned about the possibility of English competition on the market, since he exports 20 per cent of his hemp produce to England. (Forty per cent goes to Spain).

The present situation with the industrial hemp market is a remarkable example of how the economics of scale and multinational business investment can deprive people of control over their environment. Hemp is a fibre which can be produced on a relatively small scale for the production of high quality cloth and paper. Highly capitalised industry has developed a technique of processing and utilising the plant which disregards its textile potential and which requires such huge sums of investment that no small operators can possibly afford to break the effective monopoly. Serious attempts are being made to widen hemp's usage in paper; one of France's largest paper companies which manufactures the paper on which Paris Match is produced is seriously considering changing over part of its production to hemp to cut back on its Canadian wood import bill; wrapping paper manufacturers are also thinking of mixing in hemp with other fibres. These are all extensions however of large scale investment techniques. To change this, what is required is an availability of small scale machinery, principally for separating the fibre and weaving, as well as the lifting of UK criminal sanctions on cultivation, so that people, be they farmers or out of work textile workers, can have a say in this industry.

Tim Malyon and Anthony Henman



Hemp harvest circa 1930. France.



# Cannabis and Health

by

Professor James Graham

The laws against Cannabis are ostensibly to protect society from a dangerous drug. Is the drug dangerous? Does society need protection?

Strains of hemp (*Cannabis sativa*) contain a psychoactive cannabinoid called THC. Cultivation or possession of the plant or its products for use as a leisure drug is forbidden but the law is widely flouted. Is it justified in the light of recent research findings?

Cannabis is the generic name for hemp, the plant having been described by Linnaeus in 1753 under the title of *C. sativa*. Most taxonomists subscribe to the notion that there is only one species and at least two chemovariants. The controversy is not without practical importance in the United States of America where the wording of the laws which control the use of dried herbal cannabis (marihuana) as a leisure time drug refer specifically to *Cannabis sativa*. A favourite device of defence attorneys in such cases is to challenge the prosecution to prove that the material in question is in fact *sativa* and not one of its cousins. Our lawgivers in the U.K. have been more lucky or more astute and refer only to cannabis in generic terms.

Hemp is a vigorous bushy green plant, usually mono-sexual but on occasion dioecious; if given good conditions and overwintered it may attain fifteen feet in height but is usually cultivated in close rows and harvested as an annual. All strains of the plant contain variable amounts of a mixture of characteristic compounds called cannabinoids. Several of these, principally  $\Delta$ -tetrahydrocannabinol or THC affect the mind; all of them affect the body. The two strains of hemp are those plants grown commercially for bast fibre and for seed (neither of which is controlled by law) which contain little or no THC; and those strains grown illegally as a source of psychoactive drug and which contain variable amounts of THC. The plant grows more or less world-wide as a weed and is not likely to be eradicated despite periodic official action. Cannabinoids are highly soluble in fat and poorly in water; they are readily absorbed as particles from smoke, about half of the initial content of a smoke being lost, or when eaten ('hash cookies'); and only slowly cleared from the body in the urine. Psychoactive THC is rapidly transformed to inactive compounds but clearance of the metabolic products in the urine is very slow. It may take a week or longer for a single dose to disappear entirely and accumulation from frequent indulgence seems inevitable. Cannabinoids are concentrated by the plant and

secreted in a resinous exudate from small glands. These are found in increasing numbers as one proceeds on the surfaces of the larger older and coarser leaves up the stem to the small newer leaves and in great profusion on the bracts which protect the inconspicuous flowers. This substance is cannabis resin and its ecological function is obscure but has been attributed to a defence against hot dry air which might wither the delicate green parts of the plant. The consequence of this pattern of distribution is that dried leaves are relatively weak in THC (notionally one per cent); dried fruiting and flowering tops are stronger (say two per cent); a crude preparation of the resin prepared by drying the tops, powdering and finely sieving the mass (hashish or 'hash') is stronger still (say five per cent); and an extract of either of these sources made with a suitable solvent ('hash oil') is strongest of all. The latter product is referred to officially as liquid cannabis and is an increasingly popular vehicle for the smuggling of cannabis through customs. This graduation in potency is to an extent equated in law with harmfulness and reflected in the classification of cannabinoids in Class A of the *Misuse of Drugs Act* of 1971 which attracts more severe penalties for possession etc. than does Class B in which are to be found herbal cannabis, cannabis resin by which is meant hashish, and liquid cannabis.

The effect of cannabis depends on the amount taken at any one time and the frequency of consumption which is related to the preparation used (marihuana by itself or mixed in a pipe of tobacco; hashish mixed with tobacco or hash oil sprinkled on tobacco and rolled into a loose cigarette); the age, weight, sex and state of health of the consumer; his or her expectation of the effect to come and the setting or circumstances in which the indulgence takes place. The majority of Westerners who use this drug smoke it, (marihuana in America and hashish with tobacco in the U.K.) although the current high price of hashish has led to a great increase in the number of persons who are prepared to risk the penalties in law for cultivating a few plants for personal use. On the whole they seem to take it as a form of tranquilliser and expect to be soothed by it rather than stimulated.



## The Acute Effects

The immediate consequence of smoking is appreciated within fifteen minutes, reaches a peak after an hour or so and fades out in three or four hours. There are many published descriptions of the effect of a customary dose (approximately one gram of marihuana containing one per cent of THC but varied according to choice and experience; or 100-250 milligrams of hashish at five per cent THC) but experienced smokers seek and feel relaxation of tensions, peaceful attitudes, frivolous ideation and hilarity in company, lack of aggression and with higher doses indifference to others and sleepiness. About half of them claim an increased appetite for food or for sex and (not always the same person) an increased enjoyment. This is especially claimed by women about sex; it may be that they have been rendered less anxious about the possible consequences of intercourse by the drug. Some subjects have demonstrated an enhancement of sensory perception in laboratory tests — tactile, visual or auditory. If put to the test by a psychologist most subjects display a variable degree of failure of short term memory (recall of word sequences etc) cognitive power (association, thinking, solving problems), motor skills (tracking, driving, flying) and concentration or capacity for learning, while under the influence of the drug. Obvious acute physical effects are trivial — a quickened pulse rate which makes this drug inadvisable for patients who suffer from cardiovascular disease, irritation of the respiratory passages which makes it unsuitable for sufferers from bronchitis or pulmonary disease, some redness of the surface of the eye and a variable degree of shakiness or weakness of the limbs.

Novices or those who take too large a dose may experience unpleasant effects (a 'bad trip'). These vary from nausea, unpleasant shakiness, headache and anxiety to panic reactions and an acute but reversible toxic psychosis — distortion of perception giving rise to illusions and delusions about shapes, colours, sounds or the feel of things. Most serious are occasional paranoid delusions about the personal intentions and attitudes of one's companions. This syndrome is not without danger but is usually successfully dealt with by calming supervision by an experienced companion without benefit of medical attention. Some persons apparently enjoy and seek aspects of this experience (the 'stoned' condition) in the belief that it extends the field of experience or enlarges the mind. This is what is generally meant by the word psychodelic but it is a vague and dubious concept.

## Comparison with Other Popular Drugs

The above account is very different from the acute effects of tobacco which has a soothing action in small doses, probably largely due to completed ritual, reinforcing taste and smell on a background of expectation; and in beginners or after large doses a nauseating effect which is accompanied by disturbances in pulse rate and blood pressure. These are pharmacological effects of nicotine. Cocaine and amphetamines are cerebral stimulants, the former of great potency. In excessive doses they may produce convulsions which can be lethal and they always stimulate the heart and

cause marked cardiovascular effects. Heroin, morphine, opium and the host of related substances have an ambivalent action. Taken by intravenous injection heroin gives rise to a well-nigh orgasmic surge of elation throughout the body followed by relief from the miseries of abstinence. It is a powerful drug of addiction and the dose may be easily misjudged with lethal effects. Lysergide (LSD) is a most potent disturber of sensory perception and therefore of mental balance which is dangerous because it not infrequently gives rise to repeats (flashback) and is in another dimension for the power of its acute action when compared with hashish. Tranquillisers are ingested and therefore do not have the speed of action of smoked cannabis in 'defusing' the anxious consumer; any benefit which they may give is a longterm one and if the dose is greatly increased they cause a lasting intoxication like alcohol. They also alter sleep patterns although to a lesser extent than barbiturate. This makes it difficult for the user to give up his habit. They also have some actions on bodily functions. The drug most often compared with hemp is alcohol which produces a similar effect up to a point but with marked differences. Alcohol and barbiturate are clearly associated with the release of aggression, cannabis has the reverse effect. Alcohol being taken by mouth is slower in its onset and remains in the body in a psychoactive form much longer than does THC which is transformed into non-psychoactive metabolites within a few minutes of absorption. It is the non-psychoactive related cannabinoids which linger. It is therefore not difficult for an experienced smoker of cannabis to adjust his intake since he can judge the probable effect within quarter of an hour of beginning to inhale and need not smoke any more if he feels likely to be satisfied, whereas the difficulty in judging the dose with alcohol is notorious. Alcohol has a greater tendency to cause vomiting, shakiness, impaired cognition and motor skills in the amounts which are so frequently consumed. There is less tendency to illusion and distortion of perception with alcohol despite double vision; apart from the toxic psychosis (DTs) of severe alcoholics in abstinence there is less likelihood of an acute mental disturbance with alcohol than with a large dose of cannabis but chronic alcoholism causes mental deterioration and a variety of clearly described cerebral deficiencies. Withdrawal from cannabis may cause some hangover, dry mouth and disturbance of sleep patterns but is in no way comparable with the severe and dangerous withdrawal from heroin, barbiturate or alcohol when these drugs have been consumed in high dosage for a long period of time.

## Chronic Effects

Anxiety as to the effects of chronic heavy smoking on the health of the individual and collectively on the well-being of the community form a principal reason for the present policy of containment by prohibition. Another problem is the conviction that a relaxation of controls would inevitably be followed by an increase in the number of users, some persons would become heavily involved and others having acquired a drug taking habit would move on to more toxic substances. There is little convincing published evidence of physical harm in man



from chronic usage. Heavy smoking causes a catarrh of the upper respiratory passages; there is a water soluble carcinogen in the gas of smoke (as with tobacco) but this evidence is confined to work with tissue culture and no smoker of marihuana can consume as many cigarettes in a day as a smoker of tobacco. Heavy smokers develop tolerance to most of the measurable effects of cannabis but only to a moderate degree. They may increase the amount taken at one time to overcome some loss of potency in their customary form of the drug but this is not a marked effect as with heroin, amphetamine and some other drugs. The pulse rate is increased very soon after the first inhalation of smoke, the blood pressure may fluctuate, falling when one stands erect and rising when one is recumbent. Any smoking, tobacco or cannabis, is bad for the cardiac performance of patients who suffer from angina, but the socio-political argument about the wisdom of the present system of control is not greatly concerned with sick persons but about the recreational use of this drug by otherwise normal and conforming persons. There is clear enough evidence of a diminution in sperm counts in men and of infertility in dosed rats. In this overcrowded world that is not a biological disaster. Accounts of lowered plasma levels of male sex hormone vary; when this occurs libido is depressed and a few males have actually developed feminisation of the breasts. There is pictorial evidence by electron microscopy of alteration to nerve cell membranes and to the nuclei of other cells grown in tissue culture and exposed to THC. There is bio-chemical evidence of a reduction in the incorporation of essential nutrients into the cells of rat brain. A widely discussed report published some ten years ago claimed that in the cases of a small number of youths who had smoked cannabis for a number of years and who came under the care of a neurologist on account of unexplained headaches etc. that the brain was in all cases shrunken and the inner cavities of that organ (the ventricles) enlarged. The technique employed at that time in such investigations was to insert a needle into the ventricle, withdraw some of the fluid and replace it with sterile air which is then displayed by radiography. From the pictures a calculated volume can be attributed to each cavity. Several attempts to confirm these observations in groups of exceptionally heavy longerm smokers using new noninvasive scanning techniques have failed. The interpretation of these findings is now somewhat discredited but still paraded in arguments for the strict control of the use of cannabis. It is not surprising that heavy smokers may show a diminution in the number of circulating white cells in the blood which operate the immunity system to protect us from infection. No direct consequence of this inhibition has been attributed to smoking cannabis but the suggestion has been made that we may suffer from an excess of colds and influenza if we smoke hemp. Such propositions are impossible to evaluate without carrying out an extensive prospective experiment on volunteer populations. Large doses of extracts of cannabis have caused some species of laboratory animal to have a markedly reduced number of offspring but no birth defects in live foetuses. Cannabis is therefore not held to be teratogenic as was the notorious thalidomide but there is little doubt



Tim Mayon

There is no evidence that smoking cannabis is harmful to health

that it reduces fertility in male and female animals. There is no way short of a large scale prospective experiment which would not be ethically acceptable to settle this question in mankind but history is on the side of those who discount the likelihood of foetal damage by human usage of cannabis in that no such correlation has emerged in untold centuries of use. It is probable that this drug would be refused licensing in its present form by the Committee on the Safety of Drugs as a therapeutic agent on these grounds but we are faced with a drug which is already accepted and used by many people as an adjunct to leisure despite the illegality of the procedure and the uncertainty as to its effects. No deformity in a human baby has been directly attributed to the use by the mother of cannabis, but in common with many other drugs, controlled or otherwise it were best for pregnant women to avoid it. There is clear evidence of abnormalities of the shape of the head of the sperm in mice and rats exposed to cannabis smoke or to cannabinoids, including THC, of an abnormally high incidence of chromosomal deficiencies in the spermatogenic tissue of these animals and in the circulating white blood cells of heavy smokers. The present conclusion is that can-

nabis can produce powerful anti-fertility effects but that it is not mutagenic (the transference through generations of inheritable defect) not teratogenic (the causation of a deformed foetus).

A number of very longterm heavy smokers of hemp and hashish have been examined — Greek, Jamaican, Puerto Rican, Indian and Egyptian. All reports agree that the general health, life expectancy and history of medical morbidity in these persons differs in no way from that of comparable groups of subjects. There is some disagreement about the mental state of these persons but this is particularly difficult to assess because they were all relatively ill educated deprived people — low caste Indians, Jamaican labourers in the sugar cane fields, and their cultural status is very different from that of the investigators. There is also the insoluble problem of post hoc and propter hoc. Are these people mentally a little subnormal or unbalanced, oppressed by socioeconomic circumstances and prone to seek a form of relief in heavy indulgence in an available drug with no strong cultural taboos attached to its use; or is it that indulgence in the drug to a gross extent (from 4.5 to 2.3 times per day on average over a mean period of 23 years in one study; a consumption of 3.1 to 7.4 grams of hashish containing 4-5 per cent of THC daily) damages the brain, dulls the intellect and leads to indifference, apathy and social degradation as some eminent scientists believe? The Egyptians and some Indian workers support the latter theory as do some Americans (the 'amotivational syndrome' is their descriptive term for college dropouts) whereas most of the official reports, from that of the Indian Hemp Commission of 1893 to the most recent (*Cannabis; a Report of the Commission of Inquiry into the Nonmedical Use of Drugs*; Ottawa 1972) do not. The Jamaican field workers smoke marihuana just as a British worker takes a teabreak to interrupt monotonous work and to refresh and restore strength.

### Controversy over Legalisation

The principal areas of controversy on the possible ill effects of liberalising the present British law on cannabis are two in number. Firstly there is doubt about the possible extent to which cannabis might precipitate acute psychotic reactions and secondly the possible extent to which its misuse might give rise to chronic psychosis and mental deterioration. To quote one well-known expert psychiatrist, Professor Griffith Edwards of the Addiction Research Unit of the Institute of Psychiatry in London, "Given that in any population there will be a certain natural incidence of functional psychosis, then if in that population cannabis is widely used, one would expect some interactions to be seen". This cautious statement could be interpreted as implying that some affected persons will benefit and some suffer from use of the drug. To continue: "It has sometimes been asserted that cannabis is responsible for induction of a psychotic illness which will continue unremittingly when the drug is withdrawn. There is no sound evidence either to support or rebut such a conclusion, and it is difficult to see how any investigation could at present be set up to resolve so difficult a research question". The mental hospitals are certainly

not crowded with patients of this type.

### Socio Economic Factors

Just as another contributor to this issue will have discussed the economics of hemp as a crop so it seems reasonable to touch on the socioeconomics of hemp as an illegal leisuretime drug. On the one hand there are the legitimate fears and responsibilities of government that free access to cannabis would lead to chronic mental and social illhealth in a considerable number of young people. The United Kingdom has a relatively stable population in which some 900,000 persons attain legal adulthood annually. If half of them experimented with cannabis and 2 per cent of these became involved to an extent which modified their life style this adds 9000 per annum to the toll of alcoholics and pill swallowers. No government is inclined to take the risk of this possibility when there is little obvious political advantage and the likelihood of disadvantage. On the other hand there is the cost of maintaining police drug squads which are mainly involved with cannabis; the irritation of 'stop and search' as applied to tens of thousands of young people; the cost of forensic officers who examine more than 10,000 specimens of alleged cannabis each year and attend court in all defended cases; the cost of attendance by magistrates, officers, clerks, solicitors and witnesses; and above all the personal cost in anxiety and loss of job prospects to the 11,000 or so who are convicted annually of simple possession of a small quantity of the drug for personal use or sharing with friends. Perhaps the greatest cost to the community is the growth and establishment of organised crime as evidenced to by the phenomenal hauls of cannabis products which have been made by the customs officers (10,000 plants, 2000 kg. of herbal material, 2400 kg. of hashish and 28 kg. of liquid cannabis during 1977). The total for 1979 is likely to be much higher and sadly we have now experienced the first killing of a customs officer in the streets of London by day. So called Chicago style gangsterism is not far off, nourished by the same situation as created the original plague — the prohibition of a drug which a large number of persons apparently seek and which they refuse to recognise as potentially harmful.

If the present policy of containment is deemed to lack success and to be too expensive in social terms an alternative is to modify the present law (*The Misuse of Drugs Act 1971*); to withdraw, with reference to cannabis only, from our international obligation (*The Single Convention on Narcotic Drugs 1961*); and to set up a Cannabis Control Commission which would supervise the production and distribution (by post with monitoring and if necessary rationing) of a standardised hashish or even a THC product, on personal registration and prepayment. Penalties for activities outside the legal scheme could be made Draconian to reassure the doubters. In this way one might remove the motive for the major crime associated with illegal supply, discover who really wants this intoxicating weed, how often and at what price, and provide funds for research into the neglected area of the motivation which first directs a youngster towards drugs, be it glue sniffing, pills or smoking.



# The Forgotten Medicine

by

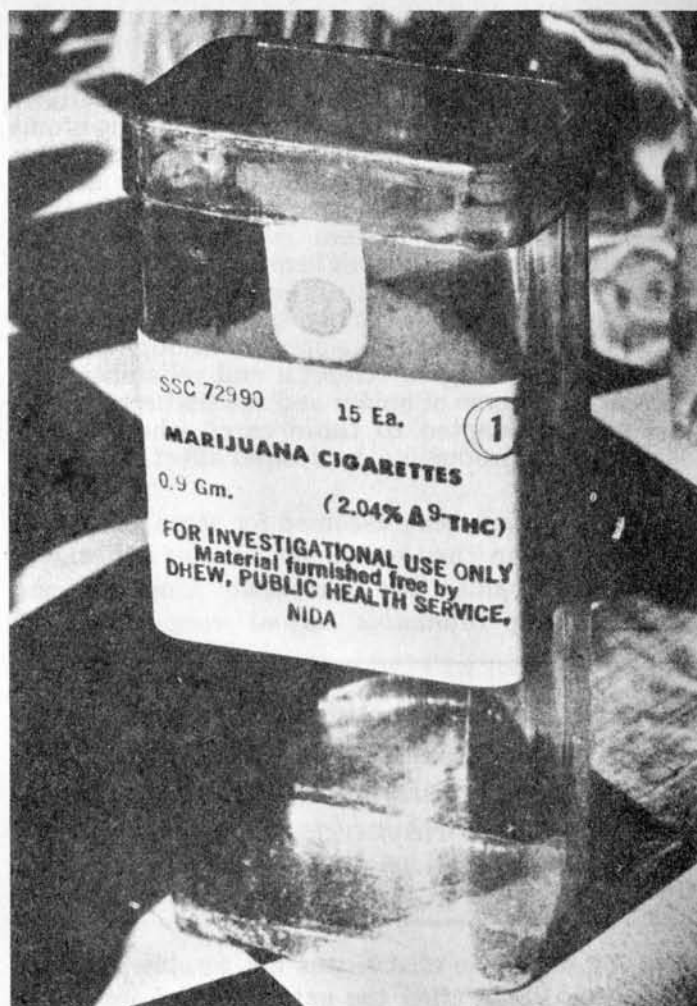
Don Aitken and Tod Mikuriya M.D.

A look at the medical uses of Cannabis.

Medicine in the western world has forgotten almost all it once knew about the therapeutic properties of cannabis. As a result of cannabis prohibition we have lost not only a valuable agricultural crop but a valuable medicine also. The history of cannabis in western medicine lasted from the 1840s to the 1940s, during which period it was extensively used to treat a wide variety of diseases.<sup>1</sup> According to Prof. A.D. McDonald of Manchester University, writing as recently as 1941: "In the clinical experience of many alienists, a good preparation of hemp is incomparably the best drug for depressive mental conditions."<sup>2</sup> It was equally widely used in the treatment of physical conditions.

The western experience with cannabis as a therapeutic substance must be seen against a background of traditional use of the plant as a folk-medicine over many thousands of years. Although the details are obscure it seems that such use was established in China, India and the Middle East during the first millenium BC.<sup>3</sup> It continues today throughout South Asia, Southern and Eastern Africa, South America and the West Indies.<sup>4</sup> Cannabis is one of the mainstays of the Unani Tibbi and Ayurvedic systems of medicine which in 1965 were estimated to be the only form of medical care available to 80 per cent of the population of India.<sup>5</sup> It was from India that cannabis as a medicament was introduced to Europe and North America, although the plant has been cultivated in these areas for fibre production for many centuries. Surprisingly, it seems certain that neither its intoxicant nor its medicinal properties were generally known in the West at the beginning of the nineteenth century, although there are a number of earlier references in herbals, particularly Culpeper's of 1652.<sup>6</sup>

The therapeutic use of cannabis was introduced into Western medicine in 1839 through a forty-page article by W.B. O'Shaughnessy, a thirty-year-old physician serving in Bengal.<sup>7</sup> His discussion of the history of the use of cannabis products in the East reveals an aware-



ness that the drugs had not only been used in medicine for therapeutic purposes, but had also been used for recreational and religious purposes.

After studying the literature on cannabis and conferring with contemporary Hindu and Muslim scholars, O'Shaughnessy tested the effects of various hemp preparations on animals, before attempting to use them to treat humans. Satisfied that the drug was reasonably safe, he administered preparations of cannabis extract to patients, and discovered that it had analgesic and sedative properties. O'Shaughnessy successfully relieved the pain of rheumatism and stilled the convulsions of an infant with this strange new drug. His most spectacular success came, however, when he quelled the wrenching muscle spasms of tetanus and rabies with the fragrant resin. Psychic effects resembling a curious delirium, when an overdose was given, were treated with strong purgatives, emetics with a blister to the nape of the neck, and leeches on the temples.

The use of cannabis derivatives for medicinal purposes spread rapidly throughout Western medicine, as is shown in the report of the Committee on Cannabis Indica of the Ohio State Medical Society, published in 1860. In that report physicians told of success in treating stomach pain, childbirth psychosis, chronic cough, and gonorrhea with hemp products.<sup>8</sup> A Dr Fronmueller, of Fuerth, Ohio, summarized his experiences with the drug as follows:

I have used hemp many hundred times to relieve local pains of an inflammatory as well as neuralgic nature, and judging from these experiments, I

have to assign to the Indian hemp a place among the so-called hypnotic medicines next to opium; its effects are less intense, and the secretions are not so much suppressed by it. Digestion is not disturbed; the appetite rather increased; sickness of the stomach seldom induced; congestion never. Hemp may consequently be employed in inflammatory conditions. It disturbs the expectoration far less than opium; the nervous system is also not so much affected. The whole effect of hemp being less violent, and producing a more natural sleep, without interfering with the actions of the internal organs, it is certainly often preferable to opium, although it is not equal to that drug in strength and reliability. An alternating course of opium and Indian hemp seems particularly adapted to those cases where opium alone fails in producing the desired effect.

It seems to have been assumed for some years that only Indian hemp (then known as *Cannabis indica*) was of medicinal value. The fact that American and European hemp (*Cannabis sativa*) were capable of

**"Indian hemp, when pure and administered carefully, is one of the most valuable medicines we possess."**

*J. Russel Reynolds, Physician in Ordinary to Queen Victoria.*

producing the same effects was not established until 1869, when Wood tried the extract of 1.5 ounces of Kentucky-grown cannabis on himself and found the effects unmistakable (they lasted for 24 hours). About one per cent of this dose was found to be therapeutically effective in cases of neuralgia.<sup>9</sup> In spite of this clear demonstration that American cannabis could be as effective as the best Indian (also, incidentally, that the male plant is as active as the female), the pharmacopoeia specifications continued to require Indian hemp and the material used in the preparation of extracts and tinctures used in American and European medicine continued to be obtained from India.

### Effective in Treating Many Illnesses

Cannabis was used during these years, with varying degrees of success in the treatment of dysmenorrhoea,<sup>10</sup> strychnine poisoning<sup>11</sup>, menorrhagia<sup>12</sup>, pericarditis following rheumatic fever<sup>13</sup>, delirium tremens<sup>14</sup>, chloral and opium addiction<sup>15</sup>, insomnia<sup>16</sup>, dyspepsia, indigestion and other stomach disorders<sup>17</sup>, persecution mania<sup>18</sup>, phthisis<sup>19</sup>, migraine and other headaches<sup>20</sup>. The purpose for which it chiefly established itself, however, was as a sedative and hypnotic, in which role its superiority to the opiates was established to the satisfaction of many physicians, notably Suckling<sup>18</sup> and Mattison<sup>21</sup>. According to Suckling:

With a wish for speedy effect, it is so easy to use that modern mischief-maker, hypodermic morphia, that they (young physicians) are prone to forget remote results of incautious opiate giving.

Would that the wisdom which has come to their professional fathers through, it may be, a hapless experience, might serve them to steer clear of narcotic shoals on which many a patient has gone awreck.

Indian hemp is not here lauded as a specific. It will, at times, fail. So do other drugs. But the many cases in which it acts well, entitle it to a large and lasting confidence.

My experience warrants this statement: cannabis indica is, often, a safe and successful anodyne and hypnotic.<sup>18</sup>

The most influential of the nineteenth-century reports on the therapeutic uses of cannabis was probably that of J. Russell Reynolds, published in 1890.<sup>22</sup> The author's position as Physician in Ordinary to HM Queen Victoria and President of the Royal College of Physicians, in addition to his thirty years of clinical experience with the drug, all served to give credence to his emphatic statement that "Indian hemp, when pure and administered carefully, is one of the most valuable medicines we possess". Reynolds carefully listed both those conditions in which he had found cannabis useful and those which he had not. He recommended it in senile insomnia, neuralgia, migraine, gouty pains, epileptoid and other spasms and convulsions (as distinct from true epilepsy), spasmodic asthma and spasmodic dysmenorrhoea.

### Advantages and Disadvantages

In their study of the medical applications of cannabis, physicians of the nineteenth century repeatedly encountered a number of difficulties. Recognizing the therapeutic potential of the drug, many experimenters sought ways of overcoming these drawbacks to its use in medicine, in particular the following:

- Cannabis products are insoluble in water.
- The onset of the effects of medicinal preparations of cannabis takes an hour or so; its action is therefore slower than that of many other drugs.

Different batches of cannabis derivatives vary greatly in strength; moreover, the common procedure for standardization of cannabis samples, by administration to test animals, is subject to error owing to variability of reactions among the animals.

- There is wide variation among humans in their individual responses to cannabis.

Despite these problems regarding the uncertainty of potency and dosage and the difficulties in mode of administration, cannabis has several important advantages over other substances used as analgesics, sedatives, and hypnotics:

- The prolonged use of cannabis does not lead to the development of physical dependence. There is minimal development of tolerance to cannabis products.<sup>11 13 14 24</sup>

- Cannabis products have exceedingly low toxicity.<sup>24 9 21</sup>

<sup>22 23</sup> (The oral dose required to kill a mouse has been found to be about 40,000 times the dose required to produce typical symptoms of intoxication in man.)<sup>21 24</sup>

- Cannabis produces no disturbance of vegetative functioning, whereas the opiates inhibit the gastrointestinal tract, the flow of bile and the cough reflex.<sup>12</sup>

<sup>24 44 46 25</sup>

### Psychic Effects

Besides investigating the physical effects of medicinal preparations of cannabis, nineteenth-century physicians observed the psychic effects of the drug in its therapeutic applications.<sup>4 27</sup> They found that canna-



bis first mildly stimulates and then sedates the higher centres of the brain. Hare suggested in 1887 a possible mechanism of cannabis' analgesic properties:

During the time that this remarkable drug is relieving pain a very curious psychological condition manifests itself; namely, that the diminution of the pain seems to be due to its fading away in the distance, so that the pain becomes less and less, just as the pain in a delicate ear would grow less and less as a beaten drum was carried farther and farther out of the range of hearing.

This condition is probably associated with the other well-known symptom produced by the drug; namely, the prolongation of time.<sup>16 26</sup>

Reynolds stressed the necessity of titrating the dose of each patient, increasing gradually every third or fourth day, to avoid 'toxic' effects:

The dose should be given in minimum quantity, repeated in not less than four or six hours, and gradually increased by one drop every third or fourth day, until either relief is obtained, or the drug is proved, in such case, to be useless. With these precautions I have never met with any toxic effects, and have rarely failed to find, after a comparatively short time, either the value or the uselessness of the drug.<sup>22</sup>

### Synthetic Drugs Take Over

The unchallenged position of cannabis as the remedy of choice in cases of migraine was recognised in 1916 by its inclusion in Osler's standard textbook.<sup>27</sup> The flurry of papers in the medical journals, particularly notable in the 1880s and 1890s, died away as cannabis took its place as a routine prescription for many conditions. By this time, however, there was increasing competition from new synthetic drugs, and the extensive use of cannabis was coming to be the mark of a rather conservative, and probably elderly doctor. According to Walton:

This popularity of the hemp drugs can be attributed partly to the fact that they were introduced before the synthetic hypnotics and analgesics. Chloral hydrate was not introduced until 1869 and was followed in the next thirty years by paraldehyde, sulfonal and the barbitals. Antipyrine and acetanilide, the first of their particular group of analgesics, were introduced about 1884. For general sedative and analgesic purposes, the only drugs commonly used at this time were the morphine derivatives and their disadvantages were very well known. In fact, the most attractive feature of the hemp narcotics was probably the fact that they did not exhibit certain of the notorious disadvantages of the opiates. The hemp narcotics do not constipate at all, they more often increase than decrease appetite, they do not particularly depress the respiratory center even in large doses, they rarely or never cause pruritis or cutaneous eruptions and, most important, the liability of developing addiction is very much less than with opiates.<sup>44</sup>

### Cannabis Under Attack

The addiction liability of the opiates had been dramatically increased by the introduction in the 1850s of the hypodermic syringe, which enabled water-soluble drugs to be administered intravenously, with virtually instantaneous effect. The fact that cannabis, being non-soluble, could not be administered in this new, more 'scientific' way was doubtless held against it by some members of the medical profession, as indeed it still is today.

By the 1930s, when the scare campaigns against marihuana smoking by Mexicans in the New Orleans area and elsewhere were beginning to get under way,<sup>28</sup> cannabis was regarded among the medical profession as an obscure and unexciting traditional drug on which little original research had been done for more than thirty years and which was notoriously variable both in composition and in effect. Furthermore, the intoxication occasionally seen with medicinal doses, which was well recognised by the nineteenth century practitioners, who invariably pointed out that it was quite harmless<sup>20 22</sup>, was now looked at in quite a different light in view of the increasingly lurid reputation attached to recreational cannabis use, which was being described at this time as the major cause of insanity in both India and Egypt.<sup>29</sup> However, when international control of the cannabis traffic was established under

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**"Cannabis is a thoroughly vicious drug, deserving the odium of civilised people."**

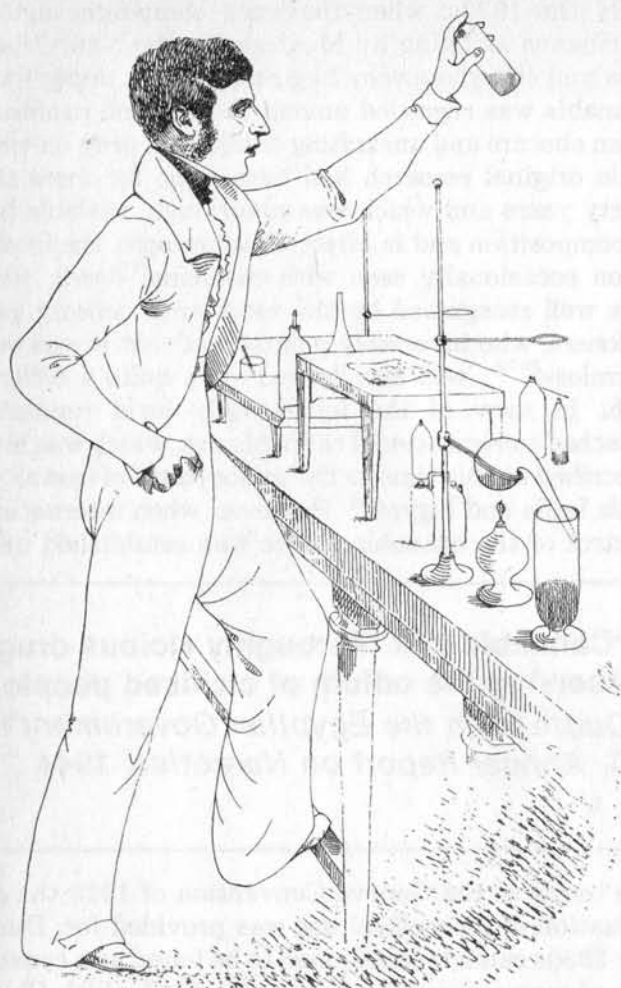
*Quote from the Egyptian Government's  
Annual Report on Narcotics, 1944*

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the terms of the Geneva Convention of 1925 the continuation of its medical use was provided for. During the 1930s cannabis continued to be found as a constituent of many proprietary medicines<sup>30</sup>, of which Chlorodyne became the best known. However, cannabis was never a major source of income for the pharmaceutical companies; the semisynthetic derivatives such as Cannabin which was first marketed in the 1890s<sup>31</sup> never replaced the natural extract and tincture, on which profits were inevitably much lower than on synthetic drugs. American-grown cannabis was introduced onto the US pharmaceutical market in 1918 in competition with the Indian product, which was heavily taxed.<sup>32</sup> In spite of the enactment of prohibitory legislation in many states, the American Medical Association continued to defend the medicinal use of cannabis:

... there is positively no evidence to indicate the abuse of cannabis as a medicinal agent or to show that its medicinal use is leading to the development of cannabis addiction. Cannabis at the present time is slightly used for medicinal purposes, but it would seem worthwhile to maintain its status as a medicinal agent for such purposes as it now has. There is a possibility that a re-study of the drug by modern means may show other advantages to be derived from its medicinal use.<sup>33</sup>

The AMA vigorously opposed the passage of the Marihuana Tax Act of 1937<sup>34</sup>, arguing that it would make the continued therapeutic use of cannabis impossibly difficult. Their forebodings soon proved correct. In 1941 cannabis was dropped from the US National Formulary: the Federal Bureau of Narcotics subsequently was able to eliminate therapeutic use by the simple expedient of refusing any licences for the manufacture of cannabis preparations, after which they only legal source of the drug for any purpose was the Bureau itself.<sup>35</sup>



W.B. O'Shaughnessy, M.D. Professor of Chemistry and Natural Philosophy, Medical College, Calcutta.

"In 1839, W.B. O'Shaughnessy, M.D., a thirty-year-old graduate of the medical school in Edinburgh, under service to the British East India Company, published his monograph 'On the Preparation of the Indian Hemp, or Gunjah.'

This marked the introduction of hemp into conventional 19th Century western medicine. O'Shaughnessy's monograph provided a summary of all the knowledge available to him and reviewed his experiments with animals before he performed human experiments with diseases, including rheumatism, cholera, rabies and tetanus.

Some seven years before, at the end of his medical training in Scotland, O'Shaughnessy invented intravenous fluid and electrolyte replacement therapy during a cholera epidemic. In the years following his hemp research, he went on to publish a pharmacopeia of Indian medicines. He then changed careers, becoming an engineer, and brought the telegraph to India, a service for which he was knighted. He then returned to England, changed his name, and was married three times before dying at the age of eighty-one." (The Marijuana Papers, ed. Mikuriya, 1973)

### The Chemistry of Cannabis

Outside the USA the medicinal use of cannabis continued to be legally possible, although increasingly rare. Surprisingly, the ten years following the Marihuana Tax Act saw an upsurge of cannabis research for the first time since the 1890s. Little of this was directed towards therapeutic uses, although the 1940s saw major advances in understanding the chemistry of cannabis as a result of the work of Adams in Chicago<sup>36</sup> and of Todd at Cambridge<sup>37</sup>. Adams and his group proceeded to develop synthetic homologs and analogs of the natural cannabis constituents which were up to 500 times as strong, as measured by animal tests.<sup>38</sup> The subsequent history of research on these compounds is interesting. The last published paper, in 1950, was a brilliant study of 11 different THC homologs for potency, analgesia, anticonvulsant activity, and hypnotic qualities. More than twenty

years of silence followed. In fact the work continued, under US Army auspices, at Edgewood Arsenal, Maryland and through sub-contractors Arthur D. Little & Co. and the University of Michigan, the purpose now being the production of effective 'incapacitating agents' for chemical warfare purposes. In the event, nothing of military interest resulted; the existence of this research was revealed in 1967<sup>39</sup> and the results were declassified in 1971<sup>40</sup>. As well as confirming the anticonvulsant activity first reported by O'Shaughnessy, suggesting that cannabis might be a potent anti-epileptic, this research also showed THC homologs to be powerful hypothermogenic agents, producing a reduction in body temperature which could be valuable as an adjunct to surgery.<sup>41</sup>

### Research in the Forties and Fifties

To return to the 1940s, the other main research effort of those years was commissioned by Mayor La Guardia of New York.<sup>42</sup> Publication of the results aroused much controversy, since the report dismissed many of the supposed ill-effects of marihuana smoking which had been generally accepted up to that time. The *Journal of the AMA*, which had always consistently supported the therapeutic use of cannabis<sup>43</sup>, now reversed its position and, in the course of a violent attack on the report, supported such critics as Commissioner Anslinger by describing the treatment of opiate addiction with cannabis as 'the substitution of one addiction for another.'<sup>44</sup> The *Journal* has maintained a strongly anti-cannabis stance from that day to this.

Between 1945 and 1956 such therapeutic research as there was (which was very little) concentrated on psychiatric uses, primarily in the treatment of depression. Although some spectacular successes were seen<sup>45</sup>, the results taken as a whole seemed unpromising<sup>46</sup>. By this time research with cannabis in the USA was no longer encouraged, and all the American workers in this field used Adams' synthetics. Interestingly, it was the two programmes in which real cannabis was used (Rolls and De Groot) which produced some of the best results; but by this time it was of course LSD which was the favoured drug for work of this kind.

It seems quite likely that the work of Rolls and Stafford-Clarke in 1953 (with one patient) was the only use of the therapeutic potential of cannabis by the medical profession anywhere in the 'developed' world between 1942 and the 1960s. The low point was reached in 1956; in the same year as the US Congress passed the Boggs Act, introducing 20 year minimum sentences for cannabis offences, the United Nations decided to take the opportunity of the forthcoming conference to draft a 'single convention' on international drug control to recommend the complete abolition of the medical and quasi-medical use of cannabis throughout the world. No sooner had this decision been made than the bureaucrats were thrown into a flurry by the appearance of a very detailed report from Czechoslovakia which suggested that cannabis might have a completely new therapeutic application — as an antibiotic<sup>47</sup>. This was entirely



unexpected, although it is possible in retrospect to see that the nineteenth century reports of cannabis as a cure for gonorrhoea might not be so silly as they had seemed for so long.<sup>48</sup>

### Antibiotic Effects Ignored

The Czech team established without any possibility of doubt that extracts of hemp grown in Czechoslovakia had bactericidal properties. They further succeeded in isolating the substance mainly responsible for this activity (cannabidiolic acid), although they also noted that the extract itself was more effective than any single constituent.<sup>49</sup> It was effective against *Staphylococcus*, *Streptococcus*, *Pneumococcus*, and many other Gram positive bacteria. It was inactivated by blood serum and was therefore useful only for external use<sup>50</sup>. It was, however, found superior to penicillin in the treatment of sinusitis<sup>51</sup>, used successfully on a large scale in dentistry<sup>52</sup>, applied in the treatment of ear infections<sup>53</sup>, and used to achieve complete cure of an infected thumb which had been threatened with amputation after the failure of standard antibiotics<sup>54</sup>. This work, however, was not too difficult to ignore, especially since most of it was never translated from the Czech.<sup>55</sup> The World Health Organisation had committed itself in 1952 to the flat statement that "there is no justification for the medical use of cannabis preparations."<sup>56</sup> In 1955 they recommended "extension of the effort towards the abolition of cannabis from all legitimate medical practice"<sup>57</sup>, and in the same year was "pleased to note the decision . . . to place cannabis drugs . . . together with heroin and ketobemidone in . . . Schedule IV . . . in the . . . Single Convention"<sup>58</sup> (which in the draft convention involved the prohibition of medical use.) It was not until 1961 that the Czech work was reviewed in detail.<sup>59</sup> The resulting report laid great stress on the fact that, six years after first publication, there was still no commercial product on the market (although in view of the international legal climate this was hardly surprising), as well as on the existence of other antibiotics (particularly neomycin and bacitracin) which could duplicate the effects obtained with cannabis.

Although unbiased medical opinion might have been expected to take the view that a new antibiotic, even if limited in its applications, would be a useful thing to have, the WHO group "concluded that at present the case has not been proved in favour of making cannabis resin available for the extraction of useful drugs. The opinion expressed in our third report (in 1952) remains unchanged. Cannabis and its preparations are practically obsolete, and there is no justification for their medical use."<sup>60</sup> The Czechs seem to have accepted their defeat; a few years later their team's leading chemist turned to applying his talents to the development of new analytical techniques for use by law-enforcement agencies<sup>61</sup>.

### "A Thoroughly Vicious Drug"

In spite of having so easily disposed of the Czechs, the UN master plan for world-wide cannabis prohibition came to grief after all. It was defeated by

the opposition of the British government, which had been defeated on this issue in 1956, to any attempt to prohibit the medical use of heroin, as well as the determined opposition of the governments of India and Pakistan to any measure which would deprive their people of the only type of medical care available to many of them. The Indian representative referred pointedly to the need for underdeveloped countries to make use of their natural resources (instead, presumably, of importing expensive pharmaceuticals from the West)<sup>62</sup>. The result was a complicated compromise. The new convention<sup>63</sup>, signed in 1961, provided that the prohibition of medical use of Schedule IV drugs (including cannabis and heroin) should be merely recommended, rather than obligatory. Extracts and tinctures of cannabis were placed in Schedule I, so that this recommendation did not apply to them, and the 'quasimedical' or 'traditional' use of cannabis in India and Pakistan was to be phased out over 25 years.

In spite of the compromises they had had to make the framers of the Single Convention could be reasonably sure that the medical use of cannabis was on its way out at last. The signatories of the Convention effectively endorsed the view of cannabis which had established itself since the 1930s; that "it is in fact a thoroughly vicious and dangerous thing of no value whatever to humanity, and deserving of nothing but the odium and contempt of civilised people."<sup>64</sup>

### Influence of Increased Recreational Use

No sooner had this victory been won than the whole situation was radically changed by the explosive growth of recreational cannabis use throughout North America and western Europe, and soon all over the world. It should be remembered that up to this time cannabis smoking had, at least according to official figures, been on the decline for more than half a century and an early end to it was confidently looked forward to. In the new situation, in which the harmfulness or otherwise of cannabis had suddenly become a political issue, the possible medical uses began to be looked at again. In England, in the 1960s, extracts and tinctures of cannabis could still legally be prescribed, and some doctors began to show an interest in using them in the treatment of alcoholism and addiction, as they had been used in the nineteenth century. Some doctors, also, were inclined to regard relief of the paranoia induced by fear of being arrested as a reasonable ground for prescribing them to those who would otherwise smoke illegally obtained cannabis. The Wootton Committee, in the course of their study of the cannabis situation, were impressed by the therapeutic potential of the drug and recommended that the power of doctors to prescribe it in the ordinary way should be retained<sup>65</sup>. In the event, it lasted only until 1973, when new legislation came into force which required medical use of any cannabis preparation to be licensed.

## New Research

The increase of cannabis use was followed by an increase in cannabis research, the first result of which was the successful isolation of a considerable number of cannabis constituents. As in the 1940s the irrational belief that research on pure chemicals was somehow more 'scientific' immediately diverted most cannabis researchers to working with THC. As interest in possible new pharmaceuticals derived from cannabinoids began hesitatingly to develop, the revival of medical use of cannabis itself seemed, in the late 1960s, to be more unlikely than ever. The discovery which was completely to change the situation was made, like many important scientific discoveries, entirely by accident. In 1971, in the course of a study of the effects of cannabis on driving, it was observed that the smoking of cannabis lowers intraocular pressure<sup>66</sup>. The application of this effect to the treatment of glaucoma, which many sufferers from that condition had had to discover for themselves, was now something which medicine could no longer ignore.

The 1970s saw the discovery or rediscovery of a whole range of therapeutic possibilities for cannabis, hampered throughout by a bitterly fought rearguard action by those who clung to the received view that 'cannabis has no medical uses.' In the USA cannabis and its derivatives were officially classified as 'investigational new drugs', thus requiring the consent of a multitude of regulatory bodies to any research; this classification simply ignored the whole mass of scientific and medical data accumulated over more than a century and required researchers to begin again from the beginning as if it had never existed<sup>67</sup>. The initiatives which led to the investigation of the therapeutic possibilities of cannabis in cases of glaucoma, cancer chemotherapy, epilepsy and spasticity in the 1970s came not from the government or the medical profession but from individual sufferers from these conditions who discovered beneficial effects for themselves.<sup>68</sup>

### Current Therapeutic Uses<sup>69</sup>: Glaucoma

There is now no doubt that the cannabinoids produce reduced intraocular pressure. This effect is seen with cannabis, with THC, with THC metabolites and with synthetic THC analogs, and with administration intravenously, topically, orally or by smoking.<sup>70</sup> It seems, however, that the THC eyedrop currently being tested is less effective than smoked cannabis.<sup>71</sup> The application of cannabis to the treatment of glaucoma was described in Hepler's original 1971 paper as 'obvious', and in view of the fact that this disease is responsible for 14 per cent of all cases of blindness its application might have been expected to be treated as a priority. Nothing of the sort occurred, and glaucoma patients were left, as they still are, to obtain supplies illicitly. In 1975 Bob Randall, who had been treating himself in this way for three years, was charged with unlawful possession of marihuana and acquitted on the basis of the common-law defence of 'necessity'. He was then allowed to enroll as a volunteer in a research programme, as 'a politically acceptable way of supplying me with marihuana,' as he put it. In 1978,

after his supply was interrupted, he brought proceedings for an injunction against the federal government agencies concerned, which were settled on the basis that cannabis from government sources would in future be prescribed to him within the framework of the normal doctor-patient-pharmacist relationship. He remains the only person in the USA to be supplied cannabis legally other than for research purposes.<sup>72</sup> According to the National Institute on Drug Abuse 'the long-term safety and efficacy of marihuana-related drugs administered chronically to glaucoma patients has not been established, nor is there any data from long-term controlled studies to demonstrate whether these preparations can actually preserve visual function in such individuals.'<sup>73</sup>

### Cancer Therapy

The second established modern therapeutic application for cannabis is as an adjunct to cancer chemotherapy. The drugs used in cancer treatment produce severe nausea and vomiting; sometimes so severe that patients are unable to continue with the only treatment which may save their lives. Various anti-emetic drugs are commonly given in an attempt to control this reaction: it now seems that cannabis is successful in a substantial number of cases in which standard anti-emetics are ineffective.<sup>74</sup> According to NIDA this "is probably the single most promising application of these drugs."<sup>75</sup> Again, it is being used by many patients, often on medical recommendation<sup>76</sup>, from illicit sources and illegally, while legal supplies are confined to research purposes.

It also seems likely that cannabis may be effective in reducing muscular spasticity in cases of multiple sclerosis. Although formal research is at a very preliminary stage this again arises from reports from patients who have used it on a do-it-yourself basis and found it effective.<sup>77</sup>

### Prospects and Possibilities

There are a number of other possible therapeutic applications, suggested by nineteenth-century uses, modern research on animals, or both. Some are currently receiving research attention, but a number unfortunately, are not.

1) *Antiepileptic*. This was an area of nineteenth century interest, although findings were never entirely consistent<sup>7, 18, 22, 78</sup>. A very brief research report of 1949 found a synthetic cannabinoid more effective than a standard anticonvulsant in a group of epileptic children.<sup>79</sup> Both THC and CBD (which is a natural cannabinoid without psychoactivity) have been shown to have anticonvulsant effects in animals, and favourable preliminary results in humans also with CBD.<sup>80</sup> A study of social cannabis-smoking among epileptics failed to find any effect, whether adverse or beneficial.<sup>81</sup>

2) *Gastrointestinal effects*. Appetite stimulation is one of the best known effects of cannabis, and the drug was often prescribed for this purpose in the nineteenth century<sup>7, 8</sup>. One of the unsung research triumphs of the 1970s was solemnly to 'confirm' this piece of



common knowledge by establishing that under controlled laboratory conditions "subjects given 0.5 mg./kg. orally drank a greater quantity of a chocolate milkshake preparation compared to those receiving placebo."<sup>82</sup> This effect has recently been applied in the treatment of anorexia nervosa, with some degree of success.<sup>83</sup> In addition to the now well-known anti-emetic effect the cannabinoids have a antidiarrhoeal effect, at least in animals.<sup>82</sup> One or other of these effects, or both, may explain the success achieved in treating indigestion and dyspepsia in the 1890s<sup>17</sup>, as well as stomach ulcers, for which cannabis appears to have been given at Guy's Hospital during the 1940s.<sup>84</sup> After many years' neglect it has recently been shown that cannabis appears to produce significant lowering of stomach acidity; this has led to the suggestion that cannabis consumption may have been a major factor in the substantial reduction of the incidence of stomach ulcers which has been observed in a number of western countries in recent years. More work in this field seems overdue.

3) *Anti-asthmatic*. Cannabis smoking undoubtedly causes acute bronchodilation, with beneficial results in asthma attacks, although chronic heavy smoking can produce the opposite effect as a result of the irritant effect of the smoke.<sup>82</sup> Thus another traditional use, well-established in the nineteenth century<sup>78</sup>, is confirmed by modern research. Work on aerosol preparations is under way.<sup>85</sup>

4) *Sedative/Analgesic*. The older work<sup>7, 8, 18, 21, 22, 26, 78</sup> suggests that cannabis, in addition to its sedative action, has a specific pain-relieving effect. This has been confirmed by modern research on animals, in which cannabinoids have produced effects comparable to morphine, and in cancer and surgery patients. It also seems that they have value in combatting fever and inflammation<sup>82</sup>, as suggested by U.S. Defense Department studies.<sup>40</sup>

5) *Treatment of Addiction*. The older work on alcohol and opiate withdrawal and substitution<sup>15, 18, 21, 42</sup> has been followed up to some slight extent. Although the history of substitution therapies in opiate addiction is not encouraging, recent animal work does suggest that THC can inhibit the morphine abstinence syndrome in animals<sup>82</sup>. With alcoholics synthetic cannabinoids<sup>86</sup>, cannabis tincture<sup>87</sup> and illicitly obtained cannabis<sup>88</sup> have all been used with some success.

6) *Anti-depressant*. Since the 1950s<sup>45, 46</sup>, there has been only one study using THC, which was not encouraging<sup>89</sup>. More work in this area may still be justified<sup>82</sup>.

7) *Migraine/Headache/Neuralgia*. In this area, where cannabis was once the standard treatment<sup>27</sup>, there seems to have been no modern follow up at all.

8) *Cough suppressant*. The nineteenth century observations<sup>8, 26</sup> have been confirmed in modern animal studies<sup>90</sup>.

9) *Menstrual Abnormalities*. Confirmation of the once well-known results in this field<sup>10, 12</sup> has been rendered impossible by the prohibition in the USA of all

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cannabis research on women of childbearing age. There is however one modern observation which confirms the effect to some extent; it seems that the menstrual irregularity induced by heroin use is less marked in women who also use cannabis<sup>91</sup>. Recent, as yet unpublished, preliminary findings on a study of female cannabis users in New York indicate that cannabis does indeed affect the menstrual cycle, possibly producing a reduction in fertility. In accordance with the modern tradition of cannabis research this is now interpreted as an adverse effect on health rather than a possible therapeutic application.

10) *Childbirth*. The use of cannabis in childbirth is traditional in Southern Africa and elsewhere<sup>92</sup>. The sedative and analgesic effects are clearly relevant; it has also been suggested that uterine contractions are directly stimulated<sup>93</sup>.

11) *Antibiotic*. There has been no follow-up on the Czech results<sup>49-61</sup> since 1965<sup>94</sup>.

12) *Antihypertensive*. The use of cannabis in treatment of high blood pressure has been suggested; the effect is related to that on intraocular pressure<sup>82, 95</sup>.

13) *Anaesthesia*. Cannabis is a sedative and potentiates the action of a number of anaesthetics, suggesting a possible application in premedication<sup>82</sup>.

14) *Cancer treatment*. Apart from the well-established use in connection with chemotherapy, and the possible use as an analgesic, both discussed above, there is a rather speculative possibility that the direct anti-tumour effect of some of the cannabinoids may be clinically useful<sup>82</sup>.

## Where do we go from here?

From the above description of the present state of knowledge a number of questions suggest themselves, namely:-

- Why is there such determined resistance to the provision of cannabis drugs for therapeutic purposes?
- Why is there such pressure in favour of the use of synthetics or THC rather than natural cannabis, to the extent that researchers who wish to use the latter are forced to use the former instead?
- Why is nothing happening anywhere outside the USA?

In relation to the first two questions the fundamental problem is the irrational insistence that cannabis is a new drug in the same sense that a substance synthesised yesterday in the laboratory of a pharmaceutical company is a new drug. The only possible basis for this approach is that the legal classification of the drug as having no therapeutic use outweighs three thousand years of experience to the contrary. A great deal follows from this classification, for all countries require new drugs to undergo extensive tests before they are allowed to be put on the market; in the USA these tests are particularly stringent and invariably take several years and cost several million dollars. There is nothing unreasonable about this in the case of a genuinely new drug; the pharmaceutical company which develops the drug will finance the tests and recoup the cost out of profits on subsequent sales. The synthetic cannabinoid analogs are certainly new drugs and no-one denies that this procedure should be applied to them; the delay before the drug is made available for therapeutic use is the price which must be paid for ensuring the safety of the product. In the case of cannabis itself, however, two factors completely change the situation; the first is that the drug has already been tested far more thoroughly than any pharmaceutical by several hundred million willing, indeed enthusiastic, volunteers; the second is that cannabis, being a natural product, is not patentable, and hence there is no incentive to any company to spend its funds on the necessary work.

In reality the 'new drug' classification of cannabis fulfils one purpose and one purpose only; protection for the pharmaceutical industry, which is devoting a great deal of effort to the synthetics, against the risk of having to compete with a natural product which could otherwise be on the therapeutic market before their own much more expensive and much more profitable preparations are ready<sup>96</sup>. The other effect of this policy is that large numbers of cancer and glaucoma patients are left without legal access to a substance which can certainly benefit them and possibly save their eyesight or their lives and which is simultaneously being used by millions of people for pleasure and is available on any street corner. In these circumstances it is hardly surprising that a fair number of reputable physicians have felt that they had no alternative to advising their patients of the possible benefits and leaving them to obtain their own (illegal) supplies. Guides have even been published to how best to use material obtained in this way<sup>76</sup>.

The lunacy of this situation has led to a widespread

revolt against the official line, ably co-ordinated by the U.S. National Organisation for Reform of Marijuana Laws. Twenty-four states have now passed special legislation to make cannabis available for therapeutic purposes, in disregard of the categories established by federal law, although difficulties are still encountered where supplies must be obtained from federal agencies<sup>97</sup>.

The reason for the lack of action outside the USA has been simply that cannabis research of any kind is now almost entirely an American preserve. Therapeutic effects have been discovered or rediscovered entirely as an unintended (and to some unwelcome) spin-off of a 35 million dollar research programme designed primarily to identify the deleterious effects of recreational cannabis use<sup>98</sup>, and which came into existence in response to public pressures for cannabis law reform. The extensive results of this programme are now, of course, available to be applied anywhere, although it is remarkable to see that in the UK even the basic research which is needed to allow the American information on cannabis and health to be applied to the British situation has not been done<sup>99</sup>. The only British therapeutic research yet published consists of work on the use of THC as a sedative in lung cancer patients and a study of the bronchodilator effects of cannabis extract, both carried out at the Welsh National School of Medicine. There are currently seven researchers holding Home Office licenses in this field, of whom six are working on cancer chemotherapy and one on glaucoma<sup>100</sup>. These research workers are apparently expected to maintain a low profile; their names and affiliations are not available. It does not seem that anyone wishes to be known to be working with such a disreputable substance — and the less publicity these licenses get the less likely it is that more doctors will apply for them. All these researchers are working with THC; there appears to be no official source of natural cannabis for therapeutic research in the UK. However, now that the therapeutic possibilities of cannabis have been forcibly placed before the British medical profession<sup>101</sup> it may be that action will follow. For the sake of the patients involved it is certainly to be hoped that it will. Since it is only seven years since a British pharmaceutical company was distributing extract and tincture of cannabis to pharmacies for supply on prescription it is hardly possible that it could be regarded as a 'new drug' here.

## Lessons to be Learnt

What lessons are to be learned from the tangled history of cannabis as a medicine? The first and most impressive is how sheer prejudice and superstition can lead to the total abandonment (as seen in the 1950s) of medicinal use and even of medical research into what was once a therapeutic substance of major importance. The second is how rapidly experience of its use even in the very recent past can be denied or forgotten; in the case of extract and tincture of cannabis in the UK this occurred while the substances were still available in pharmacies and listed in the pharmacopoeia and indeed after some of the new research results of the



1970s, such as those on glaucoma, were already available. The third, and in some ways the most interesting, lesson is how much modern researchers could learn from their nineteenth-century counterparts. Traditionally, before a researcher tested a drug on humans, he tried it on himself<sup>102</sup>. This excellent tradition has quite recently been abandoned by those labouring under the illusion that subjective observations are 'unscientific' — a view which has no support from any reasonable theory of scientific methodology. It is remarkably easy to distinguish between cannabis research done by those with personal experience of the drug and that done by those without, and to see how the first group have been assisted, at least to the point of knowing what are relevant questions to ask, while the second have been hindered by their ignorance. Insights derived in this way must of course be submitted to objective testing: but until the right questions are asked all the objective research in the world will produce no results of any value. A great deal of information on cannabis is available from the subjective experience of its users; it is tragic that so little use is made of it. This is particu-

larly important now that the 'psychoactive' or intoxicant properties of cannabis are increasingly being seen by medical researchers as an undesirable side-effect. Cannabis 'intoxication' is, of course, a *learned* effect; the importance of this in the context of therapeutic use has been discussed in a characteristically discursive and insightful paper by Prof. N.E. Zinberg<sup>83</sup>.

The modern pharmacologist's attitude has been expressed by Prof. R. Mechoulam in these words: "The main problem facing pharmaceutical research into cannabis is not the lack of activity but rather the wide spectrum of activity exhibited by the cannabinoids. In the clinic, one needs drugs which are specific for a certain condition and do not cause other effects."<sup>103</sup> While the process of torturing molecular configurations until they respond to human preconceptions about what a drug *ought* to do goes on apace, it may still be worth pleading for a little more investigation of the complex mixture of cannabinoids which nature has provided us with, in the form of a plant which has been associated with humanity since before the dawn of recorded history.

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# Grow Hemp . . . Or Else

by John Michell

The word 'canvas' is a corruption of cannabis or hemp from which it was formerly made, as also were such nautical gear as ropes, sails and fishing nets. Linen was also made from hemp. So important was this crop that the last Queen Elizabeth in 1563 decreed that every farm of 60 acres or over must have at least one acre devoted to hemp growing.

The Tudor penalty for *not* growing hemp, first imposed by Henry VIII in 1533, was at least as high by the standards of the time as the penalty exacted by the present Queen Elizabeth for the opposite crime of cultivating the stuff — a stiff £5 or five golden sovereigns. Nor was it easy to avoid the compulsory cannabis law. The business of detecting and fining hempless agriculturalists was a profitable one. Queen Elizabeth I licensed agents by Letters Patent to form local drug squads in reverse, who enjoyed the monopoly of extracting money from those rustic lawbreakers who refused to grow their due share of the cannabis crop.

Many did refuse, saying that their land was not suitable for hemp growing, but the alliance of central bureaucracy and local gangsters allowed no exceptions, and the revenue from cannabis evasion was considerable. Finally, in 1593, the voice of the protesting peasantry reached the ears of Authority and the Hemp Laws were repealed.

In one of his articles on local history for a South Norfolk newspaper in August 1963, Eric Pursehouse quotes extracts from the numerous 18th and 19th century records which illustrate the importance of hemp cultivation to village economy. It flourished best in "old meadows and low bottoms near rivers". The valley of the Waveney between Norfolk and Suffolk was the centre of the hemp country, producing about an eighth of the total English harvest. A tithe or tenth part of the crop in every parish belonged to the vicar. The custom at Diss in South Norfolk was to stack his share of the hemp in the church porch. Whether any of it found its way into the churchwarden pipes of the village elders is not recorded.

Hemp growing in East Anglia reached its peak in the 18th century when stands of it were to be found in thousands of gardens and small fields. According to Kirby's *Suffolk Traveller*, written in the 1730s:

"The district in which hemp is chiefly found extends from Eye to Beccles, spreading to the breadth of about 10 miles, which oblong of country may be considered its Headquarters. It is in the hands of farmers and cottagers. With cottages it is the practice to sow on the same land each year. Manuring of 16 loads of dung per acre receives great attention. Sowing is from mid to end of April, but it will bear till May. No weeding is given, for Hemp destroys every other plant."

By the beginning of the 19th century the decline of English hemp growing had begun. It followed the decline of local independence and the destruction of the village economy which resulted from the enclosures of common lands, engrossing of farms and the rising

power of manufacturers and centres of capital. The increase of wheat prices with the Napoleonic wars made it profitable to turn the old hemp fields over to corn. Cobbett in his ride through East Anglia in 1821 makes no mention of hemp cultivation, although Arthur Young on his visits to the same area about twelve years earlier had found it diminished but still active. It lingered on, however, almost into living memory. Mr Pursehouse records conversations with aged East Anglians whose parents were hemp spinners, and Enid Porter, formerly of the Cambridge Folklore Museum, has a note of hemp being sold in the Cambridge market in the early years of the present century.

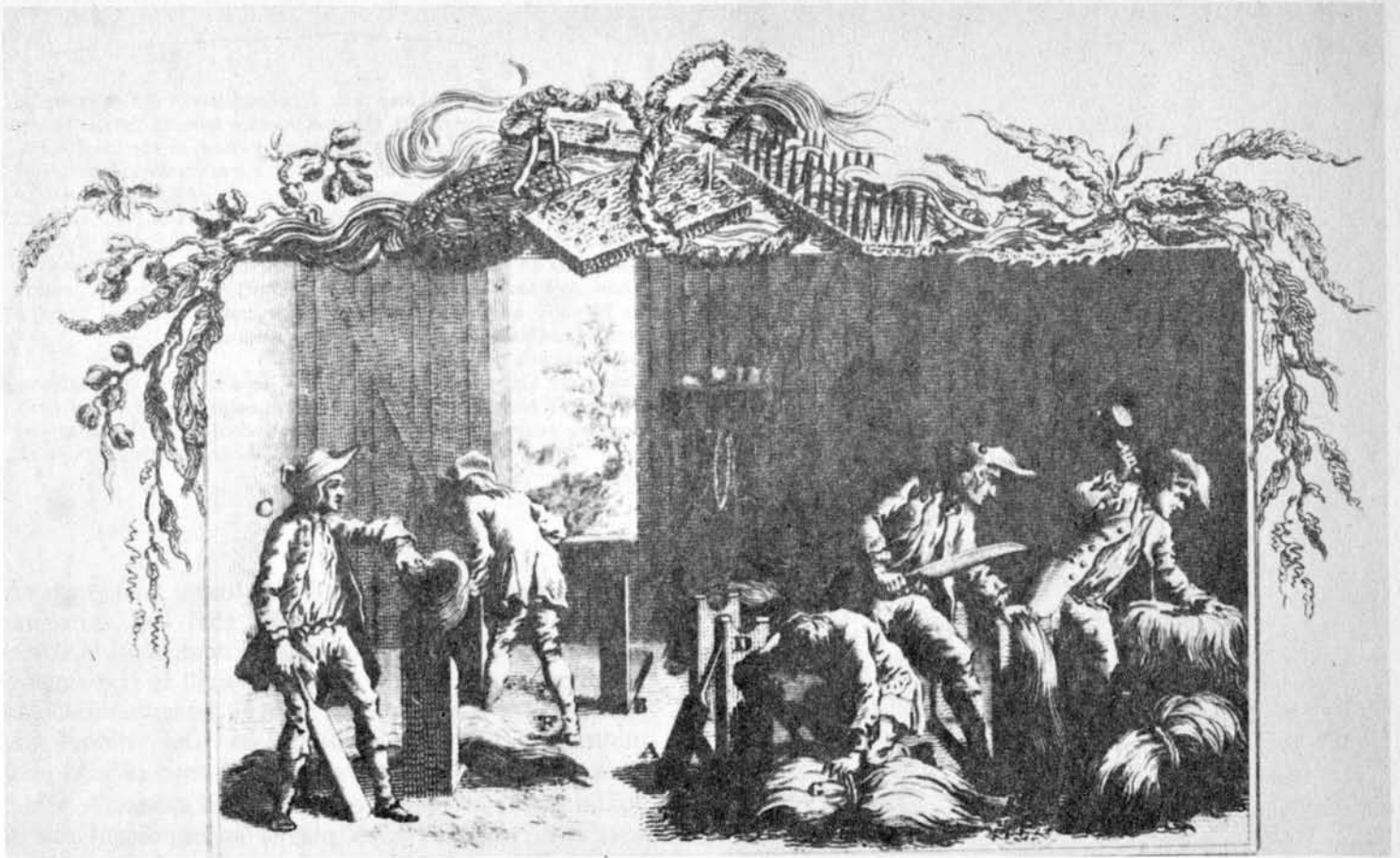
Having been a feature of English village life and industry for literally thousands of years, the hemp plant has left its mark on native customs and place names. Hempstead in Essex is an example, and Hempnall in South Norfolk was evidently a hemp knoll or hillock, a name found elsewhere about the country. As well as having traditional healing properties, hemp seed had a most interesting use in magic and divination. Scattered at midnight with a suitable charm, it would summon up an image of one's future lover. Midsummer Eve or Hallowe'en, according to Brand's *Popular Antiquities*, were the appropriate seasons for this ritual which is chillingly described in a poem called 'The Cottage Girl'.

Lo! shuddering at the solemn deed  
She scatters round the magic seed,  
And thrice repeats 'The seed I sow  
My true-love's scythe the crop shall mow.'  
Straight, as her frame fresh horrors freeze,  
Her true-love with his scythe she sees.

In the fenland districts of Cambridgeshire, where the crop was widely grown, local people recognized the soothing, therapeutic properties of the hemp plant's leaves and seeds. According to Enid Porter's book, *Cambridgeshire Customs and Folklore*, the smoke from a pipe full of crushed hemp seeds mixed with tobacco had a wonderful effect on fractious babies, and peaceful evenings for the parents were further procured by pipes of dried cannabis leaves or cups of poppy tea. One of the secrets of the old East Anglian horsemen was that crushed hemp seeds in one's pockets attracted and pacified unruly horses.

It is an odd turn of legal history that the hemp plant, which until so recently was an integral part of English country life, economy and culture, should now be an outlaw. From cottager's friend to devil's weed in the space of a few years represents a mighty feat of image-shifting for a humble vegetable. The swing of fashion against hemp, which began early last century, has reached such an extreme that it will naturally correct itself before too long. When it is again possible for its useful and picturesque qualities to be appreciated, outside the context of drug hysteria, the hemp plant will be free to resume its normal character as an ornament and support to decent human society.





▲ "Scutching (see above) is an operation calculated to clear the hemp from the small particles of the reed, leaves, weeds, dust, and the grossest parts of the broken or entangled fibres, which adhere thereto after Braking, called toppets or tow; as also to divide the longitudinal fibres, which by their adhesion form a kind of riband."

"Heckling (see below) is a business which consists in separating throughout their whole length the fibres of the hemp, which the mill or the mallet have only divided in part.

The teeth of the heckle carry off part of the gum, which is thereby reduced to dust; and by dressing and dividing over again the filaments into which they enter, separate them entirely. The oftener this operation is repeated with different sorts of heckles, coarse, middling and fine, the more the hemp acquires of softness and fineness, whether it is intended for ropes, or to be worked into cloth."

Pictures and quotes from: A Treatise on Hemp by Robert Wissett, Esq., F.R. and A.S., London 1808.





# War on Drugs is War on People

by Anthony Henman

Celestino, pictured above, is a Tenetehara Indian from Brazil. He was brutally tortured by the Brazilian police for growing marijuana. Anthony Henman reports on his story; the collision of cultures which engendered it; the use of marijuana in Tenetehara society; and how international anti-marijuana laws are being used by the Brazilian authorities to suppress traditional Indian cultures.

*Celestino: It happened like this. At about ten in the morning of 19th May last year (1977), the police came looking for me in my village . . . They told me to accompany them to the local town, Grajaú . . . When we arrived, they took me to the headquarters of the Army battalion stationed there . . . A soldier called André came up to me and asked: "Are you Celestino?" I replied: "That's me alright." "You're under arrest," he said, putting handcuffs on me, as another guard drew a hood over my head . . . Then they took me inside and left me sitting on a bench, unable to identify anybody except by their voice. Some of them I recognized, including the colonel's voice . . .*

*Interviewer's question: Which colonel?*

*Celestino: Colonel Perfetti, the man in charge of the Indians. They had been asking me a lot of questions, and I had been denying everything, when suddenly he came into the room and said: "You better try to cooperate with the boys. You tell them all you know . . ."*<sup>2</sup>

The first part of Celestino's testimony makes an unequivocal affirmation of the fact that Col. Armando Perfetti — at that time the chief officer of FUNAI (the Brazilian government's Indian agency) in the state of Maranhão — was present at least at the outset of Celestino's interrogation. In doing so, the colonel had obviously chosen to ignore FUNAI's own official position on the Tenetehara Indians' use of cannabis, which recognized that the plant played an important role in their traditional customs, and was therefore protected by Article 47 of the Brazilian Indian Statute, which affirms: "Respect for the cultural heritage of the native communities."<sup>3</sup> The President of FUNAI, General Ismarth de Araujo Oliveira, had himself stated the official line: "The consumption of drug plants by the Indians does not share the negative connotation that it has among white people . . . To forbid their use would be to interfere in tribal culture . . . which would have extremely negative consequences . . ."<sup>4</sup>

The condition for such freedom, of course, was to be that the Indians should not engage in the production of marijuana for trade, and a study was ordered to determine exactly how much they would need for their own consumption. Such a study, though never in fact carried out, would supposedly restrict the use of the dreaded weed to more acceptable contexts, variously described as 'religious rites', 'ceremonies and festivals', and 'mystic rituals'.<sup>5</sup> Inevitably, FUNAI's liberalism on this issue has come under fierce attack not only from the security forces, but also from the drug watchdogs in the medical establishment, with at least one eminent pharmacologist being quick to point out that "even among the Indians there exist serious problems of drug abuse . . ."<sup>6</sup> The emphasis on the so-called 'mystical' aspects of Tenetehara cannabis smoking has, therefore, less to do with the Indian's own perception of the drug's effects, than with the government's rather uneasy attempts to explain away their habit as a harmless cultural aberration, quite at variance with the 'reefer madness' of modern urban use. Such contorted logic serves only to confirm entrenched cultural stereotypes — the image of an innocent, child-like Indian as opposed to the desperate, violent, city-bred 'drug addict' — and does little justice to the Tenetehara people's own considerable understanding and appreciation of the plant.



*Celestino: . . . then the colonel left the room, and they continued asking me where the weed was, applying shocks up my thighs, tying an electrode to my fingers, giving me those shocks. Each shock would send me suddenly high in the sky, and then the next moment I would be back on earth again. I kept saying to them: "You'd better kill me." They only replied: "You bastard, you better tell what you know," and started beating me with a club on my back . . .*

The Brazilian Federal Police has used torture as a routine form of interrogation in drugs cases at least since the late 1960s, when such practices became institutionalized in the fight against political subversion. Abuses of this kind have frequently been reported in private by the victims. Public scrutiny, however, has usually lagged well behind the knowledge of the whole stifling apparatus of Brazil's censorship — had made special reference to the issue in an order to the news media dated 9th January, 1973: "Drugs: Any accusation regarding the use of violence by the security forces is hereby prohibited."<sup>7</sup> A year later, this ban was extended to include: " . . . the divulging of any news item, commentary or reference to the operations undertaken by the Federal Police to identify areas where cannabis is cultivated, as well as references to drug seizures and the arrest of traffickers in any part of the national territory, so as not to prejudice investigations."<sup>8</sup>

It was no mere coincidence that such orders should have been made precisely at this time, for a growing demand for marijuana in the cities had encouraged many small growers to increase their production well beyond the traditional pattern of home-growing self sufficiency. The first police operations in the showcase Indian areas of Maranhao had begun as the harvest was ripening in mid-1973, and had supposedly been authorized by the FUNAI regional delegate in the state capital, Sao Luis, in open defiance of his superiors in Brasilia.<sup>9</sup> By 1975, virtually all the Tenetehara — or 'Guajajara', as they are known locally, a group with over 4,300 members, spread over five reservations with a total area verging on 1.5 million hectares — had shared some experience of the Feds in action. The first reports of the fearful beatings suffered while in police custody were already causing a sharp drop in the production of cannabis for sale, and for the Indians the marijuana boom was over even before it had really begun.<sup>10</sup>

Not entirely by historical accident, for both pressures reflected the same thoughtless national pursuit of an illusory 'development', the anti-drug campaign of the early 70s also happened to coincide with a period of widespread invasion of the Indian reserves, mainly undertaken by a spearhead of land-hungry white peasants expelled from neighbouring areas by the multinationals, the government-subsidized credit agencies, and many large private agri-business concerns. The Federal Police is officially responsible for protecting the integrity of Indian lands, but had remained strangely inactive on this issue, not least because the marijuana campaigns had imbued its agents with a profound lack of sympathy for their cause, often expressed in explicitly racist terms.<sup>11</sup> The feeling was of course reciprocated, and — tiring of broken promises and official vacillation — the Indians

decided in November, 1976, to take matters into their own hands, attacking and burning down the invader settlement at Marajá, and expelling its thousand white inhabitants.

An interesting sidelight on this event was provided by the case of Raimundo Barroso, a local farmer who had reputedly planted large areas of marijuana on Indian soil, as a means of escaping legal responsibility for the crop should anything go wrong. Such an eventuality was unlikely, however, as despite his prominence in the local illicit trade, Barroso had never suffered any real pressure in the anti-drug campaigns. Indeed, on being threatened by the Indians with expulsion from their lands, he retorted in the presence of a journalist from Sao Paulo: "You can't touch me . . . I have the support of the Federal Police."<sup>12</sup> One can only conclude, therefore, that a similar arrangement is also in force elsewhere, which would explain the failure of this agency to extend its repressive operations into the considerable areas of Maranhao controlled by large landowners and other political allies of the ruling clique.

Certainly, this would explain a number of strange features noted in the ongoing campaign undertaken against marijuana among the Tenetehara. In the first place, the Indians constitute the perfect scapegoats, since they are the only social group in Brazil who make no secret of their use of the plant. At the same time, their limited and fiercely independent production will never be amenable to the kind of monopolization by the police and organized crime which is characteristic of the bulk trade on the world black market, and thus has little contribution to make to Maranhao's impending challenge to the already legendary producing areas in Mexico, Jamaica and Colombia. It is these factors which would explain the Federal Police's obsessive concern with proving that the Tenetehara are big-time marijuana growers, an obsession made manifest by their constant exaggeration of the size of the seizures made inside Indian areas.

In statements to the press, they have often claimed to have discovered 'vast plantations' and large numbers of 'mechanical presses' used to brick cannabis for shipment.<sup>13</sup> True, one press was in fact seized on a single occasion, but the material evidence for all the 'vast plantations' has never been forthcoming. When a FUNAI employee accompanied the Feds on their 1978 campaign, he observed that they had no qualms in inflating the size of their hauls when reporting back to base. The commander of the 1978 operation even had the gall to threaten him with a conspiracy charge, should he not sign a document which grossly exaggerated the amount of cannabis which had been seized and burned by his men in the field. On pointing out his error, the commander had explained that the data were "purely for statistical purposes."<sup>14</sup> The fact, then, that probably less than a hundred plants could be used to fabricate the reported seizures of 1,300 kilos, would obviously call into question all the Federal Police's other statistics as well, such as those for the total hauls made in Maranhao in 1978 (205 tons) and 1979 (367 tons).<sup>15</sup> What are such rigged numbers supposed to hide? According to one FUNAI witness — speaking to me off the record in February, 1979 — their only pur-

pose was to cover up the fact that marijuana was still leaving Barra do Corda by the truckload, and without any problems from the police.

*Celestino: Once it was dark, they took me out into a field with a hood over my head . . . "Either you tell us what you know or you'll die", they said, tying me to a tree, with two soldiers standing on my feet so that I couldn't slip. Then they beat me with a leather whip on my back and across my stomach, and others came up and kicked me in the kidneys so that I lost my breath. That was when I asked one to give me his gun, so that I could put myself out of this misery . . .*

The fact that so much indiscriminate violence can continue to exist without being seriously challenged is obviously the result of a carefully orchestrated campaign of public disinformation regarding the use of drugs. Nowhere is this truer than in Brazil, where the media commonly refer to all drugs by the term *tóxico* — which includes everything from harmless cannabis to the demonstrably damaging and widely used ampoules of Pervitin, a metamphetamine manufactured in semi-official laboratories in Paraguay. The words commonly used to describe users are *viciados* ('addicts') *marginais* ('criminals') and *malucos* ('crazies'). Not only the bourgeois media, but even left-wing papers such as *O Pasquim*, *Movimento*, and *Tribuna da Imprensa* adopt a very high moral tone when speaking of the use of drugs. Two new underground monthlies published in Rio de Janeiro, *Lampiao* and *Reporter*, have shown some cautious sympathy for the marijuana smoker, but arguably even these play up to established stereotypes, by categorizing the use of cannabis along with other forms of 'deviant' behaviour such as prostitution and transvestism.

The association with criminal violence and sexual aberration, therefore, serves principally to deny the existence of any balanced patterns of marijuana use, so that suppression by the media of any reference to traditional usages — other than the impossibly distant 'mystic rituals' of the Tenetehara — leads inexorably to their eventual disappearance in fact, even in remote rural parts of Brazil, with behaviour becoming increasingly standardized by the cosmopolitan patterns projected on the radio and TV. The deviant image thus becomes firmly institutionalized; by Brazilian law one can claim 'addict' status even when arrested for marijuana, a loophole used by many to escape from the rigours of prison life to the relative comfort of the mental asylum. Under these circumstances, for a newspaper to call for legalization would be tantamount to proposing a liberation of the sanguinary rapes and murders that are automatically assumed to be the results of drug taking.<sup>17</sup> One well-known musician who dared defend the use of marijuana in public after being arrested while on tour, was subsequently threatened with a 'propagandist of drug use' charge — which carries a minimum fifteen year sentence — and finally had to pay off the police chief in question with fully twenty thousand dollars to get him to drop the case.

The climate which allows such corruption to flourish — and, by all accounts, police blackmail and extortion of well-heeled drug users is a booming industry in Brazil these days — must also be based not only on the cowardice of the media, but also on considerable complicity on the part of the academic establishment. Of

all the scores of medics, anthropologists and folklorists who have studied the use of cannabis in this country, only three have ever had anything to say on the subject which was not tainted by rabid prejudice.<sup>18</sup> The Brazilian Ministry of Health's 1958 anthology of writings on the subject contains fully 29 reports spanning the first half of this century, all of which take it for granted that the smoking of marijuana constitutes a terrible vice, only engaged in by poor blacks and gangs of street urchins such as the 'grey rats' reported in Sergipe in the 1940s.<sup>19</sup> In the last two decades the solemn rhetoric of science has continued to be moulded by what one American observer has cautiously described as "the difficulties of unbiased research during a period of cultural stress, at which time the forces of law and order seem to be in the ascendancy."<sup>20</sup> More recently, the works of noted anti-cannabis campaigners such as George Russell and Gabriel Nahas are widely publicized in Brazil, and not only by the mass media, but even by some supposedly 'alternative' groups as well.<sup>21</sup>

Along with the rather evident racism and class prejudice of earlier observers of the scene, the arrival of marijuana as a middle-class phenomenon has added new fuel to the flames of intolerance, often couched in the most mindless technical jargon: "the psychoses observed in marijuana users . . . have, in common, a schizophreniform physiognomy, never presented in our casuistry, and other traditionally known syndromes of exogenous reaction."<sup>22</sup> One pharmacologist has taken a lead from the World Health Organization, attempting to categorize contemporary drug use in accordance with the classic model of the epidemic, in which "the drug corresponds to the microbe . . . man to its host . . . and the social environment to its medium."<sup>23</sup> The logic of such institutionalized paranoia is obviously itself directly responsible for most of the principal dangers faced by the drug user. These dangers include kidnapping by white-coated doctors — numerous psychiatric clinics advertise in the national press "Treatment and recuperation of drug addiction: Removals and internments from any part of the country"<sup>24</sup>; arrest without proof — in one case in Belem, four young men were imprisoned on drug charges which rested solely on the verbal accusation of an old woman who lived next door<sup>25</sup>; and murder by trigger-happy cops — one innocent sixteen year-old was gunned down in cold blood in Florianópolis on the mere suspicion of carrying marijuana.<sup>26</sup> He had not made even the slightest attempt to escape, but since the 'dread weed' was involved, public outcry on this case was very muted indeed.

The apparatus of this fearful repression includes many other dismal features as well: a special agreement of cooperation between the Ministry of Health and the Armed Forces, signed recently in lieu of a more expensive provision of special clinics to deal with genuine drug problems<sup>27</sup>; a telephone hot-line in Sao Paulo on which spontaneous informers can denounce their fellow-citizens as 'pushers' and 'addicts' without having to give their own names<sup>28</sup>; and a new, and singularly alarming, regulation which allows the Council of Anti-Drug Prevention full powers to veto any publication on drugs which does not conform to their own guidelines.<sup>29</sup> This means that the article you are reading will almost certainly never be published in Brazil itself . . .



*Celestino: With a hood over my face, I had no way of seeing, them asking me many questions, passing that thing up my legs, I was in shorts. Them passing that thing which gives a shock, which eats you up with little nibbles to the skin.*

*Question: Where did they pass it?*

*Celestino: Here on my thighs. They gave me those shocks on two occasions. When I first arrived, and out in the field.*

*Question: And what's that on your stomach?*

*Celestino: That's the mark of the beating they gave me. Now I'm so sick I can't even work any more . . . I feel that pain when I eat too much, my stomach swells up and the pain comes on. I feel pains here too.*

*Question: In your back?*

*Celestino: Here above the kidneys. The fact is they beat me very hard. Such big hairy brutes. I don't know how they didn't kill me.*

Celestino's incomprehension of the torture which he suffered is based on the fact that the smoking of marijuana has long been considered a normal, even a healthy, thing in the state of Maranhao. Almost certainly cannabis was introduced to this part of the New World by slaves from Angola, and the local word for it, *diamba*, as well as the term common in other parts of Brazil, *maconha*, are both derived from the Ambundo language of central Africa.<sup>30</sup> Myth would have it that seeds were carried over concealed in cloth dolls, and that it was in wide use among the communities of runaway slaves (*quilombos*) which flourished in northeastern Brazil early in the colonial period.<sup>31</sup> Actual documentary proof of the use of cannabis only dates, however, from the early nineteenth century, which nevertheless is considerably earlier than the first evidence available elsewhere in the Americas, such as in Mexico, Colombia, Cuba or Jamaica. Prepared as an infusion by the slaves at court, it was adopted even by queen Carlota Joaquina, wife of the Portuguese king who lived in exile in Brazil during the Napoleonic wars.<sup>32</sup> By October 1830, the smoking of marijuana was so widespread in Rio de Janeiro that the Municipal Council issued an edict which prohibited the sale and importation of the drug, and "the use of the *pito do Pango* (a name for a marijuana water-pipe current at the time) as well as its presence in public establishments."<sup>33</sup>

It is likely that a good deal of the smoke available in Rio at that time — as indeed, today — came ultimately from northern Brazil, and one might suspect a reference to cannabis in the governor of Maranhao's letter to Lisbon in 1784: "who on this occasion was sending a plant . . . which the nations of the North, and principally the men of Hamburg, make use of for rope." He added that "were it to be of interest and used to good ends, it would be possible to fill a whole ship of the said plant."<sup>34</sup> Africans had first been introduced to Maranhao in large numbers to work cotton in the late 1700s, and by the first half of the nineteenth century at the latest the Tenetehara Indians were experiencing repeated contacts with groups of fugitive slaves who settled in the lower Pindaré drainage.<sup>35</sup> The use of cannabis — called *petem-ahê* in Tenetehara, which has the meaning of both 'wild tobacco' and 'strong smoke' — almost certainly followed this route.<sup>36</sup> It seems likely, therefore, that the plant has been incorporated into the Indians' way of life for at least 150 years, or approximately ten generations, to the point where many local wags genuinely believe that "in the old days, before we settled down and planted tobacco, our ancestors only



A group of Tenetehara Indians

smoked marijuana." Indeed, by the middle of the nineteenth century, the use of *diamba* was so common in Maranhao, even in the state capital, Sao Luis, that a French trader became notorious in the town for the inspired excesses he committed while under its influence.<sup>37</sup>

*Celestino: Then I was taken by the police to the village, where the Indians got really angry with me, not with them, the police . . . saying that it was I who went around telling them where to look for the marijuana, which isn't true. When we got back to Grajaú . . . the man on the typewriter said to me: "Hey, you're not going to start telling everyone in the village that you were beaten up by the police, are you?"*

*Question: Do you remember the name of any of the policemen?*  
*Celestino: I remember the name of the one that came to fetch me, Rui, and the soldier André and another called Oscar, then there was one called Alencar, I remember those four well. Now, I don't know exactly which of them was doing the torturing, as I had a hood on, and couldn't see . . . and whenever I wanted to shout: "Stop it! Please stop it!" they would come up and cover my mouth, squeeze my throat, saying: "Stop shouting you bastard, stop shouting, stop shouting!" And they said they would take me up in a plane and throw me down from the sky, that I would die like that . . . And then suddenly this courage came to me, as if god spoke to my heart, saying: "Talk! You better not talk!" In a flash I felt as if I was floating off the ground, my courage was so great . . .*

Almost certainly, one of the main reasons that Celestino suffered so much was his steadfast refusal to 'sing' for his captors. According to the Tenetehara code of conduct, it is a matter of honour to deny any involvement in activities likely to cause offence, and to deny it

with a special vehemence when the offended parties are themselves trying to browbeat the Indians into admission of their guilt.<sup>38</sup> Compare his words while under torture:

... the police kept on saying over and over: "He knows he's got a field of marijuana, but he won't tell us here." And I replied "No, I have never been mixed up in that business..."

with his own frank admission to a friendly FUNAI interviewer:

Question: Have you ever sold marijuana?

Celestino: Yes, sir, But small quantities, you know, a couple of kilos at a time. Yes I have sold marijuana...

As a result of the police operations in the last few years, it is not easy to get any Tenetehara to talk openly to strangers about their use of cannabis. In the case of my own visits to the area in 1978 and 1979, it took two quite separate journeys and a good number of shared joints to establish enough confidence and convince them that I was not with the *Federal*, as it is known locally.<sup>39</sup> Some of the Tenetehara reserves — particularly that of Bacurizinho — have become very sensitive on the issue, and probably only a quarter or a third of the adult men ever plant cannabis and use it as a regular thing. Even in other areas, where it is smoked by the vast majority of the men — and by most boys over the age of eight or so — there are nevertheless a fair number of cases of individuals who never use the drug at all. Such behaviour is respected, even if laughed at playfully on occasion, and a 'light head' is certainly no impediment to non-smokers participating in the gatherings where marijuana is consumed.

These gatherings take place characteristically at night, and very large quantities of marijuana — rolled without any tobacco admixture in large conical cigars, and wrapped in brown paper or a special tree bark called *tamari* (*Couratari tamary* Berg.) — are normally used on such occasions, as each man rolls a joint and passes it to his friends. On one occasion that I witnessed, no more than a dozen men consumed at least a pound of marijuana in a single sitting. There is no particular order observed in the passing of the joint; it does not move in a disciplined circle as in our own culture, but proceeds anarchically in any direction from one man to the next, with each smoker taking as little as a single puff, or as much as he wants and needs. These evening gatherings commonly take place to discuss community affairs, or to honour a cannabis-smoking visitor, and provide an occasion for myth recitals and long speeches from the older leaders, and jokes and tales of sexual prowess from the younger men. Contacts with the drug culture of the surrounding Brazilian population are evident in the use of challenges in Portuguese such as *xinga a bicha!* ('curse the bitch!') to which one is supposed to reply in the rhymed couplets established by tradition, the most common of which begins:

Ó diamba, sarabamba!

Quando eu fumo a diamba

Fico com a cabeça tonta

E com as minhas pernas zamba.<sup>41</sup>

References such as these — describing marijuana as 'the bitch' and its effects as a dizzy head and rubbery legs — would suggest that the 'forbidden fruit' aspect of cannabis has definitely made some impact on Tenetehara society, no matter how virtuous individual users may consider the plant to be. This idea is borne out by the absence of marijuana in important tribal rituals, and particularly in the context of shamanism, where trance is always achieved exclusively through the smoking of strong tobacco.<sup>42</sup> Even at the all-night singing and dancing sessions which accompany the introduction of adolescent girls into adult society, men commonly get 'stoned' in the shadows, well away from the crowd. This discretion has probably resulted from a feeling common throughout rural Brazil, which sees cannabis smoking as an essentially male activity, and rather different in this respect to the almost universal use of tobacco. When women do smoke marijuana, which is relatively rare, they do so mainly in other female company, and only the most venerable and respected of the older women would ever go straight up to a man and ask him for a smoke. Probably the main use of the plant by women is boiled up as a medicinal tea, which they prepare by the law of sexual opposites exclusively from male plants, which are not much good for smoking anyway.

Something of the same discrimination or complementarity can also be seen in the observances surrounding the actual cultivation of marijuana. Throughout Brazil, when the plant is two or three feet high, it suffers a statutory pruning, which is seen to prevent it turning male. This act is undertaken with seriousness and respect and cannot be witnessed by women, who must also avoid touching the plant, or even passing nearby if they are menstruating, again to keep it from becoming male. The Tenetehara usually germinate as many as ten or fifteen seeds together in rough baskets of prepared earth about half a foot wide, either placing these straight in the ground, or moving them from their houses to the fields once the seedlings are three or four inches high.<sup>44</sup> Once planted out, each clump separately in the middle of other food crops, these small stands usually consist of about half a dozen plants, of which some remain very weak and weedy, while others turn male and are pulled out. Probably only one, two or at most three plants in each clump finally grow to full size.

In the early months of the harvest, the Tenetehara smoke almost exclusively the leaves which are constantly trimmed from the plant, drying them very simply by leaving them fifteen minutes in strong sunlight. The whole plant is only cut when the white hairs or pistils on the flowers begin to turn brown, and is usually dried hanging upside down under a shade. The buds are separated when dry, then packed tight for storage in gourds or large knots of bamboo (called *mutucas* in Portuguese), and kept either in the house or under ground, where they are said to become better cured. Larger quantities are also cured by laying the dried buds outside at night to rehumidify with the dew, then piling them indoors during the day to ferment. After a few days of this treatment they have turned from their original 'home-grown' lime colour to a much



darker brown or black. This is the standard demanded by outside buyers, though the Tenetehara themselves usually prefer to smoke their cannabis very fresh and green. Local terms for different qualities of marijuana describe its outward characteristics: *manga rosa* ('pink mango') implies a blotched, ruddy colouring, *cabeca de nêgo* (negro's head) a tightly curled and darkish preparation — or else determine its quality in relation to the whole plant: *rabo de rapôsa* ('fox-tail') denotes a bud longer than one hand, thicker than a thumb, while *pêlo de macaco* ('monkey's hair') indicates a grass full of the long stalks which occur at the base of the leaf and, by extension, conjures up a very inferior product, full of leafy material.<sup>45</sup>

What of the Tenetehara understanding of the drug's effects? Outside of the big night-time gatherings — where, as we have seen, it is used mainly as an euphoriant — the principal application of cannabis is as a stimulant, smoked before engaging in hard work such as clearing the forest or preparing the soil. The Indians commonly report that marijuana "makes one feel like working"<sup>46</sup>, and their major complaint to FUNAI after the 1978 Federal Policy raids was: "How do you expect us to plant our fields? You know that we only plant our fields after smoking marijuana ..."<sup>47</sup> At the same time, it would not be fair to say that the Tenetehara exhibit any real psychological dependence on their use of cannabis, for the second half of the year sees a distinct dwindling of their supplies, and many men probably go for several months at a stretch every year without any marijuana at all. The improvidence which characterizes their relationship with material possessions in general is also clearly manifest with regard to marijuana — they smoke pounds of the stuff when it is available, and rarely keep back small emergency rations for later. Seeing the way I held on to my meagre half-ounces for a rainy day, the Indians clearly thought that I was crazy ... 'Hey, *karaiw* (white man), where's your little bag of dust?' they would say, chiding me for my careful thriftiness.

In their view, furthermore, the stimulant/euphoriant properties of cannabis are also complemented by another very important feature, the ability of the drug to 'tame' or 'enchant' the animals which they hunt for their meat. Among the great number of plants used in Tenetehara hunting magic marijuana has a special place, its qualities allowing the hunter to creep up on game unawares, and 'transfix' the quarry long enough to aim and fire. Though the expression these Indians use to describe the sensation of being 'stoned', *hêmon-gatú*, means simply that 'everything's all right', it is often employed together with the Portuguese term *bicudo*, which has the sense of 'beaked' like a hawk. I am certain that this refers not only to the powers of sensual focussing and concentration while under the influence of marijuana, but also to the human capacity to 'fly' — sensorially, telepathically, and ultimately even in the fully disembodied state which characterizes the best mystical traditions of the Amazon basin ...

Question: Do you know of any other Indian who suffered in the same way as you?

Celestino: Djalma ... he lives in a place called Morro Branco, just outside Grajaú. Senhor Mourao (the local FUNAI agent) went to fetch him there, and when they brought him in he was put into

the same room where I had been ... later, when he found out that it was the police, he tried to escape, to run away. That was stupid. They opened fire on him and surrounded him by a fence, where he got his leg stuck and fell on the ground. They brought him back, and he suffered as much as I did. His feet were all swollen ...

Question: And what do you expect FUNAI to do about all this? Celestino: I expect FUNAI to take some action on my case. Look, I'm telling you this, because I'm not the sort of person who goes around spreading rumours. When I say something it's because I really feel it. Not even the life of the colonel will pay for the beating I received. Not even all his wealth will pay, it won't pay for it, because it really won't. Because he says he's the big chief looking after all the Indians, and at the same time he isn't, he's against the Indians. That's what I say, and I would say it to his face, and he could even have me killed ...

Celestino was fortunate that he told his story to a sympathetic listener, José Porfirio Fontenele de Carvalho, who has dedicated a lifetime to protecting the Indians of Brazil. On taking over the post in Barra do Corda in early 1978, he was genuinely shocked by the evidence that torture had been condoned by his immediate superior, Colonel Armando Perfetti — an ex-military policeman with no previous experience of working with Indians, and whose job had only been given him as as political favour. One might suppose an exemplary tale to have come out of this case, a shining example of idealism fighting back against patronage and corruption. But caution! It would be worth examining the subsequent development of this particular encounter in detail, for it demonstrates quite clearly how obscure machinations can ride rough-shod over the normal process of justice wherever the dread issue of drugs is involved.

Celestino's testimony was recorded at the end of February, 1978. Early in May, and greatly against his will, *senhor Mourao* — the FUNAI agent in Bacurizinho, a weak-kneed bureaucrat who was loath to take sides against the all-powerful colonel — was finally obliged to make a statement about his involvement in the arrest of the Indian Djalma Guajajara. He admitted that: "I witnessed ... Dr. Nazareno (the Federal Police interrogator) giving him two blows on the ears with cupped hands. As I did not approve this aggression against the Indian, I left the place, and have no way of knowing what happened afterwards ..."<sup>48</sup> It would have been enough to ask Djalma himself, of course, but neither did *senhor Mourao* do this, nor did he volunteer any information on the subject until cross-questioned by Porfirio Carvalho.

By the end of that same month of May — marijuana harvest time in Maranhão — Carvalho had been given the opportunity to experience at first hand the abuses and intimidation of the Federal Police, as this is traditionally the season for their annual rampages through the Indian reserves. Initially with some tact, and thereafter with mounting anger and despair, Carvalho had attempted unsuccessfully to convince the commander of the 1978 operation of the damage his campaign was causing to inter-ethnic relations in the area, already highly explosive as the result of land conflicts between the Tenetehara and the surrounding white population. One FUNAI observer, Elomar Gerhardt, was forced to accompany the police on their expedition into the Indian areas, and subsequently submitted a very perceptive report of the quite idiotic and brutal excesses

committed in their fruitless quest for the hundreds of acres of cannabis which they were certain existed, hidden just round the next corner.

Eventually Carvalho penned his own sharp criticism of the 1978 anti-drug campaign, and — together with Celestino's torture account and Gerhardt's fine satire of the Feds in action — sent off a complete report, first to colonel Perfetti himself in the state capital, and then to the FUNAI headquarters in Brasilia. Perfetti, an anti-cannabis hardliner, clearly had to do the utmost to discredit the stories of his involvement in torturing Indians. As a result Carvalho and his collaborators began to suffer a round of very ostensive surveillance from agents of the Federal Police. Determined to prove the involvement of FUNAI personnel in the trade of marijuana from Tenetehara reservations, the police went to great lengths to fabricate evidence, including the arrangement of clandestine encounters with Carvalho in abandoned buildings in Sao Luis. Certain that he was being set up — most probably for incrimination in a big drug raid — Carvalho steadfastly refused to come to any off-the-record accommodation with the Federal Police. And when the enraged Perfetti sent out a new man to take over his job in Barra do Corda, Carvalho got into his car and drove the two thousand miles to Brasilia to present his case personally to the President of FUNAI.

By dint of an impassioned eloquence, Carvalho was temporarily reinstated, and it was not long before his reports were leaked to the press by some well-intentioned minor functionary at FUNAI. The last week in August 1978 saw the Brazilian media making a series of sensational disclosures about the case, most of which liberally mixed the themes of drugs, Indians and torture into the sort of best-selling pulp which does so much to maintain the false equation of drugs and violence. The perfidious Perfetti counterattacked by claiming that he had never heard of the Indian Celestino, and finally hit the front page on 23rd August when he "attributed the inspiration for the accusations made against him to the marijuana dealers who operate in upstate Maranhao."<sup>49</sup>

At the same time, FUNAI's own commission of inquiry — heavily leaned on by the Feds and local political interests — decided to discount Celestino's version of events, and in an act of consummate cynicism, exonerated Perfetti, punished Carvalho and two of his subordinates for divulging official documents, and ordered their transfer to other areas.<sup>50</sup> In October, FUNAI's main institutional critics, the Catholic clergy, took the unprecedented step of publishing a full version of Carvalho's, Gerhardt's and Celestino's testimonies in their monthly CIMI bulletin. Shortly afterwards, the Indian Celestino himself travelled to Brasilia with a group of Tenetehara leaders. Confronting General Ismarth, then President of FUNAI, he repeated his accusations against Perfetti and confirmed his earlier account of torture.<sup>51</sup> As a result of this decisive intervention, Carvalho, Gerhardt and their other companion were immediately given back their jobs, but a compromise was found in allowing Perfetti to stay on as well, despite his by now public identification as a torturer.

In June 1979, almost a year later, the Federal Police concluded its own lengthy inquiry into the torture 'allegations'. Claiming that Celestino could not actually identify his torturers by name since his head was in a hood, the top dog at the department of Political and Social Order ruled that his testimony was legally 'irrelevant' and 'invalid'.<sup>52</sup> Two months earlier the 1979 anti-drug campaign had claimed a new victim, the sixty-year-old Cicero Jeovita, who was severely beaten on the soles of his feet and expelled from one village by the police for being a 'false Indian' and 'marijuana peddler'. The new FUNAI delegate in Maranhao,<sup>53</sup> major Alipio Levay — Perfetti's replacement when the latter eventually fell, not as a result of the torture case, but of his proved complicity in the invasion of Indian territory by unscrupulous landowners — simply limited himself to a straight denial that this latest round of torture had ever taken place.<sup>54</sup>

Since the abuse occurred outside of Carvalho's official jurisdiction, there was nobody even to question the right of the Federal Police to continue terrorizing the Tenetehara in this way. Indeed, infiltration by the United States Drug Enforcement Administration (DEA) of Brazil's Health Ministry and police establishment<sup>55</sup> — and through them the recruitment of minor FUNAI agents and countless other petty officials — had by now brought the new style of all-out war on drugs sharply into focus. Inevitably, such anachronisms as Indians claiming that their cultural traditions allowed them the liberty to smoke marijuana freely were coming under fierce and sustained attack. After all, in the noble struggle against the killer weed, such trifles as the human rights of a group of backward Indians can be trampled on at will.

1. in *Veja* 19/12/79
2. This and all subsequent extracts from Celestino's testimony have been taken from the full version published in the *Boletim do CIMI* no. 50, October 1978.
3. Law no. 6.001 of 19/12/73.
4. *FSP* 24/7/73, and *Beltrao* 1977:224-7.
5. *FSP* 19/7/73, *CB* 26/7/73, *ESP* 18/10/78, 22/6/79, 5/8/79.
6. *Murad* 1977:118.
7. *JB especial Os Documentos da Censura* 18/6/78.
8. *idem*.
9. *Beltrao* 1977:224-7 for 1973 coverage of this issue.
10. *Gomes* 1977:248.
11. This is made manifest also in the perceptive account of their 1978 operation by a FUNAI eyewitness, in *CIMI*, no. 50.
12. *ESP* 15/1/76.
13. *Beltrao* 1977:224-7.
14. *CIMI* no. 50:28.
15. *ESP* 20/5/79.
16. The intimate involvement of the police in 'fiscalizing' the marijuana trade in rural Brazil is self-evident. A good early source on this subject is Araujo 1961:318, who is describing the scene in the 1950s in the state of Alagoas, quotes a local mayor as saying: "What marijuana has done is give a lot of money to the police, that's the truth..."
17. see *Veja* 19/12/79 on "the desperate dependence of drug addicts... which generally results in violence... and barbaric crimes of rape and murder..."
18. Araujo 1961:316-322, Wagley and Galvao 1949:41-2, Hutchinson 1975.
19. *Ministério da Saúde* 1958.
20. Hutchinson 1975:182.
21. Nahas in Manchete, Nov. 1979. Russell 1978 was published by the Sao Paulo disciples of Rudolf Steiner, at the *Clínica Tobias*.
22. *De Pinho* 1975:299.
23. *Murad* 1977:90.



24. C do P 17/6/79.
25. P do P 28/10/78.
26. ESP 28/6/79.
27. ESP 24/7/79.
28. ESP 25/7/79.
29. ESP 25/5/79. A telling example of the Brazilian style of 'approved' literature on drugs is provided by Schmidt 1976, a truly disgusting publication full of lurid illustrations of the horror and rampant paranoia its author brings to bear on the subject.
30. Pernambuco 1937:187.
31. Carneiro 1966:18 and Pio Corrêa in Hutchinson 1975.
32. Cintra 1934.
33. Doria 1915 in Min. Saúde 1958, Hutchinson 1975.
34. Marques 1970:517. Other candidates for this identification include the tropical mallow or *malvas* - *Urena lobata* L. and *Sida* spp.
35. Gomes 1977:70,90,108.
36. Other groups of Indians have also learned of the use of cannabis by contact with Afro-Brazilians. See Doria 1915 for unnamed native groups in the northeast, and Tastevin 1923 on the Mura who live near Manaus.
37. Iglésias, in Min. Saúde 1958:16.
38. A trait also noted by Gomes 1977:248.
39. Monteiro 1966:289 provides a good example of the difficulties of the straight ethnographer who attempts to research marijuana smoking in a single field trip and without doing it himself: "Nobody feels encouraged to volunteer information to unknown visitors . . ."
41. Iglésias, in Min. Saúde 1958, recorded the exact same verse at the turn of the century, a thousand miles away in Pernambuco. Other examples of the poetic folklore surrounding the traditional use of cannabis in northern Brazil can be found in Araújo 1961:320 and Duarte 1974:215 for the state of Alagoas, and Monteiro 1966:294 for Amazonas.
42. The present-day pattern matches that reported by Wagley and Galvão 1949:42 thirty years ago. Neither is marijuana used in the strict, female-dominated Afro-Brazilian animistic cults — the *candomblés* of Bahia and *voduns* of Maranhão. The 'visionary' effects of cannabis smoking are, however, widely recognized among the black fishermen who live along the north-western coast of Maranhão, many of whom smoke during lonely vigils at sea and report encounters with the mythological beasts drawn from the syncretic Afro-Islamic-Portuguese traditions — see Dias 1974.
44. Identical forms of cultivation were reported for the Tenetehara in the 1940s by Wagley and Galvão 1949:41.
45. Dark-cured forms of marijuana (*cabeca de nego*) are generally more common and more appreciated in Alagoas — see Duarte 1974:215 — than in Maranhão, where the lighter, reddish *manga rosa* is widely considered the best 'export' quality that the state has to offer. However, perhaps more out of necessity than choice, the local people — both Tenetehara and black — often smoke green weeds of a distinctly 'home grown' type. Some of this uncured marijuana from Maranhão used to trickle through to São Paulo in the 1940s — see Pereira 1945:180.
46. Wagley and Galvão 1949:42.
47. CIMI no. 50:30.
48. CIMI no. 50:11.
49. EMa 24/8/78.
50. ESP 10/10/78.
51. ESP 18/10/78.
52. ESP 22/6/79.
53. ESP 5/7/79.
54. ESP 3/8/79.
55. Gerhardt (in CIMI no. 50:12) reported that the officer in charge of the 1978 campaign opened his presentation of the aims of the operation by reference to the 'infallible statistics' of his American advisers. At the other end of the see-saw, the pharmacologist José Elias Murad

(1977:112) had reported meeting a number of Brazilian narcs at what he called 'the best institution' in Washington DC, the DEA!

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CIMI: *Boletim do Conselho Indigenista Missionário, Brasília*.  
 CB: *Correio Brasiliense, Brasília*.  
 C do P: *Correio do Pará, Belém*.  
 EMa: *Estado de Maranhão, São Luís*.  
 ESP: *Estado de São Paulo, São Paulo*.  
 FSP: *Fôlha de São Paulo, São Paulo*.  
 JB: *Jornal do Brasil, Rio de Janeiro*.  
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# The Magic Weed

by  
**Colin Moorcroft**

Hemp is a weed. The Author looks at its ecological value and its use in ancient China.

Ours is the planet of the plants. Its earthiness is both plant-given and plant-giving. To live on earth is to live with plants — in a relationship we are free to cultivate or, through lack of awareness, to allow to degenerate. When the relationship flourishes, we and the rest of the planet flourish. When it degenerates, we and our world degenerate.

It is photosynthesis — this remarkable capability to build on light — that underlies all the significant production processes on earth. We depend on it for the air we breathe, for the weather that comforts us, for the waters within us and around us, for our food and for the energy that fuels human activity.

All human production is an interaction with plant production. At its most obvious it consists of the processing of plant products (both fossilised and living). Less obviously, it consists of activities that condition the productivity of plants (we have, for example, built up a few areas of rich soils whilst also removing most of the earth's forests and destroying large areas of soil elsewhere). We are currently in a position where, after a brief evolutionary adventure, we appear to have burnt up much of the earth's store of fossilised plant materials whilst, at the same time, having considerably damaged the global community of living plants. We, therefore, are faced with two tasks. Firstly, we have to make a transition to sustainable ways of life based on incoming solar energy and secondly, we have to restore our living environment to health. In practise these two tasks amount to one task: the cultivation of the global garden.

In the frenetic rush to develop new technologies based on renewable sources of energy the oldest and most effective solar energy converter has been forgotten. All non-plant converters are hampered by the low intensity and discontinuity of solar energy. The low intensity of the sun's rays means that vast quantities of materials and human effort are needed to cover large areas with solar collectors — denying those areas to other uses. The discontinuity of solar radiation — from day to night and summer to winter means further enormous material and labour costs are incurred in storing energy. The plants overcame these problems thousands of millions of years ago. They can tap locally available materials all over the earth and build them into self-maintaining, self-repairing, biodegradably self-disposing solar collectors that turn the sun's energy into stored energy (e.g. wood). All this is done in a way

which doesn't damage the environment but actually enhances it.

The technology of the future, just like all past ones, may, therefore well be plant-based. We already know how to obtain a wide range of solid, liquid and gaseous fuels from plants. We know how to use their structural materials for clothing, for shelter and for the production of a wide range of chemicals (the so-called 'cellulose economy'). We can obtain medicines from them. We could, if we chose, get all our food from them. We can even get high on them. Just as importantly we can, in cultivating plants, cultivate ourselves. The skills of the effective cultivator, unlike those of de-humanising production-lines, are essentially human skills. They put us back in touch with ourselves and with the world of which we are part.

Standing right at the centre of the past, present and future story of people and plants is an exemplar that is almost completely ignored. That plant is the hemp plant, an exceptionally versatile plant of far greater significance than the trivialising reefer-mad, mass media would ever allow.

## History of Hemp

Hemp originally belonged to that group of talented plant opportunists that some dismiss by calling them 'weeds'. It is to these plants we owe all our major crop plants. They were the first plants to leap into the new natural habitats, such as kitchen middens, created by early human activity. They are mostly vigorous in growth, adaptable to varying conditions and reproduce at an extravagant rate.

We can only speculate how these weeds became crop plants. It has been pointed out that the whole process could have occurred unintentionally. People might, for example, have collected the largest, most easily picked seeds and dropped a few around their dwelling-places. In time the plants would be unconsciously 'selected' for the size and detachability of seeds (all the cultivated grains have large seeds that detach more easily than their wild precursor) and for their ability to grow on humanised sites. On the other hand people may well have used their powers of observation and have deliberately selected and sown seeds of plants with desirable properties.

In the case of hemp the original wild stock appears to have been spread right across Asia and may have been originally brought into cultivation independently in more than one place.



## Hemp in Early China

Currently available evidence points to northern China as one of the earliest areas of hemp cultivation and provides an outstanding example, stretching over thousands of years, of the interdependence of human culture and of plant culture.

It is easy to imagine stone age Chinese being drawn to the hemp plant. Its resinous smell alone would make it stand out amongst other invaders of the land around early settlements. Its long fibrous stems and generous bunches of fruits must also have presented a tempting invitation to experimental, playful investigation.

The plant first enters history books as an important part of the Yang-Shao culture that flourished in northern China about five to six thousand years ago. This culture is mostly known for its painted pottery. Many of the fragments of pots that have been unearthed are covered in pictures that include ropes and woven cloth that were probably hempen.

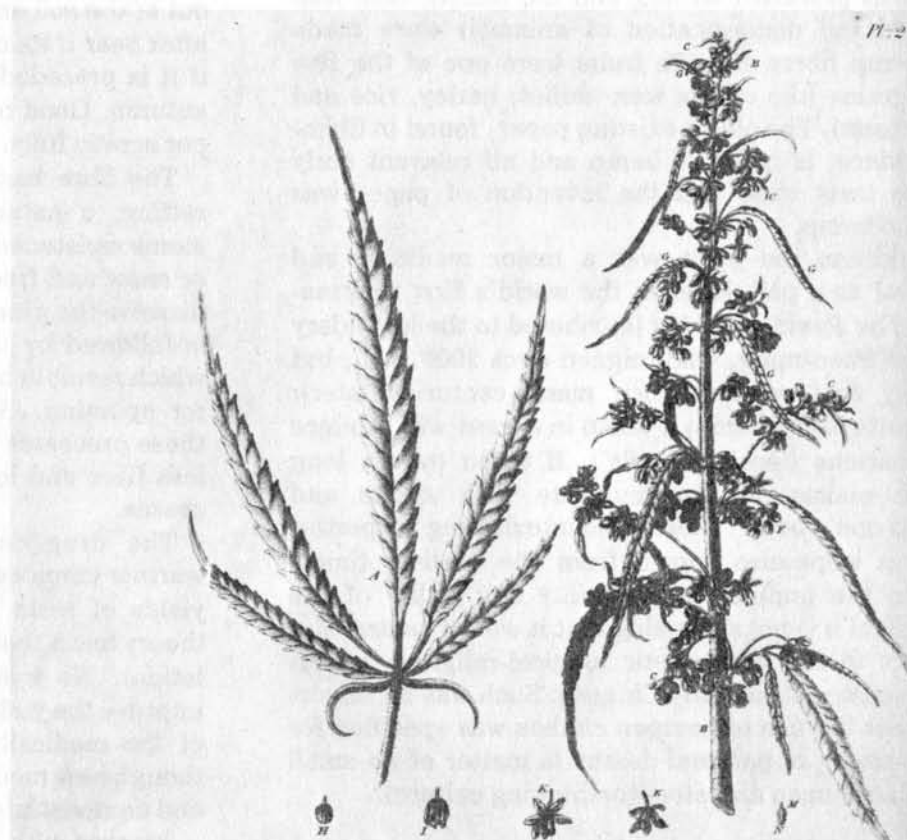
As Hui-Lin Li has pointed out, 'textile fibres are next to cereal grains in importance to the founding of human culture' and, in the case of Chinese culture, hemp was the original textile fibre (indeed, it was the first in the world) as well as being a major grain crop. All Yang-

## Hemp: The Plant

Tim Malyon

In the original Hebrew text of the Old Testament, and the Aramaic translation, God directed Moses to make a holy oil composed of "myrrh, sweet cinnamon, *kaneh boshm* and cassia." (Exodus 30:23) According to Professor Sula Benet, this *kaneh boshm* is almost certainly derived from the Sanskrit *cana*, meaning either reed or hemp, and *boshm*, meaning sweet, and may well be the root for *cannabis*. Error crept into subsequent translations, in particular the 3rd century BC Septuagint, the oldest Greek translation of the Bible, so that now *kaneh boshm* is variously translated as 'sweet calamus' (Exodus 30:23), 'calamus' (Ezekiel 27:19), or 'sweet cane' (Isiah 43:24; Jeremiah 6:20). As reported by Herodotus (Herodotus, IV:142) in the 5th century BC, the Scythians used '*cannabis*' to purge themselves after funerals by throwing hemp seeds on heated stones to create a thick vapour, inhaling the smoke and becoming intoxicated. "The Scythians howl with joy for the vapour bath." Ashkenaz, the Scythians' progenitor, is named in the Bible as the son of Gomer, great-grandson of Noah.

The cannabis plant can be grown both for fibre and seed, as well as for its intoxicating qualities. Different growing methods are employed for these different purposes, fibre cultivation encouraging a tall plant with few branches to create long, unbroken strands of fibre, 'smoke' cultivation encouraging a bushy plant with as many branches as possible. Fibre plants are seeded close together to encourage tall, uninterrupted growth, 'smoke' plants far apart to allow room for a rich branch and leaf formation. Controversy rages amongst botanists as to whether 3 distinct species of cannabis exist, *Cannabis sativa*, used by both fibre growers and herbal cannabis producers, *Cannabis indica*, used predominantly for hashish production, and *Cannabis ruderalis*, a lesser known species which grows



in the Volga region, western Siberia and central Asia. It is hard to know what constitutes a distinct species, and what differences arise from such a long history of specialist breeding. Whilst cannabis sativa can undoubtedly be cultivated for high quality 'smoke', a basic shape differentiation exists between *sativa* and *indica*, *indica* being a short (3–6 ft), conical shaped, bushy plant, *sativa* tall (5–18 ft), with smaller leaves and fewer branches, particularly when grown close. All types of cannabis plants are annuals, although plants do survive for more than one season provided they are not killed off by frost. As a rule, plants growing in tropical climates, tend toward 'smoke' production, plants in temperate climates towards fibre.

Whilst typically dioecious, the cannabis plant enjoys a varied sex life. The best herbal cannabis for

smoking can be obtained from the flowering female plant, so modern 'smoke' farmers are separating male from female plants in order to allow the female to flower for longer and to stop her from going to seed. Farmers have found, however, that females, when deprived of male plants, can develop their own male pollen sacs and pollinate their own flowers. In contrast, fibre cultivators who also grow for seed have exploited these monoecious tendencies, breeding a specifically monoecious type of cannabis which develops both male and female organs on the same plant and ensures more reliable fertilisation and seed production. Since male plants reach maturity quicker than females, monoecious plants have the added attraction of all being ripened for harvesting at the same time.



Shao textiles and cordage (including the knotted tally ropes that preceded writing and the fishing nets that preceded the domestication of animals) were made from hemp fibres and the fruits were one of the five major grains (the others were millet, barley, rice and the soybean). The oldest existing paper, found in Shensui province, is made of hemp and all relevant early Chinese texts state that the invention of paper was based on hemp.

In addition the plant was a major medicine and appeared as a pain-killer in the world's first pharmacopeia, *The Pents'ao Ching* (attributed to the legendary emperor Shen-nung, who reigned circa 2000 B.C., but probably first written down many centuries later): '(the fruits of the hemp) if taken in excess will produce hallucinations ('seeing devils'). If taken over a long term it makes one communicate with spirits and lightens one's body'. Clearly the intoxicating properties of hemp were also known from the earliest times.

Given the impressive versatility and utility of the hemp plant it is not surprising that it was of central significance in the shamanistic magical-religious beliefs and practises of the early Chinese. Such was its importance that the use of hempen clothes was specified for the mourning of parental deaths (a matter of no small significance in an ancestor-worshipping culture).

### A World-wide Crop

Having already established itself as a major fibre, food, medical and magical crop plant in northern China over five thousand years ago, hemp was to demonstrate its astonishing adaptability by spreading over the next few thousand years, over most of the planet. The most active early agents in these travels were probably the Scythians, a highly nomadic people who took the plant from northern Asia right across the continent to the gates of Europe (where it became a major fibre crop and folk medicine) and down into India (where it became a medicine and its psychoactive properties were much celebrated in religious rituals).

Hemp is still a major world crop. Its strong, durable, waterproof fibres make it the best known source of cordage fibres and an excellent source of textile fibres. Its seeds, although now only eaten by canaries, are pressed to yield an oil that is used for cooking and in industrial processes such as the manufacture of varnishes. The flowering heads, the leaves and the resin exuded by special glandular hairs are smoked and eaten for pleasure by millions of people.

### Full potential not realised

Nonetheless the full potential of the plant is hindered from realisation by a variety of forces, not the least of which is the largely unsuccessful attempt to suppress its use as a drug. Very little work has been done on the selective breeding of hemp. Over time an enormous number of strains with widely differing qualities has emerged.

One group is particularly suited to fibre production. It is grown mainly in cooler temperate climates. The plants are grown close together to suppress weed growth and discourage branching of the stems.

It is allegedly a cultivator's dream: it has a short growing season; its penetrating roots improve soil structure; it suppresses weeds; if grown around the edge of a plot it will repel certain pests; it takes little out of the soil and can be grown on the same spot year after year if its unused bits are returned to the soil and if it is preceded by a green manure crop sown in the autumn. Good husbandry yields 1000-1500 lb. of fibre per acre in Italy.

The fibre has traditionally been made available by retting, a natural process in which bacteria invade stems moistened by water (preferably river water), dew or snow and free the fibres from the woody stem and dissolve the glues that hold the fibres together. Retting is followed by the process of breaking and scutching which result in bales of combed, beaten out fibres ready for spinning. Great claims for the mechanisation of these processes have been made but still seem to yield less fibre and lower quality fibre than traditional processes.

The drug-yielding strains are mainly grown in warmer climates where they are able to produce higher yields of resin than the fibre strain. (One disputed theory has it that the resin is a form of botanical suntan lotion). No systematic research has been done to improve the yield of the psychoactive substance THC or of the medically active constituents of the crop (although new medical uses are continually being claimed and demonstrated).

An area with enormous potential for future development is the use of the currently discarded woody stems — or hurds — that are left after fibre, seed or drug production. These form much of the bulk of the harvest and consist of about 27 per cent cellulose. Cellulose is an extremely useful chemical that can be used to manufacture over 25,000 products from much-needed liquid and gaseous fuels to biodegradable plastics. It is seen as the major replacement for fossilised plant chemical feedstocks and for some diminishing mineral resources.

The possible use of hurds for paper-making could be equally significant. Given the pressure on the world's forests any alternative to chopping down trees to produce paper must be welcome. As hemplands produce four times as much fibre per unit area as many commercial woodlands, the hemp plant could well ease the strain.

In freeing hemp from oppressive legislation we would be doing far more than reversing an abolitionist error. We would be taking a small step in cultivating our own future.



# Just Another Cash Crop?

## The Cannabis Market Present & Future

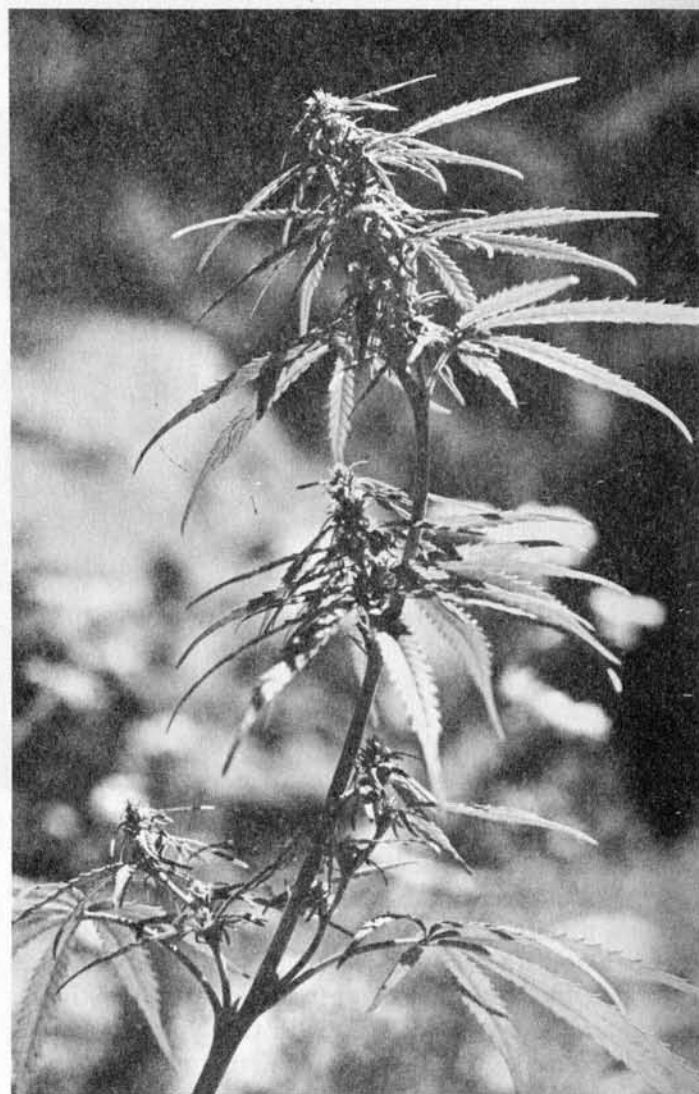
by  
Tim Malyon

Cannabis is big business and the economies of some countries are wholly dependent upon it. Legalisation would take the drug out of the hands of organised crime — probably to the benefit of the multinationals. Tim Malyon argues for decentralisation of production and marketing to avoid cannabis becoming 'just another cash crop'.

Over 200 million people worldwide use the herb cannabis for medicinal, spiritual, recreational and industrial purposes.<sup>1</sup> A huge international marketing network exists to supply this mainly illegal demand, and an equally huge force of police and military exists supposedly to close down the business.

UK law enforcement services now expend more energy catching cannabis offenders than all other drug offenders combined. According to the Home Office, "87% of all drug offenders in 1979 were concerned with cannabis, as compared with 76% in 1974." Of the 12410 people convicted or cautioned for cannabis offences in the UK in 1979 (838 more than in 1978), 10774 involved simple possession.<sup>2</sup> Catching suppliers takes time too. After the September 1979 seizure of 4½ tons of cannabis, Gilbert Kelland, Assistant Commissioner (Crime) for the Metropolitan Police estimated that ⅓ of the drugs squad had been occupied for 3 months on the case. Taking into account officers on leave, sick and engaged in routine investigations, this does not leave many men free to investigate, for instance, the huge quantities of heroin flowing into the UK at that time.

The social cost of cannabis prohibition is considerable. 1667 people were given custodial sentences for cannabis offences last year. Moreover, whatever the sentence imposed, damage caused simply by a criminal conviction for cannabis can be immense. During the last year the Legalise Cannabis Campaign has heard from many people — seamen, nurses, students, taxi



Tim Malyon

drivers, teachers, postmen, a trainee lawyer — who have lost their jobs, been refused travel visas or turned out of their homes as a result of a cannabis conviction. Courts can also be discriminatory in their sentencing practice, with maximum sentences of 7 years for possession and 14 years for cultivation and supply available to them: Winston Joseph was sentenced to 6 months imprisonment in July for cultivating one cannabis plant, whilst Sarah Ponsonby incurred a £50 fine for 292 plants. Sarah Ponsonby is white, related to a former Tory minister and lives in Wiltshire. Winston Joseph is black and lives in the East End of London. Whilst the relatively sensible sentence handed down to Ms Ponsonby is to be applauded, such increasingly common discrepancies can only serve to heighten racial and class tension.

Discriminatory law enforcement enhances this problem further. Degrading personal searches for cannabis within the Black and White Club this spring contributed to the sparks which fired up the Bristol uprising. Whilst that incident's roots emanate from the prosperity Bristol inherited from its slave trade, as well as present day unemployment and bad housing, repeated 'stop searches' under the authority of the 'sus' (Vagrancy) and cannabis laws have caused immense bad feeling between the police and the local community, black and white, aggravating the underlying social injustices.<sup>3 4</sup>



Anti-cannabis laws have led to unnecessary antagonism between young people and the police.

### Cannabis and The Ecology Movement

In recent times cannabis has frequently been used by workers, artists, and religious groups critical of establishment politics and values. In Britain, the cannabis laws are increasingly used against rock festivals, venues and events associated with the 'youth' culture. The advice agency *Release*, which runs regular emergency services at festivals, reports a significant increase in police 'stop and search' operations around rock festival sites this year. Whilst the popular stereotype of the cannabis smoking hippy is wearing somewhat thin, illegal cannabis use and its repression cannot be disassociated from liberation politics. Dr Zbigniew Thielle, chairman of the Polish Psychiatric Society's Commission on Drug Problems recently discussed a similar phenomenon in Poland. "The feeling of hostility, of fear, of moral disgust is not directly connected with the effects of use of definite intoxicants. If it were so, such feeling would be stronger in relation to alcoholics than to grass smokers. The establishment rejects in the first place the new, alternative socio-cultural values, manifested, either intentionally or unawares by circles shaping the 'pot' culture." A careful review of the rate of development of social attitudes in hostile and negative behaviour of the establishment was noticed at a time when the increasing number of drug users was accompanied by the youth protest movement. The bourgeois mentality defends those morals, behavioural and cultural values which encourage a firmer grounding of consumer attitudes.<sup>15</sup>

Such indications of 'pot culture' values have already arisen within the UK ecology movement, counting as it does a large number of cannabis users amongst its supporters. At the recent Ecology Party Summer Gathering at Glastonbury a strong group pushing the party towards more radical policies and campaigning methods were also canvassing support for Ecology Party policy on cannabis legalisation. One of the largest

meetings at the gathering was in fact devoted to cannabis legalisation, where the structure of a future legal market was discussed in relation to land and agricultural reform. Could cannabis benefit the smallholder and mixed farmer, or will its cultivation and marketing be taken over by large concerns as just another, albeit very profitable, cash crop? Clearly such questions are inseparable from the whole debate around agricultural and land reform.

In France close ties also exist between ecology and cannabis. The radical ecology magazine *La Gueule Ouverte* helped found the French legalisation campaign, supported by the national daily paper *Libération*, founded by Jean-Paul Sartre. In Italy, one of the main parties campaigning on ecological and civil liberty issues, the Radical Party, is also pushing hard for legal cannabis. The Party, which increased its vote from 1% to 3½% at the last election, giving them 18 Parliamentary deputies, has just collected 650 thousand signatures against nuclear power and 550 thousand against cannabis prohibition, forcing the government to hold national referenda on these and certain other matters. With cannabis, a referendum may not be necessary. Despite howls of protest from the Pope, the Health Minister has suggested a proposal to remove all but major trafficking offences involving cannabis from the criminal law.

Given such ideological connections between pressure to legalise cannabis, and wider pressures for a more socially and ecologically sound society, what is the present impact of the cannabis market on agriculture and economies, and could a future legal market be worth more than just another cash crop?

### The Size of the Market

The cannabis market is large. How large is hard to estimate. In 1973 a *Midweek* survey suggested that some 3.8 million people in the UK had tried cannabis.



That somewhat unreliable figure may well have topped 5 million by now. According to Home Office figures, nearly 12 tons of cannabis were seized in 1979, as compared to some 6½ tons in 1978. Since the release of those statistics over ten tons have been seized in one operation alone. Given such scanty yet rapidly escalating figures, guesstimates as to total market size are hard indeed. An estimate published in *Police Review* by a drugs squad officer and based on information from customs places total UK imports at 500 tons a year.<sup>6</sup> Taking an average retail price of £50 per oz, such a quantity would be worth some £896 million on the street, less than half of this at wholesale prices. Unfortunately the body which advises government on drug policy, the Advisory Council on the Misuse of Drugs, does not see fit to quantify patterns and extent of use, perhaps because the size of the market indicates so clearly the failure of a prohibition which a majority of members of the Council still blindly support. Apparently user surveys would be too costly.

Perhaps the most reliable indication of just who this market services is to be found in the Legalise Cannabis Campaign's membership lists. Whilst not all LCC members are cannabis smokers, the Campaign numbers amongst its members students, doctors, lawyers, miners, journalists, engineers, computer programmers, musicians, seamen, members of the armed forces, a former assistant prison governor, gardeners, the list goes on.

According to surveys carried out by the National Institute on Drug Abuse (NIDA) and the Drug Abuse Council 51 million Americans have tried cannabis in the last 15 years, and 26.6 million continue to use it. The US Narcotics Intelligence Estimate states that 10-15,000 tons of cannabis was smuggled into the United States in 1978, worth between \$15-23 billion. A study based on somewhat lower estimates of consumption has calculated that \$1.8 billion in taxes could be raised from this market annually,<sup>7</sup> whilst at the moment the government spends \$600 million a year on prosecuting cannabis offenders. The US Federal Drugs Squad (Drugs Enforcement Administration-DEA) has even estimated the total value of the cannabis industry as high as \$48 billion, which would mean that if all cannabis dealers amalgamated into one corporation, it would be the third largest in the US after General Motors and Exxon. Whatever the truth of these figures, which must remain to some extent guesstimates, the US 'industry' is clearly huge and undoubtedly wields immense economic and political power, power totally out of official government control.

### Organised Crime and the Cannabis Trade

So who works in this business? Until recent years the cannabis market has remained remarkably free of organised crime elements, mainly because other substances such as cocaine and heroin are far easier and more profitable to smuggle. In the case of heroin a hard core of customers also form a somewhat captive market. By 'organised crime' I refer to groups who do not smoke cannabis themselves, who are involved in other types of major crime, who are trafficking purely for commercial gain, who use violence to protect their in-

terests, and who involve themselves in high-level police, political and business corruption. Agents of such groups are often armed. Recently, due to the burgeoning size of the market, the cannabis business has become increasingly attractive to such elements.

A clear example is the present military junta in Bolivia. The US State Department has accused the army officers who organised the coup of running the Bolivian cocaine trade and the US Drugs Enforcement Administration has withdrawn all cooperation with the new so-called government.

Against this type of dealer should be compared the cannabis smuggler — someone who smokes cannabis and who often becomes initially involved in the trade to provide self and friends with a reliable supply. They are not armed, rely on native wit and luck rather than corruption and violence to outwit police and customs. They typically deal nothing but cannabis and are, sad to say, being pushed out of the market. Such dealers are still common amongst the lower echelons of the network where often the borderline between commercial dealing and 'getting in a few ounces for the family' is very narrow. They generally remain active as exporters in remoter areas of the world where large scale dealing has not yet arrived. Often genuinely disillusioned with conventional work, they have a zest for travel, adventure and ready cash. They are however usually by no means rich, smuggling relatively small quantities with high risks. Those that I have met abroad are very often the people with the best understanding and sympathy with local cultures. 'Importers are into the last great adventure; as someone wrote on the wall of the police cell near the Afghan border, 'Marco Polo never had these problems' ...the trade routes of the dope culture are just as dangerous, its merchants just as resourceful ...'<sup>8</sup>

In Sept. 1979 2¼ tons of cannabis were seized by UK Customs off the Cornish coast, and a further 2¼ tons found in a London garage. During the operation, no guns were involved, neither police nor customs were armed. In what other enterprise, criminal or legal, would £5 million worth of goods be moved around without armed protection? This seizure contrasts sharply with more recent events, where in one instance a customs officer was shot dead in a cannabis raid; in another, guns, clear links with organised crime and death threats emerged from an investigation into an amphetamine and cannabis smuggling operation. A third incident in Ireland involved guns, a former Provisional IRA associate and 850lbs of cannabis hidden under a containerload of bananas. As the market grows, so will such organisations take an increasing interest. Prohibition has not stopped them, rather handed them more money.

### Corruption

Indeed, in this booming market ever more disturbing information emerges as to just who is involved. A Scotland Yard Drugs Squad officer was sentenced this July to 7 years imprisonment for 'recycling' at least 900lb of cannabis back onto the market, part of a 11½cwt haul seized by senior colleagues which, according to the prosecution, was never destroyed. In an unusual outburst

the trial judge stated: "The prosecution are probably right in regarding you as a tool of other officers, higher up than yourself in the drugs squad."

Over the other side of the Atlantic an American arms dealer and advisor to numerous right wing Latin American dictatorships (who has himself admitted complicity in a plot involving the CIA to finance clandestine guerilla activities in Latin America<sup>9</sup>, was charged with conspiracy to import some 22 tons of cannabis a month from Colombia. He was found not guilty after pleading that he was planning the runs for a friend of his, a senior Drugs Enforcement Administration Officer, with the view to entrapping a major trafficker, and after the star prosecution witness died in somewhat mysterious circumstances.<sup>10</sup> His DEA friend has himself been publicly accused of "organising an assassination program" to eliminate supposed major drug traffickers without the messy business of resorting to the criminal courts.

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## **In Columbia almost 40,000 families derive their income directly from activities relating to Cannabis.**

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Both of these cases illustrate the perilously thin line between police entrapment of traffickers by undercover officers becoming involved in the trade, and active police participation in the trade. The Scotland Yard detective sentenced to seven years pleaded that he was selling the cannabis to catch a trafficker.

### **Influence of Cannabis Trade on National Economics**

Due to its sheer size, and the professional organisations involved, the cannabis market is beginning to exert a serious influence on national economies, in particular economies of producer countries. In Colombia, which is the largest supplier of cannabis to the US, such is the influx of illegal dollars that the black market rate for dollars is lower than the official rate. The huge sums of liquid cash available to traffickers is having a real effect on rates of inflation and is beginning to influence the political processes. "A number of Colombian Congressmen who have represented their districts for a number of years have said that, during the Parliamentary elections in 1978, they suddenly found themselves facing unknown candidates with apparently unlimited financing."<sup>11</sup> As well as attempts to involve themselves directly in politics, traffickers also try to launder their money into legitimate businesses. The US ambassador to Colombia recently told the following tale to illustrate this point. "In 1976 Colombia's largest bank was almost taken over by a group of narcotics traffickers. The bank's board of directors had thought it opportune to open up stock ownership to a broad segment of the population. A large non-preferred stock issue of greater than 51% of the bank's total stock was announced. Two

groups of narcotics traders promptly bought up the entire stock issue. Realizing they were on the brink of losing control, the board of directors swiftly came out with a new preferred stock issue which enabled them to maintain control of the bank. This type of take-over is even more threatening today because criminal elements have a growing liquidity just as business finds itself illiquid."<sup>11</sup>

It was with such stories in mind that the Colombian National Association of Financial Institutions (ANIF) recently conducted a thorough investigation into the economic and social impact of the cannabis trade<sup>12</sup> and as a consequence started publicly campaigning for a legalised trade. They have now applied to join ICAR, the International Cannabis Alliance for Reform, which is pushing the UN to remove cannabis from the international treaty which forbids legalising the trade. ANIF itself is "a research centre supported by the Colombian financial sector" and has been backed in its call for a legal market by Gen. Matallana, former head of the National Security Department in charge of drug control; Leonidas Londono, a leader in the coffee industry; Anibal Martinez, Colombia's Fiscal General; and Eduardo Goetz, chairman of the Bogota Stock Exchange. Hector Correa, President of the Senate, is planning to introduce an ANIF backed legalisation bill.<sup>13</sup>

ANIF's research produced some remarkable figures concerning the Colombian trade. \$110 million are paid out annually in bribes to Colombians, a fact which heavily influenced the army in pulling out of a major growing area. They weren't stopping the traffic and widespread corruption of military personnel was becoming a serious problem. Of 10,000 tons exported every year, 8500 tons go to the US. The cannabis trade is estimated to equal in value 39% of all Colombian exports in 1978.<sup>14</sup>

### **Influence on Agriculture**

The impact of the trade on agriculture is stressed. ANIF estimates that in Colombia "almost 40,000 families derive their subsistence income directly from activities related to marijuana." 75,000 acres are estimated to be under cultivation for cannabis, much of this having come under the direct control of large traffickers. Unfortunately, big business and small farmers do not seem to mix very well, and the Colombian cannabis trade is no exception to this rule. Of every dollar spent on Colombian 'grass' in the US, 80 cents go to US dealers, 19 cents to Colombian middlemen, and just 1 cent to the farmers<sup>14</sup> — the people who work the hardest, take the greatest risks, and stand to lose the most.

Big business in Colombia is also managing to distort agricultural production by concentrating on cannabis in a way which has not been experienced in traditional cannabis producing societies. "The purchase of large tracts of agricultural land on Colombia's north coast by drug traders threatens to cause a drop in agricultural production and is exerting upward pressure on the price of food staples along the coast."<sup>11</sup> This trend, as I shall show in the following paragraphs, is a new one, and a direct result of large, albeit illicit businesses moving in and altering traditional, ecologically sound growing methods. Keeping cannabis illegal will not stop this





Aeroplane left abandoned by drug-smugglers in Jamaica. Organised crime earns billions from the illegal cannabis trade.

trend, indeed it will aggravate it by causing cannabis prices to remain artificially high, encouraging large scale monoculture, whilst making sure that no control can be exerted on the businesses running the trade. As I shall also show, legalisation alone is not the magic elixir to this problem, since it is perfectly possible for future legal 'agrobusiness' to move in and adopt monocultural methods. If legalisation is to have the wide benefits possible from it, a concrete model for a legal market must be evolved which protects the small producer and checks present trends towards monopolistic 'multinational' production. We are dealing first and foremost with a plant, an agricultural product. In searching for a legal cannabis market, we must find the same solutions as those which we seek for a social and ecological Utopia. Central to this struggle are those consumers involved in cannabis law reform, whose ideologies I have already mentioned, and the farmers.

#### Traditional Cultivation: Himalayas

Although fine smoking cannabis can be grown on low lying land, most of the world's finest herb is grown in mountain areas. This may be attributable to the mountain climate, or to the suitability of mountainous regions for hidden cultivation. Certainly cannabis production lends itself to small scale growing patterns essential in the mountains. Whilst the plant likes good soil, it has a high yield (up to 1lb per plant) and can be grown on small, hilly patches located away from a village and only marginally suitable for agriculture. It is extremely easy to grow, keeping down weeds itself after initial germination, and can adapt very easily to both short and long growing seasons. The main growing areas now are in India, Pakistan, Afghanistan, Morocco, the Lebanon, Jamaica, Colombia and Thailand, and the farmers are poor smallholders.

I visited one typical growing area high in the Himalayas in 1978, which has been producing quality hashish (cannabis resin) for over a thousand years.<sup>15</sup> In some

of the most remote villages, several days walk from 'civilisation,' the cash economy has hardly penetrated, hash representing an important medium of exchange and barter, fulfilling many of the basic requirements of money: lightness, compactness, durability and widely accepted worth. In that area it is accepted by many as a sacred plant, dedicated to the Hindu deity Shiva. The 'chilam' pipe from which it is smoked is itself a sacred vessel, representing the four essential universal elements, water and earth used to make the clay pipes, fire and air which are combined when the pipes are smoked.

The hash trade is a cottage industry, carried on by large numbers of local people as an essential supplement to subsistence food production. Plants are either cultivated for resin production, or often grow wild in abundance of sufficiently high quality for resin. Villagers rub the plant between their hands to produce 'charas,' a special quality of hash, rolling the sticky resin from the flowering remale plants into an increasingly large sausage. Recently, however, this traditional method has been replaced in some areas by foreigners coming in and beating the crop for its resin, a method of thrashing the plant against a mesh to knock off resinous leaf material, which is then pressed. Such a process, more common in Morocco and the Lebanon, was frowned upon, by local people, both because of reduction in quality, and because the wild plant stock was being decimated by this faster method, particularly when producers beat large patches without allowing any plants to go to seed.

Dealers going into the mountains were either Indians, who would bring the crop down to the towns to sell, or low level Western dealers, who would trek from village to village, tasting and bartering, not only with money, but sometimes with goods useful to the farmers and hard to obtain in the mountains. Many dealers spoke local dialects and enjoyed good relations with farmers to whom they would return each season.

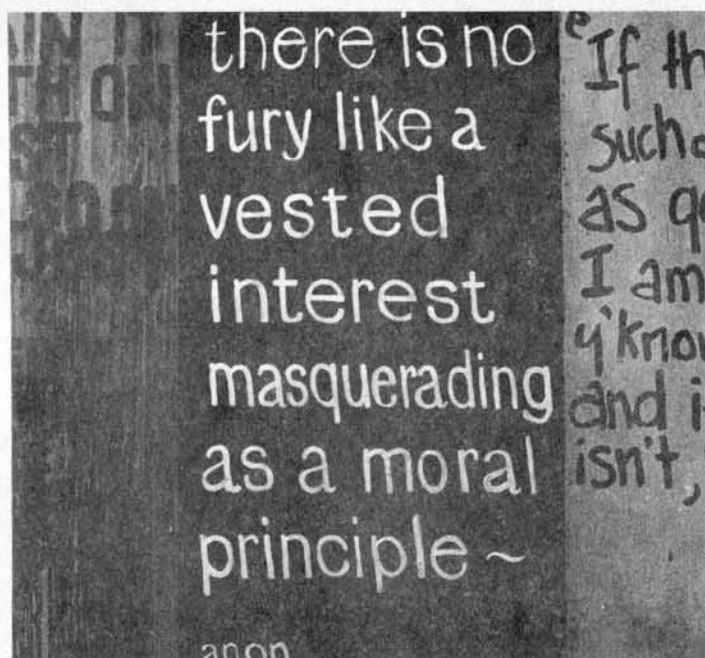
## Jamaica: Rastas vs Organised Crime

The large quantities of ganja grown in Jamaica, mainly by smallholders, must be better hidden than in the Himalayas. The country is less remote from 'civilisation' and police actively search out fields. Jamaican farmers either carve out a patch in the hills, far away from any path, sometimes building themselves a small shelter where they live as the harvest approaches. Or, more boldly, they grow the crop hidden amongst other plants. As in India, many of the farmers who use cannabis for medicinal, recreational and sacred purposes consider it to be a holy plant.

Many Rastafarians are involved in cultivation and small dealing, believing the 'herb' to be sacred. According to Daniel Wight, a social anthropologist recently returned from a Jamaican field trip, the cultivation and trade amongst Rastas is facilitating a small reversal of the move from land to town. Rastas place great value on growing their own 'ital' food (free from chemical fertilisers) including herb, the 'brain food,' thereby rendering themselves independent of the 'Babylonian shitstem.' They are another example of pot culture liberation politics referred to earlier. As one close observer of the movement summed up: "The cultural resistance of Rasta remains an integral part of the struggle against American imperialism and commodity fetishism, which attempts to reduce human beings to zombies."<sup>16</sup> Pushed by over 30% unemployment and intolerable conditions in the towns, many Rastas in Jamaica are setting up their own smallholdings, sometimes aided by the government's land-lease scheme. Whilst they try to live off the food and herb they cultivate, a surplus is often produced which is sold for cash. One such Rasta, when asked by Dan Wight what he would do with the proceeds of his crop, replied: "Not car, buy two goat."

The present situation in Jamaica, as in the Himalayas, is delicately balanced. On the one hand, the trade assists small farmers, for whom cannabis is an integral part of culture and religion, if anything boosting agricultural production by the surplus it so easily produces; on the other hand, big business (in this case organised syndicates) have moved in because the profits from mass exploitation can be so huge. They threaten the delicate indigenous superstructure of supply and demand, just as their successors, multinational agrobusiness, could threaten this same superstructure under certain types of legal market. Both must be fought, for both represent their own brands of enslavement. One possible reason for the very rapid take-over of the Colombian cannabis market by big business may indeed be that hardly any cannabis use trade or customs existed before the export trade started to expand. Only 3%<sup>12</sup> of the Colombian population uses cannabis, in comparison to between 50 and 70%<sup>17</sup> in Jamaica, and a large proportion in India. No superstructure, no allegiances, — business, friendly, religious or political — existed which had to be supplanted before the trade could be controlled from above.

A very strange situation is now developing in Jamaica where a right wing religious sect, the Ethiopian Zion Coptic Church, which shares many beliefs with Rasta, including a belief in the sacred nature of the



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herb, is launching explicit verbal attacks on Rasta, including referring to Rastas as 'rope-heads.' This religious sect is immensely rich, owning at least 4000 acres of land and employing some 1000 people in businesses, one of which ranks amongst the major Jamaican container transport companies, Coptic Containers.<sup>18</sup> The sect is widely suspected of organising a large slice of the Jamaican cannabis export market and faces criminal charges of conspiracy to import large tonnages of cannabis into the United States, as well as bribery of Jamaican coast guard officers. Twelve tons were seized on a US farm, 19 tons on a yacht, both belonging to the President of Zion Coptic Church Inc., the Miami end of the Jamaica based sect. Five acres of plants uprooted on one of the Coptics' Jamaican farms resulted in no convictions due to lack of evidence as to who was growing the plants. It is indeed politically significant that an organisation which is spiritually opposed to the Rastas should at the same time be quite possibly attempting to supplant the economic substructure upon which many individual Rastas depend. Dawn Rich, a regular columnist on the conservative *Jamaican Daily Gleaner*, took the following view: "Jamaican small farmers are in the process of being recolonised by an extremely dubious Miami outfit which proposes to use an indigenous cult, Rastafarianism, as its religious cover, so that it can be free to market ganja ... in the United States."<sup>19</sup>

## Production in the USA: Reviving local communities

The cycle of problems associated with cannabis growing, high prices bringing in big crime, often violence, is also discernible amongst growers in the United States, who manage to procure a much better price for their product but are facing escalating problems with thefts and police activity. In the late sixties and early seventies numbers of young people, part of the flower power and hippy movement, moved out of towns and bought or rented land in the country. In California many of them moved into the depressed hills north of San Francisco where small farms were falling into neglect and the local economy stagnating. They naturally started growing small patches of marijuana, both for their own smoke and to sell some to help set themselves up.



Many of these people, as in India and Jamaica, felt cannabis to be a somewhat special plant, in some ways a symbol of their demands for a better life. Amongst those growers were some very fine botanists, who worked on crossing different strains, producing a seed ideally adapted to the climate which produced a very fine marijuana. They were amongst the first farmers to develop sinsemilla, a method of growing the female plants without allowing them to be pollinated and go to seed. The result is a much higher yield and more potent smoke. With an excellent quality product and crack-downs on imported cannabis, home grown farmers started to take over an increased slice of the market, possibly supplying 30% of the domestic market in 1979, as opposed to 10% in 1978.<sup>20</sup>

Helicopter assisted police raids on the 1979 California harvest areas netted 52,165lbs of 'sinsemilla'. According to the Drugs Enforcement Administration, cannabis has now outstripped grapes as California State's number one cash crop, earning some 1 billion dollars last year. (Grapes \$864 million, cotton \$691 million in 1978). Individual growers receive around \$1500-\$2000 per lb for their product, one claiming a \$66,000 yield from a 4 acre patch.<sup>21</sup> Individual earnings between \$150,000 and \$200,000 are mentioned in some reports.<sup>22</sup> Such huge profits have had an electrifying effect on local communities. "With luck, you'll survive, bring in your harvest, reap the rewards of a long season both in good smoke and bucks. And you'll probably spend a bunch of that money in the local hardware and grocery stores, maybe buy that long promised rototiller from the feed store and a bunch of lumber from the building supply for the new shed. Since you can't bank what's left over, and it won't do anybody any good in a hole in the ground, you might loan some to a neighbour who needs it to build a house, or maybe to the food co-op that's buying a new building ... Marijuana growers will make the difference between continuing rural economic stagnation and prosperity."<sup>23</sup>

One result of local prosperity dependent on the cannabis trade was an amusing incident last year in Mendocino County, the heart of growing country. There the board of supervisors voted 5 to 3 to reject a DEA \$19,613 grant to assist the local Sheriff's Department in enforcing prohibition. Supervisor Danny Walsh, who voted against the grant, stated his satisfaction with the job the Department was already doing, enforcing the laws "with an understanding of the lifestyles, sociology and culture" of the growers. "I don't want to see anyone killed over the growing of a simple weed," he said.<sup>24</sup>

As elsewhere, growers are becoming increasingly concerned about large numbers of crop thefts, as well as armed police intervention. Some are starting to arm themselves. As elsewhere, increased violence and high profits lead to worries that larger, more organised groups of growers will move in on the trade. The old cycle leading to destruction of a useful crop and lifestyle has already started. Although the benefits of such high profits would be lost, many growers would willingly take a drop in income to be allowed to cultivate legally and in peace. They are concerned, however, that a future legal market will destroy their business also. "Most current marijuana production occurs in upland

areas unsuited to large-scale farming. If legalization occurs without acknowledging the increasing economic dependence of these marginal lands on marijuana, then the current pot regions will lose their precious crop to the prime agricultural lands. Present small scale labour intensive cultivation will give way to mass methods of production, agribusiness, and the shifting of the economic benefits into the hands of those who already control most of the American agricultural complex."<sup>25</sup>

### Home Production in the UK

Should this all seem somewhat far removed from the UK situation, a recent seizure of 2000 plants in one large greenhouse would indicate that UK growers are

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**"If legalised, tobacco companies would have to consider selling cannabis. There is obviously a big market out there."**

*Ken McAllister, former President of Liggett and Myers Tobacco Company.*

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starting to take the home cultivation question seriously. Convictions for cultivation rose from 932 in 1978 to 1225 in 1979. 22306 plants were uprooted by police in 1979, as opposed to 8467 in 1978. Don Irving's book *Guide to Growing Marijuana in the British Isles* has sold around 20,000 copies. Police have expressed concern, warning young farmers' clubs about clandestine cultivation on quiet corners of land. A London University Professor of Pharmacognacy (the science of plants used as medicines) has been growing cannabis under license in the UK for some years now, and concludes from his research: "As a result, we can say that herbal cannabis of high activity can be produced readily in our cool climate."<sup>25</sup>

### Cannabis and Land Reform: a Necessary Link

To produce high quality smoking cannabis, relatively little land is required although the tending and harvesting of the plant requires considerable labour. The process could, however, be mechanised, although a considerable drop in quality would ensue. In theory, it would for instance be possible for the UK government to license 250 hop farmers with 30 acres each, using present day hop harvesting machinery, to produce the entire UK annual consumption. Quality would be low, but the declining hop industry would boom and the government could keep a tight control on production. I have based this estimate on a yield of 2 oz. of smoking material per plant, a very low yield which could undoubtedly be improved. This type of solution is exactly what many smokers and others concerned with the pattern of agricultural production would not want — a drop in quality, concentration of the business into government hands and a small group of relatively rich farmers, use of prime food production land for cannabis. Solutions to this dilemma clearly encompass the whole area of land distribution and agricultural policy.

We are in effect confronted by an agricultural business worth billions of pounds which has traditionally been run by small farmers. These farmers have often

enjoyed a reasonable relationship with the plant, which has supplemented their meagre incomes and in return has been treated as a god-given gift. Because of the massive rise in Western demand, big business is moving in, attracted by fat profits. The balance has been destroyed, but we cannot return to the old status quo. Either those of us who use and respect the plant must bury our heads in the sand and watch as violence, corruption and monopolistic control take over, or we must fight. What we must fight for is not simply a legal cannabis market. Why should we, who have been persecuted so long for our use and defence of the plant then hand over its trade to the same multi-national concerns that dominate almost all other processes of production and have managed both to reduce our own personal control over our needs, and the quality of production processes? We have nothing left but to fight for an ideal, if we are not to consign modern society to the suicidal, yet eminently 'practical' path upon which it now runs. The ideal is a cannabis market which will satisfy the 'liberation politics' of those fighting from all over the world against prohibition, which will leave control of cultivation and supply in the hands of people, not concentrated into anonymous government departments and fat corporate boardrooms.

### The Multinationals and a Legal Market

*Playboy* magazine recently ran a terrifying article entitled "Who'd profit from legal marijuana?" They interviewed representatives from the tobacco, alcohol, cigarette paper and advertising businesses, who whilst in no way giving support to legal cannabis or objecting to the gross infringements of civil liberties caused by present laws, saw a legal market as economically inevitable and rubbed their pudgy hands in glee at the potential profits. "Tobacco companies would, purely from a business standpoint, have to consider selling it. They owe it to their stockholders, because there is obviously a big market out there . . . Mechanically speaking, they could get into it overnight," said Ken McAllister, former President of Liggett and Myers Tobacco Company. One senior Californian advertising executive stated: "Legislation would be like suddenly giving people the key to Willy Wonka's chocolate factory." He spoke of marketing menthol cigarettes with cannabis, and 'marketing strategies' for building 'brand loyalties.' New brands would be aimed at different types of markets, for instance 'macho, sophisticated, slick funk.'<sup>26</sup>

If our modern marketing system once takes a hold on cannabis, with its escapist advertising and pre-packaged low quality 'joints', possibly mixed with tobacco, it could turn present usage into something akin to the habitual, mindless, escapist and dangerous usage now associated with tobacco. Tobacco usage was not always like this. One has only to smoke pure, untreated forms of tobacco, or watch Indian lorry drivers ritually sharing a hookah water pipe filled with tobacco to understand just how far the eminently 'practical' multinational tobacco companies have destroyed the quality product, sensible usage patterns and our society's health. Given half a chance, they will do exactly the same with cannabis. "The cannabis market will be seen as one that

primarily provides for western demand: the place and meaning of cannabis for non-western cultures, which has never been analysed seriously, will be subsumed into the western liberal stance . . . and all will be as it was before, with this 'threat to society' transformed into a 'recreational product' with a price, label and social status."<sup>27</sup>

### Possible 'Alternative' Marketing Schemes

Few studies exist that have seriously looked at the possibilities of a legal market whilst avoiding the pitfalls of 20th century business patterns. In the US the 1977 Kentucky Marijuana Feasibility Study (Kentucky was one of the largest hemp producers in the union before prohibition) recommends a system run by a State marketing board, with a 100lb limit on commercial cultivation. Farmers would be licensed by the State and sell to the marketing board, which would weigh and grade for quality. Retail outlets would also need state licenses and could only buy from the marketing board. Even assuming a \$100 per lb selling price to the farmer, as against \$1500-2000 under present conditions, the individual producer still stands to make \$10,000 per year from at the most a 5 acre patch.<sup>28</sup> Some California growers have proposed an acreage limit to support the small market. Two other detailed systems have also been suggested for the US, running along much the same principles, handing over control for licensing to the State, as is the situation right now in the US with the liquor industry.<sup>29</sup> *The Cannabis Revenue and Education Act*, a prototype statute for the regulation of cannabis in Massachusetts is prepared by lawyer Richard Evans and suggests that in order to keep the marijuana industry as decentralised as possible, owners of licenses, to import or to retail, may not hold another license of any class. The importer, for instance, would not be allowed to retail. Richard Evans also accepts that cannabis will be taxed, but suggests a double system, where part of the tax goes to the usual state tax authority, the other part to a "public, philanthropic trust known as the Cannabis Education Trust." He suggests that advertising of cannabis should be prohibited. Whilst his suggestions form an interesting concrete example of how the market could be legalised, it is hard to see that those same state authorities that have allowed the liquor industry to develop as it has will adopt a very different policy towards cannabis. Who will control the market? seems to be the crucial question, a question which must force us to doubt existing power structures within politics and business. Would a nationalised industry within the UK be any more suitable than a private industry? Going on past performance, nationalised industries seem to function in alarmingly similar ways to corporate industry as regards treatment of workers, quality of product, and marketing techniques.

The only comprehensive report to emerge in the UK on cannabis marketing, apart from the Legalise Cannabis Campaign's own study, was a recent study prepared by the Institute for the Study of Drug Dependence (ISDD), a widely respected library and research facility based in London which organised an independent group to look at *Options for Control*, the title of their work.<sup>25</sup> It is in itself noteworthy that such an 'estab-



lishment' organisation should have felt it necessary to carry out such a project. In their introduction they state: "It is clear that marked shifts in public opinion have occurred in recent years and the possibility cannot be ruled out that at some time in the future there might be very strong, perhaps irresistible pressures to relax the present prohibitory system. It therefore makes sense to set out what seem to be the available choices, to examine how they work if applied to Britain, and to try and predict their likely consequences." The study group which produced the report consisted amongst other people of two London University professors, an Oxford University professor, a representative from a drug company, a detective chief inspector from Lancashire constabulary, a member of the government's Advisory Council on the Misuse of Drugs and several other 'respected' figures.

The report looks at present prohibition; making use legal and permitting cultivation; a fully legalised trade; and a number of licensing systems — such as those used to control drugs and poisons. They consider legalization, but are clearly worried, not looking further than the obvious 'free for all' structure where the market might well develop along much the same lines as alcohol or tobacco. The option they seem to favour most is a 'poisons type' licensing system, where smokers would have to register with their local pharmacy and might be restricted in quantities and quality of material purchased. No attempt is made to tackle the problem of how production would be organised. The implicit assumption is that much the same systems would be employed as now in use for domestic agricultural production and agricultural imports.

Whilst the report has met with considerable interest as a first step to breaking the blind prejudice of a blinkered prohibition policy, it clearly is hampered by the fact that few users were consulted as to the kind of system they would like to see. Registering at a pharmacy under the Poisons Act might not be too well received. It also suffers from the limitation that it does not look towards any new ideas concerning agricultural production or distribution.

### The Need for Decentralised Production

Since its foundation 2½ years ago, the Legalise Cannabis Campaign has devoted considerable thought to this problem, and has stimulated discussion within the Campaign as to possible solutions. The First International Cannabis Legalisation Conference organised by the International Cannabis Alliance for Reform, an organisation representing national legalisation campaigns, also discussed this question at length. With 300 delegates from 19 different nations, there existed a remarkable degree of agreement as to broad principles, agreement which was also in line with conclusions reached by the LCC in its internal discussions. The overwhelming desire was to cultivate cannabis in small units, preserving in so far as possible the cultures at present involved in production, both in the west and developing nations. Likewise the organisation of sales outlets should utilise present small scale superstructures of supply. Above all, present day large scale techniques of agriculture, and marketing which take control

away from the consumer and individual producers should be avoided; multinational corporations should be kept out. The at times hopelessly vague 'liberation politics' of the cannabis movement should be harnessed to creative alternatives to free enterprise or state control. Both LCC members and International Conference delegates have been determined to proceed from principles to practice, examining their unashamedly idealistic desires and looking to economic and political models to satisfy them. I perceive this attempt as one which shares much in common with efforts within the ecology movement as well as certain elements of the 'new left' to break away from old and stultifying political models and look to a new future which will give individuals a real say in how society is organised.

### LCC's Scheme

A group within the LCC is now looking at possible practical models for putting first principles into practice. It has produced a preliminary discussion document entitled *Cannabis in the Market Place*,<sup>30</sup> which suggests that ultimate control of the cannabis industry must lie with the workers which produce cannabis, be they in developing nations or the west, and the people who consume it. As a basic model for fulfilling this ideal, the group has proposed that all cannabis should be handled through co-operative structures, be they producer or consumer co-ops, as the only viable alternative to state or private ownership of the trade, neither of which offer any prospect of a 'new deal.' This idea is now being refined, with research being carried out into co-operatives and the present functioning of the trade. The Rt Hon Anthony Wedgewood Ben recently commented on the growth of the co-operative movement in a message to the 1980 UK Co-ops Fair: "The co-operative movement is coming into its own, partly because of the growing dissatisfaction with centralised and multinational power, partly because of a feeling that decisions should be rooted nearer the place of work, and partly because profit has come to seem an inadequate guide for production for social use."<sup>31</sup>

As a first concrete step towards full legalisation, the Legalise Cannabis Campaign is insisting that legal personal cultivation is just as important a right as legal possession. "It's the last hedge against high prices and a sick market, be that an illegal market overrun by organised crime or a legal market taken over by the multinationals," says Andy Cornwell, one of the Campaign's full-time co-ordinators.

Journalist and Legalise Cannabis Campaign sponsor Brian Inglis concludes his book *The Forbidden Game — A Social History of Drugs* with the following observation: "Drugs will not be brought under control until society itself changes, enabling men to use them as primitive man did; welcoming the visions they provide not as fantasies, but as intimations of a different, and important, level of reality".<sup>32</sup> The reality of many cannabis users seems to contain a powerful common vision for a better society, a vision shared to some degree by Indian Sadhus, Jamaican Rastas, and western hippies. The leaf with its 3,5,7, or 9 points is a potent symbol which has become closely associated with those old catch words — freedom, peace and love,

inner vision, the alternative culture, revolution. Unlike many other symbols, this one has a profane aspect, worth billions of pounds and demanding practical political solutions. As one whose life was dramatically influenced by that extraordinary flowering of idealism in the middle and late sixties, I sincerely hope that in the eighties we can unite the sacred and profane in cannabis, developing a new order of marketing for this extraordinary weed, which could help return plant power to the people.

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## Authors' Biographies.

**John Hanson.** Independent film maker. Studio potter, designer, restaurateur and indifferent actor. First documentary, *Days of our Youth*, won first prize in Mexico Olympics Film Festival. First feature, *Secrets*, was England's first super-16 mm. feature in 1971. Current projects include: *The Dilessi Affair*, *The Social History of Hemp*.

**Professor James Graham** is a member of the government's Advisory Committee of the Misuse of Drugs and holds the chair of Pharmacology at the University of Wales, Bangor.

**Don Aitken** has been active in the field of cannabis research and information since 1968, working at different times for SOMA, the Institute for the Study of Drug Dependence, the Church of England Council for Social Aid and Release. Regularly gives expert evidence on drug issues in the courts. Author "*Cannabis: A Select Annotated Bibliography*" (1970); contributor "*Problems of Drug Abuse in Britain*" (1978), "*Cannabis: Option for Control*" (1979).

**Tod H. Mikuriya.** Author of many papers on various aspects of cannabis use. Formerly Head of Marijuana Research for the US National Institute of Mental Health. Editor "*Marijuana: Medical Papers*" (1973). Now practising as a physician in Berkeley, California, specialising in biofeedback techniques.

**Anthony Henman.** Born in 1949 in Sao Paulo, Brazil, of British parents. Came to England in 1961 and attended Downside School and Trinity Hall, Cambridge, graduated in 1972 with an M.A. in Archaeology and Anthropology. In 1973 and 1974 taught at the University of Cauca, Popayan, Columbia, collecting material for the book *Mama Coca*, first published in London in 1978. For eighteen months in 1978-9 travelled widely through Indian areas in Brazil, studying the use of local stimulants and hallucinogens, and researching the feasibility of community aid projects based on the native medicinal flora. The present article will shortly be incorporated into a full-length book on the drug plants of Brazilian Amazonia, and their use in the context of Indian resistance to cultural and economic domination.

**John Michell.** Born 9th February 1933, educated Eton and Trinity, Cambridge, once Russian interpreter, RN, lives in London W11. Since 1967 he has written books and articles on archaeology, perennial philosophy and unexplored aspects of mundane reality. Influences include Plato, Cobbett, Dostoevsky, Alfred Watkins and Charles Fort. Active in Radical traditionalist association, anti-metrication board and cosmological reform. (anti Darwin) Books include *View over Atlantis*, *City of Revelation*, *The Earth Spirit and Phenomena*. Schumacher Lecturer, 1979.

**Colin Moorcroft.** Writer concerned with technology and the environment. Past contributing editor to various magazines, including '*Rolling Stone*', '*Frendz*', '*Time Out*', '*Architectural Design*' and '*The Beast*'. Author of '*Must The Seas Die?*' (published by Maurice Temple Smith). Currently working on a book about the relationship between people and plants.

**Tim Malyon.** After graduating with a modern languages degree, Tim Malyon spent 5 years working as a social and legal counsellor in community projects and at Release, often involved in helping people with serious drug problems and giving legal advice on cannabis arrests. In 1978 he helped found the Legalise Cannabis Campaign, for which he worked until February of this year. He has published articles and photographs in a wide range of papers, including *The Leveller*, *International Times*, *Sunday Times*, *New Statesman*, *Time Out*, *Home Grown*, *New Musical Express*.



# The End of the Oil Age

by Vince Taylor

The current conflict in the Gulf has shown once again the vulnerability of our oil supplies. How long can we continue to rely on Middle East oil?

Since the embargo of 1973, the industrial nations have been struggling to solve the oil crisis to no avail. Nuclear power, coal, Mexican oil, solar energy, synthetic fuels, conservation — all the potential solutions are proving inadequate to the task. The crisis is growing worse, the winds of war blowing harder.

By becoming massively dependent on the Middle East for oil, the industrial economies have created a mortal threat to their survival, a threat with which they cannot long live and, yet, from which they cannot soon escape. No resolution to this contradictory situation is in sight that is compatible with continuing to make economic growth the primary goal of the industrial world. The conflicting forces created by oil dependence have set in motion a dynamic that is pushing the industrial world, all too quickly, toward financial-economic collapse. The United States is preparing for military confrontation in the Middle East. War, if it comes, will not avert but hasten economic collapse and carries with it the risk of far greater catastrophe.

The present rate of oil consumption is politically and economically unsustainable. To restore a stable situation, nations will need to rebuild their economies to use far less oil than now. There can be no pretence that rapid, forced transition to a less petroleum-intensive economy will be easy or entirely pleasant, but if a devastating war can be avoided, neither will the outcome be a return to the dark ages. For the industrial countries to cut oil consumption in half — a reasonable estimate of what may be required — per capita consumption would need only to return to the level of 1960. The hardships involved in this transition would certainly be far less than those caused by a major war, and after the transition is completed, we might be pleasantly surprised to find many aspects of life more pleasant than today.

## Political Vacuum

Latter parts of this article describe what seem, on current evidence, to be probable developments in the oil crisis. Too much attention should not be focused on the specifics of these descriptions. Rather they should be treated as provocative illustrations of how the forces that have been created by the oil dependence of the industrial nations might manifest themselves in the future. It is the forces themselves that are important. The details of the future are unknowable, but the forces at work in the oil crisis are so powerful that one can have far more confidence than usual about the direction of events and the general nature of what must occur to restore stability.

The critical dependence of the industrial nations on the oil of the Middle East has given the countries of this region enormous power. What makes the present world situation so unstable, so untenable, so certain to change is the basic incongruity of so much power in the hands of countries that, on their own, would be entirely insignificant. Only the dire need of the great nations for their oil has given the oil states such vast power. This derived power is all out of proportion to their intrinsic capacities. Actual power in the world still resides in the great industrial nations. Just as nature abhors a vacuum, either physical or political, it rebels against the existing disparity between actual and derived power. Enormous forces are working to bring about a more stable arrangement.

## Origins of the Crisis

Ironically, that which raised industrialization to its present heights now threatens its downfall — Middle Eastern oil. The wave of growth that swept the globe after World War II could never have moved so swiftly and so far without the incredibly rich oil resources of the Middle East.

Available in essentially unlimited quantities, at production costs of pennies per barrel, easily transportable, low in pollution, completely under the control of European and American companies, oil from the Middle East flooded into world markets, fuelling an economic boom that quickly doubled and redoubled oil consumption.

Those in charge of the post-war economic miracle did not care to look too closely at where their fuel was coming from. Although after the first Suez Crisis, in 1956, the United States restricted oil imports for "national security reasons" (and at least as importantly, to protect politically powerful domestic oil producers), Europe and Japan allowed unrestricted entry of imported oil, and the security implications of oil dependence were conveniently forgotten in the United States by the time domestic production could no longer be expanded to meet still growing demands.

Signs and warnings of impending trouble were ignored, and when the 1973 October War arrived, the industrial nations found themselves dependent on imports for *two-thirds of their total oil requirements*. Seventy-five per cent of these imports were from the Middle East, including nearly all oil consumed in Europe and Japan. The situation today is nearly the same. The only significant change has been negative: an increase in the import dependence of the United States, from 35 to 45 per cent of oil consumption.

## The Incomparable Middle East

Efforts since 1973 to find replacements for Middle Eastern oil have proven fruitless and will continue so. The oil resources of the Middle East are unique, incomparable. They constitute more than half of the known and prospective oil resources of the world and nearly all of the potential, future imports of the industrial



*To reduce import dependency by two-thirds, the industrialised nations would need to reduce oil consumption by half.*

world. The region around the Persian Gulf is dotted with gigantic oil fields each containing more oil than the combined total of the fields in most of the world's other major producing regions or 'provinces.' A single field in Saudi Arabia produces more oil, 5 million barrels per day, than any other country except the United States and the Soviet Union, each of which produces about twice that amount. Only 700 wells are required for the production of Saudi Arabian oil, 9.5 million barrels per day; by contrast, the United States needs 600,000 wells to produce its 10.5 million barrels per day.

Richard Nehring of the Rand Corporation argues convincingly that Middle-East oil dominance is unlikely to be eclipsed by new discoveries elsewhere.<sup>1</sup> He notes that 80 per cent of all oil discovered to date is in 'giant' oil fields, those containing over 500 million barrels of recoverable oil, and that exploration techniques are such that few exploratory wells need be drilled in new provinces to discover such giant fields. He cites as an example, but not a unique one, experience in the Middle East. The first wells drilled in Bahrain and Qatar each discovered giant fields. The second well drilled in Kuwait discovered Burgan, the second largest oil field in the world. After the first giant was found in Saudi Arabia in 1938, the next 55 new-field exploratory wells, drilled between 1939 and 1976, resulted in at least 37 discoveries. The first 15 found seven super-giants, defined by Nehring as those containing over 5 billion barrels of oil (one-sixth of

present, total U.S. oil reserves). Half the new-field wells drilled in Iran between 1958 and 1976 resulted in discoveries. Because exploration is so efficient, oil provinces that have been explored initially without success are unlikely to become major producers, no matter how great are future exploration efforts.

Only about 15 per cent of the geologic oil provinces of the world accessible with present technology are relatively unexplored, and of course they are not those with the most promising features. In spite of greatly intensified exploration activities following the 1973 oil embargo, no major new provinces have been identified since 1970, when the Reforma region of Mexico was discovered. The most likely location of major new discoveries is — unfortunately for the industrial world — the Middle East, which has been so responsive to past efforts that thorough exploration has been unnecessary.

#### **Dimensions of the Crisis**

The modern world runs on oil: it heats homes and offices, powers factories, fuels the cars that get people to work, the tractors that plough the fields, and the trucks, trains, and planes that link everything together. There is little short-run flexibility in oil requirements. Substantially less than the expected amount of oil would be disruptive to individuals, farms, factories, stores, and vital government services, endangering lives as well as livelihoods. Dependable, adequate supplies of oil are essential to the smooth functioning of the industrial economies.

Although events of 1979 demonstrated how helpless are the great industrial powers in the face of threats to crucial oil supplies, the full implications of oil dependence do not yet appear to be widely appreciated. The future may look uncertain, growth may need to slow down, energy may be scarcer and more expensive, but still, in the prevailing view, the world will go on much as it has in the past. That there are serious problems is acknowledged, but, it is argued, the United States and her allies did not rise to their present positions without meeting challenges, and the present ones will be overcome by technological ingenuity and industrial initiative — or failing that, by military might.

It does not yet seem to have sunk home that by unthinkingly becoming critically dependent on imports for oil, the industrial nations lost control of their destiny. They conferred on the oil states a power superior to their own, the power of life and death over their economies. So long as present circumstances prevail, there can be no solution to the industrial world's crisis — for control of oil by others is the essence of the crisis. Indeed, the crisis seems likely to worsen as the oil states gain more experience in exploiting their new found power. Yet, there is no near-term prospect that the industrial economies can continue to expand, as they must to avoid rising unemployment and its attendant political and social problems, without remaining critically dependent on Middle Eastern oil.

If this were the entire picture, the



outlook for the industrial nations would be unhappy but not life-threatening. The industrial world is, after all, the goose that lays the golden eggs. To kill it would be counter to the self-interest of the oil countries. Thus, it seems possible that the industrial world could struggle through the next several decades, paying burdensome but not impossible tribute to the oil nations, while working hard to find new sources of oil, develop alternative fuels, and improve energy efficiency until dependence on oil imports were reduced to manageable proportions. This 'optimistic' vision assumes implicitly that the situation is under the control of the oil producers. The peril is that no one is in control.

### The Inescapable Dangers of Oil Wealth

The fundamental problem is that the industrial nations need oil so desperately that they are willing to pay for it far more than the small kingdoms of the Middle East can absorb economically, socially, or politically. The wealth represented by the oil deposits of the Middle East — \$270 trillion at \$30 per barrel, equal to over 100 years of total U.S. economic output (GNP) at current rates — is unprecedented in the history of the world, as are the amounts of money flowing into the region. The inability of the oil countries to spend all of their growing revenues is creating stresses that threaten to tumble the entire world's financial system. The revenues that are being spent are causing great social changes and internal struggles for control in nations that are still largely feudal, nomadic, and agrarian and, thus, ill-equipped to cope successfully with these pressures. Violence could explode at any moment. Civil war, the rise of new governments hostile to the West, or outbreak of war between the oil states — any of these could shatter the fragile system of oil production and distribution on which continued functioning of the industrial world depends.

Now that Iran is unfriendly, Saudi Arabian oil has become absolutely crucial to the West. The Saudi's produce nearly as much oil as the United States, providing almost one-third of the total imports of the industrial world. They have been largely res-

ponsible for the degree of pricing restraint that has so far been exercised by OPEC, the cartel of oil producing countries. Revolution that halted the flow of oil or installed an unfriendly regime would be disastrous.

Saudi Arabia is presently ruled by the royal Saud family, a family with 4,000 members, about 200 of whom form an inner ruling circle, suggesting the complexity of royal politics. The assassination of King Faisal in 1975 and the recent armed takeover of the Grand Mosque in Mecca, the holiest site in the Moslem world, are signs to be taken seriously, but the West is too ignorant of internal Saudi affairs to even know how seriously — a frightening situation in itself. What little is known is not encouraging. Even before recent events in the Middle East two 'Saudi watchers,' men with years of experience and personal contact with the royal family, were quoted as follows:

Five years ago (1973) no one heard words against the government; now one hears, "This government has to go."

I judge the government's chance of survival for a half-dozen years to be quite good, and for a dozen years, fairly good. *But there could be a successful revolution this evening.* (Emphasis in the original.)<sup>2</sup>

Tensions in Saudi Arabia and other Middle Eastern nations are being heightened by rapid economic and social changes that are disrupting traditional patterns of living. Although the Iranian revolution has made neighbouring countries acutely aware of the dangers of rapid modernization, these dangers seem almost unavoidable. The sudden influx of oil wealth has created expectations among both the common people and the upper classes that cannot be satisfied without major changes in society. Even achieving the most basic goals of better housing, health, education, and transportation will unavoidably upset traditional village and rural life. To deal with the complexities of wealth and power, the oil states have been raising the level of education of their populations; but this has created the need to provide suitable jobs for

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those educated, including the rapidly expanding numbers of foreign-educated university graduates, many of whom have acquired Western values along with their technical educations. Improved education has, thus, created a rationale for industrial development and an influential pressure group in favour of it. Further, some leaders see industrial development as essential to guaranteeing the future security of their nations both within the region and in the larger world. The massive industrial development programmes of the richest oil states, most notably Saudi

Arabia, are creating serious problems, such as foreign work forces larger than the indigenous ones, extensive corruption in ruling circles (which leads, in turn, to an open display of wealth that is resented by the less privileged), and widespread violations of the traditional Moslem prohibition against consuming alcohol.

Although it is now commonplace in the West to question the wisdom of the large industrial development programmes in the Middle East, such criticism ignores the dilemma faced by the oil countries. If oil revenues are not to be spent on development, what is to be done with them? To simply put them in bank accounts or allow them to be spent on lavish consumption would be even more explosive socially. Nor can the oil countries, as a group, reduce the flow of money with which they must deal: the need of the industrial nations for oil is so great that, at least in the short run, reductions in OPEC output cause prices to be bid up by more than enough to offset the fall in production, leading to higher rather than lower total revenues.

Oil wealth is, inescapably, propelling the Middle East into unexplored ground. Politics, economics, and religion are undergoing dramatic changes. And, there is nothing that can be done to guide this process into safe, non-violent channels. No one, *including the present leaders of the oil states*, knows what will happen next. In these circumstances, efforts by outsiders, such as the United States to force events in directions favourable to them are more likely to harm than to help. Although chances seem great of developments that will threaten the oil supplies on which the West depends, there is virtually nothing that the industrial world can do to prevent them. Truly, what happens in the Middle East depends upon Allah, not man.<sup>3</sup>

### **An Irresistible Pressure**

Even if political upheavals or war do not disrupt oil supplies from the Middle East, the industrial world faces rapidly escalating oil scarcity and prices. Again, the root of the problem lies in the overwhelming need of the industrial nations for imported oil, a need so great that the oil countries can raise prices at will

by acting in concert to reduce output. A small shortage of oil is sufficient to cause the industrial nations to bid prices up sharply. The 1979 price surge that doubled contract oil prices was precipitated by a short-lived drop of only a few percentage points in OPEC production during the Iranian revolution. In raising prices, OPEC was in no sense 'forcing' higher prices on the world but merely following a panicky market created by the consuming nations — a market that several members of OPEC attempted to calm, to no avail, by increasing production sufficiently to largely offset the loss of Iranian production.\*

Current contract prices of \$30 per barrel are obviously nowhere near the upper limit of the willingness of the industrial nations to pay. Last year a great deal of oil changed

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**"The industrial world's massive dependence on imported oil can be reduced only slowly and at great cost."**

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hands at \$45 per barrel — up from \$1.00 to \$1.50 per barrel in 1970 — yet no one was deterred from buying: oil demand hit still another new high. In light of last year's experience, relatively modest cuts in OPEC production seem capable of raising prices to \$50, \$75, or even \$100 per barrel.

The ability to increase revenues while simultaneously keeping more oil in the ground for future needs creates an almost irresistible pressure on the oil nations to reduce output. Indeed, even though Saudi Arabia has so far refused to agree to joint cuts, the move toward lower production has begun. Kuwait lowered its production to 1.5 million barrels per day on April 1st of this year, one-half millions barrels per day less than the level prior to the Iranian revolution, and its oil minister recently suggested that production might be decreased further, to one million barrels per day, by 1985.<sup>4</sup> Iran's output is less than half of the pre-revolutionary rate. Among Middle Eastern countries, only Iraq appears to be planning higher output levels, and its leaders would quickly modify this decision in exchange for

joint OPEC agreement on lower production levels and higher prices. Even Saudi Arabia recently warned, in a speech by its oil minister, Sheik Ahmed Yamani, that it was now earning more money than it needed, that these surplus revenues were declining in value after taking into account inflation and the weak U.S. dollar, and that "Unless we assure ourselves that there is a reasonable rate of return over inflation on surplus revenues, I don't think we will continue at this high rate of production." Sheik Yamani emphasized that he was not threatening the industrial nations but only "explaining the policy of a country that is doing something against its own interest," at a time when opinion within the country is increasingly questioning continued high oil production.<sup>5</sup> A group of 'Young Turks' within the ruling circle is reported to be campaigning for a reduction in oil production from the current level of 9.5 million barrels per day to five million barrels per day.<sup>6</sup>

Predominant pressures within OPEC are clearly in the direction of lower production. The major uncertainty is how fast future production will decline and prices rise. The only force acting to restrain price increases is possible concern among some OPEC members that too high prices will cause world economic collapse. Increasingly, however, control of policies appears to be shifting from Saudi Arabia to the OPEC 'radicals,' who are far less concerned about this possibility. Some would undoubtedly welcome it. The fate of the industrial world is resting on a thin reed that is threatening momentarily to give way.

### **Spiralling Toward Collapse**

The world economy is beset on all sides. Inflation is escalating. The international banking system is deteriorating. Confidence in all forms of paper wealth is eroding. Credit and commodity markets are in disarray, labour productivity is dropping. The U.S. economy is declining at an unexpectedly sharp rate, and Europe and Japan may not

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\* At its lowest point, the first quarter of 1979, Iranian production was 4.7 million barrels per day (MBD) below pre-revolutionary levels, but total OPEC production was down by only 1.2 MBD or less than 4 percent. In the following quarter OPEC output again exceeded the pre-revolutionary level of output. International Energy Trends, "Monthly Supplement on Oil Trends," OECD, Paris, August 27, 1979.



be far behind. The threat of economic disaster is greater than at any time since the great depression of the 1930's. Underlying all is the perilous dependence of the industrial nations on imported oil.

The chances seem small of surviving for as long as five years without major interruptions in oil supplies. Even if such interruptions were not to occur, merely the *risk* of their occurrence may be more than the economic and financial systems of the industrial world can tolerate without collapse. Long range planning and investment by business in these circumstances is nearly impossible; yet major investments are required if the industrial economies are to adjust successfully to sharply higher energy prices, prices never imagined as possible when the present economic structure was built; and these investments must be made while nations are struggling to pay oil import bills that are, in many instances, larger than their bill for *all* imports ten years ago. Moreover, the prospect is for much higher oil prices and even greater oil scarcity in the near future, since oil countries stand both to increase present revenues and to preserve more oil for the future by acting together to reduce production.

Adding to the oil countries' incentives for reducing oil output is the lack of any safe place for the oil countries to keep oil revenues in excess of their foreign expenditures. During the next five years, the cumulative total of these surplus revenues will be between \$500 and \$1000 billion (compared to \$200 billion in 1973-79) — if no drastic surprises intervene. The surplus revenues represent foreign investments for the oil countries, since they are, by definition, income not brought home but left overseas, and they are, thus, not within the ability of the oil countries to safeguard. The U.S. freeze of Iranian assets (including all deposits in domestic and overseas branches of U.S. banks) in November 1979 made all oil countries acutely aware of how insecure would be their own foreign investments in future conflicts with industrial nations, conflicts that seem almost inevitable. Moreover, there is a growing danger that value of these foreign investments will be wiped out by world-wide financial or

economic collapse — a danger that both derives from and exacerbates the stresses created by the oil crisis.

If the OPEC countries are to continue to add to their foreign bank accounts, as they must if chaos is to be avoided, they must be paid a return on these deposits that compensate them for the risks involved. But, the banking system was unable to provide interest payments in excess of inflation on the smaller previous surpluses of the oil countries; it can hardly be expected to do so on the much larger prospective surpluses. Such an accomplishment would only be possible if the banking system could channel these huge sums into safe, productive uses, but in the current state of economic disarray, this seems virtually impossible — doubly so in light of the

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### **Tensions in the Middle East are being heightened by rapid economic and social changes.**

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necessity to loan, or 'recycle,' over half of the OPEC surpluses to the non-oil developing countries to finance their suddenly-huge oil bills.

Many of the developing countries have already borrowed more than they have any reasonable prospect of repaying, given the level of oil prices; yet unless they receive substantially larger loans in the future, they will be thrown into depression and bankruptcy. Leaders of the private banking system, which largely underwrote the expansion of debt of the developing countries during the 1970's, are warning that it will be unable to fulfill this role in the future.<sup>7</sup> Governments of the industrial nations will undoubtedly find some way to provide the funds, since failure to do so would make world-wide financial collapse inevitable. There is no way, though, to avoid the growth of debt in countries with doubtful repayment abilities, and this will add to fears of major defaults by these countries, further undermining the already shaky international financial system.

The growing likelihood of world financial collapse is as evident to the oil countries as to everyone else;

thus the continued accumulation of surplus revenues must appear to them a dangerous gamble, and the conservative rulers of the large surplus countries (Saudi Arabia, Kuwait, and the United Arab Emirates) are not gambling types. A major justification put forward for the Saudi Arabian development programme is, in fact, the desire to have the proceeds of oil sales safely within Saudi Arabia rather than in foreign banks; but even the Saudi's huge development programme cannot absorb their oil revenues. At current prices and production levels, Saudi oil revenues will exceed foreign expenditures by about 100 per cent. Unwanted foreign investments will be accumulating at the rate of \$40 to \$50 billion per year. It seems, thus, only a matter of time until those within Saudi Arabia arguing for lower production gain the upper hand.

The more likely financial or economic collapse becomes, the stronger will be the case for keeping oil in the ground rather than trading it for money in Western bank accounts. But, any concerted move toward lower oil production would drive prices sharply higher, increase the surpluses of the oil countries, add still more to the economic and financial burdens on the industrial world, and bring collapse still nearer — reinforcing incentives for further cuts in production, and so on, in a vicious, repetitive cycle.

Looking into the future, one sees mounting pressures on the financial and economic institutions of the industrial world and no respite in sight. This can go on for only so long. E.F. Schumacher, a British economist, in his most recent book likened the industrial world to a balloon that grew to enormous size on the strength of oil. October 6, 1973, the day the oil countries announced their embargo against the allies of Israel, he said, was "the date when a hole appeared in the skin of the balloon — perhaps to start with, quite a small hole — and the air started whistling out."<sup>8</sup> The hole has since been getting larger and larger, and the industrial countries have had to keep pumping more and more air into the balloon. Much of this 'pumping' has been in the financial system, as evidenced by both the enormous expansion of debt and the ever

mounting inflation. Although this has helped temporarily, it has been adding to the stress on the skin of the balloon. One, not too distant day — although no one can predict precisely when — the balloon seems all too likely to pop.

### The Gravest Danger of All

As the dangers inherent in continued oil dependence have become apparent, thoughts, especially in the United States, have turned toward military action. Although appealing to many as a potential 'solution' to the oil crisis, an attempt to gain control of the Middle East by military force poses the gravest danger of all to the industrial world.

There is little possibility that military action could achieve even the narrow objective of capturing relatively intact a single country's oil facilities. The capability of the United States to conduct military operations is too limited and slow, and the critical components of oil production are too easily and quickly destroyed.<sup>9</sup> Even if the oil facilities were somehow captured intact, keeping them in this state in the face of certain attacks by a hostile population would be impossible. In referring to the much smaller threat posed by internal dissidents in the Gulf states, the director of a leading oil company has commented that oil installations are virtually indefensible and "depend on Allah for their security."<sup>10</sup>

In the unlikely event that an attack were to succeed militarily, it would certainly fail on broader grounds, for other oil states would be compelled by self-interest to immediately embargo all oil shipments to the West. They could also lend their military forces in support of guerrilla efforts to prevent oil shipments from captured territory, a task that seems all too easily accomplished in view of the vulnerability of giant oil tankers and the narrow straits through which they must pass.

This dismal picture of U.S. military prospects does not even include the Soviet Union, whose invasion of Afghanistan brought its military forces to within 300 miles of the Persian Gulf and amounted to an open declaration that U.S. military operations would not go unopposed. Thus, rather than guaranteeing the continued flow of Mid-East oil, mili-

tary action seems guaranteed to halt it — at the same time incurring the risk of global war.

### A Path to Certain Disaster

The industrial world's massive dependence on imported oil can be reduced only slowly, with great difficulty, and at high cost. There will be no easy escape from the trap of oil dependence. No matter how great the effort made, it is uncertain whether escape can be achieved before catastrophe, in the form of political upheaval or war in the Middle East, collapse of the international banking system, or an uncontrollable economic depression, overtakes the world.

What is certain is that present policies of the industrial nations offer no hope of escape from disaster. Their primary aim remains, despite all the warnings of the 1970's, continued economic growth, subject to a secondary concern about inflation. Only lip service is being paid to the goal of reducing dependence on imported oil to less frightening proportions. Contrary to the impression created by the political rhetoric of the oil crisis, the energy programmes of the industrial nations aim only to *keep imports from growing*. For instance, the energy ministers of the leading oil consuming nations, meeting in December 1979 after the shocks of the Iranian revolution, agreed to voluntary quotas for 1985 oil imports that were essentially the same as actual 1979 import levels.<sup>11</sup> Rising oil prices and increasing economic difficulties seem likely soon to cause forecasters to reduce their estimates of future oil consumption, and these reductions will undoubtedly be translated by politicians into lower 1985 and 1990 'goals' for consumption, but, these modest reductions will not lessen OPEC's power over the industrial world.

Reducing oil consumption sufficiently to gain a reasonable chance of averting disaster would require radical redirection of the economic and energy policies of the industrial world. To reduce import dependency by one-half, the industrial nations would need to reduce oil consumption by one-third, to reduce it by two-thirds, consumption would need to be cut in half. The difficulty of achieving reductions in this range is indicated by the past record: in spite of

all efforts, the industrial world's consumption of oil was slightly higher in 1979 than in 1973. Present government policies differ only modestly from past ones and thus will fail to achieve substantial near-term reductions in oil consumption. Their emphasis is on expanding internal production of oil and gas and their alternatives, such as synthetic fuels, nuclear power, and coal. Government mandated reductions in oil consumption are minimal. Higher market prices (and fuel taxes in Europe and Japan) are being relied upon to induce conservation measures. These policies will affect oil imports only slowly and to a modest extent.

Attempts by the industrial nations to expand their own production of oil and gas are doomed to failure by the success of past efforts. Reserves in the United States and Canada, the major producers of the industrial world, have been drawn down to the point (less than 9 years of oil production in the United States) where declines in output in the range of 20 to 30 per cent are anticipated by 1990.<sup>12, 13</sup> These declines will more than offset planned increases in production from the European North Sea fields, leaving the industrial world as a whole in a worse supply position in 1990 than today.

Coal cannot be readily substituted for oil, as energy planners in the U.S. have found to their dismay. In spite of efforts to promote greater use, consumption of coal by U.S. industry fell by one-fifth between 1973 and 1979. Even though gas and oil are far more expensive than coal, they are still strongly preferred by most industries. The dominant use for coal, outside of the iron and steel industry, is for electrical generation. Coal and nuclear energy compete for this market, and in combination, they can be expected to make substantial inroads over the next ten years into that fraction of oil that is now used for generating electricity. Unfortunately, this fraction represents only slightly over 10 per cent of the total oil consumption of the industrial world;<sup>14</sup> thus even if utility use of oil were cut in half, total consumption would be reduced by only five per cent.

In order for coal to reduce oil consumption substantially, it must first be converted into petroleum-type



fuels, so called 'synthetic fuels.' But, only the United States has the coal, water, monetary, and environmental resources necessary to build a major synthetic fuels industry, and even for the United States, development of such an industry would be an immense undertaking, replete with technical, financial, environmental, and political difficulties. To produce 10 per cent of present U.S. oil consumption (4 per cent of the industrial world's consumption), the optimistic goal proposed by President Carter for 1990, would require the construction of 90 coal liquefaction plants, each of which would cost several billions of dollars (indicating their size and complexity). As inputs, they would require an amount of coal equal to *one-half* the entire output of the U.S. coal industry in 1978. This scale of operation will not be easily achieved.

Nuclear power plants take more than ten years to bring from conception to operation; thus even if present programmes were not mired in controversy all around the world,\* efforts to accelerate them would not yield results before 1990. Even then, nuclear power's ability to substitute for oil would be small. It is a source only of electricity, a special, very expensive form of energy whose use tends to be restricted to applications where its unique properties justify its premium price — lighting, electronics, and powering stationary motors. As a consequence, the share of electricity in total end-use energy (after subtracting energy lost during production and distribution) is less than 15 per cent in all industrial countries,<sup>15</sup> and there is little prospect that electricity will soon make inroads into the markets for directly consumed fuels that currently constitute more than 85 per cent of energy consumption.

Major barriers to the substitution of nuclear electricity for oil are its high cost — equivalent on a delivered heat basis to about \$100 per barrel of oil (at present costs of nuclear plant construction) — and the continuing cost and performance gap between electric and gasoline



*Iraqi guns shell Iranian positions. The war has destroyed Iran's largest oil refinery. What will be the repercussions on oil exports to the West?*

autos.<sup>16</sup> Finally, it needs to be recognized that even a very large nuclear power programme will seem small in comparison to present levels of oil consumption. For example, if the approximately 100 nuclear power plants licensed for construction in the United States (twice the amount now operating) were brought into operation by 1990, their delivered energy contribution would equal about 5 per cent of present U.S. oil consumption.

Solar energy, although of great long-term potential, can be introduced only slowly. Its largest near-term use, heating for homes, will be realized only as new houses are built. And despite all the publicity about gasohol, the alcohol contribution in the 1980's will amount to only a few per cent of U.S. gasoline consumption (and much less in Europe and Japan).

In sum, there is no realistic prospect that the industrial world can significantly reduce oil import requirements during the next ten years by any combination of measures to increase the supply of oil or alternatives to it. Indeed, since oil and gas

production by these nations seem likely to decline by over 10 per cent during this period,<sup>17</sup> merely staying even on the supply side will not be easy.

The outlook for oil conservation is far brighter than that for expanding energy supplies, but the amount of conservation induced by price alone seems certain to fall well short of what would be needed to cut import dependence substantially. First, conservation efforts must contend with economic growth, which will tend to raise oil consumption. If the industrial nations are even moderately successful economically in the coming decade, oil requirements in 1990 in the absence of conservation measures would be at least one-quarter larger than today. Second, although the potential for conservation is large, it will be realized only gradually. This is because most voluntary conservation will take the form of improvements in energy efficiency rather than doing without desired energy services, and making these improvements will generally require replacing or substantially modifying existing buildings and equipment.

\* Except in France, where although nuclear power is controversial, the bureaucracy that controls the French energy program has not, so far, allowed this to affect its ambitious plans. How long this can continue is, of course, open to question.

Many energy services have the character of basic necessities (space heating, cooking, water heating, and personal auto transportation). In other instances, energy costs represent a small part of the total costs of a highly valued service or process, such as automobile and airplane transportation, motor power and process heat in manufacturing, and heating and cooling of buildings. Even at today's prices, oil costs represent only a small fraction of most people's income and businessmen's budgets. Thus, rather than foregoing the services that oil provides, most will choose to maintain the services but to reduce the burden of oil bills by, for example, buying more efficient cars, improving home insulation, and in industry, by installing heat recuperators and redesigning manufacturing processes to save energy. These changes will take time to accomplish. The most important single measure in the United States, replacing the existing stock of low-mileage autos with more efficient ones, will take well over ten years including the time for Detroit to retool its production lines.

The limitations of conservation have been recognized even by its proponents. For example, the widely praised report of the Harvard Business School, *Energy Future*, stressed the neglected opportunities for improving energy efficiency and also for speeding the application of solar technologies. Still, its recommended, 'Balanced Energy Programme' for the United States in the late 1980's, which assumed (over-optimistically) that domestic oil production would remain at the present level, projected a slight increase in oil imports from 1979 levels.<sup>18</sup> In Europe and Japan, where efficiency levels are already much higher than in the United States, gains will be more difficult and come more slowly. Thus, although sharply higher oil prices will induce substantial conservation, probably more than is generally realized, reductions in absolute levels of consumption will not be large enough to materially affect the industrial world's dangerous dependence on imported oil.

Substantial reductions in oil use can be obtained quickly *only* by conservation programmes that go far beyond anything now being contem-

plated by the industrial nations. Gasoline rationing, oil quotas for industry, forced conversions to alternative fuels, and government directed and subsidized crash programmes aimed at major improvements in the efficiency of energy use in residences, factories, offices, and vehicles would be necessary. Serious dislocations in the economy would be unavoidable. Personal travel would need to be greatly reduced, affecting many businesses and industries. More national production would need to be devoted to investment and less to consumption, causing shortages in some places and excess capacity and unemployment in others. Dealing with the dislocations, hardships, and adjustments would require a degree of mobilization and government control not seen since World War II.

The political will to undertake such far reaching efforts to reduce oil dependence is not yet in evidence. The present leaderships of the industrial nations rose to power on the wave of industrial expansion that swept the globe following World War II, and they show no signs of willingness to turn onto a course that would mean foregoing, at least temporarily, all chances for economic growth. Nor is the public demanding actions that would require personal sacrifices. Most still fear certain change toward a more austere life more than uncertain disaster. There is much confusion about the extent of the dangers and many unfounded hopes about the effectiveness of current programmes. In these circumstances, the almost certain prospect is for continued drift toward disaster.

This does not mean that disaster is inevitable, but only that at present we are headed toward it with no signs of turning aside. Perhaps, though, continued deterioration of economic and political stability, coupled with more oil shocks, will persuade the public and its leaders that emergency measures to reduce oil consumption are justified. What seems impossible today may seem easy when the situation becomes sufficiently desperate.

### **Inevitable Changes**

So far, this paper has consisted of laying out evidence and pursuing a

trail of logic to its natural conclusion. To go further and discuss the implications of this conclusion is to leave the realms of evidence and logic and to enter these of judgement and intuition. It seems important to do so, even recognizing that many who find the logical analysis persuasive will part company at this point, because what has been said seems so dark and pessimistic — whereas I myself do not feel at all pessimistic about the future.

We are witnessing the end of the era of cheap energy. Even if economic collapse can be avoided, the world is going to move in new directions. The industrial world was propelled to its present heights of power and material prosperity by oil. The entire structure of the industrial economy reflects the implicit assumption that unlimited supplies of cheap oil would always be available. This assumption has now been proven false. The full political and economic implications of the new realities of high-priced, scarce oil controlled by others are only beginning to emerge. They will not be fully understood for a long time, but what is clear is that the long period of growth without limits has come to an end.

In deciding how to respond to the impending changes, we need to look beyond our immediate natural fear of the unknown. This fear will make failure of the present economic order appear to be a disaster to be avoided at all costs. What needs to be recognized is, first, that superficial remedies are not going to avert the need for fundamental changes, second, that the further the economy is distorted in a futile effort to keep it moving forward along old paths, the harder will be the fall when it arrives, and third, that collapse is *not* a disaster to be avoided at all costs. The disaster is what is going on right now: the frenzied exploitation, without regard to the eventual consequences, of the world's natural resources, environment, and people, and the accelerating world wide preparations for war — all of which are being driven forward by the power of and the need for oil. If these grind to a halt, it will be no disaster but a blessing!

Although undeniably, economic failure has its scary aspects, these need not dominate our thoughts if we



see it as an opportunity for a new beginning — an opportunity needed far more desperately than additional oil. The costs of industrial expansion have been outweighing its benefits for some time now. This can be seen not only in the litany of growing social and environmental ills that are too familiar to need repeating, but in the increasingly apparent decline in the standard of living, reflected in the United States, for example, in

the now general need of both husband and wife to work in order to live decently and in the explosion of housing prices that has forced most young families out of the market entirely. Yet, all attempts to alter the course of industrialism have so far failed, the influence of those benefiting from its progress too strong, its forward momentum too powerful to overcome.

If the stresses of oil dependence

do cause a collapse of the industrial economy, the world will not end. Rather, a period of great ferment will begin. No one can at this time foresee the outcome. The possibilities exist for better as well as for worse.

Great changes are now inevitable. Rather than resisting them all blindly, we need to search among the possibilities for the opportunities that are surely there.

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A major thesis put forward here is that none of the standard energy solutions will prevent the downfall of the present economic order. This conclusion may seem, to those familiar with my previous writings, to be contradictory in tone and substance to arguments I have made in the past. These contradictions, which in part are real and in part only apparent, are reflections of radically different approaches to understanding the world.

In earlier writings, I took the prevailing assumptions of the energy policy community — first, that rapid economic growth must continue, and second, that dependence on Middle Eastern oil was unavoidable and, illogically, therefore tolerable — and then employed the prevailing, standard techniques of quantitative, economic analysis to show that improvements in energy productivity, such as higher-mileage cars, better insulated and designed buildings, and improved industrial processes, could substitute entirely for nuclear power, synthetic fuels, fusion, etc., throughout the necessarily long transition to renewable resources. This conclusion is as valid as ever, given the assumption, which is still implicitly accepted by the governments of all the industrial nations, that present oil imports can be sustained virtually indefinitely without catastrophic consequences.

As a mode of argument, accepting the methodology and basic assumptions of one's opponents has its merits; as a route to understanding the oil crisis, its defects are manifest. As I have argued elsewhere, narrowly quantitative analysis of the type favoured by the U.S. Department of Energy to justify its programmes has inherent deficiencies that make it a bad guide to policy:

(Highly quantitative) analyses of real-world processes are subject to . . . catastrophic failures because, in order to reduce analyses to manageable proportions, analysts ignore (or assume to be fixed or to vary as in the past) a multitude of integral aspects of the real-world process being studied. Conceptually, analysis removes a piece of the world process, isolates it, and sees how this isolated piece responds when parts of it are changed . . .

The fatal weakness with this approach, for all policy issues of

any significance, is that the aspects of the world ignored are usually equally or more important to determining how the process evolves than those parts included in the analysis. Nor does extending the scope of the analysis remedy matter; first, because data requirements expand geometrically with scope (and most of the data for the expanded study will prove to be unavailable or not available on a timely basis — the world just keeps rolling along, outmoding all data collected in the past — forcing the analysts to make heroic guesses about data values), and secondly, even if the data were available, theories are not available to explain the interrelationships among the expanded data-set.

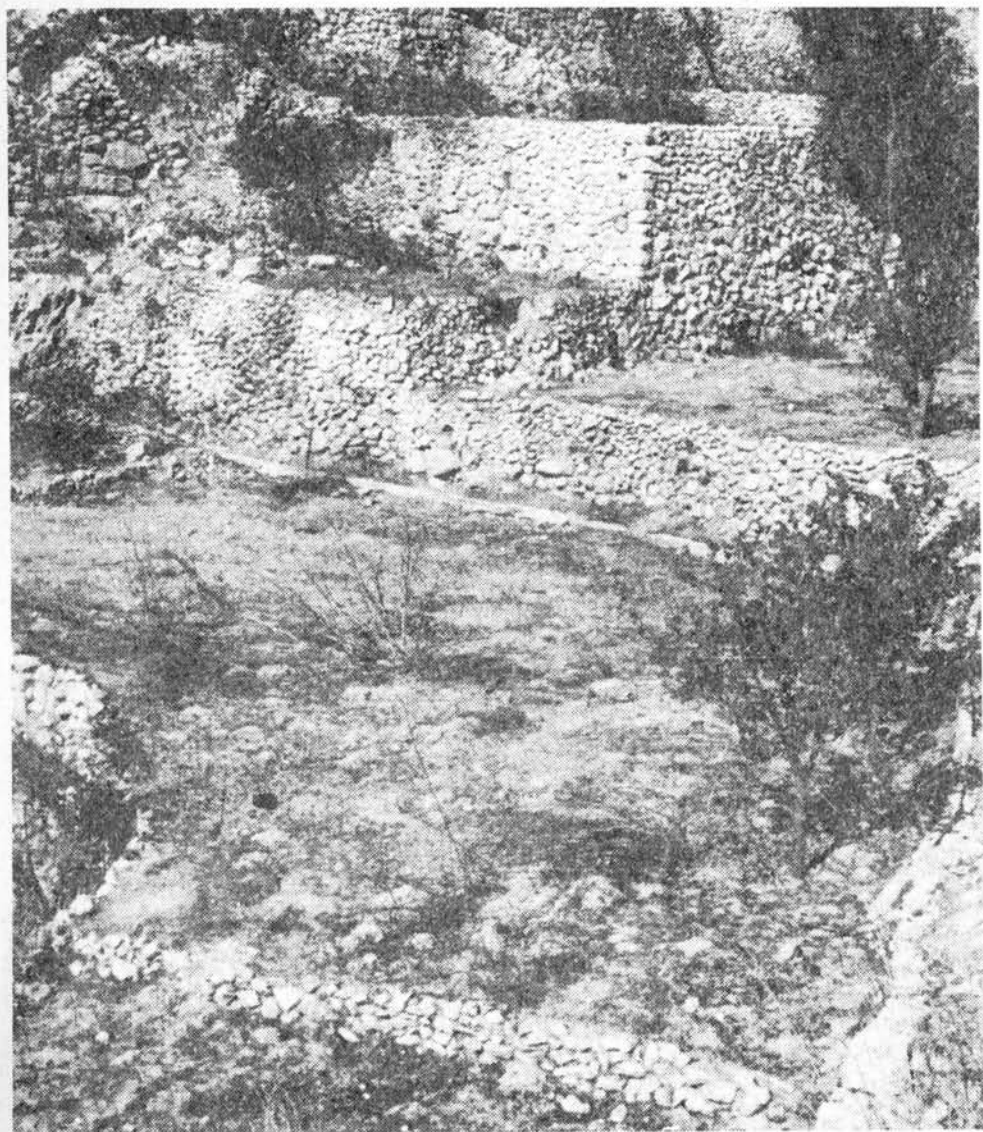
The analysis presented herein foregoes narrow quantitative investigation in favour of a more comprehensive treatment of the forces, many of which are unquantifiable, shaping developments in the oil crisis. The attempt is to see the unfolding of events in the ongoing oil drama as part of an organic process, in the spirit of the Chinese, Taoist approach to understanding. The organic view appeals to natural analogies for understanding and to imagery for explanation. It stands in marked contrast to quantitative policy analysis, with its complex, computerized systems of equations filled with unknown and unknowable parameters and its multitude of numerically expressed alternative scenarios.

The evolution of organic processes is determined largely by intrinsic forces following natural laws. Thus, organic analysis sees the ability of individuals and governments to deliberately shape the future as relatively limited; their actions are viewed as inseparable aspects of a natural pattern of development. By contrast, standard policy analysis views the world as a mechanical process controlled, usually in a complex and empirically unverifiable manner, by levers whose settings are primarily determined by policymakers.

Finally, the two views of the world imply very different ways of relating to it. In scientific policy analysis, the world is filled with problems, and the task of analysis is to assist in their solutions. In organic analysis, the world just is, and the goal is to see it clearly, unclouded by prejudice or predilection, so as to be able to adapt as gracefully as possible to its inevitable changes.

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# Terraced Agriculture in the Middle East

by  
**Peter Bunyard**

Over the millennia since the origin of agriculture man has fundamentally altered the earth's landscape. Forests have gone and marshland been drained, but perhaps the most spectacular changes are those where man has literally fashioned hillsides and mountain slopes into a cascading series of step-like terraces.

For more than four thousand years man has been using terraces in order to farm hillsides and to broaden his agricultural base. It is ironic that today, when world population is more swollen than at any other time in history and when man is shrinking his land base by millions of hectares every year through industrial deve-

lopment and expanding wastelands, he should be turning his back on terraced farming. The costs in manpower are considered too high, the productivity too low; instead hillsides are abandoned and terraces are allowed to collapse or they are simply bulldozed away. In Tuscany for example, where once terraces supported olive trees, vines and wheat, the Chianti slopes are increasingly covered solely in vines planted directly down the hillside, the reason for such monoculture being the world's growing appetite for wine. The terraces have been swept away to make a uniform slope on which tractors can move up and

down. Meanwhile permanent concrete posts have been dug in to replace the chestnut poles which were traditionally used to support the vines horizontally across the terrace. Consequently the Chianti slopes have all the appearance of a world war cemetery rather than the site of a renowned wine. Critics point out that erosion caused by the heavy winter rains will greatly increase through enhanced run-off. The Chianti landowners, many of them new to the area, shrug their shoulders; the profits to be made over the next twenty years are sufficient to justify the enterprise. Future problems are for future generations, even the professor of agronomics at the University of Siena is putting his faith in some future technology which will overcome the erosion problem, or make it irrelevant by bypassing the need for south-facing sunny slopes.

## The Beginnings of Terracing

In the western world terracing was probably first practised in Lebanon where the Phoenicians rapidly learnt the lesson that mountain slopes shorn of their indigenous trees and shrubs will lose their scant topsoil in a matter of years, leaving little but bedrock behind. There was perhaps less of genius behind the notion of terracing than the demand for sheer hard work, but the rewards were manifest inasmuch as the construction of the terraces neatly utilised the boulders cleared from the slope and provided a flat level surface for planting which could be easily worked by hand or by a beast of burden. Meanwhile the breaking of the original slope into a series of horizontal platforms checked run-off and instead of pouring relentlessly down a denuded terrace-less hillside, carrying away soil and whatever vegetation was left, the rain had time to soak into the accumulated soil contained by a terrace wall, thus gradually saturating it and providing a source of water to last during the growing season. Excess water would flow gently through the gaps between the dry, uncemented stones of the terrace wall and down into the next terrace. If the original slope was steep and the winter rains hard, the system was made more elaborate with channels fashioned to the side of the terrace to carry flood water away.



## A Bulwark against Erosion

Contrary to what one might expect, given that overall rainfall is generally low, the semi-arid lands around the Mediterranean are particularly prone to run-off and subsequent erosion, more so than similarly steep land in the humid tropics. The reason is the difference in the rate and extent of growth of vegetation in the two geographical areas. In the tropics the growing season is generally all-year round and ground cover returns far more rapidly than in Mediterranean areas which suffer from poor plant growth in the winter season when the rains are heaviest. Indeed if sediment run-off is plotted against rainfall, it reaches a peak in those areas with a Mediterranean-type climate and falls away in areas with a higher annual rainfall. Once a hillside is cleared of its natural cover in the semi-arid Mediterranean, terracing is mandatory if soil is to be conserved.

Yet innumerable hills had their cover removed without any attempt to build terraces, and to this day they have remained grim testimonies of the consequences of drastically altering the finely adjusted ecological balance of the natural system without substituting a proper alternative. Arnold Toynbee and others have suggested that the history of the peoples of the Mediterranean with their resourcefulness and inventiveness is a consequence of responding to the challenge of a naturally harsh and infertile environment. Probably such historians have a mistaken view of cause and effect since the denuded and barren state of the area was man-created, not inherited.

Terraces have been part of the agricultural scene in mountain areas for countless centuries and few people in modern times, agronomists included, have bothered to investigate them and their efficacy in providing a stable base for food growing. Thus little has been done to save terraces from being given up. In the Canary Islands, for example, the abandoning of terraces goes hand in hand with the development of tourism; there are easier ways to make money and live than clamber up and down steep slopes.

## Israel's Experience

Undoubtedly one of the most

extensive investigations of terraces has been carried out in Israel and in the West Bank by the geographer Zvi Ron at the University of Tel Aviv. What began for him as straightforward academic curiosity into the geography of terracing has become more akin to a passion for trying to revive interest in terraced agriculture as a means of broadening Israel's food base. To date he has met with markedly small success.

Israeli farmers, with government backing, did in fact attempt to modernise terrace farming, using heavy mechanical equipment to broaden the terrace and to push away boulders. And to avoid arduous time-consuming labour to build the terrace walls, concrete was used instead. The notion behind the scheme, says Zvi Ron, was to adapt the mountain to the machine rather than the other way round, and the result was basically a disaster. The terraces were far too broad and the terrace walls consequently far too high to prevent erosion, the winter rains gaining sufficient momentum as they ran down the walls to wash away the soil. The new terraces also suffered from drainage problems inasmuch as the solid concrete wall blocked off water flow and prevented seepage. Nearly all the new terraces made with heavy earth-moving equipment have since been abandoned.

Traditional terraces with a Mediterranean-type climate cover some 55 per cent of the Judean mountains, thus encompassing a relatively large region all the way from Hebron in the south to beyond Jerusalem some forty miles to the north. Up until the end of the British Mandate in Palestine some 60 per cent of those terraces were being worked by the Arab population; today they are virtually all abandoned. In some areas the Israelis have planted trees, ostensibly to conserve the soil. According to Zvi Ron, the ancient terraces have been the main agents of soil conservation, and without them there would have been no soil left in which to plant the trees.

## Function of Terracing

Zvi Ron has formulated what he considers the three main functions of terraces: they transform a continuous slope into a series of level surfaces; they prevent run-off and sim-

ultaneously enhance the accumulation of soil and water; thirdly the terraced wall holds back the soil and provides an obvious repository for stones which are dug out when leveling the hillside.

Stone walls are often used in wide flood plains and on plateaus to mark field boundaries. These stone wall enclosures are not true terraces, says Zvi Ron, inasmuch as the incline is small, the soil is deep and unlikely to erode and stones may be rare. In a true terrace, the ratio of the width of the terrace surface to the height of its wall should not exceed the value of six. In stone walled enclosures on the other hand, where the field may stretch for considerable distances and only drop a shallow distance into the next field, the terracing coefficient may reach relatively high values. In using the terracing coefficient as a distinguishing feature between true terraces and other kinds of enclosures, Zvi Ron has one proviso; in some valleys where run-off is sufficiently great to cause potential erosion problems, the stone-wall acts as a proper anti-erosion device, and even though the terracing co-efficient may be considerably higher than six, the fields and their stone-walled constructions must be considered bona fide terraces.

The distribution of terraces throughout the Judean and Samarian mountains indicates that the terrace-builders, whether they were Canaanites, Israelites or the Arabs who ultimately followed them, had a sound, empirical understanding of the environment in which they were working. Not only did they meticulously avoid building their terraces too broad, they were careful to select first those sites with the best available microclimate. By mapping out all the terraces, Zvi Ron has shown that given two comparable slopes, one facing north and the other south, the terrace farmer would be far more likely to choose the former. The reason, he suggests, is that on south facing slopes with a 20 to 40 degree inclination, the insolation reaches its maximum during the winter wet season and hence drying out is rapid. The average rainfall is between 500 and 800 millimetres annually, and on north facing slopes, where insolation is less and hence there is less dry-

ing out, is more likely to provide a suitable growig medium than on corresponding south facing slopes. Consequently more than 60 per cent of north facing slopes in the region studied by Zvi Ron are terraced and under 45 per cent of south-facing slopes.

Where the rock is hard, as on the dolomite of the Mizzi Yahudi, the terrace is always built on top of the rock surface, the soil being used to make a horizontal flat surface. In soft rock areas, marly limestone for example, the terraces are cut into the hillside, the rock itself providing the horizontal base for the soil to lie on. Such terraces did not necessarily require high retaining walls; surplus stone derived from quarrying out the terrace is therefore often left in mounds besides the terrace.

### As Old as King Solomon?

Most terraces have been in some use right up to the 1948 War of Independence and have been kept in a state of reasonable repair. It is therefore difficult to put a date as to when they were first constructed. Zvi Ron reckons many to have been constructed in the days of Herod the Great; others may date back to the First Temple of Solomon and before — in other words are pre 1000 BC. The evidence for such claims is scant inasmuch as the terraces were not mapped in ancient times. However by unearthing some unusual irrigation systems Zvi Ron has good reason to believe that terraced farming was widespread throughout the Judean mountains in Roman Times and in all probability before.

Curiously, despite their intense interest in archaeology, few Israelis have any awareness or particular interest in ancient farming systems which their ancestors and others developed over the past thirty centuries. Zvi Ron himself relates how surprised he was when his professor at the Hebrew University in Jerusalem suggested he looked into terracing as a research topic. "But where shall I start?" Zvi Ron asked. "Why not at the Mountain of Pilots?" his professor replied.

As the young research student soon discovered the Mountain of Pilots was just about the only mountain in the Judean hills devoid of any agricultural relics; nevertheless he

went on to map its distinguishing geographical features as well as those of all other hills in the region. Early on in his study he came across clear indications that some terraced areas had once been irrigated. The irrigation water appeared to come from tunnels driven into the mountain and initially Zvi Ron believed that they led to natural springs. Being rather cautious by nature he did not immediately investigate, but on one occasion while peering in through a chimney-type hole above a tunnel he dropped his glasses and decided to go in after them. Armed with a powerful torch he clambered down and having retrieved his glasses, he started walking along a tunnel with neatly quarried sides and stone slabs for the roofing. Finally he emerged in a large cavern in which water was dripping slowly from the exposed rock surface and gradually trickling into a collecting channel on the floor. Another channel cut into the floor of the tunnel then carried the water out of the mountain and onto the terraces.

### Irrigation Systems: Tunnels in the Hills

Since that initial discovery Zvi Ron has investigated nearly every irrigation system connected with terracing, in some instances penetrating nearly one hundred metres inside the mountain as at the village of Artus just below King Solomon's pools. Irrigated terraces were held in high esteem by the ancient farmers, and Zvi Ron has found them to be the most carefully and elaborately built of all those found in the Judean Mountains, even though they might suffer from all manner of other disadvantages, such as they are south-facing, on steep inclines, on an unsuitable rock base, or are inherently awkward to get to.

Irrigated terraces comprise less than ten per cent of all the terraces, and overall they cover a relatively small area. Thus the total area irrigated by 42 springs in the Jerusalem corridor amounts to little more than half a kilometre square. Judging by present Arab practice, as seen at the village of Battir midway between Bethlehem and Jerusalem, irrigated terraces have always been used for growing vegetables, while terraces dependent purely on rainfall are

used for growing vines, fruit trees and for grain.

To tap mountain aquifers, the ancient peoples of Palestine needed to be experts in hydrology and in engineering. If a tunnel was driven too high it would miss an aquifer, if too low it could drain the aquifer faster than it would replenish. Zvi Ron has found a few instances of tunnels abandoned because they had missed the aquifer, and often enough a tunnel would be lengthened or side tunnels cut into new caverns to improve a dwindling water supply. Nevertheless the number of hits far exceeded the misses.

Zvi Ron's discovery of the ancient technique of mining for water also throws light on an incident recorded in old talmudic writings. It concerned a farmer who complained that he was paying the high rent demanded for an irrigated terrace while not getting his water. The judge of that time apparently ruled that the onus was on the owner of the terrace to drive his tunnel deeper into the mountain. That ruling makes sense only in the light of Zvi Ron's discovery of the collecting caverns deep inside the mountain.

### A Village Economy

The irrigated terraced land at Battir, still very much in use, is a marvellous example of a rural economy based on an ancient system. Battir, now an Arab village, used to be called in Hebrew Beit Har — the house on the mountain — and it is famous in Jewish history as the last stand of the Jewish rebel Bar Kochba who was ultimately defeated after a siege lasting three years by the Romans. After their victory, the Romans of the Tenth Legion inscribed an account of Bar Kochba's capture above the entrance to the original irrigation tunnel opening, as a reminder to all the villagers who would come there daily for their water. Obviously the inscription indicates the minimum antiquity of the irrigation system. Similarly at Abu Ghosh, west of Jerusalem, Zvi Ron has found the remains of an irrigation system which the Romans later adapted to feed a reservoir supplying their garrison there. In more recent times the Turks converted the building above the reservoir into a stables, and today it is now incorporated into a French monastery.



At Battir water from the sealed spring flows along an open conduit outside the hill to a large reservoir. Eight Hamullahs, or extended Arab families, use the water from the reservoir to irrigate their terraces, the water being supplied in strict rotation. So that each gets his share and no more, a trusted elder of the village holds a knotted stick down on a marked spot in the reservoir.

The sluice to one family's set of terraces is then opened and the water cascades down until the water level in the reservoir has fallen a notch; that then is the ration of water for the day. In other villages, at Artus for example, some families cannot afford to have their own water reservoir. They therefore exchange water from a richer family for produce from their land.

According to Zvi Ron the Arabs are afraid to enter the tunnels because they believe them inhabited by evil spirits. So it is unlikely, he thinks, that the Arabs would have constructed any such irrigation systems. In fact when Zvi Ron went into the tunnel at Artus the Arabs were sure that he would never come out alive. Therefore when he emerged twelve hours later, early next morning they were utterly astonished. Meanwhile the geographer had sorted out for them why their water was coming from the tunnel blood red — a fall of rock had caused rust-coloured earth to slide in from the mountainside above.

In contrast to the modern practice of taking the best agricultural land and covering it with concrete — as at Heathrow for example — the terrace farmers have always built their villages on sites which are the least suitable for cultivation. And if a sealed spring was used for irrigation then the villagers would build their houses above, even though that meant they had to carry heavy pitchers of water up, sometimes steep slopes, to their homes, so great was their concern not to lose an inch of useful land. At Battir today Arab women still carry water up the slope from the tunnel entrance.

#### Stone huts

Scattered throughout the Judean and Samarian hills, amongst the terraces and farmland are stone huts of various sizes and shapes. Both the old and new testaments mention



such stone huts and they are also referred to in the Mishna and Talmud. Indeed archaeological excavations show that a number of stone huts in the south-western Samarian hills were in use during the later Hellenistic as well as Byzantine periods.

As with the terraces and irrigation systems little research has been done on their history and the usual explanation is that the stone huts were watch towers guarding roads, ancient mausolea or defence towers against Bedouin attacks. The very names of the various types of stone huts as recorded in the Mishna and Talmud indicate some sort of 'police' function. Thus one type is called Burgan meaning small fortress, another Migdal or tower and another Shomera or guard post. But the point has been missed, Zvi Ron suggests that the real purpose of the stone huts is agricultural in their providing a temporary dwelling for the farmer and his family during times when they need to work for several days on end in the fields, as during harvest time. In most regions in the Judean and Samarian hills, the stone huts were still in use during the 1940s and 50s, but most have now fallen into disuse, since with modern transportation most farmers can get to and from their fields in a relatively short time.

Stone huts were constructed from

unhewn stone gathered from the nearby fields and put together dry, without cement. The better huts had a vaulted ceiling, as with village dwellings, and were provided with a hewn-out water cistern and very often with a wine press, the latter indicating their use in pre-islamic times. Although the use of stone huts is dwindling fast it is most in evidence around Hebron, where whole families still stay, sometimes for weeks on end out in the fields.

Not surprisingly Zvi Ron has found the highest frequency of stone huts midway between a village and its outermost boundary some five kilometres away. That finding in itself supports his theory that the stone huts always had an agricultural use rather than a militaristic or police one.

The stone huts provide a relatively comfortable environment, their thick walls insulating the inside from the heat of the sun, and yet retaining their warmth throughout the nights. When the nights are too warm for comfort, then the farmer and his family sleep outside on the roof. The hut also functions as a store house for fresh fruit which would otherwise quickly spoil in the sun. Much of the work to preserve fruits, by sun-drying for example, are also carried out when the farmer is staying in his stone hut.

## Growing Grapes

Hebron is famous throughout the Middle East for its grapes, and many farmers still use traditional grapes such as Dabuki and Zenei which are fungus resistant and therefore do not need to be grown on wires. Because these varieties can be left trailing on the ground without mould developing the farmers have taken to covering the grape clusters with earth and small stones to keep out the sun; by clearing away the covering the cluster soon ripens. The harvest can thus be extended for as much as six weeks, preventing a glut of grapes on the market at any one time. Moreover the extended sale helps the Muslim farmer overcome the religious taboo against making wine. In addition to selling the grapes the Hebron farmers make raisins, wine vinegar, a concentrated fruit juice, grape molasses, a special jam and a type of unleavened bread impregnated with grape juice and dried in the sun, the result called mulban, being highly nutritious.

The traditional crawling varieties cost the farmer next to nothing to maintain other than his own labour, since he needs neither posts nor wires. On the other hand his total yield is between 700 and 1000 kilograms for each tenth hectare (dunam). Agricultural advisers are therefore trying to persuade the farmers to switch to higher yielding varieties such as shamei or hallawani or even some varieties from France where yields of up to three or five tonnes can be obtained. But the farmer has to pay out a substantial investment for cordons or trellises together with

the sprays which are needed to counter disease. The advisers are telling farmers that it is to their advantage to harvest quickly, and that with modern transportation a market can readily be found for the harvest, albeit several times larger. The present-day trends are in favour of a quick harvest in that farmers are having increasing difficulty to get and pay for labour to stay out in the fields for long periods. A similar labour problem with regard to the olive harvest is becoming evident around the town of Ramallah to the north. Indeed farmers are finding that instead of following them into the fields their sons prefer to go to the cities, particularly those in Israel to earn substantially higher wages with far less effort.

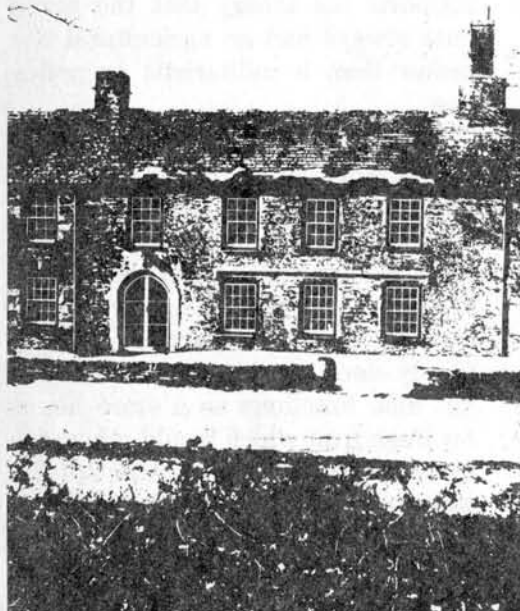
## Vital Need for Terracing

While the terraces within Israel remain abandoned and neglected, the Arab farmers of the West Bank, particularly around Hebron, fear that unused land, terraced or otherwise, might be requisitioned for the site of a new Jewish settlement. That fear at least has its productive side by making them work land that has been out of use for some time. But the overall situation throughout the Western world is of a sharp decline in terrace farming as farmers no longer find the economic returns on their labour to their liking. Deprived of labour, terrace farming can only fail, and with that failure there will be a significant decline in the Mediterranean food base.

Zvi Ron feels that the abandoning

of terraced farming is a tragedy not simply because of a vanishing way of life, but because the maintenance of the terraces, particularly in the semi-arid Mediterranean-type regions, is the only real buffer between soil conservation and uncheckable erosion. As he points out small machines can be adapted to work on traditional terraces, and he is hopeful that with a proper approach terraced farming could again become profitable and worthwhile, as it still is for many Arabs of the West Bank. But then they have not yet succumbed to a wholly western standard of living.

Terrace farming is a critical indicator of the state of health of the farming community throughout the world. Once farmers resort to labour saving machinery and to chemicals they inevitably pay less attention to the demands of the land. In the past farmers would rigorously ensure that soil carried to the bottom of slopes would be carried back again to the top. They did that when land was cheap. Today when land prices have soared to astronomical figures farmers treat it with extraordinary carelessness, allowing soil losses to take place that would never have been tolerated before. Farmers throughout the world might well learn from the terrace farmer's determination to conserve his soil and to improve fertility by employing every conceivable resource. It is vital that terraced farming be given a new impetus, but ecologically, by adapting the techniques used and the approach to the mountain, not the other way round.



## ECOLOGICAL FOUNDATION — Residential Courses 1981.

Residential five-day courses (Thurs.-Mon.) are planned for May 81.

1. A **General Course** led by Edward Goldsmith, Nicholas Hildyard and Peter Bunyard (based on lectures given at the University of Michigan as well as the Student's Union of Exeter University) comparing the Ecological World View with that of Industrialism, considering the basic problems facing our society today, i.e. unemployment, inflation, poverty, crime, war etc. in the light of these two rival world views.

2. An **Ecology of Economics Course** with additional lecturer Kenneth Penney, lecturer in economics of Exeter University. During this course there will also be talks given by members of ECOROPA's Ecology of Economics working party, who are attending their fourth meeting at that time here in Cornwall. Participants at previous meetings have included Nicholas Georgescu-Roegen, Ivan Illich, Orio Giarini, Jean Pierre Dupuy, Rene Passet and Joseph Huber.

The location is Worthyvale Manor, near Camelford, where superbly restored medieval buildings surrounded by farm land and trout lakes offer accommodation, lecture rooms, lounge and dining room.

The cost is £80 per 5 day course, inclusive of course fees, accommodation and food, but excluding VAT.

Further details from Maria Parsons, The Ecologist, 73 Molesworth Street, Wadebridge, Cornwall, PL27 7DS, U.K.





## Roots in Reality

**PLANTS OF THE GODS**, Origins of hallucinogenic use, by Richard Schultes and Albert Hoffman, Hutchinson, London, 1980 £12.95.

*Plants of the Gods*, like the vines, mushrooms, cacti and shrubs with which it is concerned, contains far more than immediately meets the eye. One's initial impression is of an expensive but, probably, unsubstantial coffee table book, heavy on illustration but light on content. In fact, nothing could be further from the truth. It is learned, informative and considered an ideal introduction to the nature of psychoactive plants for the general reader. The approach is multi-disciplinary embracing botany, chemistry, anthropology, ethnography and history — the only really effective way of tackling such a complex subject. Albert Hoffman, the discoverer of LSD, and Richard Schultes of the Harvard Botanical Museum strike a note that happily combines both scholarship and a sense of wonder at the awesome powers of the plants they have examined.

There is no question that people and peoples tend to be imprisoned by their everyday vocabulary and experience. For hundreds of years, alcohol has been the habitual drug of Western Europeans, and the language and concepts of substance-induced states of consciousness have been largely bound by the experience of alcohol intoxication. The incomprehension and suspicion that greets experimentation with other substances, particularly plants, is a reflection not only of our ethnocentricity and fear of the unknown, but

also of the lack of respect we have for alcohol despite our frequent recourse to the bottle. Priggish as it may sound, drug use without respect for the drug can be stupid, gross and sometimes emotionally, if not physically, dangerous. The tribal cultures described in *Plants of the Gods* would probably regard careless or flippant use as a form of blasphemy and, even in ethical monotheistic terms, they would probably be right. Simple getting high ought to entail something more than just a fast road to oblivion.

It is no accident that drugs like alcohol, barbiturates and tranquilisers, much favoured in our society, are more concerned with blocking our reality than letting it flood in. It seems offensive as well as ironic that the publishers have felt obliged to print a disclaimer, affirming that this balanced and uncontroversial book is in no way intended to encourage the use of psychoactive plants. Meanwhile Heineken, Valium and Benson and Hedges continue to bombard those consumers that other advertising agencies have, as yet, failed to reach.

Out of a probably half-million species of the earth's flora, only about 150 are known, or suspected, to be used for their hallucinogenic properties, although such use occurs in almost every part of the world. In a useful plant lexicon, Hoffman and Schultes provide basic descriptions of 91 plants believed to have psychoactive properties and explore in further considerable detail those whose use seems most established such as cannabis, fly agaric, ergot, datura, psilocybin iboga and peyote. Photographic illustration is extensive, particularly of the plants themselves and their consumption in religious, sacramental and tribal ceremonies. A magnificent *Amanita Muscaria* graces the back cover of the book. Unfortunately within the text itself, a full-page plate of two other *Amanitas* looks as if it has been staged by a Monty Python travel agency or is part of the set for a soap opera directed at garden gnomes who have developed a taste for *Crossroads*. But this is a minor cavil compared to the book's overall achievement. Sadly it sells at a price more suited to public libraries or the interested communal household. Information

about psychoactive plants, like their synthetic analogues, tends to come expensive.

Attempts by the state to use hallucinogens for offensive purposes are not a new phenomenon either. Duncan I of Scotland managed to demolish King Sven Canute's entire army by sending the Norwegians oatmeal mixed with belladonna. Even when we know as much as we can about the composition and effects of psychoactive plants, we would do well to learn from so-called more 'primitive' peoples and treat them with an equivalent wisdom.

Roger Lewis

## Dr. Hueting Pricks the Bubble of Economic Growth

**NEW SCARCITY AND ECONOMIC GROWTH** (more welfare through less production?) by Dr. R. Hueting. With prefaces by Jan Tinbergen and Dennis Meadows. North-Holland Publishing Company, Amsterdam/New York/Oxford, 1980. 270 pages, \$30.

Brilliant studies are not published every day in the Netherlands, but this tradition has now been breached. *New Scarcity and Economic Growth*, by the economist Dr. R. Hueting, is a unique book that may well form a turning point in economic thought. The author, known to many through his articles and his booklet 'Wat is de natuur ons waard?' (What is nature worth to us?), but also on account of his musical talents as pianist of the long-standing Down Town Jazz Band, has been working for the last ten years with a group of associates at the Netherlands Central Bureau of Statistics on the quantification of environmental deterioration.

Hueting argues that the environment (or nature) and 'economics' can no longer be placed in separate compartments. The decline of the environment is an economic problem. It is no luxury to spare or clean up the environment, as many think, but a choice that is of the same order as opting for factories or roads or, to put it in general terms, opting for production.

Dr. Hueting's crystal-clear analy-

sis (this book is highly readable for the layman too) amounts in brief to the following: economics is the science that concerns itself with studying the way in which people satisfy their wants and how for this purpose they make a choice from the scarce means available such as land, labour, capital and other factors of production, with which they ultimately engage in production and render services. If more and more wants are satisfied, scarcity is averted and prosperity results.

Prosperity is thus a psychical quantity. Wants cannot be subdivided into material and immaterial ones, as is argued practically every day by almost everyone who plays a part in economic life. After all, the satisfaction of wants always occurs because certain things are achieved, and it makes no difference whether that satisfaction occurs via the stomach or via the mind.

However, since a disproportionately large place has been reserved for that part of wants that is met by produced goods, other wants suffer. The reason is that production of material goods requires making demands on the environment, owing to the fact that space, water, soil and air are used in the process. Since this environment performs numerous functions for the satisfaction of human wants, but is not simultaneously suitable for all kinds of use, the one use is at the expense of the other. These potential uses of the environment are called environmental functions. When a loss of potential uses occurs, reduced prosperity is the result. The losses of function of the environment caused by the growth of production can be added up by means of market data. As economic growth amounts to the elimination of any kind of scarcity, the loss of environmental functions, interpreted as (new) scarcity, means negative economic growth. If the loss of these environmental functions becomes greater than the sum of goods becoming available thanks to the growth of production, there is *no* economic growth, for after all the balance is negative.

This idea was set out several years ago by Hueting and has meanwhile been adopted by numerous economists and politicians. Hueting and his associates have, however, suc-

ceeded in transforming the first ideas into a watertight calculation method. This has far-reaching consequences, as no less an authority than Professor Dennis Meadows, the compiler of the report to the Club of Rome, writes in a foreword to Hueting's study.

After all, in recent years it has become clear that Gross National Product is not the right measure of prosperity, since that sum for GNP includes in addition to good production the 'bad' form, consisting of corrections of the mistakes made. To put it differently, in the ironic words of Professor Ehrlich: "If the number of cases of accidents, mental strain, disease and crime increase to unprecedented heights, this will lead in many countries to an increase in GNP and thus of prosperity. For the production and services required for this misery (pharmaceuticals, hospitals with all the trimmings, body shops, surgeons, etc., etc.) are considerable and are added to the indicator of prosperity known as GNP."

Hueting is of the opinion, on the strength of his research, that no further growth is possible in the Netherlands. The potential uses of the environment have all been exploited to the full. No virgin territory remains; reserves of space have been exhausted. Every new form of use is at the expense of another, so that every profit yields a loss. In his opinion, therefore, it is a waste of breath to talk about the need for increasing 'economic growth', since this growth is an illusion.

The reason why the advocacy of economic growth nevertheless continues lies in the confusion between growth in production and economic growth. Increase in national income is not economic growth, but growth in production, not an economic but a commercial matter.

En passant, Hueting shows a number of these economic writers the weakness of their arguments — for instance A. Putter, Director of General Economic Policy at the Dutch Ministry of Economic Affairs, who once wrote: "The choice occasionally presented between prosperity or fresh air may perhaps be interesting for a philosophical study, but for society as a whole it is completely untenable." And although according to Putter too, the demand for clean

air and nature is steadily growing and moreover these environmental goods are becoming increasingly scarce, in his opinion economics has nothing to do with this.

Against this Hueting argues: "As a result of the undesirable deterioration in our environment we have to do with a problem of choice or a conflict between production and environment. As both contribute to our satisfaction of wants (prosperity), the abandonment of a further increase in production cannot be defined as weighing an economic disadvantage (giving up a certain amount of potential production) against a non-economic advantage (improvement of the environment). If — for whatsoever motives — the general feeling catches on that the situation in which our environment finds itself is unacceptable, and the authorities lay down imperative measures regarding production processes and consumption habits that lead to the smaller quantity of goods and services available, the total satisfaction of wants obtained from economic goods is increased as a result. In that case less production leads to more prosperity". Or: economic growth through less production.

The book has been translated into English with the aid of the World Wildlife Fund. It will shake economic science and economic policy to its foundations. It is a very special piece of work.

*Wouter van Dieren.*

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## Other Books Received

A number of readers have expressed regret that our feature *Other Books Received* has been dropped — this came about in fact not as a matter of policy but simply because shortage of space has caused it to be squeezed out time after time. Here, to make up, is an extended version which also includes some books that we would have liked to review at length, but which for reasons of space, have been unlucky.

### POLLUTION

**Nuclear Power — Anyone Interested? S.C.R.A.M. Aberdeen People's Press, 75p.**

A short, illustrated anti-nuke Guide to Scotland's energy options. Useful for starters, but like so many of these simplified information leaflets, this one will do little to arm you with ammunition to confound the opposition.

**The Nuclear Controversy: A Guide to the Issues of the Windscale Inquiry, Martin Stott and Peter Taylor published by the Town and Country Planning Authority in association with the Political Ecology Group.**

This one, on the other hand, has it all — and has been extremely thoughtfully put together so that you can find what you need and look up what it was that who said at the Inquiry. A reference book that no anti-nuke campaigner will want to be without.

**Lead in the Environment, William R Boggess and Bobby G Wixson [editors] Castle House Publications, £17.50.**

Readers of *The Ecologist* will be familiar with the implications of lead in our environment. This exhaustive work is not really for the common reader but gives an in depth account of every aspect of the problem which will be of great assistance to those engaged in pollution research.

**Pesticides. Contemporary Roles in Agriculture, Health and the Environment, T.J. Sheets and David Pimental [editors]. Humana Press Inc [USA], \$19.50.**

A view from the United States written in part by David Pimental who will be familiar to our readers — and many other contributors who come to the conclusion that chemical pesticides cannot be abandoned, and propose therefore biologically acceptable ways of using them. They make

their plea for continuing the use of them sound convincing, but this is achieved by leaving out all evidence that will damn the proposition.

**The Pesticide Conspiracy, Robert van den Bosch, Prism Press, £6.95.**

Sub-titled *An alarming look at pest control and the people who keep us 'hooked' on deadly chemicals*, and with an introduction by our own Teddy Goldsmith, this book makes no such compromises and explains exactly why people must not be allowed to listen to the watered down arguments found in the previous title mentioned. Robert van den Bosch is angry and frightened by the grip the pesticide industry has on all our lives, and his own knowledge has been gained during a long and distinguished career in pest control — his thesis that pesticides will eventually lead to the death of every living thing seems inescapable.

**Air in Danger. Ecological Perspectives of the Atmosphere and Weather Modification Prospects and Problems. Both by G. Breuer (translated from the German) Cambridge University Press £10.00 each or £3.50 in paperback.**

An ecologist explains the nature and dangers of air pollution and proposes reforestation as the sanest antidote. In the second title he examines the different ways in which man can intentionally or carelessly affect the weather. Both books are comparatively short and the price seems excessive.

**Atmospheric Processes, James Hanwell, George Allen and Unwin £3.50.**

Better value for money. The author is a school master and gives a very clear and straightforward account of the way the atmosphere works. Well illustrated — you don't have to be a student to appreciate this helpful and attractive book.

### ALTERNATIVE TECHNOLOGY

**ATINDEX Compiled by John Noyce and published quarterly at £25.00 per annum, from John Noyce, P.O. Box 450, Brighton, UK.**

A quarterly indexing service for Appropriate Technology (which includes alternative technology and intermediate technology) covers subjects such as aquaculture, resources in agriculture, forestry, energy, food, health, transport and so on. Impossible to give an opinion as to its usefulness or comprehensiveness without trying it. Get it from your library before spending all that money. It'll be worth it if it is really kept up to date.

**The Buyers Book of Solar Water Heaters, Dr Kaiman Lee and Michael Silverstein, Environment Design and Research Center USA, \$5.00.**

Companion volume to Dr Kaiman Lee's *Encyclopaedia of Energy Topics* (\$150.00 — they don't come cheap these energy writers) This must be the definitive work on solar heaters to date — but how long will it remain up-to-date enough to rely on? Lots of tables and diagrams, but at that price the text should be printed not typed.

**Running on Empty: The Future of the Automobile in an Oil Short World, Lester R. Brown, Christopher Flavin and Colin Norman. Norton/Worldwatch Institute, \$7.95.**

Alternative fuels, possible modifications, sources, funds, managing with less, it's all here and predictable.

### SELF SUFFICIENCY

**A Guide to the Do's and Don't's of House and Cottage Conversion, Hugh Lander, Acanthus Books, Lanner, Redruth, Cornwall by post, £1.25.**

Short and sweet, likeable and pleas-

antly illustrated — will tempt you to have a go.

**The Self-sufficient House, D-I-Y techniques for saving fuel, heat and money, Brenda and Robert Vale, Macmillan, £7.95.**

A pretty impressive handbook that covers just about everything by architects who have really tried it all themselves. Highly recommended.

**The Integral Urban House — Self Reliant Living in the City, Helga Olkowski, Bill Olkowski and Tom Javits, all of the Farallones Institute. Sierra Club Books, published in the UK by Prism Press £7.50.**

Huge, comprehensive paperback covering everything that an urban dweller could need to know in order to make himself as self reliant as an urban situation allows. Described by distinguished reviewers as 'imaginative and inspiring' (Buckminster Fuller) 'pioneering' (Amory Lovins) 'exciting, essential' (Wilson Clarke) and 'wise and beautiful' (Hazel Henderson) who am I to disagree? It might be a bit overwhelming, but it is very good value for money. There's one thing that bothers me, why, if we are all learning to husband resources does this huge book have margins over 7cms wide?

## EDUCATIONAL

**Outline Studies in Ecology. General editors George M Dunnett and Charles H. Gimingham, Chapman and Hall, £1.95 each.**

The very antithesis of the huge comprehensive volumes which so often hail from the US, this quite modest series have short manageable texts on ecological subjects. The first two John Miles's *Vegetation Dynamics* and M. Gorman's *Island Ecology* make a promising start. Further titles are planned and one must hope that they will not get lost in the present publishing recession.

**The Public on the Farm; Volunteers in the Countryside; Tree Planting Programmes; Guided Walks and other titles published by the Countryside Commission (no price is mentioned)**

Information, commentary and advice on a range of suitable subjects. They may make you a bit hot around the collar if you know about country matters, but must surely be useful to Youth Club Leaders, urban school teachers and others concerned with helping people to enjoy the country-

side without driving farmers up the wall.

**The Countryside Heritage, an Introduction. Hampshire County Planning Dept., £3.00.**

An excellent and most beautifully illustrated introduction to the County of Hampshire by people who well know the pressures and conflicts of interest that threaten it. Other County Councils might profitably follow suit, and meanwhile do get this one, for much of it is relevant to us all, wherever we may live.

**How to Ride a Bicycle, Anita Notdurft-Hopkins, Phoenix Press, Arizona. Unpriced.**

Thirty pages of advice and instruction for the bicycling enthusiast. Simple line drawings.

**Living Under Thatch, Grinacombe Farm, Grinacombe, Broadwoodwider, Lifton, Devon, 20p.**

A four page typed leaflet about thatch — not a D-I-Y guide, but written by someone who wants very much to pass on his personal experience, and seems to know his subject.

**Breeding Plants Resistant to Insects. Fowden Maxwell and Peter Jennings [editors], John Wiley and Sons, £15.20.**

This collection of papers, mainly from the USA, is addressed to the specialist in agricultural science, but it is full of riveting information none the less. Did you know that all species of the maidenhair or ginkgo tree are virtually immune to insects, bacteria, viruses and fungi? With all the anxiety we feel for the loss of forest trees to insect pests it is comforting to know that so much research is going on.

## ANIMAL RIGHTS

**Interests and Rights. The case against animals, R.G. Frey [Clarendon Library of logic and philosophy] Clarendon Press, £9.00.**

Professor Frey acknowledges that his will be an unpopular proposition, and goes on to state the case against animal rights on the grounds that animals do not have a 'sense of beauty' cannot make 'moral' judgements or form 'beliefs'. One cannot argue with those statements, but only ask what right has man to condemn them to ill treatment because they do not possess these human characteristics?

**Compassion is the Bugler. The Struggle for Animal Rights. Clive Holland, Macdonald, £6.95.**

A very personal account of the politics of animal rights. The author was a prime mover in the organisation of Animal Welfare Year. He clearly has little patience with those who do not share his concern — but what successful campaigner ever has?

## COOKERY

**Hedgerow Cookery, Rosamond Richardson, Penguin Original, £1.95.**

Prettily illustrated addition to the free-food enthusiasts' shelves. Largely, one might say, a question of taste.

**Wings of Life. The Pleasure of Vegetarian Cookery, Julie Jordan, Souvenir Press, £5.50.**

English edition of an essentially American book, but none the less likeable for that. Heaps of bread and grains, nuts and sprouts. Mouth-watering recipes described with infectious enthusiasm. You definitely don't have to be vegetarian to find this a useful book.

**Growing Wheat and Making Bread on a Small Scale, Hugh Coates and J.R. Stanford. Thorsons Publishers Ltd., £2.50.**

In the small-scale tradition. It probably contains all you can learn from a book — after reading it you just have to go out and try. It's more difficult than they make out, but they do make it sound enjoyable.

## WORLDWATCH PAPERS

**International Migration: the Search for Work, Kathleen Newland. Worldwatch Paper No 33.**

A subject familiar to Ecologist readers and endlessly interesting — its implications go to the roots of all our cultures and alter the very direction in which our society moves. The paper is full of insights and interest as well as amazing statistics.

**Inflation: The rising cost of living on a Small Planet, Robert Fuller, Worldwatch Paper No 34.**

"The biological and physical systems that underlie economic activity are reeling under the impact of excessive demand . . ." that inflation is a central feature of global economics is undeniable. Mr Fuller states this case and suggests that we should look at naturally frugal soci-



eties, such as the Eskimos, for solutions to our condition. If so we should do so very soon, for we are surely already in the process of weaning the frugal Eskimo away from his cultural background and submitting him to a course of consumerism.

**Food or Fuel: New Competition for the World's Cropland, Lester R. Brown. Worldwatch Paper No 35.**

Another area of unavoidable global conflict explained with the insight and wealth of factual material, that we have come to expect from Lester Brown.

**The Future of Synthetic Materials: The Petroleum Connection, Christopher Flavin. Worldwatch Paper No 36.**

As much as ninety per cent of the energy used in making synthetics could be saved if these indestructible materials were recycled, and, Mr Flavin suggests, they will play an increasingly important part in the battle to conserve natural resources. All the above available from The Ecologist office at £1.00 each.

## BELLES LETTRES

**Henry Williamson. The Man, the Writings. Edited by Brocard Sewell, published by Tabb House, Padstow, Cornwall, £6.95.**

This collection of memoirs, critical appraisals and little known essays by Henry Williamson himself, throws new light on this very private man. Williamson was of course a writer of novels and much else; he was also an inimitable observer of nature; it seems likely that it will be for Tarka that he'll be remembered. His eye and ear for the countryside were faultless.

**The Hills and Vales and The Gamekeeper at Home and The Amateur Poacher. All by Richard Jeffries, Oxford Paperbacks, £1.95 each.**

The growth of towns, the organisation of village life, agriculture, the ways of country people and above all the flora and fauna of his surroundings, were captured by the warm, witty and wise pen of this nineteenth century naturalist and philosopher.

**Nature Near London. Richard Jefferies. A facsimile reprint by John Clare Books. £5.50.**

A collection of pastoral and nostalgic essays by the great observer of life who could comment, a hundred years ago, without the twinges of anxiety and gloom that so often colour our own enjoyment.

**The Common Ground. A Place for Nature in Britain's Future? Richard Mabey, Hutchinson, £8.95.**

Richard Mabey examines the evolution of our countryside and suggests that some of the solutions to present problems, and future pressures may lie in the creation of a 'land ethic'. Illustrated.

**On My Own Terms, John Seymour, Faber £7.95.**

Early Seymour rewritten by an older wiser Seymour. As readable as he always is, this account of his early life and the background that gave rise to the later self-sufficiency Seymour, will delight and intrigue his many admirers.

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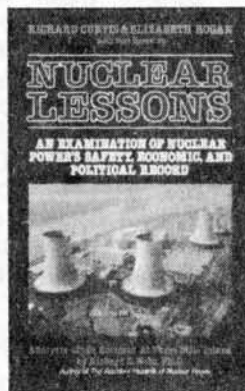
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## NUCLEAR LESSONS

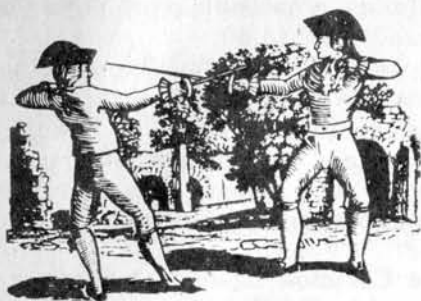
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## Letters

Sir,  
Peter Bunyard's article (April/May 1980) is a strange mixture of fact, error, and opinion which a non-technical reader may find difficult to disentangle. It is clearly impossible to deal with every point and I will concentrate therefore on the strands of his disjointed argument and some points relevant to each.

1. Governments are trying to force people to use electricity. False. The UK Governments commitment to a nuclear programme of 15 GW(e) over ten years from 1982 was based on electricity demand growth rates they believed to be conservative and is dependent on the achievement of this growth rate. Conservation policies such as those advocated by IED are probably impractical<sup>1</sup> and even to approach the savings advocated would demand Government intervention on a considerable scale, as Leach has acknowledged.

2. The French nuclear programme will take a long time to produce net energy savings. Any capital project takes time to repay its costs in either money or energy terms. A single nuclear reactor replaces the energy used in its construction and fuel manufacture within a few months of start up<sup>2</sup>. For a programme of reactors the payback time depends on the installation rate. If one has to invest energy to gain energy, is it not better to do it while prices are low?

3. The French have insufficient indigenous uranium for energy independence through nuclear power. They would not deny this<sup>3</sup>. Use of the fast reactor is the only way in which the EEC or Japan could become independent of uranium imports and this will take time, hence the French enthusiasm for its early rapid introduction.

4. Uranium fuel takes more energy to extract and produce than it yields. False<sup>4</sup>. Even for low grade sources the positive net energy balance is sizeable though recovery is not likely to be economic (granite at 20ppm 2.2 to 1; seawater at 0.003ppm 6 to 1 or more).

# Dr Jones of the UKAEA takes issue with the Nuclear Illusion

5. World uranium sources are small. False<sup>5</sup>. Known low cost resources could provide energy equivalent to 500 years supply at present world total energy consumption rates if used in fast reactors. Further discoveries and the use of lower grade ores can greatly expand this contribution.

6. Reprocessing spent fuel is difficult but vital. True. The nuclear industry has to pay great attention in its design and operations to safety and environmental releases. Operators have to satisfy independent inspectors before operating licences are granted and releases have to be held within internationally accepted limits under the supervision and monitoring of Government Departments not concerned with energy supply. The conditions laid down are such that the maximum permitted radiation dose to a member of the public from the nuclear power industry is about the same as the variation in natural background in the U.K.; a variation which appears to be of no significance to health. The average dose is smaller by a factor of over 100, so that the hazard to the population as a whole is quite trivial. More substantial radiation doses are accumulated by those working in the nuclear industry but detailed study of the death rates shows that employment in this industry is one of the safest occupations. If energy is to be provided, nuclear (including uranium mining) remains second only to natural gas in its safety record. In the last few years hundreds have died in North Sea oil accidents and as a result of tanker explosions, thousands have died from dam failures and many tens die annually in the U.K. mines. The Three Mile Island incident was an economic catastrophe but the chances of anyone dying or suffering health effects from it are vanishingly small.

7. Fast reactors produce more fission products than thermal reactors and the wastes more difficult to dispose of. False<sup>6</sup>. The fission products produced per unit of heat output must be approximately equal for both reactor types. The higher thermal efficiency of fast reactors means they produce fewer fission

products per unit of electricity and less waste heat. The whole process of waste glassification can be controlled to achieve desired temperature limits. This is no different for thermal or fast reactor wastes.

8. Plutonium losses are so high fast reactors can not breed. False<sup>7</sup>. There should be a distinction between thermal reactor fuels with a low plutonium content and fast reactor fuels and between plutonium locked up in residues and plutonium waste. The total is expected to be less than 1 per cent for fast reactors and the waste very much smaller. The residues from reprocessing and fabrication will almost all be recycled not discharged as waste.

9. The Civex process is designed to speed recycling. False<sup>8</sup>. Civex is one possible long term route to making fuel more diversion resistant.

10. Fast reactors are less safe than thermal reactors. False<sup>9</sup>. There are good reasons (large heat sink, low pressure circuits, etc.) for believing that fast reactors will be even safer than thermal reactors and that their routine emissions and environmental consequences will be smaller.

11. Economics — Peter Bunyard is right in pointing out (page 127) that the U.S. tend to use changing value dollars and to include guesses of future inflation in their calculations, which is precisely why the Ryan report referred to later (page 128) made so many elementary errors<sup>10</sup>. It is better to work in constant money and only to build in allowance for real price increases, whether this be in capital or fuel. Bunyard's own calculations use excessively high costs for reprocessing and fail to take account of the value of recycled uranium or consequent reduced waste management costs. Both the AEA and CEBG include reprocessing, waste management, and decommissioning in their estimates of future comparative generating costs and independently conclude that nuclear power is likely to remain the cheapest route to base load electricity generation in the U.K.<sup>11</sup>. Similar conclusions have been arrived at in most countries where abundant local supplies of cheap coal are not available.



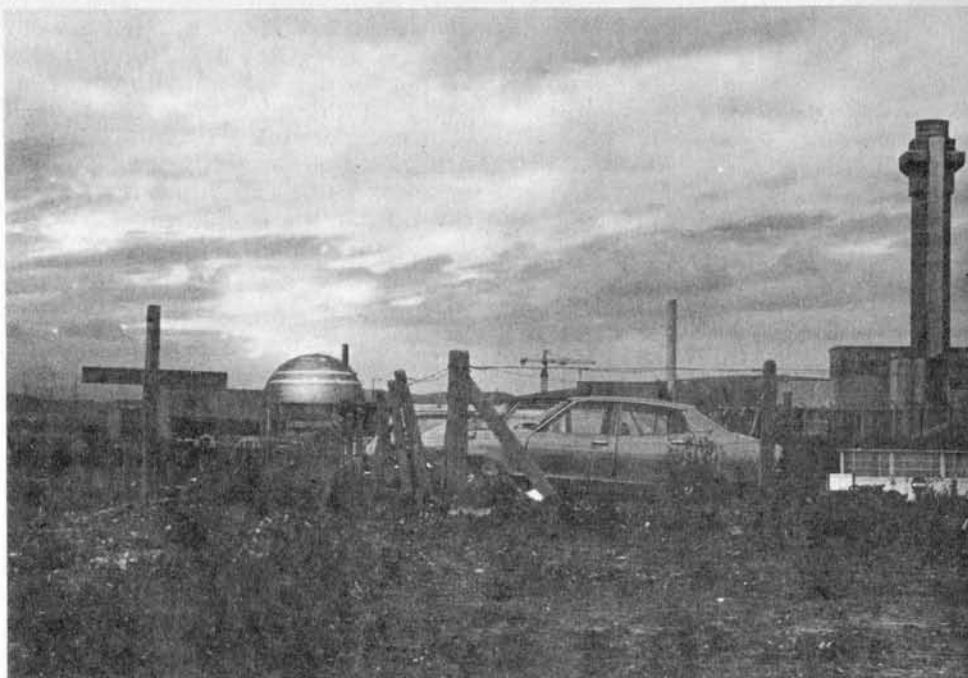
12. Bunyard's conclusions substitute opinion for fact. International studies suggest that nuclear power could be contributing up to a quarter of the world's primary energy needs by 2025, on a roughly equal footing with coal and oil. How much nuclear capacity will be installed will clearly depend on economic growth and the economics of competing sources. Given the advent of the fast reactor it will be demand growth rather than fuel constraints that set the level of nuclear contribution. The facts show that they are, if anything, even safer than thermal reactors, they will have a lower impact on the environment and there is no technical reason to believe that reasonable breeding gains can not be achieved.

It is important that the communities energy needs are met from whatever source cheaply, reliably and without introducing unreasonable risks for the present or future generations. Avoidance of all risk is impossible, since even shortages of energy can create national and international stresses which could be disastrous. The institutional arrangements in the U.K. seek to provide the necessary checks and balances and a full airing of public concerns. Unfortunately it will never be possible to satisfy everybody.

Yours faithfully,  
P.M.S. Jones,

#### References

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3. See French returns in *Uranium Resources*, OECD, Paris, 1980
4. *Fuel and Heavy Water Availability*, Report of INFCE W.G.1, IAEA, Vienna, 1980, p. 170
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6. *Fast Breeders*, Report of INFCE W.G.5, IAEA, Vienna, 1980, Chapter 4
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8. *Ibid*, Chapter 3, p. 110
9. See for example *Atom*, November 1979, p. 292
10. P. M. S. Jones and J. Sargeant, *Nuclear Power Costs*, *Atom*, August 1978
11. CEBG Evidence to Select Committee on Energy, March 1980; P. M. S. Jones, *The Economics of Nuclear Power*, *Electrical Review*, 1979, 204, No. 9, p. 38.



## Peter Bunyard replies:

Dr Jones claims that my article is disjointed, but the main arguments are, I hope, clear. First, that a large expansion of thermal reactors will create uranium supply problems, not simply because all the uranium in the world will be consumed, but because of difficulties, both economic and technical, of extracting uranium from the poorer ores and of preparing that uranium in a form suitable for a reactor. Second, that a fast reactor programme will not generate plutonium fast enough to fuel an expanding nuclear power programme and hence that the size of a world nuclear power programme will be limited at any one time by the availability of uranium-235. Furthermore the success of the fast reactor will be contingent not solely on its own safe operation but also on efficient reprocessing and fuel fabrication as well as on fail-safe security against the diversion of plutonium. I refer in my article to unacceptable environmental contamination once reprocessing becomes the norm for handling spent reactor fuel, and in particular fast reactor fuel, and I am by no means alone in expressing such fears.

But to answer his points in more detail:

1. The French have one of the most aggressive nuclear power programmes in the world, and I happened to be in Paris when Giscard D'Estaing promised those living within a 20 kilometre radius of nuclear power plants that they would have 15 per cent slashed off their electricity bills. Nor has L'Electricité de France (EDF) been backward in promoting sales of electricity. Clearly no government can actually force people

to consume more electricity, but it can play the subsidy game or slap on a fuel tax to manipulate consumer choice. Why else should the present government in the UK tax natural gas so heavily? Clearly the government's plans for nuclear power hang on maintaining growth in electricity consumption.

But why I would ask Dr Jones is the low energy strategy of Leach et al at the IIED impractical? Could it be that whereas the government is prepared to sink vast sums in nuclear energy in the hope that electricity growth will pick up, it has no real intention of supporting schemes which will not only save energy but will be far more cost effective than nuclear power or even conventional power plants can ever be?

2. The figures for the net energy returns from the French nuclear power programme were obtained from the recent 1980 edition of *Le Dossier Electronucléaire* produced by the CFDT, one of the main trade unions involved in constructing and operating nuclear power plants. The 11 to 16 years energy payback time were reckoned on the basis that L'EDF achieved its oft-stated aim of 'tout électrique, tout nucléaire'. In other words electricity would be used for as many consumer purposes as possible including space and water heating, where its efficiencies in terms of end-use energy were relatively low compared to the use of direct (and far cheaper) fuels such as gas. As for investing energy to gain energy, we come back to the point raised in 1. Are there not better ways to invest than to resort to such capital costly, dangerous ventures as nuclear power stations?

## NUCLEAR POWER The Grand Illusion



3. Dr Jones is right. The French Atomic Energy Authorities when dealing with those in the know are explicit in stating that France's indigenous supplies of uranium will go only so far. When dealing with the public they have been less than honest. Indeed the Messmer plan for building up a 40 GW nuclear power programme based on PWRs was heralded as the means by which France would achieve energy independence. Only in the past few months has Giscard D'Estaing begun talking about the need for expanding the fast reactor programme in order to achieve energy independence. One wonders, too, whether the expansion of the fast reactor programme could have military connotations insofar as the plutonium bred in the blanket zone (as distinct from the plutonium in the core) is as simple to extract in a reprocessing plant as the plutonium from low-burn up military reactors, and its weapon quality is just as good.

In its attempt to achieve energy independence via nuclear power, France has had to borrow vast sums from foreign banks. The economic returns France will get from its investments will depend very much how well the reactors work. What happens to that investment when the recently detected fissures in the pressure vessels and heat exchangers cause lengthy expensive shutdowns of a succession of power plants?

4. My main point with regard to uranium resources was to show that while total reserves may be sufficient for a much expanded nuclear power programme, the poorness of the ores in the majority of instances will actually impose their own stringent limits. A similar reasoning applies to the vast reserves of shale oils and Athabasca tar sands which can be exploited only at a snail's pace. In fact the great majority of uranium resources are locked up in ores, which in terms of the useful energy contained are no better and in many

cases are worse than from coal reserves — that is assuming the uranium is consumed in thermal reactors. Uranium from such poor ores requires far more processing and preparation than does coal, and the economics of exploiting it must be doubtful in the extreme.

5. Dr Jones in common with his colleagues at the UKAEA has unlimited faith in the fast reactor to make it worthwhile to use those poor uranium resources with which the world is so bounteously supplied. Yet the fast reactor together with all the ancillary processes such as reprocessing which are essential to it, is an unproven, intrinsically dangerous technology of dubious economic worth. Indeed to use uranium from poor grade ores in thermal reactors in order to extract plutonium for fast reactors would be an economic farce which if pursued extensively would hasten the bankruptcy of the industrial world.

6. Dr Jones agrees with me that reprocessing spent reactor fuel is difficult. Yet it is a vital part of the nuclear fuel cycle if nuclear power is to have any long term future. Questions over what limits are acceptable for contaminating members of the public and the workforce in nuclear installations have become highly controversial. Moreover the efficiency of containing radioactive wastes — the decontamination factors — will have to improve by orders of magnitude if the environment around reprocessing plants is to be deemed liveable and workable in by present-day standards (which some radiation biologists consider far too lax). How many people have died as a consequence of nuclear power — uranium miners and reprocessing workers for example — remains controversial, but is neither a trivial nor negligible number, as can be seen from my article.

The pro-nuclear lobby is fond of comparing the numbers of deaths in the various energy industries, the CEBG for example talking of coal mining and nuclear power stations in the same breath. In so doing the CEBG neglects uranium mining carried out elsewhere in the world and therefore not resulting in British deaths. It must also be remembered that nuclear power still provides the world with no more than a few percentage points of its energy, and that in the main the industrialised world operates on fossil fuel. How many deaths would result from nuclear power should it become the world's main energy source? How many deaths from accidents and from the insidious build-up of radioactivity in the environment?

7. Dr Jones is setting out to confuse the reader so as to diminish the

truth of what I was saying; that per unit weight of fuel spent fast reactor fuel is far better in radioactive terms than thermal reactor fuel. On that account, and because of the 20 times greater concentration of plutonium, spent fast reactor fuel is intrinsically more difficult to deal with, especially on an industrial, routine basis. Furthermore to achieve the 'desired' temperature limits for glassification spent fast reactor fuel will have to be considerably diluted down with glass, hence putting up the cost of disposing of such waste. We must distinguish between processes which are technically feasible in pilot plants and which then have to be scaled up for industrial use.

8. The atomic energy industry maintains that plutonium losses in the radioactive residues after fast reactor fuel is reprocessed will be no more than one per cent. Nevertheless in its calculations the UKAEA does consider losses of up to four per cent in the residues. In addition there will be plutonium lost with the effluent discharged from the reprocessing plant and during fuel fabrication.

A loss of 4 per cent in the residues together with the other losses would come uncomfortably close to the 6.5 per cent theoretical plutonium gain of Super Phenix, Dr Jones contends that the residues themselves could be reprocessed to wrinkle out the plutonium tied up with them. In theory anything is possible; in practice such a venture is most unlikely for the technical problems it would pose and for the added cost to already considerable reprocessing costs.

9. The Civex process, as described by Dr Marshall of the UKAEA, would seem to have been conceived as a means both of making fuel 'diversion-resistant' and of speeding up the recycling of fast reactor fuel. For technical reasons the Civex process is likely to be a non-starter.

10. Not all nuclear physicists are as happy over the safety of fast reactors as Dr Jones is. While the low-pressure pool of liquid sodium metal may offer certain advantages in terms of safety they are counteracted by other features such as the inflammability of that sodium in the presence of air, or the production of hydrogen when in contact with water. Meanwhile a nuclear excursion in a fast reactor, by which enhanced reactivity brings about an explosion, remains a real possibility. What happens if such an excursion leads to a rupturing of the reinforced containment structure? It is known that improving fast reactor safety through achieving better control of the nuclear reaction leads simul-



taneously to worsening economics and to poorer breeding of plutonium. Will economics be traded for safety? Nor does safety end with the reactor, it must also cover spent fuel handling and reprocessing.

11. There are so many unknowns involved in assessing the economics of nuclear power — the cost of reprocessing spent thermal oxide fuel, decommissioning, ultimate waste disposal, new mandatory safety requirements and effluent control — that it is exceedingly hard to put an exact price tag to generating costs. Nevertheless the CEBG insists that for base load electricity nuclear power is the cheapest bet. Dr Jones claims that I use excessively high costs for reprocessing. Until a thermal oxide reprocessing plant is commissioned and in full operation, the costs of reprocessing will remain speculative. Experience to date with thermal oxide fuel has not been satisfactory inasmuch as throughput, has been well below design capacity: for example the French UP 2 plant at Cap de la Hague has achieved no more than 30 per cent of design capacity. Reprocessing and waste disposal costs are escalating considerably faster than other fuel cycle costs and are thus coming to make up a greater and greater proportion of overall costs. Indeed, after the Windscale Inquiry, Colin Sweet suggested that reprocessing costs alone of thermal oxide fuel could amount to as much as 20 per cent of fuel cycle costs, (See *New Ecologist* Number 1). It is curious therefore that the CEBG indicates in its latest published figures that inclusive fuel cycle costs will remain exactly the same for both its Magnox and AGR reactors when in fact THORP — the thermal oxide reprocessing plant necessary for reprocessing AGR fuel — has not even been built. Clearly foreigners such as the Japanese and anyone else who wants to dump their nuclear waste on Britain will be subsidising our own nuclear power operation thus giving the CEBG the chance yet again to falsify electricity generation costs from nuclear power plants.

12. In conclusion I would remark that 'facts' with regard to nuclear power do not exist, so many of the figures have been manipulated. In 1969 Searby of the UKAEA suggested that the world would have one quarter of its primary energy needs met by nuclear power in the year 2000. Now Dr Jones, ten years later has added another 25 years to that earlier estimate. Both Searby and Jones referred to 'International Studies'. Does that reference transmute opinion into fact?

Peter Bunyard



## Amory Lovins Replies

Though I am writing from the Maine woods and have no library here to verify references, I fear Dr P M S Jones's zeal to discredit Peter Bunyard's generally accurate article (*The Ecologist*, April/May 1980) has led him into some obvious inanities. Taking Dr Jones's points by number.

1. Bunyard does not say "Governments are trying to force people to use electricity." In fact, however, both the UK and French governments are subsidizing electricity in general and nuclear electricity in particular compared to its shadow price (reflecting true marginal costs). Tariffs favouring off-peak usage are also generally designed to cross-subsidize electric heating from other classes of users. Both governments continue various forms of direct promotion, and fail to remove institutional barriers (mainly split incentives and peculiarities in the funding of public-sector construction) which favour electric heating in new buildings. There is little chance that the high demand growth on which the UK and French nuclear programmes are predicated will be achieved despite these subsidies — especially now that the Chairman of the CEBG is lamenting (on page one of *The Times*, 1 March 1980) the "vicious circle of rising electricity prices causing further reductions in demand, which in turn would push up prices still more." Some of us have been trying in vain for years to persuade him of the reality of price elasticity and the folly of overinvest-

ment. As for a trebling of UK primary energy efficiency over about 50 years being "probably impractical", the rate of implementation needed to do this has *already been exceeded* in recent years despite subsidies to supply and failure to remove market imperfections. In the nine EEC countries during 1973–8, 95% of new effective energy "supply" came from efficiency improvements, and only 5% from actual supply expansions including the North Sea and the Western European nuclear programme. My colleague David Olivier, expanding Leach's analysis, has found in work sponsored by the UKAEA that efficiency improvements roughly twice as large as those calculated by Leach *et al* are still highly cost-effective compared to new power stations. The "Government intervention on a considerable scale" required to achieve such savings would therefore be the purging of market imperfections so that market forces can operate. I had assumed this to be the intention of the present Government, but evidently professed ideology is less dear to Mrs Thatcher's heart than nuclear power.

2. The nuclear net-energy controversy is old and familiar (see e.g. Price's and my treatment in *Non-Nuclear Futures*, Ballinger 1975 and Harper & Row 1980). Using *Electricité de France's* net-energy figures — which, like Westinghouse's, are less favourable to nuclear power than mine — a French PWR would



repay its energy investment in a few years, not months, as its declared energy output/input ratio is 9.1, and a programme of such plants doubling nuclear capacity each 4–10 years would require between all and a quarter of the nuclear output to power its own construction and fuel manufacture. Given a stock of initial energy (relatively cheap fossil fuels) that needs little energy to win, investment strategy should favour sustainability and fast payback, not mere haste in sinking the fuel in more steel and concrete.

3. Dr Jones neglects to mention that the fast-breeder fuel cycle takes the best part of two centuries to come to equilibrium: at least one century even under unrealistically sanguine assumptions. Therefore fast breeders, successfully developed and aggressively deployed, can save only about as much cumulative uranium (less than a factor of five) over the next 75 years or so as could otherwise be saved with a similar programme of uranium-efficient thermal reactors in fuel cycles that throw away all plutonium with the wastes. Breeder enthusiasts impressed by some French officials' desire for "early and rapid introduction" of undemonstrated short-doubling-time breeders should also ponder this sum: if, as projected in 1976, France achieved in 2000 a nuclear capacity of 104 GWe (sufficient nearly to treble the 1975 level of total French electricity production) and if total French primary energy growth slowed as projected by the Workshop on Alternative Energy Strategies, projected French oil and gas needs in 2000 would still be 70% greater than in 1975 — to which must be added uranium imports equivalent to anywhere from half to all of the oil import requirements. The uranium requirements in 2000 would have been reduced by only about a third and would still run at about 8600–15,600 short tons  $U_3O_8$  per year. (Calculation by Vince Taylor).

4. Bunyard does not say that uranium fuel has a negative net energy yield; rather, that the extractable energy content (with thermal reactors) is about the same for low-grade sources, such as Chattanooga shale, as for coal. That is correct. Indeed, Pigford's nominal fuel cycle for LWRs today (*Annu. Rev. Nucl. Sci.* 24:515–59 (1974) at 523) shows that sending out 1 GWe-y of electricity requires the open-pit mining of only 85,700 tonnes of 0.2% carnotite ore — but the moving of 2.54 million tonnes of overburden. If this stripping ratio of nearly 30 reflects general practice — as it apparently does in the Colorado Plateau — then a nominal LWR fuel cycle is already moving about as much rock as an equivalent low-stripping-ratio coal cycle. (Generating 1 GWe-y at 0.33 thermal efficiency from 29 MJ/tonne coal would burn 3.28 million tonnes of coal, plus of course requiring the money of its own overburden). The 16 acres of Pigford's uranium mine to fuel 1 GWe-y, incidentally, would probably result in considerably larger areas being required permanently for tailings from the mill.

5. I agree, and Bunyard does not deny in terms, that there is plenty of uranium identified to fuel all present and probably all planned *thermal* reactors at moderate cost for their lifetimes. That is a lot of uranium compared to the shortage one must show to make any economic case for the breeder during the next half century or more, but not much compared to long-term world energy needs. Jones's way of expressing the total is rather odd: he does not mention that supplying 8 TW of primary energy (or a third that much delivered energy) with fast breeders would imply, among other things, 8000 1-GWe plants (ordering one per day for the next 50 years) using a stock of over 50,000 tonnes of plutonium (of over 25 million bombs' worth or over 50 million million million lung-cancer doses' worth). Such fantasies aside, the reason it is hard to stretch uranium resources with fast breeders (point 3 above) is that starting up a 1-GWe breeder requires over 7 tonnes of plutonium for its first core and its fuel cycle. Making that plutonium requires the earlier operation, for a prolonged period, of a lot of thermal reactor capacity (a 1-GWe LWR produces around 1 tonne of net plutonium every four years), and those thermal reactors in turn use up a lot of uranium by the time the breeder's initial inventory has been accumulated. The entire UK stored inventory of extracted plutonium — presumably of the order of ten tonnes — cannot fuel much of a breeder programme; and though it is a nice

idea to "melt down" the stocks now held in bombs, they would provide in total only a fraction of a tonne. This — and the failure of the La Hague reprocessing plant to handle more than a small fraction (as I recall, about a seventh) of its design throughput — should explain why the French Super-Phénix may have to use British plutonium. A final note on uranium resources: nuclear advocates used to emphasize that an advantage of nuclear fuel is its ease of stockpiling. They are right. Carrying charges on a 10-year fuel supply for a big PWR would increase its delivered electricity cost by only about 1% (or about five times less for a uranium-recycling CANDU). The logical conclusion: if, however eccentrically, one is worried about a future uranium shortage, then stockpiling, not breeder-building, is the sensible course.

6. Bunyard does not say that reprocessing is vital — except for fuel cycles that re-use plutonium or uranium (such as fast breeders) or for Magnox fuel stored in water. (Magnox fuel is stored without deterioration in dry  $CO_2$  at Wylfa, but there seems to be no interest in extending this system to other Magnox and gaz-graphit reactors despite the dangerous constipation of Windscale and La Hague with rotting fuel). Bunyard is doubtless aware, and implies, that reprocessing thermal reactor fuel does not make waste management easier or safer — it may well do the opposite — and that, as the UK authorities have admitted for several years now, such reprocessing is a net financial loss even after counting the value of the recovered fissionable materials. Dr Jones's recitation of regulatory arrangements in UK fails to note that the discharge limits are highly controversial abroad and that British marine discharges are considered by many experts in other countries to be a deplorable practice. His further statements about occupational safety, comparative risks, and effects of TMI are written with a notable economy of truth. In fact, competent studies at Hanford and several other nuclear installations show unexpectedly large occupational risks now emerging after the usual latency period; a recent official mine safety study in Canada showed that uranium mining is unusually dangerous; the comparative risk conclusion Dr Jones repeats apparently comes from the "Inhaber Report" whose publishers (the Atomic Energy Control Board of Canada) have declared it officially out of print following its demolition by Professor John Holdren (who in consequence received the Public Service Award of the Federation of American Scientists); and though



many official statements hold that nobody is likely to be physically harmed by TMI releases, nobody has officially looked to see whether epidemiological data, especially for infants, show any effect, some unofficial observers believe is both real and large.

7. Bunyard does not say fast reactors produce more fission products than thermal reactors. He does say, correctly, that their higher burnup makes the fuel thermally and radiologically hotter and hence harder to handle. (It also tends to have more of the nasty higher actinides). Neither reprocessing nor vitrification has ever been demonstrated on any significant scale for fast reactor fuel. Both have shown only limited success using the much less radioactive LWR fuel under realistic conditions. As the 1979 Gorleben International Review showed in detail, reprocessing LWR fuel is speculative and immature; commercially reprocessing breeder fuel may be impossible. Reprocessing of any nuclear fuel creates new categories of waste, including low-level alpha wastes which may turn out to be more hazardous in the long term than the high-level wastes to which attention is normally restricted.

8. Bunyard does not say breeders cannot breed; he only casts doubt on whether they can achieve economically interesting breeding gains. He is right. The DWK reprocessing and fuel-fabrication plant design discussed in the Gorleben hearings, supposedly reflecting the best present art, showed losses of plutonium to waste streams of about 1% for reprocessing plus a further 1% for fuel fabrication (net of scrap recycle). Losses in reprocessing breeder fuel, if a process to do so can be developed, would probably be larger, owing in part to thermal and radiation damage to reagents.

9. Dr Jones is right about the alleged purpose of CIVEX, but does not mention that this process — proposed with much fanfare by the UKAEA — has been generally discredited.

10. Nobody knows whether fast reactors are more or less as safe as thermal reactors, nor how safe the latter are. Besides the potential safety advantages Dr Jones mentions for fast reactors, there are major disadvantages, many of which I described in *New Scientist* (14 March 1974, pp 693–5), and which become worse at high breeding gains.

11. Real (inflation-corrected) reactor and fuel-cycle costs have apparently been rising strongly in France, and Framatome has made no net profits. (Neither has Electricité de France, which just got a gift of 5

milliard francs in the form of Government forgiveness of debt). The French Finance Ministry has been unhappy with the programme for years. Bunyard's gloomy economic conclusions do not rest on speculative assumptions. No official or unofficial finding that newly ordered nuclear power stations will be the cheapest source of baseload electricity, of electricity generally, or of energy can be or has been supported by *empirical data publicly available in sufficient detail to permit proper analysis*. Such data are certainly not available in the UK or France. They are, to a point, in the US, and careful analysis of them leads to the opposite conclusion, independent of whether "abundant local supplies of cheap coal" are available.

12. The unnamed "international studies" Dr Jones mentions cannot have taken proper account of elementary economics, for reasons that two colleagues and I explore in the Summer 1980 issue of *Foreign Affairs* ("Nuclear Power and Nuclear Bombs", pp 1137–77). In that article we summarize, so far as those not privy to French official secrets can do, the real status of the French nuclear programme. It is a fragile programme, continuing for the moment with a heavy mortgage. To continue for long, it must find a way to fix the reactor cracks, make La Hague work, solve the waste problem, find export markets, keep EdF solvent, find politically acceptable reactor sites, make a truce with the main nuclear union (CFDT), and win public acquiescence by means more lasting than mere autarchy. Some of these problems may be soluble by themselves, but the chances of solving all of them look very slim indeed.

Herein lies a lesson for Mrs. Thatcher. The nuclear issue has created deep divisions in French society at all levels (including Cabinet level for at least the past five years). It is a major and growing source of political and regional polarization. Reactors are being imposed on an increasingly restive rural population by federal command, often without the consent of local government, let alone of local people. Since the programme could not survive the rigours of a free market, it is being fully insulated from them by an enormously costly, centrally planned raid on the Treasury. In its pursuit, both market and democratic processes have been abrogated. The information necessary for informed analysis of alternatives has been kept secret, and such analysis has itself been discouraged or suppressed both within the government and through its funding and other controls on outside bodies. Though a senior member of the French Cabinet

asked me several years ago to set up a soft-energy-path study for France (for he suspected, rightly, that France is poor in fuels but rich in energy, and that reactors are the slowest and dearest known way to replace oil), it has so far proven impossible to give his support practical effect within the bureaucracy or to inject into the French policy process the several rough-cut but very suggestive studies already done privately with scant resources. And throughout, the French people, like the British, have been presumed to be rather a dull lot who cannot understand these complex technical matters and should not be allowed to meddle in them. Of course their views can be aired, as Dr Jones suggests, preferably in a forum in which they receive no wider currency and are not actually allowed to affect official policy. But policy remains in practice a matter for the technocratic elite, not for the voter or the marketplace.

What is being hazarded here, I suggest, is not merely the nuclear programme itself, but the perceived legitimacy of the institutions of government. When I first heard of Mrs Thatcher's enthusiasm for building many LWRs, my immediate reaction was that if carried through, her intention would be the death blow to the entire British nuclear programme: licensing and siting would have to be done by means so openly farcical, like motorway inquiries, that the discredit and loss of public confidence would rub off not only on all the institutions concerned, but also on the existing gas-cooled reactors which those institutions had certified as safe. I later found that the same logic had run through many senior minds in Whitehall. It is, I am convinced, an argument not to be lightly ignored. If my colleagues and I who have tried to divert British energy investments from nuclear to more sensible paths were interested only in tactical advantage, I suppose we could just let matters take their course: let the self-destruction of the nuclear enterprise proceed unhindered. But I believe our society will soon be facing many really big problems that cannot be solved — if they are soluble at all — without the help of a government that enjoys the respect of practically the whole population. Pursuing nuclear power beyond the constraints that a sensitive regard for the brittleness of public trust should impose is a sure way — as several European governments have found — to destroy irreversibly that essential legitimacy. Dr Jones and his colleagues should earnestly consider whether their talents are well spent as apologists for that process.

Amory B Lovins

# Yves Lenoir replies

1. The belief that the interests of the public coincide with those of the electricity generating industry has led governments to encourage in every way possible (by the appropriate investment programmes, taxes and subsidies) the ever increased consumption of electricity. Indeed if electricity consumption is to be quadrupled by the year 2000 — the present goal — then there is no time to spare in making the most frenzied efforts to electrify just about everything that can be electrified.

2. The problem is not so much to know when an energy programme starts to provide net energy as whether it satisfies socio-economic needs. From this point of view it must be noted that half as much capital is required to save a given amount of energy than to produce this same amount from a nuclear power programme. Indeed not only would the latter strategy reduce our dependence on oil twice as slowly as would the former but it would also lead to a doubling of the price of energy. In addition it would mean tying up capital for a very long time (it takes seven years to build a nuclear power station) which would drastically reduce capital availability for any renewable energy systems, which, in the long term, are the only sustainable means of cutting down on our consumption of fossil fuels.

3. We should look more carefully into information obtained from official sources. It is not in the interests of any oil or mining company to prospect for raw materials that would be required in more than twenty years time. To begin with they could not afford to. In addition it is useful to encourage the fear of shortages so as to keep prices high. This is why the petrol companies have been predicting that "shortages will occur in twenty years" since 1920.

The 'French enthusiasm' is largely that of the nucleocrats of the CEA

(French UKAEA) who need a long term project to justify their existence. Dr Jones of the UKAEA knows perfectly well that the techniques involved in reprocessing have not yet been fully mastered and that electricity obtained from breeder reactors will be twice as expensive as that derived from PWRs, the price of which, in any case, is constantly rising.

6. Stringent safety standards are necessary because repairs are so difficult. Industrial history confirms that the safety standards adopted are invariably the minimum that workers are prepared to accept. (See what is happening in the coal mines, also uranium mines and the steel industry).

On the other hand when accidents occur in a plant using highly toxic materials and this leads to shortages lasting up to several months if not years (as at Windscale, Chooz, Three Mile Island and also Seveso) the authorities have no alternative but to improve safety standards which enable them by the same token to pass themselves off as philanthropists.

7-8. That the inventory of fission products produced should be proportionate to the thermal energy generated is quite evident. The issue is a different one. One can formulate a principle analogous to the First Law of Thermodynamics: to the effect that the greater the specific activity of the irradiated fuels the greater the technical problems involved in retreating them — because of the parasitical chemical reactions and the cost of radiolysis.

Moreover, official promises concerning plutonium losses have never been kept. I remember a document submitted to us in 1974, during a meeting of the Inter-Ministerial group on Radioactive Wastes of which I was a member, by Yves Sousselier who was then in charge

of plutonium matters at the CEA. It explicitly stated that overall plutonium losses during reprocessing and plutonium production did not exceed 1.5 per cent, yet at that time — though we did not learn it until the beginning of 1978 and then only because there was a leak — the amount of plutonium present in the sludge left after reprocessing was equal to 3 per cent of production. The trouble is that the results obtained in laboratory conditions, when neither time nor money are a constraint, cannot be reproduced during large-scale commercial production. To suggest, as the nuclear authorities do, that the plutonium remaining in the sludge can be recycled is simply preposterous.

10. A factor affecting the safety of breeder reactors is their positive reactivity with temperature. When there is local overheating, this could lead to a nuclear excursion. One knows today that this risk has not been correctly appraised by the designers of Superphenix (France's first commercial breeder reactor under construction at Creys Malville). Indeed they have since had to reconsider the size and the material used for the containment vessel. The changes involved are so radical that studies concerning the safety of the installations are having to be conducted at the same time as these installations are actually being built.

This means that the scientific data that must be provided to show that the Superphenix satisfies safety requirements will not be available until two or three years after it has entered into operation.

The conductivity of sodium is not always an advantage. It is in fact so high, as it is now realised, that the over-heating of the core could lead to the extremely rapid heating of the 'slab' from which the reactor is suspended. In certain conditions this heating could damage the metal in this key component.

11-12. Let us return to the question of economics. A massive nuclear programme is the worst way to solve our energy problem. It means immobilising vast amounts of capital, it has little influence on reducing our dependence on oil, it leads to an increased use of electricity which is only economic for certain specific uses such as lighting, electro-chemistry and for powering electric motors. The fact that there are still powerful nuclear lobbies in a few countries at a particular stage of economic development must be seen as a historical reality and not as evidence that they in any way satisfy social needs.

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