

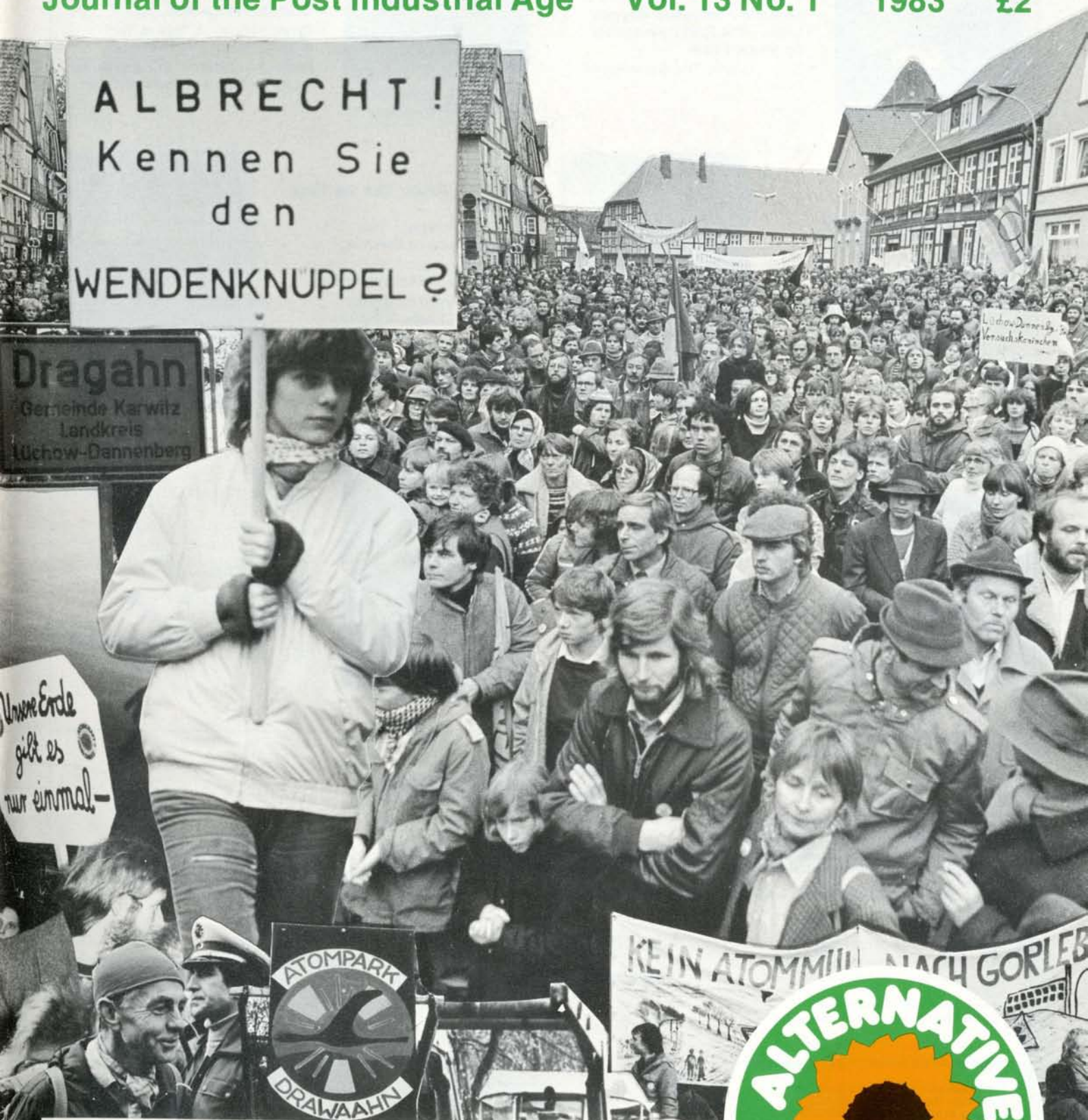
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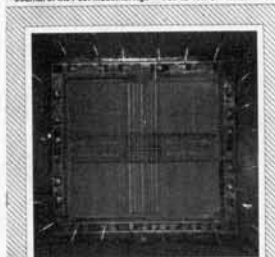
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Apology:

We apologise to Professor Hans Sedlmayr for misspelling his name in our last issue (No. 6, 1982).

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Dissidents—The True Democrats

After President Mitterand's betrayal of the Ecologists in France, when having used them to gain power, he ditched them and their policies, it is good to see that the Greens have at last begun to get themselves elected, first in Belgium with four MPs and five senators, and now in the West German Bundestag. Clearly the 27 Green members of the Bundestag do not hold any balance of power, Chancellor Kohl and his Christian Democrats having gained such an overwhelming majority, but they are at last a voice in the Federal Parliament, and a reminder that environmental issues cannot be simply brushed aside.

Without doubt the Bundestag Greens are in a difficult position. It is their stated aim to make parliamentary activities transparent to the electorate and they are pushing for the proposed sites of Pershing 2 and Cruise missiles in West Germany to be made public, as they already are in Britain and in Italy. Meanwhile the government is insisting that the Green's right to participate in closed sessions on such sensitive subjects as defence, will depend on their being sworn to secrecy. Their choice then, unless they win their battle for open parliament, is to take up their parliamentary rights to the full, in which case they will be seen to betray those who elected them, or to remain true to their fellow Greens and be kept more or less outside the parliamentary system. Most probably the Greens will opt for the latter course, the hope being that as time goes on they will gain in power and prestige and get sufficient members into the Bundestag to determine the course of German and hence international politics. In the meantime, according to reports, the Greens are to maintain their demonstrations and rallies against the siting of missiles in West Germany, and presumably too against civil nuclear power installations; they are thus determined not to become respectable in the sense of giving up the very causes which won them their foothold in the Federal Parliament.

Chancellor Kohl, although having confirmed his country's commitment to Nato, is apparently taking the peace movement sufficiently seriously, as well as perhaps giving voice to his own inclinations, to make it known to Washington that the Administration there should introduce a measure of flexibility in its disarmament talks with the Russians and achieve an interim agreement, even though that

falls short of the zero-option. But as has become self-evident over the years since the first atomic bombs were exploded, the arms race has got its own inexorable momentum and its own perfidious logic; otherwise it might have stopped when each side had reached a stage when it could, just once, obliterate the other. In fact that race is both a consequence of improving technology and the goal of being one step ahead, and equally important of the fear and deep-rooted suspicion of one side's leaders for another. Reagan's now famous speech in Orlando to fundamentalist Christians, when he railed against the evil that was the USSR, upholding himself and the USA as almost one with the Heavenly host, is a terrifying ingredient in present-day politics, especially when combined with disclosures that his chief emissary at the Strategic Arms Reduction Talks in Geneva, General Edward Rowny, wanted half the American team sacked because of their excessive enthusiasm in trying to come to an agreement with the Russians.

The situation in Britain is hardly better, with Thatcher and her government comparing the unilateral argument with the attempt to appease Hitler in the 1930s. Russia, according to Heseltine is pursuing 'insane' arms-escalation policies; hence by that argument we must match insanity with insanity. But what if that analysis of Russia is wrong, and reason rather than missiles might prevail, could we not be making a fatal mistake? It certainly seems that if lunacy and evil versus self-righteous goodness are the motivations for the arms race then we are doomed anyway, irrespective of whether we have nuclear weapons or not. And the idea that Hitler would have restrained his evil impulses had Britain been prepared for war and made bellicose sounds, is too ludicrous to be countenanced by any person with a sense of history.

Unfortunately the British Government can get away with its nonsense about the USSR's intentions of world domination because those who voted it into power are not really concerned with such issues at all. What is in the Budget or in the election manifesto is of far more interest to them. Thus the decision on the siting of missiles in Britain and against unilateralism is taken in essence by a small caucus of individuals in the Cabinet, carefully selected so as to mirror the convictions and policies of the Prime Minister. Such a process of decision-

making falls far short of democracy especially when with the establishment behind it, it can muster all the apparatus of law and order in support.

It is therefore ironical in the extreme that the government should attempt to ridicule the 'peace-mongers' as weak-kneed appeasers, ready to cow tow to any aggressor, when those same people, such as the Greenham Common women, are prepared to be manhandled and arrested for their fight for peace. Their courage and determination is little different from that of the dissidents in Russia whom Thatcher and other leaders of democracy are so keen to uphold as shining lights in the cold dark world of Russian totalitarianism.

But it would be quite wrong to assume that dissidence in Britain is the prerogative of those who act against nuclear weapons. In fact many environmentalists are dissidents in that they are prepared to defend, even with their lives, the well-being of the environment and of those organisms that inhabit it. Greenpeace in its courageous battle against the culling of seals is a prime example of a group of people prepared to act undemocratically insofar as its actions run counter to those of the elected representatives of the government of Canada. As it happens Greenpeace's Campaign has practically brought an end to the cull not by changing the minds of the cullers or of the Canadian government but because people having learned the facts, no longer want seal skin products and the bottom has dropped out of the market. And occasionally scientists, whether in industry or in government departments, get up to proclaim against the distortion of facts being used to sustain policies or legislation that are convenient to their bosses. It needs courage to get through, and a nuclear engineer Rodney Fordham who was in the Safety and Reliability Directorate of the UK Atomic Energy Authority, was told by the Authority that he would not be allowed to present a

paper giving his own opinion on PWR Safety at a conference on the Sizewell PWR at the Polytechnic of the South Bank, London. He did not come to the conference, but subsequently left his job and resigned from the Authority. The discovery too, that Nigel Lawson, as Minister of Energy, had a report that was prepared within the Department of Energy, withheld because the information in it conflicted with his determination to proceed with nuclear power in Britain, and instead had one of his cronies publish a report favourable to his point of view, indicates how far a democracy such as Britain is prepared to be democratic.

In effect our modern democracy operates behind a veil of secrecy, the aim being to let out as little for public scrutiny as would seem to satisfy the electorate that it is being given the chance to vote according to the 'true' facts in front of it. Any information that would reveal too much or would expose the deceit is obviously kept 'under wraps', unless as happens all too rarely that a brave person emerges from within the establishment and tells a different story. Such people are true dissidents, and if Thatcher and her ministers were properly consistent they would have to applaud and uphold them. In effect the system is always trying to muzzle opinions and findings that contradict its own validity.

Our hope is that an increasing number of people will have the courage to speak out and act against the growing threat to destroy us together with the fragile organic system that sustains us. The environment has no voice except through humanity and increasingly it seems that those who are its real friends are the dissidents, the protestors. Indeed in a world of millions of organisms and of natural systems keeping a precarious equilibrium such people are the true democrats.

Peter Bunyard

NUCLEAR WASTE MANAGEMENT IN WEST GERMANY—THE BATTLE CONTINUES

Dr. Helmut Hirsch*

Having decided on the concepts for nuclear waste management early on—both industry and government in West Germany have stuck to them over the years, even as shortcomings have become more clearly revealed. This rigidity of attitude provides an excellent case study as to how a choice of technology that is prematurely adopted for political and economic reasons—without a systematic, scientific investigation of the available alternatives—becomes subsequently inflexibly adhered to as more and more personnel and financial resources are caught up in it.

In the early sixties, when no large commercial nuclear power plant was yet in operation, the necessity of reprocessing spent nuclear fuel was officially established. Early arguments in favour were the anticipated reduction in uranium imports by recycling uranium from spent fuel, as well as the perceived advantages for waste disposal. Hence the 'environmental' argument used by BNFL at the 1977 Windscale Inquiry. Another argument was the necessity to remain in the forefront of this 'advanced' technology in order to be competitive on the world market.

At about the same time, salt domes were chosen as the most suitable geological structures for the final disposal of radioactive wastes. The high heat conductivity and plasticity of salt—the latter seemingly guaranteeing perfect isolation of the radioactive wastes were praised, and no alternatives were seriously considered; mining in salt was comparatively cheap and a number of potentially suitable salt mines already existed; thus salt seemed to be the cheapest and easiest way out.

In 1967, West Germany's first commercially-sized nuclear power

plant at Gundremmingen (250 MWe BWR) went into operation. That same year, construction of a pilot reprocessing plant began near the Karlsruhe Nuclear Research Center (the WAK, Wiederaufarbeitungsanlage Karlsruhe). The capacity of this plant (35 t/yr.) was chosen in order to make possible a transfer of the operating experiences to a large industrial plant. In 1967, too, the first barrels with low-activity-waste were dispatched to the Asse II salt mine as a test for final disposal in salt formations.

Everything seemed to be under control and proceeding smoothly until the early seventies. Large amounts of military fuel had been reprocessed elsewhere with the Purex-process; and no major difficulties were foreseen for the reprocessing of high-burn-up, LWR-fuel. As for final disposal, the amounts of waste were still small in West Germany by the time larger quantities would begin being produced by the reprocessing plants, disposal capacity in salt domes should be readily available.

Some even expressed fears that there might be an over-capacity in reprocessing plants in the seventies, and in order to avoid a situation in which strong competition might lower profits, a monopoly was form-

ed in West Europe. In October, 1971, British Nuclear Fuels Ltd., (owners of the Sellafield reprocessing plant), the French Commissariat de l'Energie Atomique (then owner of La Hague reprocessing plant) and the German Kernbrennstoff-Wiederaufarbeitungsgesellschaft (KEWA, a daughter of the chemical firms Bayer, Hoechst and Gelsenberg and the nuclear enterprise NUKEM) founded United Reprocessors Ltd., a company based in Frankfurt.

According to URG's plans, reprocessing in Europe was to take place over the following years at La Hague and Sellafield (Windscale). Later, a large plant (2,000 t/yr) was to be built in West Germany and to come into operation in 1986.

Over the following four years, however, the overall picture rapidly changed and grew more problematical. The shut-down of the West Valley reprocessing plant in the USA in 1972—after only six years of operation—was the first indication of trouble. A year later the head-end plant for LWR-fuel at Windscale was shut down after a severe blow-back accident in which 35 reprocessing workers were contaminated, some seriously. It had operated only for four years. Nor did the enlargement of capacity in La Hague pro-

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ceed according to plan, and in 1974, the small pilot-plant of Eurochemic in Mol was shut down, the reasons being that the European states participating in that international enterprise could not agree on financial and procedural matters; moreover the method of chemical decanting tested in Mol proved unexpectedly cumbersome.

The WAK reprocessing plant in West Germany went into operation in 1971. Problems with process and equipment, for example, the high vulnerability of the first generation of mixer-settlers to plugging by crud, led to a poor performance. Thus only an average of 8 t/yr was reprocessed in the first four years, a performance which was to improve only slightly to 10-12 t/yr. from 1971 to 1980.

By 1975, the chemical companies forming KEWA decided to withdraw from the reprocessing business one reason being that it had come to realise that safety and process-related problems had reached dimensions not foreseen only a few years earlier and had "led to investment sums, which are many times those of earlier assumptions", with the effect, "that reprocessing by itself cannot be operated economically any more."

Waste Disposal Concept

As it became evident that international cooperation could not be relied on, because of growing technological and economic problems, West Germany began to seek a national solution to the nuclear waste problem. In April 1974, the 'Integrierte Entsorgungskonzept' (Integrated Waste Management Concept) was, for the first time, presented to the public by the Federal Ministry for the Interior. The idea was to realise reprocessing, mixed oxide fuel, fuel fabrication, and treatment, intermediate storage and final disposal of wastes together as components of one integrated system, if possible on one site. The first large reprocessing plant (1,400 t/yr) was to go into operation in 1985.

After the chemical industry had withdrawn from the reprocessing business, the electrical utilities had to take the initiative, because they had a growing amount of spent

nuclear fuel at hand, stored provisionally in pools in the nuclear power plants. In July 1975, 12 electrical utilities founded PWK (Projektgesellschaft Wiederaufarbeitung von Kernbrennstoffen), and began to consider one of three alternative sites in Northern Germany for an integrated Entsorgungs Center.

Meanwhile, nuclear waste management became an increasingly controversial topic. Government and utilities started getting nervous; each tried to blame the other for the delays and uncertainties and in the spring of 1976, the Federal Ministry for the Interior announced new legal measures in order to force the electrical utilities to tackle the nuclear waste problem in a more determined manner. Under the new legislation the Federal Authorities were made responsible for the final disposal of radioactive waste; with the utilities shouldering responsibility in the short term. The guidelines under which the utilities were expected to operate, however, proved remarkably accommodating, and site operators had to make provision only for the intermediate storage capacity for six years' discharge of spent fuel.

On February 22, 1977, the Government of the State of Lower Saxony decided on a new site for a nuclear Entsorgungs-Center which was to contain all the components of the Integrated Entsorgungskonzept. It was Gorleben, in the district of Luchow-Dannenberg, located in a sparsely populated area immediately at the West German-East German border. In fact as most salt domes, and therefore potential final repositories for radioactive waste, are located in Lower Saxony, the Federal Government had left the choice of site to the State authorities. The three sites previously favoured by the electrical utilities were out, and despite the Federal Government being very surprised, even dismayed at the new choice of site so near the border, the electrical utilities reacted quickly in accepting the proposition. Moreover PWK was transformed into DWK (Deutsche Gesellschaft für Wiederaufarbeitung von Kernbrennstoffen) with the actual task of planning, building and operating the Entsorgungs-Center,

and in the following years, DWK eventually took over the operation of KEWA and WAK. On March 31, 1977, DWK submitted its safety report on the Centre to the Licensing Authority which was the Ministry for Social Affairs of Lower Saxony, and applied for the first partial construction licence which comprised an entry store for spent fuel. The Federal Government took until July 25 before finally accepting the choice of site. Three days later, the PTB (Physikalisch-Technische Bundesanstalt) submitted an application for the final repository since, according to Section 9a of the Atomic Energy Law, it was responsible for that part of the Centre and not DWK.

In October 1977, the Federal Government's highest advisory bodies on questions of nuclear safety, the RSK (Reaktorsicherheitskommission) and the SSK (Strahlenschutzkommission) declared after surveying DWK's safety report, that the Entsorgungs-Center as planned could be realized with a sufficient degree of safety. Concerned citizens of Luchow-Dannenberg as well as in other parts of Lower Saxony suspected that the judgement—coming from the highest official bodies—would prejudice the licensing procedure and that, for all practical purposes, the decision to build the plant was already taken. Thus lacking faith in the independence of the licensing authorities and of the experts they employed, who were mainly from the TÜV (Technischer Überwachungsverein) and from the State Geological Survey of Lower Saxony, citizen groups demanded that DWK's plans should be reviewed by a committee of international experts who were in no way bound by the interests of the nuclear industry.

Because elections to the State Parliament were scheduled for June 1978, and the nuclear safety cause had become popular Governor Albrecht of Lower Saxony agreed to establish an expert committee and to provide state funds to finance its work.

The committee (The Gorleben International Review, GIR), consisting of twenty scientists from the USA, Great Britain, Norway, Sweden and France started its work

in July 1978, one month after Albrecht had won his election. But both the state bureaucracy and the DWK did everything to make GIR's task difficult, concealing information and failing to provide proper facilities. Because of complaints five German scientists were then brought in to work closely with the GIR, but they too were hindered in their task.

In December 1978, the GIR finally decided it could not accept such conditions. It threatened to stop work and make public its reasons: Albrecht felt that, having already given publicity to the State Government's decisions to establish the GIR, he could not afford to allow it all to end in a scandal. He called his civil servants to order; and reasonable working conditions were created to enable the GIR, as well as the independent German experts, to submit a report of 2,200 pages in February 1979.

The Gorleben Hearing

The State Government then organized Hearings to discuss the experts' reports. The Gorleben Hearings took place from March 28 to April 3, 1979. The State Government invited representatives of DKW, PTB and the two Commissions to give evidence. However, the Federal Minister for the Interior forbade members of his advisory commissions to take part in the Hearings, the implication being that feared their professional image might suffer badly in the debate. Most surprisingly, DWK and PTB also refused to take part in the discussions; and remained silent observers.

Before the Hearings began Albrecht demanded that the Federal Government and DWK pay DM 500 million to finance the costs of police measures that he deemed would be necessary during the construction of the Entsorgungszentrum for protecting the site, and keeping the regional population under surveillance. In December 1978 the Federal Government and DWK agreed to pay DM 200 million each.

To allay public anxiety Albrecht got his State Government to stop the interim storage of more radioactive waste in the Asse II salt mine; and to withhold the licence. Conse-

quently the last barrel of low-activity waste was brought into the mine on December 29, 1978 bringing the total up to 124,000 barrels of low activity waste and 1,300 barrels of medium activity waste coming from nuclear research centres, nuclear power plants, and industrial applications of radionuclides. Shortly afterwards on February 27/28, 1979, safety problems arose in the Asse II mine with intrusion of brine. The licence, incidentally, has not yet been renewed.

Most of the discussions at the Gorleben Hearings concentrated on the problems of reprocessing. One point GIR made clear right at the beginning of the Hearings was that DWK's 'safety report', the 3000 page document on which the evaluation was mainly based, was in most parts far too vague to serve as the basis for a licensing procedure. DWK had to admit in a press release on the third day of the Hearings that its own safety report was "not detailed enough and in parts rather superficial". Nevertheless the two commissions had been happy enough with the same safety report to judge the proposal sufficiently safe.

A detailed discussion of plant components and process features revealed that the disastrous experiences with real reprocessing plants, including the German pilot plant WAK, were not simply because of bad design and careless work. Thus the GIR claimed that adequate solutions simply did not yet exist to such problems as maintenance and durability of the fuel element chopper; cleaning of the dissolver off-gas; avoidance of the formation of cruds and sludges in various parts which could lead to clogging and heating-up; criticality control and prevention. The expert panel concluded that it was a mistake to try to apply the Purex Process—which had worked moderately well for low burn-up magnox fuel—to LWR-fuels with high burn-up. Problems seemed to multiply above a burn-up of about 10,000 MWd (th)/t.

Another conclusion was that reprocessing by the Purex-process created inevitably, out of several hundred cubic metres of comparatively compact spent fuel, over

10,000 cubic metres of radioactive wastes. Moreover serious doubts existed as to the suitability of glass in which to encapsulate high activity radionuclides for some tens of thousands of years.

Furthermore, considerable parts of the other waste streams—although labelled 'low'—or 'medium'-activity waste—contained large amounts of highly toxic, long-lived alpha-emitters, distributed over large volumes. According to DWK's plans, those wastes were to be immobilized in cement, bitumen or concrete thus in matrix materials with considerably less long-term stability than glass. GIR also concluded that 'mishaps' and 'incidents' would occur with noticeable frequency during plant operation including, criticality incidents, chemical explosions and fires and would lead to exposure of the employees as well as to radioactive emissions in addition to those already occurring during 'normal' operation. And even though the probability might be small, the risk existed nonetheless of accidents to the storage pool for spent fuel elements, the storage tanks for high-level liquid waste, and the plutonium store with catastrophic consequences.

In the first two instances, cooling failure could lead to self-heating of the highly radioactive fuel elements, or of the waste solutions respectively; reinforced by exothermic reactions between the zircaloy cladding and steam in the first, and by explosions of accumulating hydrogen in both instances. Radioactive releases which could contaminate hundreds of thousands of square kilometres of land might follow.

Regarding the store containing up to six tons of plutonium nitrate solution, because of the smaller size and lower heat output, the possibility of a self-generated accident would be much lower than in the first two examples. On the other hand, the extremely high toxicity of plutonium would create a particular hazard if external events, for example sabotage or the crash of a large airplane, led to the release of a fraction of store content.

Another consideration was the question of plutonium theft. A 1,400 t/yr. reprocessing plant is expected to process some 14 t of Pu per year.

Because it is impossible to make an inventory of plutonium passing through the plant that is accurate to more than 99 per cent, up to one per cent, or 140 kg, could be stolen without it being possible, on the basis of balancing the plutonium throughput, to determine whether a theft has taken place or not. Thus, measures of a different kind become necessary: for instance plant workers must be strictly controlled and surveyed, their personal history must be closely checked and their whole life kept under observation. Clearly, their families and friends will also be affected by such measures, as will the population in the neighbourhood of the plant.

This aspect was analyzed in detail by the internationally recognized human rights lawyer, Paul Sieghart, who came to the conclusion that, if the Gorleben reprocessing plant were to go into operation, the police control and surveillance necessary would reach such dimensions as to be no longer compatible with the democratic system of West Germany.

Whereas the problems of reprocessing received considerable attention very little discussion both in the GIRs report and during the Hearings, took place with regard to the final disposal of radioactive waste at Gorleben. The GIR had collected considerable information both on salt domes in general, and on the Gorleben salt dome in particular. It came to the conclusion that although the site investigation programme in Gorleben had not yet commenced, enough was known to make it seem unlikely that the Gorleben dome would be suitable for a final repository. But at the Hearings, Governor Albrecht, who was present at the round table most of the time, and other politicians insisted on ignoring the analyses based on earlier drillings at Gorleben, analogies with other sites and the work of Professor E. Grimm of Hamburg University, who, as a geomorphologist, had shown that even from the surface structure of the area, it was evident that the dome was unsuitable. But the State Government insisted that nothing said about the Gorleben dome had any validity until results from the site investigation programme had been made available.



The Consequences of political and scientific Opposition

A sudden change in the programme of the Hearings was the first indication that the GIR's presentations had made an impression in high quarters. Albrecht requested that a special session on alternative spent fuel management strategies, that is, on the possibilities of waste disposal without reprocessing, should be held. Previously, during the preparations for the Hearings, the state bureaucracy had consistently refused to allow such alternatives to be on the agenda. During the special session delegates emphasized that direct disposal of spent fuel might well be a far better alternative than reprocessing with regard to waste management.

On March 28, coincident with the Gorleben Hearings, a few thousand people set off from Luchow, among them many farmers on their tractors, the numbers swelling each day, until finally, on March 31, 1979, some 140,000 people demonstrated in Hanover. No anti-nuclear demonstrations had ever reached that size before in West Germany.

Whereas before the Hearings the State Government was decidedly pro-nuclear and pro-reprocessing—

and many feared that the Gorleben Hearings would be little than a sham—people now felt that owing to the power of the opposition Governor Albrecht could not but tread cautiously. His official statement on the Gorleben plans was expected with tense anticipation; and indeed, when given on May 16, 1979, appeared to have changed nuclear waste policy in West Germany.

In his statement, Albrecht took pains to make it perfectly clear that he did not doubt the feasibility of reprocessing and that he was convinced that the Gorleben plant could be operated without undue risk to the population, if some modifications in the concept were implemented. But while the reprocessing plant was, in his opinion, technologically feasible, Albrecht stated that it could not be carried through politically. Indeed because of resistance by citizens, he said, there would be no reprocessing plant at Gorleben.

Before any reprocessing plant could be built in Lower Saxony Albrecht stated the risks of large catastrophes would have to be substantially reduced. Hence inherently safe storage methods would have to be used in all plant

areas where large amounts of radioactive materials were stored, in particular with regard to the spent fuel store and the high-activity liquid waste tanks. Furthermore, storage facilities underground should be provided so that the entire radioactive inventory of the plant could be evacuated should there be threat of war.

Albrecht avoided taking any position over the threat to civil rights posed by a reprocessing plant and plutonium store. Although such a risk existed, he said it was for the Federal Government to decide whether it was acceptable or not.

He also agreed that the sole justification for reprocessing on economic grounds might be as an essential component of a Fast Breeder Reactor programme. Given that no such programme yet existed, then concepts for alternatives to reprocessing should be developed and a comparative study of reprocessing and direct disposal of spent fuel performed so as to provide proper information on which to base later decisions.

In the meantime, spent fuel should be kept in intermediate storage facilities, and investigations of the Gorleben salt dome continue as planned. Apparently, Albrecht had never seriously intended to question that part of the nuclear waste strategy, and had successfully suppressed discussion of the Gorleben salt dome at the Gorleben Hearings. Accordingly PTB's application for deep drilling received a state licence on June 27, 1979 and actual drilling began in September 1979. A hydro-geological drilling programme was implemented in April 1979, just after the Hearings.

Albrecht's strategy was officially accepted by the Chiefs of Government of States and of the Federation on September 28, 1979 and a timetable specified. Thus investigations of alternatives to reprocessing were to proceed so as to allow a final judgement by 1985 whether they offered decisive safety advantages. At the same time, the Chiefs of Government expressed their confidence in the integrated Entsorgungs-Concept and made it quite clear that they still regarded it as feasible and desirable.

THE PROBLEM OF SCALING-UP

In June 1980, the Enquete-Commission 'Future Nuclear Energy Policy' of the Bundestag, consisting of politicians of all parliamentary parties and experts representing different attitudes towards nuclear energy published an intermediate report, which although it was never accepted as policy did carry some weight. The Commission recommended that the decision as to whether to embark on a large-scale nuclear power programme be postponed and that large-scale commercial reprocessing should not be introduced before 1990. Meanwhile, a non-commercial reprocessing plant for the purpose of demonstration and development was to be built, the size of which had yet to be determined. The majority of the Commission recommended, in addition, that studies on the reprocessing plant should be performed by two independent teams, one of them to consist of scientists with a sceptical attitude towards reprocessing. That recommendation was not accepted by official authorities. In March 1981, the Ministry for Research and Technology commissioned Professor Wolf Häfele—Director of Jülich Nuclear Research Establishment and well-known for his pro-nuclear views—to study the question of optimum plant size. However, Häfele concentrated mainly on aspects of energy policy, and such questions as what plant capacity would be needed to guarantee the reprocessing of spent fuel arising in nuclear plants in operation in 1990. For him, process engineering and safety problems were only of marginal concern since he considered the technology as sufficiently proven and mature. Important areas such as off-gas-treatment, waste-treatment including vitrification of high-activity waste, and the danger from chemical explosions in the plant were not considered. Instead he concluded that a 'demonstration' plant ought to have a capacity of 400 to 800 t/yr.—up to more than half the original Gorleben size and well compatible with DWK's plans of building a plant with a capacity of 350 to 700 t/yr.

So as to get another view on the matter, Professor Gunter Altner, a member of the Enquete-Commission, commissioned an independent, ecological research institute, the 'Gruppe Ökologie' in Hannover, to perform a parallel study, the author being a member of the team of scientists. The results were published in 1982 and the conclusions—drawn from an analysis of operating experiences of reprocessing plants worldwide, a survey of R & D programmes as well as a detailed analysis of the process itself—were substantially different from those of Häfele. Thus the report pointed out that: Only a very small proportion of all possible combinations of parameter values can be investigated in the laboratory and during cold tests. Therefore, it is impossible to design a functioning large plant on the basis of laboratory experiments and of small-scale development. The problems associated with scale-up should not be overlooked, furthermore, the usual, stepwise procedure for the development of larger plants—from the laboratory to pilot plants to semi-commercial demonstration plants—will not be successful."

Thus, if large reprocessing plants were to be built on the basis of scaling-up, it could prove a costly trial-and-error procedure, on the off-chance that by luck more than by anything else one day one plant design might prove satisfactory.

Helmut Hirsch

One of the first changes was that the Entsorgungs-guidelines of June, 1977 by which power plant operators could only operate nuclear power plants only if there was proper provision for spent fuel, were conveniently revised. Thus, so as to make sure that the new situation brought on by the Hearings and their conclusion would not militate

against the construction and operation of new power plants, the conditions set by those guidelines were made less stringent. The revised version was published on February 29, 1980. Shortly before, at the end of 1979, DWK was invited to submit a new application for a reprocessing plant—this time by the State Government of Hessen. As the final

repository was still to be at Gorleben, but without a reprocessing plant, the concept of an Integrated Entsorgungs-Center had clearly been modified. DWK submitted its application on February 25, 1980.

Reprocessing makes a fast Come-back 1980 to 1983

Following the invitation by the Hessen State Government, DWK submitted its application for a 350 t/yr. plant in February 1980, without specifying the site. On July 23, 1980, the Federal Government explicitly and officially stated that it did not see a contradiction between the postponement of the decision for or against reprocessing until 1985 on the one hand, and the start of construction of a reprocessing plant on the other. One, 'small' plant would not prejudice the later decision, it said despite the plant proposed being for a throughput of 350 t/yr, and therefore almost the capacity of the commercial LWR-fuel reprocessing plant at La Hague, and more than twice the throughput of Tokai Mura plant in Japan. The Federal Government fully supported the Government of Hessen in its policy.

At about the same time, rumours started that the site was to be near the small city of Volkmarsen, in Northern Hessen. The new game was 'site poker', and it soon caught on in other states. Thus, in December 1980, the State Parliament of (CDU-governed) Rheinland-Pfalz took the decision that the State would, in principle, welcome an application for a reprocessing plant. In the same month, a Bavarian newspaper published confidential information from the Bavarian Ministry for the Environment indicating that there were plans to build a reprocessing plant near Schwandorf in Bavaria. And on February 19, 1981, Governor Albrecht, speaking before the Bundestag, indicated that Lower Saxony, too, would be willing to consider an application at a site other than Gorleben.

In Northern Hessen around the suspected site area, public resistance spread like wildfire. Large 'Burgerinitiativen' formed in every small town and village. At the com-

munal elections on March 22, 1981 a newly founded 'Citizen's List', the main aim of which was to stop the reprocessing plant, gained 41.7 per cent of the vote in Volkmarsen and became the strongest faction in the town parliament.

When on June 9, 1981, it was officially announced that the site was to be near Diemelstadt-Wethen—less than 10 km from Volkmarsen—the protests, with many local politicians in support, were so vehement that the decision was taken back on August 18. The official reason was that new geological data had shown that the ground was not suitable to support a heavy facility. It turned out, however, that the facts had been known for decades and simply ignored. During the phase of uncertainty following that defeat for the proponents of reprocessing, a government report on the status of the Entsorgungs concept was published on October 10, 1981. In it, the strategy to start immediate construction of a reprocessing plant was defended. On the basis that spent fuel went first into compact storage at the power plant, with the exception of some 2,000 t which were to go to Cogema and BNFL according to existing contracts, facilities for further storage of spent fuel and/or reprocessing would be needed from 1980 onwards.

The report did not mention that since the spring of 1981, DWK had tried to buy a 25 per cent share of the US Barnwell reprocessing plant. One reason was certainly to get better acquainted with US technology and possibly another the fear that strong resistance would prevent it from building a plant in West Germany. In October 1981, the Reagan administration lifted the ban on civilian reprocessing; but as yet no action has been taken to get Barnwell into operation, nor has DWK yet managed to buy its way in.

In December 1981, DWK nominated two sites in Northern Hessen, Wangershausen and Merenberg for consideration. In the same month, the rumours concerning plans for a plant near Schwandorf in Bavaria, were officially confirmed, and on February 18, 1982, DWK identified three sites, all in that area, for which the regional planning procedures

necessary for the construction of a reprocessing plant were started.

In March 1982, after the State Parliament of Rheinland-Pfalz had held a Hearing on reprocessing with proponents and opponents of the plant, a site near Cochem was selected. In July 1982, out of the two sites in Hessen, Wangershausen was chosen. Although all official statements and decisions mentioned only one reprocessing plant, DWK kept its cards hidden and its plans vague and it was not made clear whether, in the end, only one plant was to be built or whether construction on more than one site would take place.

In September 1982, the Federal Government changed, and CDU/CSU came into power. That development put new life into the site poker game. DWK submitted an application for one of the Schwandorf sites in October, and even more surprising, the Lower Saxony State Government on November 1 selected Dragahn, about 26 km west of Gorleben, in the same district of Luchow-Dannenberg, as a potential site. That Governor Albrecht had broken his word led to a storm of protest. Albrecht's often repeated declaration "no reprocessing plant at Gorleben" was also supposed to hold for the near vicinity of this site.

The State Government later declared that "considering the sum of his various statements", Albrecht had not excluded another site in Luchow-Dannenberg.

Meanwhile DWK withdrew its applications for sites in Hessen and Rheinland-Pfalz in November 1982, the reason perhaps being that in Hessen since the elections of September 1982 the SPD State Government had no parliamentary majority and had to depend on the support of the Green Party, which itself had newly entered the Landtag. Thus for political reasons sites in Lower Saxony and Bavaria appear to have become first choice. Together with the new sites has also come a change regarding plant size. Whereas in Hessen, capacity was planned for no more than 350 t/yr., the plants in Bavaria and Lower Saxony were to have a capacity of 350 t/yr. in the first stage of construction, to be enlarged shortly afterwards to 700 t/yr.

New Concepts—New Risks

Concepts of plant size have definitely changed downwards; while such change leads to less radioactive inventory at one site, it fails to bring overall improvement, since more sites are needed for a given capacity. Other changes aim at reducing the accident potential of the plant: Instead of the 'swimming' pool concept, spent fuel elements are now to be kept in dry storage in modified transport casks. Cooling is guaranteed by natural circulation, and no accidents comparable to a cooling-failure accident in a pool are possible. Such storage, however, has other shortcomings: the temperature of the fuel is much higher than in a pool, leading to a possibility of cladding failure. The cooling air, leaving the storage building through large vents, can neither be filtered nor even properly monitored; thus, a leaking cask, for instance, through corrosion, will lead to radioactive emissions to the environment. Moreover, owing to damage to the cladding and to fuel pellets brought about through the high temperature, the handling of the fuel after it is taken out of the cask becomes very difficult.

And finally, the new concept is particularly vulnerable to external influences such as sabotage, and airplane crashes; indeed the Reaktorsicherheitskommission ruled in February 1978 that an inherently safe system of spent fuel storage could not be realized without a reduction in protection against external events. Even representatives of the nuclear industry stated in the summer of 1978 that such storage concepts were far from mature; but less than one year later, at the end of the Gorleben Hearings, the new concept was suddenly presented to the public.

Whereas the modification of the spent fuel store would thus do little to reduce the overall risk of the plant, another modification, if really implemented, would certainly do so: Thus large storage tanks for high-activity liquid wastes were to be done away with, and vitrification is to follow immediately after the wastes left the reprocessing plant. It is more than doubtful, however whether this change of concept will be realised. Evidence is accruing that

the French vitrification process—AVM (Atelier de vitrification de Marcoule)—is not suitable for the production of glass products with sufficient stability; and the development of similar German processes is about ten years behind schedule. Indeed for many years, the time of the start-up of hot operation of a pilot plant has been put as just three years away. Hence there is no guarantee that a functioning vitrification facility will be available when the reprocessing plant goes into operation and if not, the decision will have to be taken either to postpone the start of operation of the reprocessing plant, at a cost of several million DM per day, or to use waste tanks after all. If suspicions that glass is generally unsuitable for radioactive waste prove correct, the situation will be still worse since it will take at least several decades until a new waste form is developed.

No significant change has occurred concerning the risk of the third major problem point, the plutonium store. Indeed, proponents of reprocessing appear to have conveniently forgotten Albrecht's demand in his statement of May 1979 that provision must be made for the evacuation of the radioactive inventory to underground storage in case of war.

A major change in concept is that the planned cooling time of the spent fuel before reprocessing has been prolonged from one year to between five and seven years. For the first ten or fifteen years of reprocessing, that change is of no practical consequence because of the large backlog of spent fuel. Meanwhile the year of planned start-up is practically the same, 1991 for the old, 1993/4 for the new concept.

The aim of the change is to reduce process problems owing to solvent radiolysis inasmuch as the overall radioactivity of the spent fuel is reduced by a factor of five if cooling time is extended from one to seven years. The price for that short-term gain is an increase of about 60 per cent in the long-term toxicity of the reprocessing wastes because of the build-up of Americium-241—decaying to Neptunium-237—derived from Plutonium-241 during the cooling period. Furthermore, because of that and other nuclear processes oc-

curing during storage, the quality of both the uranium and the plutonium product falls, thus making multiple recycle increasingly difficult.

Reprocessing Experience

Operating experience with reprocessing plants in West Germany and abroad were discouraging during the 1979-83 period. Corrosion caused a leakage in the steam heating system of the dissolver of the WAK plant in May 1980, and radioactive materials in excess of emission limits escaped. The plant was shut down immediately; the repair—originally to be finished within eight months—took until October 1982. A series of mishaps and accidents also characterize the operation of the two other LWR-fuel reprocessing plants in the world, that of La Hague and of Tokai Mura: Indeed in the latter plant, a dissolver leakage similar to that described for the Karlsruhe plant occurred in April 1982.

In such vital fields as off-gas cleaning, design of extraction equipment, process control and criticality prevention, no significant breakthrough has been reached. According to recent work by independent German scientists, it seems that the dangers of criticality have been underrated and that comparatively strong explosions, destroying the building structures from the inside and leading to large radioactive emissions, as well as to further accidents such as solvent fires, can occur—in contradiction to what has been considered as possible in official safety studies so far.

New Toxicity

The toxicity values for several key radionuclides contained in the radioactive wastes were increased in 1980 by ICRP in their publication, ICRP-30. Consequently, the often-quoted "ecological long-term advantages" of reprocessing practically come to nothing. Before ICRP-30, proponents of reprocessing had argued that the long-term toxicity of reprocessing waste was lower than that of spent fuel by a factor of 10 to 100. Because of ICRP-30 that dif-

ference between the two options has shrunk, indeed, even assuming optimistically low values for plutonium losses into the waste during reprocessing, but taking into account the higher toxicity because of longer cooling time, the difference is reduced to no more than a factor of about three to five for spent uranium fuel, and about two for spent mixed oxide fuel—that is, fuel made with recycled plutonium. It remains to be seen whether ICRP-30 will have an influence on reprocessing plant costs in general, owing to more stringent demands on retention systems and on radiological protection for employees. Undoubtedly it will lead to an increase in the costs for waste conditioning for final disposal, since the engineered barriers will now have to be made considerably more durable. And costs are a critical factor for a technology which is outrageously expensive already, and exhibiting a cost explosion the end of which is not yet in sight. During the planning phase of the integrated Entsorgungszentrum when a 1,400 t/yr reprocessing plant was under consideration the escalation was about 80 per cent per year. Hence the costs for the plant envisaged in 1974, were DM 0.74 billion; in 1979, DM 13.9 billion; (all in 1982 DM). In 1982, a 350 t/yr. reprocessing plant without final disposal was to cost about DM 10 billion. According to a Dutch study published in October 1982, using mainly German and French data, reprocessing alone would cost, in the year 1997 (in 1997 DM), between DM 0.062 and DM 0.406 per kWh, the latter figure being so large that it alone would make nuclear power completely uneconomical.

After all such considerations, the obvious question arises, why is reprocessing so persistently pursued by the German Government and nuclear industry if it is beset with so many safety, social and economic problems?

Why Reprocessing?

The main reasons appear to be three. Undoubtedly the most important is that of using the plutonium extracted from spent LWR-fuel as start-up fuel for fast breeders. According to official policy, the breeder

is to be the long-term source of energy for the coming millenium. In that respect construction of the SNR-300 prototype at Kalkar goes on in spite of constant delays owing to technical problems and rapidly rising costs. Among the scenarios constructed by the Enquete-Commission in its 'Future Nuclear Energy Policy' the one favoured by nuclear proponents involved an installed breeder capacity of 54,000 MWe by 2030. On the assumption that the first core and the additional fuel needed during the first three years of operation for half of such reactors have to come from LWR-fuel reprocessing, some 250 t of plutonium would be needed. That quantity would take almost 40 years to produce from a 700 t/yr. reprocessing plant—if it reached design output. Thus, at least two such plants would have to be built in the near future to support adequately a breeder programme of that size. In addition the reprocessing of LWR-fuel is expected to provide experience as to how to reprocess high burn-up FBR-fuel.

The second reason for reprocessing, however much the proponents of a civilian nuclear power programme try to deny the connection, is that plutonium extracted from spent LWR-fuel is suitable for the construction of atomic bombs. Owing to its higher content of isotopes Pu-238, 240, 241 and 242, it is more difficult to use such reprocessed fuel for building reliable bombs of high yield compared with the use of specially produced weapons-grade plutonium. That drawback however, can be remedied either by enriching reactor-plutonium in Pu-239 through laser technology or simply by reducing the burn-up of the fuel—in the latter case, no modification either of civilian reactors or of civilian reprocessing plants are necessary. It is true that for the production of a small nuclear arsenal, methods other than that via commercial civilian plants are probably much cheaper. No other method, however, has the great 'advantage' that practically all activities—plant planning, construction and operation—can be performed openly, the military nature of such plants being high impossible to prove. Thus relatively large stocks of plutonium

can be accumulated with the official explanation that they are destined for (civilian) breeder reactors.

The time between the moment that military activities become explicit and recognisable—that is the converting of plutonium oxide into plutonium metal—and the moment that the first bomb can be detonated—is only a few months, perhaps even weeks. Added to that, if a large military programme is aimed at, the coupling of civilian and military enterprises is likely to offer economic advantages. Civilian reprocessing is therefore attractive for those countries that do not wish to work openly towards possession of nuclear weapons, but want to keep the option open of a comparatively rapid acquisition of such weapons. Certainly a sizeable minority among politicians in West Germany support reprocessing for that reason—be it that plutonium may be needed in an emergency to feed NATO arsenals. For instance, in the USA, some claim that a shortage of military plutonium is imminent and the recent discussion on the starting up of the civilian Barnwell plant to produce plutonium for the weapons programme demonstrated the connection between the civil and military use of nuclear power more clearly than ever before. Others in Germany may dream of a purely German atomic bomb.

The third reason for reprocessing is that the German nuclear industry is trying to improve its position as a seller of nuclear plant abroad against stiff international competition; if it can offer both reactors, and fuel cycle facilities, then it could make a deal more attractive. Thus a small reprocessing plant of some 35 t/yr. was part of the German-Brazilian nuclear deal. However, that deal keeps being reduced and may in the end come to nothing.

With such powerful reasons behind plans for reprocessing, it is of little wonder that the research and development programme for concepts to dispose of spent fuel directly, without reprocessing, is being performed without much enthusiasm by the authorities. Thus although scientists working on that development may perform their work zealously the time period for

thorough investigation is far too short—just three years between 1981-84. The budget is about DM 60 million, hence only a small fraction of the several billion DM spent to date on reprocessing. In the comparative study, which is to provide the basis of any decision, vital aspects such as the connection between civilian reprocessing in West Germany and its ability to acquire nuclear weapons, are completely ignored. Nonetheless it is now being realised that without the later introduction of breeder reactors, reprocessing makes no economical sense at all, if it does even then, and has a high negligible effect in extending uranium resources.

Intermediate Storage of spent Fuel and other Wastes

The necessity for longer-term intermediate storage of spent fuel became evident well before the Gorleben Hearings. Indeed only very small amounts of fuel were being reprocessed at La Hague or in the WAK. In order not to have to shut down nuclear power plants, compact storage in reactor pools, as well as away-from-reactor storage in large pools, was envisaged to accommodate the large amounts of spent fuel produced every year—some 200 t in 1978. The first licence for compact storage, enabling the reactor operator to store six to twelve yearly discharges of spent fuel, rather than one or two as with normal storage, was applied for in 1978, and granted in 1980. In some instances—most effectively at Biblis A—law-suits by citizen groups have been or still are delaying the implementation of such licences. In two instances Wurgassen and Stade—where compact storage was out of the question for technical reasons—separate storage buildings on the reactor sites for up to about 100 t of fuel in transport casks have been planned since late 1979.

The first large away-from-reactor store, apart from the 3,000 t entry pool planned at the Gorleben Centre, was originally to be built by DWK in Ahaus (Nordrhein-Westfalen) near the Dutch border. A licence for a 1,500 t storage pool-facility was applied for on January 24, 1978. After pool storage at Gorleben had been deemed unacceptable by

Albrecht in May 1979, DWK changed its concept for Ahaus, and planned a dry storage facility with transport casks similar to that planned as an entry store for the new reprocessing plants. Construction at Ahaus, however, has not yet started.

The transport cask storage facility at Gorleben, planned since 1980, has been under construction since January 1982. The building is nearing completion, however the licensing procedure, according to the Atomic Law, is still at an early stage and considerable delays because of legal actions by citizen groups are to be expected. The facility of 1,500 t capacity could in the future conveniently serve as entry store for the Dragahn reprocessing plant. Another 1,500 t facility is envisaged as an entry store for the Schwandorf plant. Original plans to reduce the overall risk of reprocessing plants by reducing the inventory of the entry store, which was to be only 200 to 300 t at the Hessen plant, apparently had to be abandoned owing to unexpectedly strong resistance at planned sites for away-from-reactor storage. Thus the 1979 communal elections in Ahaus indicated a 26 per cent support for the anti-nuclear list, a result that was not much less impressive than that in Volkmarsen.

Whereas pool storage away from the reactor was officially abandoned nationwide owing to the high accident potential demonstrated at the Gorleben Hearings, not a murmur of official talk is to be heard forbidding compact storage in reactor buildings. In fact, although the inventory, 200 to 400 t is smaller, the risk is increased by the possibility of the coupling of accidents between pool and reactor: indeed the pool cooling system is usually not independent of the reactor emergency cooling system, and in some instances, it has to be switched off while the reactor emergency cooling is on. The reason for that inconsistency is political as well as economical. Thus compact storage in reactor pools is the last line of defence for reactor operators since to implement it, no new sites have to be chosen, no new buildings are necessary. Furthermore, compact storage is considerably cheaper than any other method of intermediate storage, if it

takes place in an already existing reactor pool.

Low-and medium-activity waste, until now stored provisionally on reactor sites and state gathering stations before being disposed of in the Asse II mine, is also accumulating dangerously since that mines's closure. Two new large storage halls for those wastes are being built, one at Gorleben beside the fuel element store for 35,000 barrels, one at Mitterteich in Bavaria for 50,000 barrels—thus both are much larger than the state facilities in existence so far.

At the Gorleben Hearings, the State Government insisted that the Gorleben salt dome itself was not to be discussed, except in general terms. Nevertheless the disadvantages which made salt domes generally unsuitable for the disposal of radioactive waste were listed, the main points being: salt domes were by nature geologically unstable since the very existence of such structures indicated a thrusting upwards through dynamic equilibrium being attained between salt constantly entering the water table where it was dissolved, and a movement to maintain a balance. Thus, the layers around the salt dome, the interface of the dome with those layers, and the dome's internal structure were gradually changing all the time. Furthermore, the inner structure of salt domes was usually found to be very complicated, with impurities and brine and gas inclusions, all of which might endanger the safety of the repository. Although the salt itself was plastic, not all layers in the dome were. Of particular importance was the anhydrite in which open cracks and fissures could form which might serve as paths for water right into the domes. Another problem was that salt dissolved very easily in water, forming a corrosive brine, so that once water had entered the dome, the tendency would be for any such cracks to widen.

Development of final Disposal 1979-1983

The investigation programme began with the first hydrogeological drillings into the layers above the top of the salt dome, in April 1979. To date some 100 such drillings have taken

Reprocessing and the CEBG

At the Windscale Inquiry of 1977, BNFL, with the CEBG concurring, stated that reprocessing of spent thermal oxide fuel was necessary for three main reasons: one, that the integrity of spent fuel cladding could not be guaranteed for more than ten years' storage in cooling ponds, and any leaks would therefore bring about problems of environmental contamination; two, that reprocessing, followed by storage and vitrification of high activity wastes provided the most compact and clean solution for disposing of radioactive waste; and three that the extraction of uranium and plutonium from spent fuel for use in a fast reactor was essential if nuclear power was to have a long term future. In his report, Justice Parker thrust all objections aside to the proposed thermal oxide reprocessing plant, his conclusions being that reprocessing was a desirable activity from an environmental point of view, and one that the British in particular should indulge in, since Britain could be guaranteed to look after plutonium and hence prevent proliferation better than most other countries in the world.

Now six years later it is transparently clear now right were the objectors in their arguments and how wrong was the judgement of the learned inspector. Thus evidence from all over the world shows that spent thermal oxide fuel can be stored intact almost, if not, indefinitely; that reprocessing is an extremely dangerous and dirty business which not only contaminates workers and the surroundings but which multiplies the volumes of radioactive waste to be disposed of by a factor close to ten; and thirdly that it has become so expensive—twenty times more in real terms than was predicted ten years ago—that the fast reactor which depends

on reprocessing for its plutonium fuel, is unlikely ever to be an economic proposition, even if it could be made to operate with something approaching a reasonable performance.

The CEBG has apparently begun to learn its lesson. It is now admitting openly that the costs of reprocessing spent Magnox fuel comprise more than fifty per cent of total fuel costs rather than the eight per cent of a much smaller fuel cost claimed at the Windscale Inquiry. Indeed overall fuel costs for Magnox reactors are now practically the same as those of coal for coal-fired plants; hence the claim that nuclear power's higher capital costs would be offset by much cheaper fuel costs, compared to coal, no longer stands.

In its proof of evidence for the Sizewell B Inquiry, the CEBG has stated—using BNFL figures—that the discounted cost of reprocessing, will comprise no more than one quarter of a much reduced total fuel cost—less than half that now prevailing for Magnox reactors. John Baker's recent statement on behalf of the CEBG that the Board is now seriously considering storing spent fuel indefinitely rather than sending it to BNFL for reprocessing—the reason being one of cost—would seem to indicate that having been bitten before by high reprocessing costs, the CEBG has now become shy. But if the CEBG no longer trusts the figures given to it for thermal oxide reprocessing, how much can objectors to the proposed PWR rely on other figures that the CEBG has had on trust from the National Nuclear Corporation and its Bechtel advisors, and has then passed on in its proofs of evidence?

Peter Bunyard

place including some 40 drillings just into the salt dome's surface, to a depth of about 300 m, four deep drillings well into the dome, down to 2000 m, and two deep drillings into the dome to about 1000 m, for the purpose of helping to identify the best place for sinking a shaft. Furthermore, there were seismic, geoelectric, mechanic and temperature measurements, chemical analyses and flow measurements of ground water, and an investigation of the quaternary geology of the area. The number of drillings into the dome was deliberately kept as small as possible, as each puncture could potentially threaten the repository's safety. The second stage of the investigation programme was to take place 'from the inside', after access had been gained through a shaft.

The whole impressive programme has been handicapped right from the beginning. The Gorleben dome is closely linked to the salt dome of Rambow, both together constituting a kind of double-structure which needs to be investigated completely if waste is to be put into one of its parts. As the Rambow part lies on

the other side of the border, on East German territory, half the system to be investigated is inaccessible, and the result of the investigation programme will always remain fragmentary.

Nevertheless, from the results available so far, many negative characteristics of the salt dome have already become apparent. The authorities tried to keep the data secret as long as possible, issuing only very shortened and 'polished' accounts of the results. However, because of the refusal of concerned citizens in the Luchow-Dannenberg area as well as of independent scientists, to take part in official hearings on the salt domes, unless all such data were made accessible, the Federal Government—after a public controversy that lasted almost one year—agreed in the summer of 1980 to make them public. At first the scientists involved in the investigation programme refused to admit that their findings were negative, and it was up to independent scientists to draw conclusions from the data and publicise them. In June 1982, the discussion gained a new dimension when Professor Duphorn

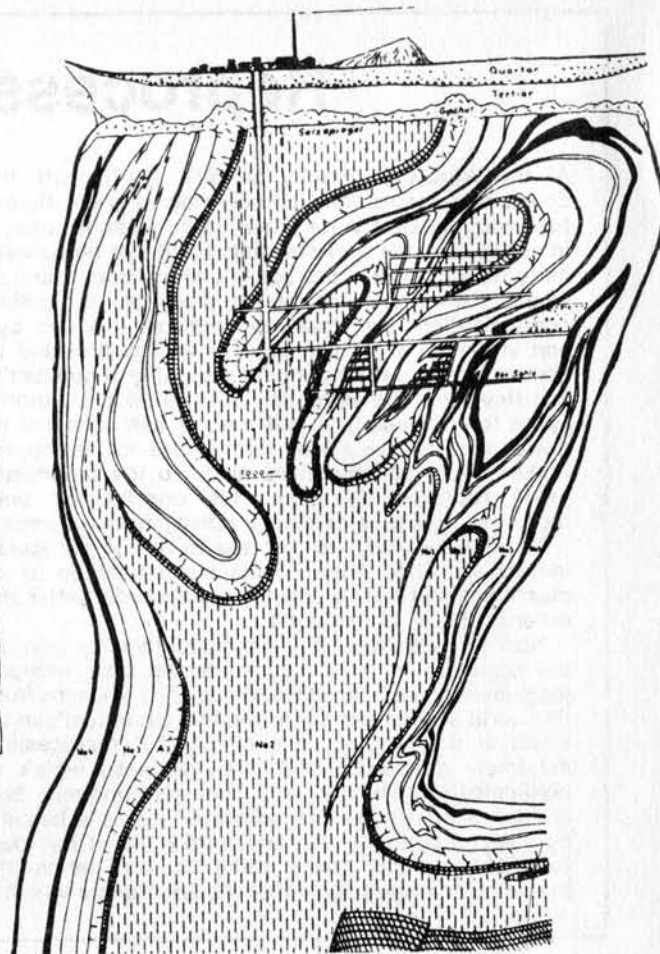
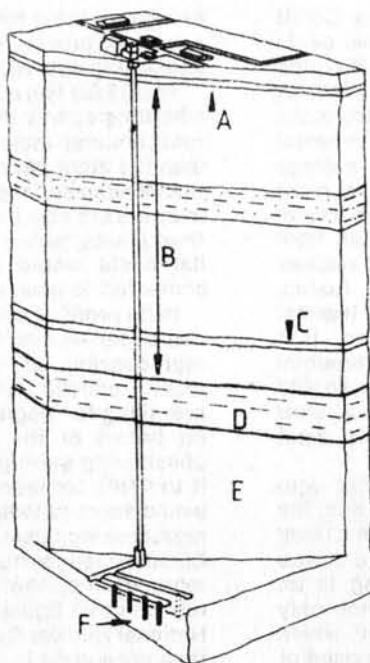
from Kiel University, who had performed quaternary geological investigations—with 5300 drillings into a depth of a few metres—for the Government, submitted his report in which he explicitly drew the conclusion that the findings were so catastrophic that the site should be abandoned. The summary of that report became public through an indiscretion.

As all the negative information on the salt dome gradually became public, the Federal authorities stubbornly maintained that there was "no reason to doubt the suitability of the Gorleben salt dome". Now and then, however, glimpses behind the facade indicated that doubts were growing in official quarters. At a public debate in Luchow in May 1981, for example, one representative of the Federal Ministry for Research and Technology declared himself impressed by the critical arguments, he was later called to order by his superiors. Shortly after Duphorn's summary became public, an anonymous note reached the press in which an attempt was made to discredit him. The note is assumed to have originated in the

Ministry itself; if true, it indicates in a most disquieting way the lengths to which a Government is prepared to go should scientists employed by it dare to voice dissenting opinions.

Below are the main findings which became public partly in Duphorn's summary, and partly through analysis of the data from the site investigation or from earlier surveys by independent scientists.

1. It is proven that upward movements of the salt dome have taken place in the quarternary era; and it is extremely likely that they have gone on during the last hundred thousand years and still go on today. If official Dutch criteria were applied to the Gorleben dome, that alone would be a reason to abandon it.
2. A valley, filled with aquiferous sediments, had cut into the caprock of the dome in the elster glacial. In some places, it even cut right into the salt so that aquiferous layers have direct contact with the dome. A considerable amount of subrosion—salt dissolution by ground water—has occurred during the recent geological past. Most likely the valley serves as a pathway for concentrated brines getting into higher ground water layers.
3. There is no coherent layer of clay above the salt dome, which could protect it from contact with higher ground water layers. On those grounds the site would be excluded by Dutch criteria.
4. Carnallit—a mineral giving off water at temperatures above 90°C—is widespread in the dome. Even in the older Zechstein-Salt (Na₂), destined to house the wastes, such inclusions as well as open cracks have been found.
5. The main anhydrite layer contains cracks and fissures, so that pathways for water between the surface of the salt dome and the zone intended for final disposal could be formed or possibly exist already.
6. The deep drillings hit several brine pockets and gas inclusions in the salt dome.
7. The investigation of the salt dome surface displayed unex-



Left: A salt dome as the Nuclear Industry world like to see it.
Right: Reality—cross-section of a German salt dome.

pected irregularities, which the geologists have so far been unable to explain—most notably, a pillar of salt reaching 80 m above the dome surface in one place and which will in some way have to be connected to quarternary diapirism and/or subrosion.

8. The central region of the dome containing the older Zechstein-Salt which alone is suitable for final disposal is much smaller than originally hoped.
9. Near the flank of the Rambow salt dome, right at the border, natural gas has been found. It seems irresponsible to locate a final repository in an area potentially containing valuable resources.

Meanwhile, new important problems have emerged which were not discussed at the Gorleben Hearings. Since 1979, A.G. Hermann, professor of geochemistry at Gottingen University, pointed out the dangers of geochemical metamorphosis, leading to brine migration in salt domes owing to heating by radioactive wastes. It took until March 1982, before the RSK conceded that

such a possibility might be a point worth investigating.

Armed with that negative evidence, independent scientists and environmental organisations vigorously demand that the site investigation programme at Gorleben be stopped and that the whole concept of waste disposal be subject to reconsideration. The official authorities, however, maintain that only after the shafts are sunk—work which is to begin in 1984, and further investigations are performed and evaluated—will a judgement be possible, probably in the late 1990s.

The Asse II salt mine was closed for disposal of additional radioactive wastes at the end of 1978. Talks took place after the closure suggesting that because of safety problems, it would in future be used for scientific experiments only. However, as wastes are accumulating and prospects at Gorleben look gloomier, officials are considering reopening the Asse mine for low-and medium-activity wastes. Negotiations between the Federal Government and the State Government of Lower Saxony took place in 1981 and 1982; no decision has been taken

so far, but the change of Federal Government in September 1982 will probably speed up matters, and a decision can be expected between 1983 and 1984.

At the third site under consideration for final disposal, the former iron-ore mine shaft Konrad near Salzgitter in Lower Saxony the Gesellschaft für Strahlen- und Umweltforschung (GSF) carried out site investigations for the Federal Ministry for Research and Technology from 1977 to 1982, and submitted a report to the Ministry, coming to the conclusion that the site was suitable. The licensing procedure started in September 1982 and from 1988 onwards low-activity wastes and wastes from the decommissioning of nuclear power plants are to go into that shaft.

The people of Salzgitter became extremely anxious as to the scientific quality of the GSF's report; and the city council finally decided in December 1982 to commission the Gruppe Ökologie in Hannover to carry out a critical survey of GSF's findings. Problems have again arisen over data that are being kept secret by the Ministry; but even during the early phase of the work, it became apparent that GSF's report is faulty in many respects. One important example is that GSF has concentrated solely on the dangers of water intrusion into the repository from above, and completely ignored the much more important possibility of water intrusion from the side, via the flanks of the nearby Broistedt salt dome.

Safety of final Disposal: the Million-year-gamble

The purpose of the safety analyses performed by the authorities is to prove that the overall safety of the repository is still sufficient—thus the radiation exposure remains lower than the legal limits, despite all the unexpected, negative results of site investigations. Hence the authorities claim that it is not necessary for single geological barriers such as the salt dome and the layers around it to fulfil certain minimal requirements, as long as the safety analysis shows that the barrier effect of the whole system is sufficient. However the problem is that a safety analysis can only give

meaningful results if the system under study is perfectly well-known and if its behaviour can be predicted for the relevant period of time.

The method and the first results of the Government safety study were presented at a public hearing in Hitzacker in Luchow-Dannenberg on October 23, 1982. There, it became apparent that in spite of all the data already collected, a great many arbitrary assumptions were still needed in order to perform mathematical calculations as to the spread of contaminated ground water from the final repository, should there be leakages. In many instances, it was even impossible to say whether the assumption lay on the pessimistic or the optimistic side. Thus even though the analysis was to be a 'worst-case' analysis there was no way to prove that it really was the worst possible case under consideration.

As an example of the uncertainties, consider the adsorption of radionuclides on rock surfaces since a variation of the adsorption coefficient by a factor of ten can lead to a change of the concentration of the nuclide in the highest ground water layer by five to ten orders of magnitude. In order to arrive at meaningful results, that coefficient would have to be determined with great precision. But such precision cannot be done, since small changes in ground water chemistry and in the properties of the rock along the path of the migrating radionuclides, all of which will influence the adsorption coefficient, are impossible to infer from the results of a few drillings which give information only for certain points along the path. Furthermore, the chemical state of the nuclides is important for adsorption behaviour, and whereas retention of positive ions is usually relatively good, negative ions, which can also contain metals, as in organic complexes in certain reprocessing wastes or colloids, show much less adsorption. Again, it is impossible accurately to predict chemical processes in the final repository.

Some of those problems are simply ignored in the official safety studies. Plutonium, for instance, is assumed to be present only as a positive ion, with an adsorption

coefficient typically in the range of an order of magnitude of 100 to 10,000; in reality, as much as 10 per cent of the Pu might be contained in organo-complexes or colloids, for which the adsorption coefficient is close to zero. The adsorption coefficient can also decrease with mounting concentration.

Realistic calculations on the basis of the new toxicity values given in ICRP-30 show that the safety of the final repository, if it contains high-activity wastes, spent fuel elements and/or wastes containing low-lived alpha-emitters, has to be guaranteed for a period of time of one million years or more. That guarantee is impossible today when not even the short-term risk can be accurately determined.

Thus, apart from the problem that Gorleben and Asse II are certainly, and Konrad most likely, unsuitable sites for final disposal, we do not know whether such a site exists at all, and we do not have a suitable scientific armoury—nor can we be sure that we will ever have one—to identify such a site even if it should exist. The long-term isolation of radioactive wastes is a problem which takes us beyond the boundaries of science.



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THE KOGI INDIANS AND THE ENVIRONMENT IMPENDING DISASTER?

G. Reichel-Dolmatoff

This paper is concerned with the analysis of a specific case of adaptation and change: that of the Kogi Indians of the Sierra Nevada de Santa Marta in Colombia. The Kogi, a Chibcha-speaking tribe of about six thousand individuals, are among the very few surviving native groups whose social, political, and religious institutions still contain many elements characteristic of the ranked societies of the ancient chiefdoms of northwestern South America. A study of their highly efficient agro-ecosystem, developed in the course of major periods of change, therefore, is of interest to the assessment of the wider northern Andean scene. Unfortunately, the Kogi Indians, having survived the Spanish Conquest are now under threat from the forces of development including the illicit growing of Marijuana.

The Sierra Nevada de Santa Marta and the surrounding lowlands have been inhabited for thousands of years. On the arrival of the Spaniards in the early sixteenth century, the region of Anta Marta (founded in 1526) and the northern foothills and ascending slopes of the massif were occupied by the Tairona Indians who formed a major chiefdom. They lived in nucleated settlements consisting of a large number of houses built on stone foundations on terraced sites containing architectural and engineering features such as retaining walls, stairs, slab-paved roads, drainage channels, and other structures. The economic basis of the dense population consisted of intensive maize cultivation combined with many other crops, cultivated fruit trees, marine resources, and trade relations.¹ Tairona irrigation engineering was openly admired by the Spaniards. From archaeological and ethnographical comparisons it seems that the Tairona originally came from Central America, more precisely from the Atlantic slopes of what is today Costa Rica, and that they first arrived in the tenth or eleventh century A.D.^{2,3,4,5}

The year 1600 marks the final defeat of the Tairona at the hands of Spanish troops; their remnants, together with survivors from other tribes, fled into the mountain fastnesses while Spanish colonizing interests turned to other regions of the country.

From the seventeenth century to present times this mixed Indian population became known under the generic name of Aruacos; in present-day ethnographic literature three tribes are distinguished: the Kogi, living mainly on the northern slopes of the Palomino, San Miguel, and San Francisco valleys; the Ika of the southern slopes; and the Sanha of the eastern slopes. The Kogi claim to be the direct descendants of the ancient Tairona, a belief that is supported by considerable evidence;^{6,7} at present they are the least acculturated tribe.

Kogi Agricultural Systems

Kogi villages, consisting of up to one hundred circular straw-thatched, single-family houses, are not permanently inhabited but are social and ritual centres where people gather only at certain times of the year; people spend most of the time on their scattered homesteads spread over the mountain flanks at different altitudes. An individual family may own up to five or more houses, each one located in a small one-half to one hectare field clinging to a steep slope or nestling in a narrow valley bottom. Each family will also own a house in the next village but this will be used only on rare occasions. Because of fluctuating rainfall patterns the carrying capacity of each field, or of a cluster of neighbouring fields, varies from one year to another and from one region to another; moreover, certain crops thrive in a slightly warmer or cooler environ-

ment, and for these reasons Kogi families frequently move from one field to another, spending at each plot the time necessary for harvesting, weeding, and otherwise attending to the crops. The entire population is actively engaged in agricultural pursuits and this transhumance pattern is the main characteristic of Kogi subsistence.

Much of Kogi territory bears the lasting marks of age-old previous human occupations. Centuries of burnings have produced a landscape of barren mountains covered with coarse grass and fire-blackened boulders. The treeless slopes are badly eroded and only along the creeks and rivers do some stands of trees survive; at some spots primary or secondary forest is present. Although some Kogi fields are found on the limited valley floors and on small alluvial terraces some 20 or 30 m above the river bed, most are located on slopes where they occupy at most 2 ha of mixed crops. Kogi agriculture is based on the following crops: at about 1,000 m, which is approximately the lower limit of the habitat, there are plantains, bananas, sweet manioc, some maize, squash, sapote, pineapple, together with coffee and sugar-cane as cash crops. At about 1,500 m beans are added to this complex but fewer fruit trees are present; above 1,500m some maize, beans, arracacha, and sweet potatoes are grown while higher up potatoes and onions are planted.

The standard procedure consists in clearing a field in December and January and in firing it by late February or early March. But there is no definite harvest season; harvesting is a year-round activity because of the variety of crops planted and because of variations in soil quality, and diversity in the altitudes of fields. Under these conditions it would be misleading to say that the Kogi practise shifting cultivation. In fact, they do not "shift"; a field may be cultivated for some five years and then left to fallow for ten years, but it is never completely abandoned during this period; even after the soil is fairly exhausted there will always be some food plants, such as curcubits, peppers, beans, or a fruit tree, left in some corner. Since a family's fields are in different stages of production, there are no clear-cut harvesting or fallowing seasons. Plantain gardens and sugar-cane fields have been observed under production with hardly any change in over thirty years. A comparison between cropping and fallowing frequencies is therefore useless; some fields are practically perennial. This type of escalated cultivation on mountain flanks differs from true shifting cultivation in a flat rain-forest environment in that it provides more spatial and temporal crop variety, an interlinking of growth cycles, and has less dependence on rainfall, since it is likely that even during an unexpected drought some rain will fall at some spot in the mountains. The effective variety of Kogi crops varies throughout the year and must always be supplemented from other levels and environments, but the overall system is that of a very stable subsistence agriculture.

In order to put this agricultural system into perspective, one must look back in time. In many parts of the present Kogi habitat one can see extensive archaeological terraces the structural details of which

are very similar to those of the ancient Tairona territory in the Santa Marta region. These linear sloping terraces are built of rows of boulders and rocks of varying sizes which not only collect eroded top soil, but also collect runoff water behind the embankments; this water is then drained off by a slight lateral sloping of the embankment. Occasionally the prehistoric Indians dug long narrow drainage channels obliquely across a slope. A contoured pattern of terraces can be observed at some points on hillsides varying in slope from a few degrees to 45° and more; but in the other regions the pattern formed by the stone rows is rather one of imbrication, of an all-over crescentic pattern of semi-circular terraces. Associated traits are small stone platforms and dressed slabs or markers set upright in the ground. These traces of former terracing activity indicate that the Tairona or other ancient tribes were quite aware of the necessity to minimize soil erosion and provide drainage. And so are the present-day Kogi; they know the benefits of soil conservation and irrigation, but use them only in a limited way. Field debris (rocks, small pebbles, branches, old tree trunks) are sometimes located at points where they might serve as small soil traps, and minor garden plots are sometimes irrigated, or narrow drainage channels are dug obliquely on a slope; but intensive irrigation is lacking although the necessary technological knowledge is plainly present.

Archaeological Terraces

It is striking that the archaeological terraces, so prominent on the barren slopes of the Kogi habitat, are not integrated with the present agricultural work organisation, nor with the prevailing settlement pattern. In the prehistoric past, when they accompanied large nucleated settlements, they probably constituted artificial ecosystems, but at present they are hardly in use. They contain good soils but sometimes are distant from settlements; and then the Kogi shy away from them because, in a sense, the terraces are sacred spots that belong to the ancestors. In sum, while the Tairona reworked the natural environment and thereby increased its yield, the Kogi maintain their natural environment by planting their scattered fields and gardens with a mixture of subsistence crops.

Current Food Production

Random finds of archaeological grinding stones suggest that the relic terraces had been used for maize cultivation, as was stated by the early Spanish chroniclers. At present, however, maize, although still surrounded by many ritual observances, is of little importance as a dietary item. The staple food of the Kogi throughout the year consists of cooking plantains, a fruit which can be harvested almost perennially; it is also clear that the important subsistence items are plants most of which are of post Colombian origin, such as plantains, bananas, yams, potatoes (post Conquest in the Sierra Nevada), pigeon peas, sugar-cane, mango and others. Autochthonous American plants such as maize, manioc, sweet

potatoes, and beans, although distinguished by the Kogi as "belonging," are of less importance. This indicates that, to a large degree, the Kogi have had to reorientate their agricultural production and with it many other aspects of their traditional life-style, such as their settlement patterns. According to the Indians, maize cultivation is not profitable in their present environment and their preference is for starchy foods such as plantains, tubers, and squash, with tree crops being of considerable importance. The use of animal resources is limited both by environmental factors and by cultural mechanisms, for most animal proteins are thought to be dangerous to health and unclean in ritual contexts. Game is very scarce and there is little garden hunting. River crabs and beetles are occasionally consumed. Oxen, acquired in the lowlands, are used exclusively as animals of burden and to operate the primitive sugar mills; chicken is an emergency food. It should be mentioned here that the Kogi and their neighbours are avid consumers of coca, the toasted leaves of which they chew with the addition of lime obtained from burning marine shells.

The change in subsistence patterns, from intensive irrigation agriculture to mixed starchy crops, from seashore and tropical resources to subtropical and highland products, was made possible mainly by the adoption of cash crops, oxen, and subsequent trade relationships with neighbouring creole peasants. Agricultural practices not only regressed in technical complexity but became completely reoriented when foreign crops were adopted. By colonial times the Kogi had adopted sugar-cane, potatoes, onions, and more recently, coffee, to exchange or sell in the lowlands. Trade relations have been going on for centuries. Dietary supplements obtained at present in this manner are dried fish and salt, but most of the proceeds of this trade are spent on bush-knives, axes, cast-iron vessels, needles and similar items. The Kogi weave their own cotton cloth and steadfastly refuse all other manufactured goods. There is no market system, and even among families hardly any exchange is carried out.

This reorientation has developed over the last three centuries and its success must be measured by the biological and cultural survival of thousands of Indians who, although exposed to strong acculturational pressures, have been able to retain their cultural autonomy. Present-day agricultural practices, therefore, are not a carry over from the Tairona but differ significantly from those of the prehistoric and early historic tribes. The period of disintegration of Tairona communal life was thus overcome by adaptive mechanisms of great efficiency.

Mechanisms of Cultural Change

Two main aspects must be taken into account here: first, the prevailing agro-ecosystem must be analysed in detail and second, the intellectual premises formulated by the Kogi leadership, which initially made this ecological adaptation possible, must be described.

The overall gradient of the Sierra Nevada is not steep, except where it approaches the snow-covered peaks, but the radiating rivers form V-shaped valleys

with steep slopes on which an entire range of life-zones can be observed. A single valley or mountain flank may offer a range of different climatic belts spanning hundreds and even several thousand metres of altitude, and in deep valleys insolation may be severely limited. But the lower one descends, the wider become the valleys, and their slopes are less steeply inclined. The lowlands, however, are avoided and no Kogi settlements are found in the tropical thorn woodlands of xerophytic vegetation which is characteristic of the base of the Sierra Nevada. The principal valleys of the Kogi habitat have two or more nucleated villages located at different altitudes and thus they provide convenient stopping places for people moving between fields. Most valleys are about 30 km long and an entire valley, from the coast up to the paramo can be walked in three days. Since altitudinal belts are often very compressed, a large number of different resources are available within a day's walking distance from any village. To walk up or down a valley is easy enough because of the gentle gradient, but to cross from one valley—however small—to another, requires a major effort because of the very steep slopes and rocky trails. There is no seasonal migration but people move according to their needs which might vary from one family to another according to the location of their fields and kinds of crops they contain. People continuously move up and down the rivers and cross from one valley to the next in a pattern which is sometimes described by them as an almost sacred network, a huge textile in which warp and woof come to symbolize life.⁸ To see entire families walking through wind and rain over steep mountain trails, carrying heavy loads of field fruits, small children, raw sugar cakes, and firewood, may easily create in the observer an image of abject poverty and call to mind the plight of an impoverished people trying to wrest a living from a degraded environment. This image, however, is erroneous; neither do the Indians think of their part-time nomadism as a heavy task, nor are the resources of the environment as scarce as might appear to the outsider. In reality, what one is witnessing here are the normal workings of a system of effective adaptation developed over long time periods and maintained by precise rules and prescriptions.

Under the distinctive ecological circumstances here described, the Kogi have made their choice from these resource environments and each settlement has worked out its own particular mode of adaptation. In exploiting a series of horizontally and vertically different microenvironments the Kogi have achieved a workable balance. In the course of centuries of being forced higher and higher into the mountains by encroaching settlers, the Indians' ecological awareness has been sharpened to a point where a precise knowledge of soil characteristics, temperature, plant cover, rainfall, drainage, slope exposure, and winds has begun to form a coherent body of procedures and expectancies. In their sloping fields the Kogi will plant a variety of species but a relatively small number of individuals, thus creating a generalized ecosystem, but on terraced or level ground near villages or on valley floors, they will do the contrary and create a

specialized system by planting a small number of species, such as plantains, pigeon peas, sugar-cane, or cocoa. To sum up, the Kogi practise a sustained yield, non-expanding economy within the carrying capacity of their environment.⁹ Fluctuations in annual productivity, resulting from prolonged dry seasons for example, are not disastrous because of this resource variety; there is always some spot where food can be found. It should be pointed out here that, in their daily food procurement, the Kogi do not attempt to produce a surplus; there is no storage of food beyond a few days and only some sun-dried plantains may be kept for emergency use.

When discussing their semi-nomadic migrations and the problem of available land resources most Indians will say that there is no real shortage of land; they will point out areas of primary and secondary forest, fallowed land, or even some unused level terrain in a valley bottom, all available for agricultural purposes. In fact, potential cultivable land is not as scarce as it would appear at first sight; by having a large number of fields at different stages of production and in different ecological niches, the Kogi have been able to accumulate certain reserves of agriculturally usable lands. One must also recognize that, by not living in nucleated settlements, the Kogi preserve the lands adjacent to the villages from degradation and, at the same time, guarantee crop protection.

As seen from the outside one might suggest that the Indians could well live permanently in their villages and exploit a limited range of neighbouring lands; their agricultural tradition and technological knowledge of water control engineering would make this possible. But no Kogi would ever accept this alternative; their life-style is to occupy their scattered homesteads, to roam over the mountain flanks, and only occasionally to gather in a village or a small ceremonial centre to celebrate some periodic rituals. The urban tradition of the Tairona (if there ever was one) has disappeared among their modern descendants. It seems, then, that the reasons for their present, diffused agricultural pattern must be sought in another dimension of tribal tradition.

Kogi Leadership and Ecological Adaptation

The Kogi live in a complex, ranked society in which priestly and lordly lineages continue to play a major role. However, none of these lineages, membership in which is determined by the principle of parallel descent, are privileged in any way by landholdings, better housing, or other physical advantage. Even the highest-ranking Kogi shares in the subsistence level, wears the same threadbare clothes, and lives in the same small hut as his lower-ranking compatriot. The difference consists in traditional power, in authority, and in the ability to establish rules of correct procedure. Although most Kogi villages have a headman who nominally represents civil authority, the true power of decision in personal and community affairs is concentrated in the hands of the native priesthood. These men, many of whom possess a profound knowledge of astronomy, meteorology, and ecology¹⁰ base their authority, in part, on their continuous

intelligent leadership, in part on strong religious principles. Perhaps the most important religious mechanism is confession. Public confession of misbehaviour and offences—in action or intent—constitutes a periodic ritual and the truthfulness of the confessants is guaranteed by priestly threats of illness and impending death. Kogi priests believe that between man and nature exists an equilibrium which might easily be disturbed by irresponsible human action. Although this equilibrium refers not only to subsistence resources, water management, and forest conservation, but also to a spiritual and moral balance of the individual, nevertheless, agricultural rituals occupy a very prominent place in Kogi religion. The repetitive sequence of the major collective rituals is timed according to astronomically-determined seasons; that is, the ritual calendar corresponds to the agricultural cycle. Individual agricultural practices are subject to many ritual rules. It is believed that all native food plants have their other-worldly “fathers” and “mothers” and that crop fertility has to be insured by frequent offerings to these spirit-beings. Soil types (humus, clay, sand, and so on) are ritually named, as are categories of rain, winds, lagoons, and the different cardinal directions with which they are associated. The planting or harvesting of any crop needs a specific “permit” (*sewa*) which only a priest can give and similar permits are required to fell a tree, fire a field, or dig a drainage ditch. These permits consist of small stone beads or other talisman-like objects and their acquisition may be costly, protracted, or may be withheld altogether. The possession of these *sewa* depends, in part, upon the user's lineage, and in part, upon priestly approval; each member of a lineage is the “owner” of certain *sewa* while the principal priestly lineages are associated with fertility symbols such as water, rain, lagoons, rock crystals, semen, or similar concepts.

Kogi priests and, indeed, most adult men are aware of the relationship between population size and carrying capacity, and are greatly concerned about undesirable population pressure. Kogi society is sexually very repressed; sex is sinful and women are said to constitute a dangerous element in society, bent upon disturbing its precarious balance. Large families are criticized and complex birth control calendars are in use. A moral tenet which is repeated over and over by priests and elders states that people should not multiply like ants, but that their model should be a squash plant which produces only here and there a single clearly traceable fruit. The ant-hill/squash antithesis not only emphasizes the necessity for population control, but also tries to keep the population from disorderly dispersal and attempts to orient it towards the maintenance of interdependent social and economic units. This native statement on a basic ecological principle is only one example of the prevalent Kogi world view. Kogi religion and philosophy are extremely severe and demanding, being based upon a harsh discipline of frugality, continence, obedience to a moral code, and meditation upon ultimate realities.

The principal cultural mechanism for any economic,

social, or religious activity is priestly divination. Divinatory techniques are many and consist of simple yes-or-no alternatives, but often take the form of complex interpretations of signs and symbols, such as the reading of cloud formations, animal voices, or the shape and number of air bubbles rising from a tubular necklace bead which has been submerged in water. Other mechanisms are muscle twitching, deep meditation, and the listening to sudden sounds or voices from within. Divination is practised mainly to ascertain whether or not a certain action is feasible. The decision may concern the planting of a crop, the clearing of a field, or any aspect of a wide range of major or minor alternatives of resource management, housing, family affairs, travel, trade, or other activities. People must continually consult these priestly oracles in order to have their actions guided by divination; should they disregard these rules, symptoms of illness will soon come to express the displeasure of the divine forces and the priests will impose penalties which, occasionally, can be very harsh. Priestly divination undoubtedly introduces a random element¹¹ but much of it appears to be manipulated and the final decision most often represents a personal choice made by the priest. This is almost always the case in matters of mate selection; in agricultural and general subsistence decision making, divination is an effective device in ecological planning because the priest's practical environmental knowledge is truly outstanding. Priestly divinations provide guidance not only for small-scale decisions in daily life but may determine major strategies such as the foundation or relocation of settlements, the intensification of a certain crop, or the nature of trade relationships with neighbouring creole settlers. The effectiveness of this, to a large degree, ritually controlled agroecosystem¹² is recognised by most Kogi Indians. In fact, the underlying reason why Kogi culture has been able to resist harmful change, is that it gives a strong backing to priestly authority.

In all these planning activities Kogi priests are concerned with two aims: to keep population density below the carrying capacity limit of the fields and their associated technology; and to maintain areas of undegraded environment which might constitute reserves in times of need. A case in point are the relic terraces and other archaeological sites which are tabooed for all immediate purposes, but whose untapped resources can be exploited at any given time if need be; a priest might simply "divine" that a certain extension can be used for cultivation. In most cases observed, permission was granted to plant single crops of high-protein yielding plants such as pigeon peas; on other occasions, when a local food shortage was arising, the usually restricted consumption of a tree fruit (*Metteniusa edulis*) with high protein content was relaxed and its use widely recommended. All kinds of ritual food restrictions, which are very common among the Kogi, may thus be removed when the priests see fit to do so after due divination.

This kind of resource control provides power; it determines the elite which administers the many "permits," but what in other societies would be

grossly exploited, among the Kogi is being handled with great social responsibility. Kogi priests will never put themselves outside this chain and will always form part of it. They obtain no material benefit whatsoever and have no special resource rights; on the contrary, by their living conditions they always exemplify the austere ideals of Kogi life. It is true that the priests command the support of their followers by threatening them with illness, but at the same time they alleviate stress and provide experienced leadership.

The agricultural system by which the Kogi tend to occupy somewhat more land than is actually necessary for subsistence, has its beginnings in several traditional aspects of Kogi culture. On the one hand, from historical experience the Indians know that any forced movement farther into the mountains would seriously reduce the choice of resources; indeed, there is a critical ecological threshold at about 2,000 m, a level beyond which they would be deprived of their staple food of plantains. The upper limit of plantain cultivation constitutes an effective check to expansion into the high-altitude areas. The possession of a large number of fields in the temperate belt, many of them almost inaccessible to the creoles, thus constitutes a reserve in times of future encroachments. On the other hand, the widely scattered field system is a means by which tribal territorial rights are being upheld. The Kogi have not forgotten the past when their Tairona ancestors dominated these regions and at present, by thinly spreading their settlements and fields over the mountain flanks, they continue to lay claim to these traditional lands. The entire headwater region of the San Miguel River above about 800 m is considered to be a sacred legacy from the ancients and the innumerable fields, houses, trails, stone markers, or ritually named landmarks express symbolic property rights to these lands. In any event, the Kogi declare they would never migrate to the lowlands and become wage labourers; their tendency would always be one of retreat into the highland regions, even if such a movement would severely reduce their present ecological diversity.

Tradition versus Exterior Forces

The situation described above does not present any truly pressing problems as long as conditions continue to evolve at the slow pace of past developments, and as long as the Sierra Nevada remains an island whose inhabitants can retain their tribal identities. But this is a hypothetical situation. The fact is that the period of isolation is coming to an end; the Sierra Nevada has ceased to be an out-of-the way mountain retreat and it is necessary to evaluate its physical resources and human problems in the context of international developments. The real problems of change and adaptation, if not of physical survival, are threatening from the outside. A realistic assessment of the present situation (1981) of the Sierra Nevada de Santa Marta and its Indian population must take into account a number of stark facts which become evident as soon as one places this small area of the world into its evolving national and international context. In the first place, a broad climate belt, located mainly on the northern

flanks where it partly overlaps with the lower limits of Indian territory, is occupied by widespread illegal marihuana crops which form part of the international narcotics trade. Although governmental controls are active, the trade is spreading and its inevitable consequences of violence and corruption are beginning to be strongly felt in the tribal territories. In the second place, owing to its particular geographical position and its favourable climatic conditions, the Sierra Nevada is of potential strategic value, especially as a base for modern communication systems. A third aspect is this: not only the Sierra Nevada but also other isolated mountainous regions are potential strongholds of political insurgence. The Northern Andes constitute a natural link between the Andean core lands and the Caribbean sphere and, in the future, political and military action may be expected to affect some regions presently inhabited by aboriginal groups or subsistence farmers. Another, even more striking, fact is that directly at the base of the Sierra Nevada, between the massif and the Venezuelan border, one of the hemisphere's largest coal deposits at El Cerrejón has been discovered and large-scale strip mining will begin in the near future. There is no need to elaborate on the eventual impact of all these developments upon the Sierra Nevada. Modernization, with the worst effects of cultural decline, wage labour, debt bondage, alcoholism, disease, and violence will take its toll and, since there exist no refuge areas for the native peoples, they are likely to be left at the mercy of modern industrialization and all its consequences. There is but little consolation in the fact that the spectacular beauty of the mountain landscape will eventually lead to the development of the international tourist trade, another prospect of doubtful benefit for the local scene. In any event, the Sierra Nevada is already well on the way to becoming connected with the world market, whatever its promises and demands.

It would be unrealistic to ignore these facts and to propose instead the usual local agricultural programmes, health services, and the like. Territorial encroachment, marijuana, violence, and large-scale industrialization are not mere problems of acculturation but are bound to have destructive aspects which, in the case of the Sierra Nevada, are likely to lead to serious problems. There can be no easy solutions; future directions must be based upon a clear awareness of the increasing threats and must attempt to prepare the native peoples for a time of far-reaching, accelerated change.

Conclusion

Two aspects deserve immediate attention: one concerns scientific interest in Kogi adaptive strategies; the particular agro-ecosystem should be studied in detail, preferably in one of the larger valleys such as that of the San Miguel River. The study should attempt to provide a coherent picture of land tenure and land use in different ecological niches, crop diversity, and seasonal variations. Soil analyses and meteorological data should be obtained and case studies of the semi-nomadic pattern of individual

families should be made. The nutritional and general health status of the Indians should be assessed and demographic data should be analysed. This body of qualitative and quantitative information should be related to Kogi social organization, power structure, and their overall religious and philosophical world view. The value of such a study would lie in its analysis of a native strategy of zero-growth development, and in its comparability with other, similar adaptive strategies elsewhere in the Northern Andes. The other aspect that deserves priority treatment refers to the urgent need for establishing a biosphere reserve, as envisaged by the Man and the Biosphere (MAB) Programme, where Kogi culture would be protected against destructive influences while long-term research could be carried on by teams of specialists in ecology, plant geography, hydrology, geomorphology, and many other disciplines. The physical characteristics of the Sierra Nevada provide ideal laboratory conditions for this kind of research.

In conclusion, the Sierra Nevada de Santa Marta is not an isolated case; many other regions of the Northern Andes present similar patterns of ecological adaptation and find themselves exposed to similar impending changes. It is evident that development of proper resource management practices to anticipate and diminish the impacts of the oncoming changes remains a major problem; the biggest challenge will lie in providing the institutional mechanisms which will protect small traditional societies from disruptive changes imposed from the outside. In this respect, the resilience of their age-old ecological awareness may contain important lessons. It is essential, then, that specialists in all spheres of planning, training, and research be made equally conscious of the cultural complexities of the material conditions for survival.

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BELGIUM—FEDERALISATION OR BREAKDOWN

Marc Dubrulle

According to the Declaration of Belgium's latest government, Martens II, the country has decided to follow the paths of federalism and regionalism: at least on paper. In fact, this government may well be the last of the Belgian nation. But will the present devolution lead towards a true federation of real regions? The danger, more than ever, is that Belgium will split in two national states, a Flemish and a Walloon one, the status of Brussels itself being the object of long disputes.

The leading traditional political parties in Belgium consider regionalism and federalism in a rather different way than do the ecologists and integral federalists. Many a 'federalist' in Belgium, be he a Fleming or a Walloon, is none other than a nationalist. Few politicians, if any, feel that right now is an unique opportunity to reshape the Belgian nation, artificially created by the will of the Allies after Waterloo, into a dynamic federation of five or more viable, autonomous regions. Obviously there are enormous interests at stake—political, financial, cultural and economic—which blindfold the decision-makers of the country and a large part of the population as well.

Also, the regional feeling of many citizens coincides with a nationalistic feeling, especially on the Flemish side. More and more politicians voice the opinion that Flanders and Wallonia should become separate entities, indeed two separate national states.

On the other hand, the vast majority of the population is fed up with what is called 'community affairs'. Many feel that these affairs somehow hide the central government's incapacity to cope with more fundamental problems such as inflation, unemployment economic recession, the collapse of social security, environmental problems and the energy crisis. Besides many people still see themselves as Belgians and do not want a complete divorce, even if they accept a growing identification with their own region.

The present situation of Belgium is most complex, hardly understandable to a foreigner. There are four linguistic regions: Flanders, Wallonia, the German-speaking Ostkantone and the bilingual Brussels; three official languages: Flemish,* French and German, two cultures: the Flemish and the French culture, and three economic regions: Flanders, Wallonia and Brussels.

One of the reasons for the present disastrous political climate in Belgium's regional policy is that no region has been defined on a firm, objective and larger basis than the linguistic basis. The ethnic factor is dominating. Other criteria, such as history, geography, ecology and sub-regional economic links, are hardly taken into account. The need for smaller communities to be involved in the decision-making is completely left out.

The identification of the regions is a risky enterprise, but at least some hints can be given as to the principles and facts which should lead towards their definition.

Political Handicaps

The 'federalism' of Belgium is both a state of mind and a consequence of fact—with two partners—based on the ethnic and cultural difference between French-speaking Walloons and Flemish-speaking Flemings.

* Officially Flemish is not a language. It is called 'Nederlands', which means Dutch. Basically they are the same. The difference between Flemish and Dutch is the same as for example the difference between English and American.

This sort of federalism is unique in the world and one that will never work. Indeed a federal Belgian state based on a Flemish and Walloon nation (with or without a special status for the bilingual capital and for the German-speaking Ostkantone) would very soon lead towards complete separation.

If the language were the determining factor, there would be no reason to change the Kingdom of Belgium into a federal state or confederation of a Flemish and Walloon state, since, according to the language criterion, the Flemings could join the Kingdom of the Netherlands and the Walloons the Republic of France.

Moreover according to such a criterion German-speaking Belgians should be annexed by the Federal Republic of Germany. Brussels, being already the headquarters of so many European institutions and corporations could become a European district.

But for many historical and psychological reasons the Belgians will never accept this sort of redistribution of their country. After all, and in spite of their quarrels, they have a common past of several centuries.

In any event the Belgian problem is not a simple linguistic opposition between French- and Flemish-speaking people.

Presently Flanders is a strong and united nation, dominated by the C.V.P.* Wallonia is still divided and has not yet completely found its identity, in spite of its remarkable evolution in the past few years,

mainly through the efforts of the federalist/separatist 'Rassemblement Wallon'. The leading political force however is the P.S.*

In between, there is Brussels, a district of nineteen boroughs, two cultures, two languages (although 80 per cent of the locals are French-speaking and 30 per cent are immigrants), the capital of Belgium, yet more and more the headquarters of international and European organizations.

If the Flemings identify themselves with their region more easily than the Walloons do, it is largely because they have put up a longer struggle for their rights. The history of the Flemish movement is the history of a social movement.

For ages Flemish was considered an inferior language, spoken only by servants and workers. Until the 1930s education was mostly given in French. The long struggle for the recognition of Flemish as an official national language which continued throughout the 19th century, shaped the national feeling of the Flemings.

The Walloons felt more at ease in the Belgian state during the first century of Belgium's history (1830-1930). Though there are many Walloon dialects, the common language was French. The Walloons took part in the prestige of the French culture.

Their economy was flourishing: coal and steel made them prosperous. Yet, there never was a strong national feeling. The Belgian Walloon is in the first place a Liegeois, Namurois, Ardennais, Gaumois.

It is tempting to consider the Flemings, by nature, culture and language, as belonging to the German ethnical group and the Walloons as Latins. In fact there has been so much criss-crossing that it is dangerous to draw such a line.

During the first centuries A.D., the North of Belgium spoke German dialects with little Latin influence, while the South had an idiom of Celtic and vernacular Latin.

In the middle-ages North and South were divided in several

countries, duchies and bishoprics (see map 1), which were united for the first time in the Burgundian lands (see map 2).

Brussels

Although a Flemish town, Brussels has undergone a period of Frenchification which began during the 18th century and was accelerated under French rule from 1794 to 1814.

The 'Belgian' revolution in 1830 was exclusively organized by the Brussels bourgeoisie and by the French-speaking upper class of the rest of the country.

The economic crisis of the 1840's left Flanders further behind while Brussels itself gradually became divorced from the majority of the Flemish population. Nowadays Flemings see in Brussels, which is supposed to be the meeting place of two equivalent cultures, a hostile prejudiced circle which draws off many valuable elements from Flemish society by providing them with jobs in which they tend to speak French and to educate their children in French-speaking schools. They also accuse Brussels of trying to nibble off bigger and bigger slices of Flemish territory.

By the fixing of the language frontier by law in 1962, the Brussels district was declared bilingual, which means that all its administration should be carried on by equal numbers of French and Flemish

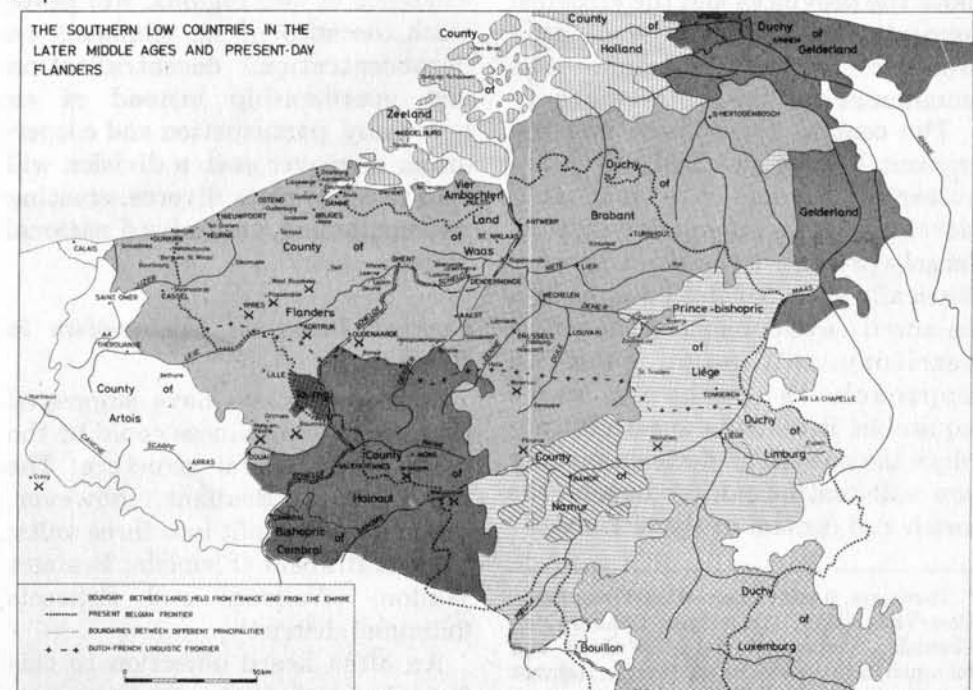
speaking officials. Each of the nineteen boroughs has its own burgomaster and council. Together they form the Brussels 'agglomeration'.

With the tendency to live out of town, many inhabitants of Brussels moved to the Flemish suburbia and countryside. The French-speaking among them often think of a 'Bigger Brussels' and demand special facilities, including French schools for their children and official administration in French, whereas they actually live inside Flanders.

Map 2



Map 1



* C.V.P.: Christelijke Volks Partij (Christian Democrats)

P.S.: Parti Socialiste (Socialist party)

No Fleming living in Wallonia—and they are considerable in number—would expect his dealings with local authorities to be carried out in his mother tongue.

Anyhow, dislike of Brussels is probably more vigorous in Flanders than dislike of Wallonia, which is seen as a different cultural community with equal rights. The Walloon minority which agitates for political union with France is not taken very seriously.

What Sort of Federalism?

The splitting of Belgium into two national states will not solve the Belgian problem since Brussels and a large part of Brabant will remain the object of endless disputes. The only alternative is a far-reaching devolution, based on more criteria than a solely linguistic one.

The first question, in order to define the regions, is: which criteria are to be taken into account? The second question is: will the population recognize itself in the smaller units within a linguistic community?

The existing provinces,* for instance, are much like the Austrian Lander, as far as their population and surface are concerned. Even the more numerous 'arrondissements' could be a sound basis for a federation since many of them are of the same size and importance as the Swiss cantons. The present government however wants to suppress both the provinces and the arrondissements, leaving no level of democratic control between the communes and the central state.

The central government and the present leading political forces are rather in favour of a functional devolution on economic grounds, as largely present in the E.E.C. policy. Basically such devolution aims at a balanced development of the entire territory; although such an approach is probably more equitable, it remains unsatisfactory since the power and decision-making are still centralized, far beyond the reach and control of the citizens.

On the other hand, regional entities, supported by ethnical, linguistic, cultural and historical motives are beginning to emerge. It is likely such an awakening will increase in the future, for example over the last few years, local dialects in songs and poetry have staged a revival.

Altogether Belgium is facing the same crisis as many a national state: too small to cope with certain aspects of the industrial society and, at the same time, too big for other aspects. The sovereign, centralised national states are the heirs of ideas and problems from before the technological age. Every day it becomes more obvious that such states fail in their ability to resolve today's problems and to meet the justified demands of the population.

In the ecological view each problem should be solved at the level where it appears. Thus the myth of the Belgian 'nation' should be revealed for what it is.

When the Belgians themselves, for the first time, declared their independence on the 11th January 1790, they formed of their own free will a *federal republic of the United Belgian States*. This structure, based on more than two or three regions, was more realistic than the artificial kingdom created by the allied forces after Napoleon's fall and dictated by Jacobine centralism.

The position held by the leading political parties, confirming the existence of two regions, will never work, because of its emphasis on deconcentration, decentralisation and guardianship instead of an autonomy, participation and cooperation; moreover such a division will lead to a complete divorce, creating two competing, centralised national states.

Current Ideas on Regionalism in Belgium

Some federalists have suggested that the nine provinces could be the basis for a federal structure. The province of Brabant, however, should then be split into three units: Vlaams-Brabant (Flemish), Brabant Wallon (Walloon) and Brussels (bilingual district).

An often heard objection to this formula is that the provinces are

artificial administrative frameworks conceived by the French and with little connection with the historical countries or with the present socio-economic regions.

Without doubt the reshaping of Belgium into a true federal state from the foundations, from the people up, will be a momentous task. It will require the theory, the ethics and the experiments of federalism, as well as an up-to-date efficiency and rational organization. Above all it will require political courage from citizens and political parties.

But both citizens and political forces need objective criteria in order to define the basic socio-economic regions of a new federal state. These criteria are:

- a sufficient geographic dimension to make the region economically and ecologically viable.
- the necessary human, capital and natural resources.
- financial means and political power.

Economic-plan Regions

The region differs fundamentally from the state by its openness and flexibility. It is difficult to confine it within rigid borders. In the classical schools of Hettner and De la Blache a region is seen as a landscape, a territory, which is geographically recognizable. But this definition is unsatisfactory. We have to start from a socio-economic approach.

Belgium made an attempt to divide the country into zones of economic development (bills on the regional expansion of 18 July 1959, 14 July 1966 and 30 December 1970).

The first bill divided Flanders into eight and Wallonia into seven developing areas. However none of these included regional urban centres of importance, so that they cannot be seen as fully viable regions in a federal state.

Another bill, of 15th July 1970, created regional economic councils and regional development departments (S.D.R.: Société de Développement Régional or G.O.M.: Gewestelijke Ontwikkelings Maatschappij). One S.D.R. was for Brussels, one for the whole of Wallonia and five GOMs for

* There are 9 provinces: West-Vlaanderen, Oost-Vlaanderen, Antwerpen Limburg (all Flemish), Brabant (Flemish, Walloon and bilingual in Brussels), Liège, Namur, Hainaut and Luxembourg (all Walloon).

Flanders, coinciding with the Flemish provinces.

The national Plan for 1976-1980 went further and divided the country into subregions. Flanders has twelve subregions, most of which could become viable entities in a federal state. This economic planning more or less sustains the proposal made by the political parties during the so-called 'Stuyvenberg' talks on devolution in 1978. An interesting feature of these proposals is that each sub-region has at least one regional centre or large urban centre. On the other hand, the authors stuck to existing administrative borders, which do not necessarily match the objective criteria for a region.

Five Regions: a Model for Federal Belgium?

One of the most interesting models for a federal Belgium is proposed by Professor Jacques Toint of the University of Louvain.

According to him, the present so-called 'federalism' in Belgium is a disaster because of the confusion between the notion of region and that of ethnical community.

If, in any event, the region has to be a coherent entity based on many kinds of human connections and interactions, it will have a tendency to look for cultural or linguistic unity. But we can see, in France for instance, that this coherence is not always possible: if the cultural groups are too small in size they cannot form a region in the full meaning of the word.

Indeed any area penetrated by two or more communities creates an insoluble problem if one confuses the region with ethnic communities. This is what happened in Brussels, which although a regional metropole, lost that role because of its bilingual character.

On the other hand, the urban network of the country leads to regions quite different from those suggested by the political parties for solving the problems of the cultural communities. Brussels is a true regional metropole and, though its area should not be extended beyond the nineteen communes, it would be absurd to deny that certain parts of Flemish and Walloon territory

should be served by Brussels. With a population of one million inhabitants and its function as European capital, Brussels offers a wide range of services and exerts a strong attraction on one third of Belgium's territory.

To avoid Brussels dominating exclusively, other metropolises should be reinforced in order to build up other viable and balanced regions. Five towns have the capacity to be the metropole of a region: Brussels, Antwerp, Liège, Ghent and the axis Mons-Charleroi.

Jacques Toint suggests five regions. The region of Ghent, or actual Flanders, would cover both provinces of West and East-Flanders, except for the 'Land van Waas' with the town of St. Niklaas, which is more oriented towards Antwerp. This region is exclusively Flemish-speaking, except for the mostly French-speaking area of Komen-Comines. The area of the town of Ronse-Renaix should become part of the Hainaut province since it has more links with the Tournai county than with Flanders, of which it is geographically separated by a row of hills.

The town of Aalst should be included in Flanders, since it undoubtedly is part of the 'Denderstreek' with Dendermonde, Denderleeuw, Ninove and Geraardsbergen. With some 2,500,000 inhabitants and 5,939 km² Flanders could well be a viable region in a federal Belgian state.

The region of Antwerp would contain the rest of the Flemish-speaking part of Belgium, except for the immediate surroundings of Brussels. Mechelen and Leuven, although close to the capital, become relatively powerful and autonomous poles of sub-regions. The present province of Limburg forms another sub-region around Hasselt, well linked to Antwerp by the Albert canal and the motorway. This region would contain 2,750,000 inhabitants on 6,834 km².

Liège is a third possible region, including the existing provinces of Liège and Luxemburg. The province of Namur, a sub-region, has excellent relations with Brussels, but nevertheless should be integrated in the Liège region for geographical

and historical reasons: both towns are linked by the Meuse and are a gateway to the Ardennes. The south-east of Belgium could become a very viable region, which some already call 'la Mosanie'. The city of Liège is the metropole of this region of some 1,550,000 inhabitants on 11,125 km². Within this region the area of Eupen and St. Vith would form a German-speaking sub-region. A delicate problem will be the 'Fourons', where there have been serious riots between Flemings and Walloons. The area should become part of Liège, with respect and facilities for the Flemish minority.

The second Walloon region would be the Hainaut, more or less coinciding with the existing province and built around the axis Tournai-Mons-Charleroi. This is a region of 5,104 km² with a population of 1,500,000.

These four proposed regions are remarkably well-balanced geographically and demographically, and all capable of great autonomy.

The problem is the region of Brussels. On one hand no extension of the present nineteen communes can be considered, but on the other a solution has to be found for the Flemish surroundings (Vlaams-Brabant) with important centres such as Halle, Vilvoorde, Tervuren, Overijse, where large French-speaking minorities live.

Whether they like it or not, French speaking people and Flemings will have to learn to live together peacefully in the central region of Brabant, as will the million immigrants in Belgium.

Economically and geographically it is impossible to split the territory of Brussels and its surroundings (1,505 km²). With a population of 1,615,000 it could become the fifth region of a new Belgium.

Sub-regions

The Brussels region has no sub-regional attraction-poles of importance. Part of it (the nineteen communes) will have to be bilingual, other parts, either French or Flemish, unilingual.

Flanders counts several important, well equipped towns, centres of sub-regions: Brugge, Oostende, Kortrijk, Aalst (all have more than 50,000 inhabitants).

Sub-regions in Antwerp are: St. Niklaas, Mechelen, Leuven, Turnhout and Hasselt. In the Liège region: Verviers, Namur, Libramont and, to a lesser extent, Arlon. The Hainaut counts three sub-regions around the cities of Tournai, Mons and Charleroi.

Professor Toint proposes that Belgium should be re-shaped within the existing frontiers. If for tomorrow we seek a federal Europe of regions, other models will be necessary for Belgium: the south of Flanders and Hainaut could indeed belong as well to the North of France (Lille-Roubaix) which used to be part of Flanders, while the North of the Meuse lies in the attraction-pole of Aachen-Maastricht. And what about Zeeuws-Vlaanderen, a Dutch territory in Flanders, separated from Holland by the Schelde estuary?

Nevertheless it will be a long fight for a Europe and a Belgium of regions, where a more sophisticated kind of democracy will bring stability, peace and prosperity to the people. The first and most difficult step in Belgium is to fight rising nationalism in Flanders and in Wallonia and the racism in the Brussels area.

Some time ago the leading Flemish weekly *Knack*, four young professors of law warn against that danger and propose a more balanced regionalisation of Belgium, as suggested in this article.

Of all political forces however, only the ecology parties of Flanders, AGALEV, and of Wallonia and Brussels, ECOLO, have clearly stated that the only way to avoid nationalism, totalitarianism and centralism is the creation of more

than two or three regions starting from scratch.

For the ecologists the first level of political decision-making is the borough, village or commune. The second level is a federation of communes, then cantons, districts, departments or provinces. The latter should be large enough to be economically and ecologically viable and small enough to allow forms of direct, self-evident democracy.

For many Belgians, fed up with the tensions between the two cultural communities and with the centralism of Brussels, such democratic schemes of regionalisation have enormous appeal. Future elections may indicate support from a large number of voters and reinforce the position of the greens into national parliament and provincial councils.

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APPROPRIATE TECHNOLOGY: REALLY APPROPRIATE OR JUST A MISFIT?

Nigel Pollard

The naturalism that forms an inherent part of the religious cultures of many Third World countries has been largely overlooked by those seeking to get appropriate technology implemented. A perusal of the appropriate technology literature reveals little emphasis, or even acknowledgement that religious tradition can be important in the acceptance, and use of, technology.¹

The Vedic traditions of India are a well documented example of the association between religion and use of technology. Moreover such traditions remain the basis of life for many today, and their influence may include both a religious injunction at the phenomenal level, thus providing an explicit relationship between man and his environment, as well as a feeling for the numinous, which gives rise to an implicit ecological relationship.

Hindu Mythology

In the *Bhagavad Gita*, one of India's most important religious treatises, phenomena which are easily perceived as being true, are often linked, or said to be caused by supernatural beings, the verification of which cannot be ascertained. For example, Krishna, the main speaker of the *Gita*, is explaining to Arjuna the importance of performing prescribed duties in order to maintain the essence of culture.

All living bodies subsist on food grains, food grains are produced from rains, rains come from the performance of sacrifice, and sacrifice is born of prescribed duties.

Demi-gods pleased by sacrifice, will also please you, thus nourishing one another, there will reign general prosperity for all. In charge of the various necessities of life, the demi-gods, being satisfied by the performance of sacrifice, supply all needs to man. But he who enjoys these gifts without offering them to the demi-gods in return, is certainly a thief.²

There is no reason to believe that the majority of rural Indians living in areas where the *Gita* is widely heard consider such an assertion allegorical or equivocal. It is simply a factual statement of how the culture operates, as a prelude to later discussions within the *Gita*. Anthropological studies record that sacrifices for rain, and other material arrangements, form an integral part of life in the Indian villages.³

The word 'myth' is derived from the Greek word *mythos*, which literally means 'story'⁴; and will be used

in this context, with no negative value judgements attached. One of the most popular stories in Hindu mythology concerns the lifting of Govardhana Hill. Krishna as a young village boy sees the villagers preparing a sacrifice for the controller of storms; somehow or other he manages to persuade them to dedicate the sacrifice to himself instead. Indra the insulted demi-god retaliates by unleashing a massive storm, but the villagers are saved from the rains as Krishna lifts Govardhana Hill with one finger to serve as an umbrella. Govardhana Hill today is a place of pilgrimage and lies about 90 miles south of Delhi. Myths such as those are acted out at village festivals⁵, and will often be invoked by politicians in support of an argument.⁶ The purport of the myths is not unique to the Hindus. Its equivalent—the spiritual traditionalist paradigm—can be found in most tribal societies, and also in the Bible.⁷

The ritual associated with such Hindu myths is that of offering ghee (clarified butter) into a sacrificial fire. More importantly the myths have an implication associated with life-style which in rural areas constitutes the culture of the people. The myths also have agricultural and environmental significance: for instance the weather can be controlled by man, via the demi-gods. Beals records that the village people feel themselves "masters of the natural environment."⁸ The statement in the *Gita* does not read that food grains cannot be supplied from water other than rainfall by irrigation for example, but that within the normal functioning of the culture the methodology is to make do with the natural. Thus if water is supplied

when needed in season by the demi-gods there is no incentive to make other arrangements that might be construed as offensive. In fact small-scale irrigation to supplement the rainfall has a long history in India, with some works as much as 2,000 years' old.⁹ Such an aberration is representative of the complexity rather than of contradictions in Hindu culture. Hindu rural settlements will nearly always include Temples for housing their Deities, the number and size of which will normally correspond to the population. Associated with each Temple will be a Temple tank or reservoir; this is used to bathe the Deity in once a year, an important religious ritual. The water thus becomes sanctified in this way and can then be used without offence for irrigation and village purposes. Clearly the available water would be closely correlated to the resources and needs of each village.

Sir Albert Howard maintained that the agricultural strategy of Indian villages, with moderate yields matching recycleable inputs, gave a comfortable self-sufficiency and enabled the maintenance of soil fertility almost indefinitely. He foresaw by the beginning of this century that in India increasing industrialization, urbanization, and the ever-encroaching market economy would mean that soil fertility would be lost to the detriment of the villages.¹⁰ In fact Jacks and Whyte indicate that the soil erosion of Northern India is a problem of relatively recent origin arising out of the changed agricultural patterns.¹¹ Balfour records that the agricultural strategy and wholefood based diet of Indian villages, such as the Hunza, was very conducive to health, which declined when refined foods were introduced by the British.¹²

In essence, given India's extremely ancient history, its philosophy provided an agricultural and environmental strategy that enabled continuity. If it had not, India would have suffered the same fate as the ancient civilizations of Greece and Rome, where the philosophy was lost as the society collapsed.¹³

The Scientific Response

From the scientific materialist perspective, the Vedic myths, are nothing but museum pieces, being primitive, absurdly fantastic, and superstitious nonsense. They are often conceived as one of the underlying reasons for the poverty and for what is seen as backwardness in India. Myths should not be allowed to impinge on a rational approach to life in areas of practical policy. In its most pure form such a rationalist belief holds that with the application of science and technology man can manipulate, master, and control the natural environment.

Modern science is in general agreement with the *Gita* that animals and man subsist, via the food chain, on food grains that require water for growth. It is in the supply of that water that major differences between Vedic tradition and rational science appear. Thus, while those within the spiritual traditionalist perspective, have their demi-gods who will bring them rain, the rational scientist actually puts himself up in the heavens so as to modify the weather by cloud seeding. A pre-requisite is that suitable clouds are available, and in restricted areas an increase in rainfall of up

to twenty per cent may be achieved. However this 'success' often results in twenty per cent less than average in areas down the prevailing wind. The experiments are presently restricted to small trials, the number of which is declining. Nor is there any evidence so far that such technologies will lead to the general control of the weather by man.¹⁴

Another strategy is to predict weather via satellite technology; such prediction being of potential use in the science of agro-climatology. Despite over 500 publications attempting to correlate the millions of data input¹⁵, the conclusions remain imprecise and man is still far from the absolute prediction of weather and climate. Without such knowledge any attempt to control weather can be none other than empirical at best, and haphazard at worst.



Rudra—Vedic God of Storms

Man's answer to a critical water supply is to build a big dam and release water for irrigation during the dry season; thus bypassing the vagaries of climate. Has this strategy demonstrated practically that the Vedic philosophy has served as an inhibitory influence to genuine progress and has now been humiliatingly exposed and superceded by the rational approach? It is important to note that the *Gita* does not deny that a big dam can be built, just questions its compatibility with Vedic culture. Without doubt large dams, constructed also for hydro-power, have come to represent an indicator of progress.¹⁶ Yet the benefits of big dams do not necessarily outweigh the costs: thus in the Third World, while dams may have resulted in higher crop yields¹⁷ they have also led to loss of agricultural land¹⁸, and whereas for some they may have improved water supplies¹⁹, for others they have led to their being contaminated²⁰. Indeed every gain can be balanced or outweighed by a loss. Thus there may be improved health²¹, loss of health²², financial loss for the government,²³ creation of jobs²⁴, loss of

jobs²⁵, introduction of new animal and plant species,²⁶ some of them damaging to the environment²⁷, and the local extinction of plants and animal species²⁸. India, with some 1,500 big dams has experienced all those problems and benefits to some degree.²⁹ Increasingly the evidence of the effect of big dams indicates that as man tries to control the cycles of nature, he does so only by setting in motion numerous technical, social, ecological, and economic changes that are beyond his control. Nor can people even within the scientific materialist paradigm agree that the changes brought by technology will be for the good. Nowhere can it be absolutely proven that rationalism is a convincing replacement for spiritual traditionalism as a healthy, alternative philosophy of life.

Appropriate Technology Response

The idea behind appropriate technology grew in response to many of the economic, social, and ecological changes that came in the wake of industrial development. Moreover, as traditional culture began to break down its collapse precipitated further changes. In effect appropriate technologists have generally tried to apply a patching operation, focusing on a technology to remedy one aspect of the change, rather than viewing the whole culture as a holistic system. Such a response met with varying degrees of success, but often produced exactly the same effects as the 'big dam syndrome', albeit on a correspondingly smaller scale. Thus with regard to water supply they advocated small dams if any, reforestation of the catchment areas, tube-wells and small scale irrigation. That is the logical response from a paradigm that sees no intimate relationship between man and his tools. In India however such an intimate relationship exists, and is known as technique, which is part of the cultural heritage, and is not freely transferable.

The degree to which an appropriate technology results in change will depend on the extent to which it affects local culture. Thus an indigenous village tool is "100 per cent adoptable" and produces no change in the society. Any technique or innovation with less than 100 per cent 'adoptability' will produce some change in society, and experience has shown that the momentum of change produced may be far greater and its effect more diffuse than intended. Sociologists and scientists tend to translate such changes into terms of 'success' or 'failure', even though there is no universal or inherent meaning to those words, nor do such people question whether they are considering the outcome under the spiritual traditionalist or scientific materialist paradigm.

The basis of science is reductionism, empiricism, and specialization; and to consider appropriate technology in terms of 'economic', 'intermediate', 'inequality reducing', 'social', 'political', or 'ecological' is to work within the mechanistic scientific methodology. Unless the scientific world view coincides with the Indian world view I would argue that its paradigm is not a very good basis for technological choice. And although appropriate technology is supposed to be distinguishable from the more rampant forms of technological transfer, the

central question must remain, as to what is the value system being used for deciding what is appropriate. The value system of India is based on its religion or *dharma* to which it is necessary to refer in order to see what constitutes the Indian paradigm.

The Vedas

The Hindu system of understanding the world is directly derived from the teachings contained in the Vedas (knowledge). This is considered infallible and the highest authority, and consists of four parts or books; *Rik*, *Yaju*, *Sama*, and *Artharva* Vedas. Although these are incomprehensible to a large proportion of mankind in the modern age, Indians believe that the sages recorded their essence in a number of subsidiary literatures. These are the epics *Ramayana* and *Mahabharata*, the latter containing the *Bhagavad Gita*, 108 *Upanisads*, 18 *Puranas*, as well as a number of commentaries on those texts.

The Law of Karma

One of the most basic concepts of Indian Vedic philosophy is that of a subtle, often considered non-material, soul or *atma* inhabiting a material body. The second chapter of the *Gita* is devoted to this concept which is termed analytical or *Sankha* philosophy. We learn that the soul is eternal, was never born, can never be destroyed, and will never die. When a given material body dies it means the soul has left the body and will pass into another body (zygote) to give it life. The soul does not pass into another body by chance, but according to the law of *Karma*. Good deeds will be rewarded by a better body in the next life, sinful deeds by a worse. This transmigration of the soul is not restricted to a species/soul specific relationship. The soul can equally inhabit and operate the bodily mechanisms of man, animals, plants, bacteria, as well as take birth in other bodies on other planets, such as a denizen of heaven.

Our main concern is not to speculate on what the corollary of this belief ought to, or could be, but to record how Hindus generally interpret it. A detailed interpretation varies considerably within India, but the basic tenets are common to most of the philosophical systems. For example it can be argued that since the soul is indestructible, and the body replaceable matter, killing can be justified on the basis of no absolute harm done. In reality the reverse is held to be true by nearly all Hindus, regardless of their exact philosophical persuasion. All life is considered sacred, and if killing is necessary, such as for food, the lower forms of life, that is plants, are to be preferred. Vegetarianism has a strong following in India, and non-violence reaches its ultimate within the Jain sect which avoids killing even the humblest insect.

Different species are seen as a continuum with no separation or major rift of man from the rest of nature. Bodies represent mechanisms which are operated by the soul, the combination of which is known by the symptom of consciousness. Thus "as the sun illuminates all this universe, so does the living entity within this body illuminate the entire body consciousness"³⁰. The greater the neural or sensory capacity of the

species, the greater the expression the soul can have for suffering or for enjoyment in the material world. In the body of all species except man, the soul merely follows the dictates of the body and nature, and follows an ordered evolution through the different species. In man, with his capacity for higher thought, the chance to understand the self and become liberated is possible. Thus man has a culture in which he seeks patterns of life that are above the whims of bodily nature; indeed control is sought of this bodily nature and not of the environment. Liberation is not the exclusive domain of man; within Hindu mythology there are many examples of exceptional animals and plants that gain a higher consciousness and become liberated. All bodies are severely restrictive to the spiritual soul, a phenomenon that is comparable to an inhabitant living in a 'city of nine gates'³¹. The nine gates being the external openings of the human body; two eyes, two nostrils, two ears, mouth, anus and genitals, through which the soul perceives the world. This outlook is in complete contrast to the scientific view which sees bodily mechanisms as representing life itself. Research is therefore carried out into genetics, biochemistry, physiology, the existence of quarks, in order to understand the life process and explain consciousness.

Hindus thus have a basic outlook on life that is conducive to living in harmony with the rest of nature, rather than competing with it. All of life is spiritualized and the Hindu believes he was very much part of it in the past, and will be in the future if he desanctifies it, and thus accumulates bad *Karma*. One of the main aspirations in life is to accumulate good *Karma* in order to make a better birth next time. But what are the activities that lead to good *Karma*, and how will such activities effect the use of technology?

The Caste System

All Hindus strive to see life on the absolute plane in which; "the humble sage sees with equal vision a learned brahmana (priest), a cow, an elephant, a dog and a dog eater."³² However on the relative plane of actual living all bodies are not considered the equal and the Hindus group humans with the same material endowments into ordered groups—hence the caste system. This system is sanctified in the *Gita* as follows: "According to the three modes of material nature and the work ascribed to them, the corresponding four divisions of human society were created by me".³³ The four divisions being: *Brahmanas* or priests, *Ksatriyas* or kings/administrators, *Vaisyas* or farmers/mercantile community, and the *Sudras* or labourers. There are no Harijans or outcasts mentioned in the *Gita*, such a group being a modern aberration of the original system.

Those divisions form the basis of the Hindu social or *varna-dharma* system, and everyone has a position in the social niche. Today a Hindu is born into a caste; many commentators claim that in the past the caste was chosen from the qualities exhibited by the child at school which was egalitarian and attended by all.³⁴ An analogy often made is that the caste system forms the community in a similar way to the parts of the body forming the organism. The *Brahmanas* represent the

intellect or head, *Ksatriyas* the power or chest and arms, *Vaisyas* the energy or stomach, and the *Sudras* the service or legs. Just as the parts of the body are needed for the organism to function, so all the castes are needed for the village community to function. In five different chapters of the *Gita* the performance of caste duties is extolled as producing good *Karma*, culminating in "by following his qualities of work, every man can become perfect."³⁵

'Right livelihood' as an example for Buddhist economics has been argued by Schumacher³⁶, and further detailed by Alexandrin³⁷. 'Caste duties' can be thought of as the best equivalent for 'Hindu economics'. Case studies of Indian villages reveal an integral relationship between different castes. The farmers provide fixed proportions of the grain harvest each year to the carpenter, blacksmith, king, barber, potter, and priest, with those groups providing their respective services to the farmer in return. At least that was the general situation throughout India prior to the market/cash economy^{38 39 40}. Thus Vandana Shiva records that with the cooperation of different castes in a village the community's wood supply could have been conserved for centuries. Later under the influence of the commercial market the more powerful castes became over dominant, and the community broke down⁴¹.

What is the effect of introducing a small appropriate technology device, such as an improved plough blade, into a traditional Indian village? The farmer may have to change his technique, and curtail or sever his relationship with the blacksmith or carpenter in order to use it. This act breaks social tradition, is an act of bad *Karma*, and will have repercussions throughout the entire community. Beals records such happenings in the village he was studying with the resulting exodus of some displaced families to the slums of Bombay.⁴² Agarwal reports that even trees for reforestation programmes and community water taps can be inappropriate. They can alter the balance of work within the social structure; thus when traditional social roles have to be extended to incorporate the new innovations, women, may find themselves with an intolerable burden of work.⁴³

The caste system of India has shown great social stability. It is class structured but also structurally unprogressive. Marx at one stage made a study of India and the Asiatic mode of production. However, finding its implications completely contrary to his programme based on an historical analysis of the occidental world, decided completely to omit its discussion from his work.⁴⁴

Vedic Knowledge

The Vedic system has its own concepts of knowledge, progress and development, these not being conceived of as alterations of the social system. In the thirteenth chapter of the *Gita*, Arjuna asks Krishna what is meant by knowledge, to which he replies:

This body is called the field, and one who knows this body is called the knower of the field...to understand this body and its owner is called knowledge.

The highest form of knowledge then is to understand the self. Progress, development and the goal of human life are towards that end. Virtually the rest of the *Gita* is devoted to an explanation of how that can be achieved.

Nature or *prakṛti* under the Hindu classification system includes both bodily nature and environmental nature. Nature is divided into three modes; goodness, *sattva*; passionate, *rajas*; and ignorance, *tamas*; these are considered the eternal qualities of nature when manifest in creation. The soul being caught up in the material world has a tendency to act according to one or certain combinations of those modes. "The living entity in material nature thus follows the ways of life, enjoying the modes of nature. Thus he meets with good and evil among the various species."⁴⁵ In the human form of life the goal of material existence can be achieved, and is described as follows:

One who understands this philosophy of the material nature, the living entity, and the interaction of the modes of nature is sure to obtain liberation. He will not take birth here again, regardless of his position.⁴⁶

The goal of the Hindu system is to achieve liberation, *mukti*, from the material world, which includes heaven and hell, and to live eternally in a spiritual body in the spiritual world. Thus finally the cycle of *Karma*, action and reaction can be broken, and this can be achieved by members of all castes. Paradise by implication cannot be created on earth by material arrangements, since nature has eternal qualities that prevent this.

In order to complete the *Varnasrama dharma* system of India, there are four *asrama* or spiritual orders to facilitate the training for liberation. They are the *Brahmacarya* student monk, *Grhastha* or family man following religious principles, *Vanaprastha* or retired *Grhastha*, and *Sannyasa* the renounced monk. Theoretically all the population will belong to a spiritual order in addition to a caste. Progress is sought by the individual within the spiritual order rather than within the caste system. A pre-requisite for understanding the self, or making advancement in one of the spiritual orders, is to achieve a level of purity, or action in the mode of goodness. If rarely achieved, this seeking of purity still represents a goal of society. Included among some of the qualities that should be cultivated, are "humility, pridelessness, nonviolence, tolerance, simplicity, self-control, and renunciation of the objects of sense gratification."⁴⁷

Implicit in those qualities is an anti-technology/consumerism ethic, and promotion of the naturalistic approach to life, as an ideal. In other Indian literatures this is made more explicit. "A wise man" the popular *Srimad Bhagavatam* tells us, "does not spend his energy in seeking bodily comforts. He sleeps on the lap of the earth, mother of all, the sky is his roof, the grass is his bed, nature supplies him with food, rivers provide his drink"⁴⁸. This concept should not be viewed as merely sentimental romanticism with no practical applications. Marco Polo visiting India in the 13th century records at length how from the king



downwards everyone sat on the ground because, as the king explained: "to sit on the earth is honourable enough, because we were made from the earth and to the earth we must return so that no one should honour the earth too highly, and no one should slight it".⁴⁹ Since the British Raj the Indian kings have become vestigial, but the idea of voluntary simplicity remains a living principle with many Indians. A further passage from the *Bhagavatam* compares forms of knowledge, with the modes of nature, and dwelling place:

Higher intellectual knowledge is *sattva* (goodness); knowledge of the physical sciences is *rajasa* (passionate); and knowledge common to the child and ignorant is *tamas* (ignorance). Complete knowledge of Me the divine self is beyond the modes of nature. To live in the forest amidst nature is in goodness, to live in a village or city is passionate, and to live in a gambling den is ignorant. But to live in Me is beyond the modes of nature.⁵⁰

Indian Concepts of God

India is generally considered as having six different systems of philosophy, or ways of conceiving of a God. Two systems have the main influence. The monotheistic or impersonalist system in which the soul *atma* and the universal spirit *Brahman* are virtually considered one, and liberation is the merging of the two. This system is largely based on the Vedanta commentaries of *Shankacarya* (8th century), and has a profound influence on many intellectuals of Indian society. However the majority of rural Indians probably have a dualistic or personalistic conception of God, in which *Brahman* is one energy or manifestation of the supreme Godhead. Deities are worshipped as either representatives or forms of the supreme Godhead, or as village deities of the demi-gods. Hinduism is better represented as pantheism, with the deities being a personalised representation of the one supreme all-pervading spirit/Godhead, rather than as a polytheism with all gods being equal.

The Ordinances of Manu

The *Manava Dharma Castra* or the *Ordinances of Manu* is jointly a religious text and a record of the Hindu of law. First translated from sanskrit in 1794 it attracted wide attention from the British colonialists who were introducing a systematic judicial system. The 2,685 *slokas* or verses of the text deal mainly with the rights and duties of each caste; its themes are concurrent with those of the *Gita* and *Bhagavatam*. We have selected some representative verses that demonstrate how much of the life of a Hindu is dictated by religious belief and tradition.

In the path by which one's father walked, by which one's grandparents walked, by that one should go the way of good; going by that one does no wrong.

He should void his excrements by day with his face to the north, during the night facing the south, but at day-dawn and at nightfall as by day.

One may not discharge into water either urine, or ordure, or spittle, or anything smeared with what is unclean, or blood or poison.

The infants going out from the house should be done in the fourth month; his eating food in the sixth month, or what auspicious practice is preferred in the family.

As many as are the hairs on the beast, so many times in the next world does one who slaughters beasts in vain (not for sacrifice) obtain a violent death from birth to birth.

Plants, beasts, trees, amphibious animals, so also birds that have attained death for the purpose of sacrifices, attain exalted births in the next world.

Having considered the source of flesh, and the slaughter and confinements of animals, one should cease from eating all flesh.

Land becomes pure in five ways: sweeping, addition of cowdung, sprinkling with cow urine, by digging, and by cows staying on it.

A fiftieth part of cattle and gold is to be taken by the King; the eighth part of grain, or the sixth or the twelfth. He may take a sixth part of trees, meat, honey, ghee,; also of perfumes, medicines, and liquids, and of flowers, roots and fruits.

Let the Sudras living by their own labour work for him a single day in each month.

As Indra rains down upon the people through the four rainy months, so should the king practicing Indras rule, besprinkle his realm with favours.

As the sun with its beams takes to itself the water during the eight months, so let the King ever take from his realm the revenue for that is the suns rule.

As the supporting earth supports alike all creatures, so when the King supports all creatures he follows the rule of the earth.

The woman is said to have the nature of land; the man is said to have the nature of seed. The origin of all corporate creatures is caused by the union of land and seed.

Those who know the things of the past, relate songs sung by the winds, to the effect that seed should not be sown by a man in the wife of another.

When there is lack of offspring, the progeny wished for may be procured by the wife being regularly commissioned (to bear children generated) by the brother in law or some blood-relation of the husbands family.

Those delighting in destruction become animals that eat raw flesh; those eating what ought not to be eaten become worms; thieves become creatures that devour each other; those who had carnal intercourse with low women become ghosts.

By stealing grain, copper, water, honey, milk, essences or ghee, one becomes respectively a mouse, a flamingo, a water bird, a gadfly, a crow, a dog or an ichneumon.

To take the fruit and roots of large trees, firewood, or grass to feed cows with, Manu said, is not theft.

Felling live trees to get firewood and eating forbidden food are secondary crimes.

Killing worms, winged insects, birds; stealing fruit, firewood, and flowers, and want of mental firmness produce defilement.

A hundred repetitions of a Vedic text must be muttered on cutting trees which bear fruit, and for cutting bushes, vines, creepers and plants which have blossoms.

On pulling up for no purpose cultivated (medicinal) plants, and those that grow of themselves in a wood, one should follow a cow for a day, performing the observance of living on milk only.

A *Brahmana* should carefully avoid agriculture as it causes great pain and is dependent on other creatures. They think agriculture is an excellent thing, but by the good this occupation is blamed, for the iron faced block of wood smites the earth and also the animals dwelling in the earth.

When a householder sees wrinkles and grey hair on himself, and also sees the child of his child, then let him go to the woods.

All food from the towns is to be given up, and all utensils as well. He may go to the jungle having given up his wife or with her also.

Let him wear a skin or bark . . . live always on mere flowers, roots, and fruit ripened by time and withered of themselves.

But having thus spend the third part of his life in the forests, let him wander about for the fourth part of his life.

These distinctions which form some of the major discussions in Hindu theology, make no appreciable difference in terms of whether or not the environment is sanctified. Thus the environment can be either a direct manifestation of an impersonal God, or an indirect manifestation or energy of a personal God. The *Gita* has been used in support of both interpretations: In various chapters of the *Gita* a strong identification of Godhead with both the living and inert natural environment emerges:

Earth, water, fire, air, ether, mind, intelligence, and false ego, all these eight together comprise My separated material energies. In My unmanifested form I pervade all this creation, all things are resting in Me, but I am not in them.

Arjuna, I am the taste of water, the light of the sun and the moon. I am the original seed of all existences.

I am the healing herb . . . of bodies of water I am the ocean . . . of immovable things I am the Himalayas . . . of all trees I am the holy fig tree . . . of purifiers I am the wind . . . of fishes I am the shark, and of flowing rivers I am the Ganges, of seasons I am the flower into each planet and by my energy they stay in orbit.

For one who sees Me everywhere and sees everything in me, I am never lost, nor is he lost to Me.

Every natural phenomenon is clearly taken to be a personification of Godhead. The Hindu in utilizing the gifts of nature does so with great reverence for the supreme being that pervades them. Exploitation of nature is tantamount to the personal abuse of Godhead and is not consistent with Hindu tradition.

Traditionally in India greater understanding of life, and the search for knowledge is obtained by receiving teachings from a spiritual master or guru. That approach is not the only method recommended, and in the *Bhagavatam*, for example, we hear of a *Brahmana* who found enlightenment from twenty-four teachers. These were all elements of nature, both animate and inanimate such as the earth, water, fire, a python, a bee, a child, and a spider. Thus:

From earth I have learned the forbearance and accomplishment of good for the sake of good. Never should a man of wisdom swerve from the truth nor lose his poise even when oppressed by others. A wise man should, like the trees and mountains yield good to all.⁵¹

These are by no means isolated examples. The four Vedas are centred around imparting their truths within poetic descriptions of nature.

Conclusion

The Hindu view of life, which has been very briefly outlined here, calls for a simple naturalistic lifestyle via an extremely complex set of metaphysical myths. Its attitude to nature is one of reference and utilization, entailing the respective sacrifices, rather than one of exploitation. The philosophy provides a traditional set of relationships to give the individual

both a social and ecological niche in the world, and a relationship with an eternal absolute. If the assumptions of the philosophy are accepted then a satisfactory explanation as to the cause and effects of those relationships is provided for the individual. For example, if all the indigenous trees in a valley catchment area are cut down, then from this abuse of Godhead, or defilement of something sacred, a reaction would be expected. Thus the resulting floods, soil erosion, followed by droughts and poor agricultural yields would be interpreted as punishment from the Gods. The mythology therefore serves as an effective social control mechanism to prevent large-scale deforestation. Science can also offer a viable mechanistic explanation of the same phenomena, learnt through experience, but can still offer no control mechanism from its attendant world view.

Scientific materialism and spiritual traditionalism are incompatible paradigms, not because one disproves the validity of the other's truth, but because they are representative of opposed value systems. If an introduced technology is not compatible with the value systems of that society then clearly it is inappropriate, unless it is intended as a proselytising mechanism to convert the Hindus. Where both paradigms can be identified to have common ends, that does not imply a common means to reach that end. If the question of appropriate paradigm does not precede the question of technology—it can never be an 'appropriate technology.'

Conclusion

The Vedic base of Hindu society, which has only been very briefly outlined here, calls for a simple, naturalistic lifestyle by means of a very complex set of metaphysical myths. The attitude to nature is one of reverence and of utilization with the respective sacrifices, rather than of exploitation. The philosophy provides a set of traditional relationships to give an individual both a social and ecological niche in the world, and a relationship with an eternal Absolute. These relationships form a complete and encompassing system of life in which technology plays a very minor part. The introduction of a new technology, and its associated system, will almost certainly entail the contravention of the traditional relationships, and should thus be considered inappropriate. If the Vedic traditions are taken as the ideal, technology should be seen as a retrogression from this ideal, rather than embodying any notion of progress. This is a direct corollary of the fact that the value systems of spiritual traditionalism and scientific materialism are diametric and opposed.

However Vedic conditions are not found in India today. The natural environment is becoming increasingly degraded, Vedic values are being lost, and the population has increased many-fold, although remaining largely rural. Indeed, because an intimate relationship exists between Vedic philosophy and the natural environment, Vedic traditions are unable to function adequately in the degraded environment. Vedic tradition both demands and requires an ecologically balanced environment, as they are mutual

and complimentary components of the same system. Vedic philosophy gives no incentive to undergo technological development, as this implies breaking the relationships that are an inherent part of the philosophy itself. Technology has been introduced by alien people under the guise of development, and has caused the self-regulating system to break down. The material manifestation of this breakdown is the resulting environmental degradation, and oppression of the lower castes.

The alleviation of India's problems will not come via a technical solution, appropriate or otherwise, for the precise reason that these initiated the problems in the first place. Neither will social or political adjustments aimed at moulding Hindu society to suit the technology produce any benign effect. It is imperative that India should redirect its policies towards the restoration of the ecological balance and Vedic culture of the villages. A pre-requisite for this is to abandon the market economy, and let each village function as a virtually self-sufficient autonomous unit. This is the system on which the Vedic traditions were based, and the only system under which Vedic ideals can be realised. Clearly this cannot be achieved overnight but represents the starting point at which the question of an "appropriate technology" might arise. Those technologies might serve in a transient phase during the restoration of the ecological balance, as a precursor for the philosophy to function, which could then lead to the abandonment of technology and the regaining of self-regulation.

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THE GREENING OF GERMANY

With 27 seats in the Bundestag the political party 'Die Grünen' (The Greens) seems on the verge of bringing about a major political change in what has been until now a stable West German party political system. In the West German general election of March 6th, 1983 the Greens obtained 5.6 per cent of the votes and are the first new party to join CDU/CSU, SPD and FDP in the Bundestag since the 1950s. As Christian Democrats and Liberals together have a clear majority, the Greens will, however, not hold the balance of power but form the opposition with the Social Democrats (see table).

What *prima facie* might look like a normal process of the decline of one party and the rise of another is really only the tip of the iceberg of a potential radical transformation of West German politics—and the outcome is uncertain. The Greens are not just another party, nor are they prepared to abide by the rules of the game as practised by the established parties so far. A new party political cleavage has emerged which may well entail new political forms, new policies, new institutions, and a new political culture.

The way the West German political system reacts to the new challenge depends to a significant degree on the political moves of the Greens themselves. Who they are and what they want is not only obscure to most foreign observers, but also to Germans previously unacquainted with the colourful realm of ecological politics. Indeed they find it difficult to comprehend fully the size and shape of the new political force.

To explain why the Greens have become powerful in Germany, and to make some suggestions about how they may develop, one has to go back to the fate of the German environmental movement in the 1970s.

The environment emerged as a political issue at the end of the 1960s in Germany as in other countries. The politicization of the issue was actively pursued by the SPD/EDP reform government. But from the early 1970s onwards, a new social force became its main political protagonist: the 'Bürgerinitiativen'. These citizen action groups emerged spontaneously at the local level to fight single local issues, mainly by mobilising public opinion with information cam-

paigns, signature collections, demonstrations and occasional sit-ins. This form of action was an innovation for the West German political system which, apart from the student movement, had previously been characterized by political apathy and inactivity outside the electoral process. This movement of 'Bürgerinitiativen' quickly became the main carrier of environmental pressure. In its early years, political action remained isolated, and single issues were fought locally without regional or national co-ordination. Then, in 1972, fifteen action groups formed a federal association to represent environmental causes at the national level. The BBU, as it was called, became the mainstream environmentalist organisation of Germany. Thus, the German environmental movement from the start had its base at the local level, which is still one of its most important features and of particular relevance to the Greens.

To transform a collection of isolated, local action groups with limited aims and temporary existence into one, relatively coherent political movement of national importance, it was necessary to have a catalyst. That catalyst emerged in February 1975, when local wine growers occupying the site of a planned nuclear power station were brutally ejected by police, only for more than 25,000 demonstrators successfully to re-occupy the site a few days later. Those events in Wyhl in the south-western corner of Germany became the symbol of widespread protests, and transformed the environmental movement. Firstly, it led to greater co-operation between local action groups at both

**Results of the General Election of 6th March, 1983
in West Germany**

Party	share of votes Per cent	difference to 1980 election per cent	number of MPs
Christian Democratic Union/Christian Social Union (CDU/CSU)	48.8	+ 4.3	244
Social Democratic Party (SPD)	38.2	- 4.7	193
Free Democratic Party (FDP) (Liberals)	6.9	- 3.7	34
The Greens	5.6	+ 4.1	27

the regional and national level; indeed the issue of nuclear energy demonstrated that environmental problems could not be resolved at the local level. Thus more and more action groups affiliated to the BBU. Secondly, the movement was prepared to take radical action, non-violent direct action, even if illegal, being broadly considered as legitimate. Thirdly, the political left became closely involved with environmental politics. The issues emerging from Wyhl were initially police repression and the illegal occupation of the site, both questions on which the German New Left had gained extensive experience in the student movement in the 1960s. Concern over the actions taken by the state in Wyhl in turn led to strong interest in environmental issues, which previously had been classified as "middle class" concerns. Apart from the politically irrelevant, Moscow-oriented German Communist party (DKP), the left consisted of three main elements, formed after the failure of the student movement: (1) an assortment of avant-garde parties with predominantly maoist ideology, the so-called K-groups (KB, KBW, KPD, KABD, KPD/ML), (2) a very heterogeneous group of drop-outs, alternative life-style enthusiasts and anarchists, who nevertheless shared a fundamental rejection of the "system", were opposed to party political activity, and believed in "spontaneous" action as their mode of political expression. Such groups were commonly referred to as "spontis"; and lastly (3) the youth organisation of SPD and FDP which in the early 1970s filled up with radicals that had set out to change the established parties from inside, forming a tough intra-party opposition. All three elements became closely involved in the nuclear conflict.

The single most important factor for the emergence of the Greens was in all likelihood the experience and development of the German anti-nuclear movements. In 1975, environmentalists believed that nuclear power could be stopped by direct action such as site occupations wherever new power stations were to be installed. In

Wyhl, the opposition had succeeded in keeping the site occupied and forcing the state government responsible for the installation to negotiate with it. In what was for the time being a success a lower administrative court withdrew the construction license shortly afterwards. The next confrontation developed in Brokdorf, a planned nuclear site north of Hamburg, which the local population opposed strongly. Here, from the start the state government wanted to avoid a "second Wyhl", and police forces occupied the site hours after the construction license was granted. An occupation attempt by protesters was forcefully resisted, and a subsequent demonstration at the site attended by about 30,000 people saw violent scuffles between police and some demonstrators trying to enter the site.

Those events at Brokdorf in effect demonstrated that the direct action strategy was unlikely to work in the future in the way it had done at Wyhl. At the same time, a major split was occurring on future strategy. The dividing question was that of violence. On one hand, the BBU, the Young Socialists and Young Liberals, and most of the local population supported non-violent direct action, but rejected the idea of re-occupying nuclear sites through open battles with the police. On the other hand, K-groups and some "spontis" favoured or at least did not want to reject such action in principle. These internal problems of the movement were heavily exploited by the state and federal governments accusing the anti-nuclear movement of being infiltrated by communist and violent, "extremist" forces. A further demonstration against Brokdorf was split into two parts. While K-groups, "spontis" and many citizen action groups demonstrated near the Brokdorf site, a rival demonstration backed by the social-democrat youth organization and the Moscow-oriented German Communist Party took place in a nearby town. A serious incident developed at the Grohnde nuclear site in Lower Saxony where groups tried to storm the site and were repelled by police.

Those events of 1977 put the environmental movement into a serious crisis. Site demonstrations were called off by the BBU. Other forms of action were now considered more carefully. Major efforts were made to change the nuclear policy of the SPD and FDP. The courts had always been a major forum of conflict. But although litigation against nuclear plans continued to flourish, the movement never had genuine confidence in the success of such a strategy. The trade unions were another focus of activity. The failure of all such activities later became a major reason for the growth of the Greens.

But the first impetus for an ecological political party had already emerged in 1977 as a direct reaction to the events at Brokdorf and Grohnde. The protagonists of the idea did not come from the mainstream environmentalist movement, but from some local groups and from the ecological "right", who thought that the anti-nuclear movement had discredited itself by the violent actions at nuclear sites. On 11th May, 1977, the first environmentalist political party was founded in Hildesheim, a small town in Lower Saxony. Other local lists were formed in Schleswig-Holstein. Local elections in 1977 and 1978 produced the first successes, particularly around the sites of Brokdorf and Grohnde. From then on, similar lists were formed all over Germany under the name Green List Environmental Protection (GLU). The GLU-movement was joined by two other forces: One was an existing political splinter party, the Joint Action of Independent Germans (AUD), representing a weird mixture of nationalist, romanticist, and anti-capitalist ideologies. The second input came from Herbert Gruhl, one of Germany's best known ecologists and a Christian Democrat MP, who left the CDU on 11th July, 1978 to form his own party, the Green Action Future (GAZ). All three forces had a predominantly conservative, right-wing trend, leading to accusations that the Greens were a sort of "neo-fascist" force. Some of these

groups indeed stand in the tradition of the German Youth Movement and other romanticist groups of the late 19th and early 20th century, which later were absorbed into the Nazi-movement. Nevertheless the party faction representing such views was, however, suppressed and eradicated in the early days of Nazi power.

The early protagonists of an ecological party had rather mixed backgrounds, involving a number of different fringe groups with often obscure ideologies. Many of them saw ecological problems as simply another form of expression of crisis of society that had been addressed before. Some demanded a radical, structural change of present society, possibly through a sort of ecological dictatorship. For many of them, the ideal ecological society reflected traditional, pre-industrial values and political structures. On the other hand, others wanted to use existing political machinery for environmental reform, and saw participation in elections as far preferable to violent demonstrations. But the early movers of the various "green" parties were soon to lose their initiative, partly because those parties were rapidly joined by younger members with more leftist views.

At the time when the various party initiatives were forming and competing with each other, a separate major impetus in green party politics came from the left: the K-groups in 1977/78 had to face that their policies had totally failed, not only in the nuclear sector. Previous attempts to radicalize the working classes had brought no results. Many of their members had left, most of them to join the amorphous "sponti" camp. The nuclear issue had been the last straw, and after its failure, a new input was needed. In that situation, initiatives for new political lists were started in Berlin, Hamburg and Frankfurt, the main K-group strongholds. As a result, "alternative" and "colourful" lists were formed, combining environmentalists with left wing issues, and involving some "Bürgerinitiativen" and "sponti" groups. The alter-

native/colourful lists soon clashed with the GLU/GAZ, leading to direct electoral confrontations in Hamburg and Hesse.

By 1978/79, the mainstream environmental movement and most of the 'sponti'/SPD left were against the initiative for a green political party. But a second wave of anti-nuclear mobilisation and the definite failure of alternative strategies led to a strengthening of the case for a party. Plans to construct a massive combined reprocessing and waste disposal plant in Gorleben, Lower Saxony, produced massive national opposition with 100,000 people demonstrating in Hanover. In May 1979, the prime minister of Lower Saxony, Albrecht (CDU), rejected the reprocessing plant, but proceeded with exploratory work on waste disposal. This partial success, which brought the German nuclear programme into major trouble, underlined the possibility of using the federal structure of the German state to obstruct nuclear power, as both the state and the federal government had to approve nuclear projects. An electoral breakthrough in one or several "Länder" could thus have significant impact. The case for using party political activity as a supplement to existing extra-parliamentary efforts became stronger, particularly as those did not prove entirely successful. Litigation had an important delaying influence, but no major nuclear project had been finally rejected by the judiciary.

After moves by the federal government to curtail the role of the courts and a ruling of the Federal Constitutional Court in favour of nuclear energy, administrative courts became more reluctant to stop nuclear projects. Furthermore, efforts to change the trade unions' attitude had totally failed. By 1979, it also became clear that the SPD at federal level would not turn anti-nuclear. The Young Socialists had lost their old verve, and intra-party opposition remained unsuccessful. From 1979 onwards, more SPD-members left their party and few young people were attracted to join.



Petra Kelly, Green member of the Bundestag

A new political base for the Greens

Another crucial factor leading to the formation of a green party was the widespread feeling in the anti-nuclear movement that abolishing nuclear power would be possible only through widespread social changes. The movement thus started not only to advocate alternative energy strategies, but an alternative society based on small-scale technology and social institutions. The green party was one result of this ideologisation of the environmental movement, a transformation from isolated protests against individual projects to a new political force with an all-embracing ideology and demands for structural political changes.

After a common platform among the many different groups had been reached for the European Elections in 1979, the federal party "Die Grünen" constituted itself in January 1980. At that time, the party already had more than 10,000 members. The first party congresses were rather rapturous, lively affairs, demonstrating the full range of ideological differences, particularly between the former K-groups and Gruhl's GAZ. But from 1980 to 1982, the party consolidated, for several reasons. First, the middle ground of "mainstream" greens increased in size, partly fed by former SPD members, but particularly by citizen action groups joining. The BBU, which

had already in 1977 contemplated taking the initiative for a political party, but had then shied away from it and had continuously maintained its independence from, if not opposition to, a green party since, became less hostile. More of its members joined the party. Secondly, the K-groups disintegrated. Many members were totally disillusioned with the old avant-garde strategies. It is difficult to assess the role of former K-group members in the Greens. In the main, their participation in the Greens seems to represent a genuine political transformation. Nevertheless some groups remain which see their role in green politics as part of a long term revolutionary strategy. Thirdly, Gruhl and his followers left the party to form their own organisation. Gruhl's Ecological-Democratic Party (ÖDP) has about 1,800 members, compared with about 23,000 members of the federal party "Die Grünen". The ÖDP failed to make any impact in the elections.

The Greens are thus a coalition of various different political currents. Despite their claim not to be right or left, one cannot overlook the fact that severe internal rifts exist as well as important differences between different green parties in the "Länder" (states). For the left outside the SPD, the Greens have become a new political haven, ending a long spell of frustration and ineffectiveness. There is a broad consensus in the party on nuclear power and the environment, but different views are held as to how to transform the present traditional economic and social issues into an ecological society.

In terms of a programme, the party's left wing wants to maintain the welfare state, secure the rights of minorities, and function as the parliamentary arm of the extra-parliamentary movements (anti-nuclear movement, alternative movement, squatter movement, peace movement, and so forth). The views of the "right" are perhaps less clear. Some elements have voiced strong opposition to the squatter movement, regard the welfare state as excessive, would like to curtail the influx of

foreigners, and support many policies usually associated with the Christian Democrats. However, most protagonists of such views by now seen to have left the party or not joined them in the first place.

Other issues transcend a traditional left-right distinction. One such is the attitude to industrialisation; some "leftists", for example, view industrialisation as incompatible with socialism. Others simply want to reform industrial society and regard the target to total de-industrialisation as an illusion. The way of transforming the present into an ecologically sound society is a related issue. Major sections of the party seem committed to a fundamental opposition without compromise. At the other end, some "moderates" want the party to conform more to traditional rules of party politics involving some major compromises. A majority view rejects both extreme positions, recognising that some compromises have to be made while the party has to maintain its position on central issues such as nuclear energy and weapons.

The Greens' present constituency is more likely to come from the political left. Their voters have consistently been predominantly young and well-educated, and the new social movements have provided a major input. Without the anti-nuclear movement, a Green party in its present form and size would be unthinkable. More recently, the squatter movement, opposition to an airport extension in Frankfurt, and the re-emerging peace movement have significantly contributed to increasing political support for the Greens. However, the party will have to decide whether it sees its role exclusively in representing extra-parliamentary movements in parliament and probably being content with a share of the vote of slightly more than 5 per cent, or whether it wants to widen its electoral base to include more moderate segments of the population who are currently frightened away by the radical image of the party. Such a second strategy would indeed give the moderate wing of the Greens more weight, and would necessit-

ate compromises which major sections of the party are presently not prepared to make. A full identification with the causes of extra-parliamentary movements can, on the other hand, also be counter-productive, if such movements resort to actions which badly damage the public appeal of the party. The Alternative List for Democracy and Environmental Protection (AL) in West Berlin, for example, has been put into a very awkward position through widespread violent action by groups associated with the alternative and squatting movement. The party's commitment to the aims of those movements makes it difficult to disassociate itself. Political debates are dominated by the question of the AL's attitude to violence, pushing other issues into the background such as the dangerously increasing level of air pollution in Berlin.

With regard to the Greens' long term prospects, its social base is rather limited, and directly related to the survival of the welfare state. Students, teachers, alternative farmers, in general people of the non-productive service sector or the "alternative economy" form the main social base of those social movements that the Greens want to represent. Trade unions have traditionally close links with the Social Democrats, and leading trade unionists have expressed a rather hostile attitude to the Greens. However, conscious efforts to win trade union grass roots supports are being made by the party. Green positions are indeed closer to trade union demands in some policy areas than those of any other party, such as in the rejection of new technologies that destroy jobs.

Continued electoral successes present the Greens with some difficult choices. Certain obvious symbolic issues such as the nuclear power programme, the Greens will not be able to compromise on nor will they be able to back down on their opposition to other local projects, such as airport extensions. Moreover, the burgeoning peace movement opposed to cruise missiles and able to bring more than 200,000 people

out onto the streets of Bonn, has been one of the major sources of political support. Nevertheless to have political impact, the Greens are in a difficult dilemma; on the one hand, they would have to compromise and reach some understanding with the SPD, which at present is the only feasible political partner; on the other hand, they are dependent politically on the continued support of the anti-nuclear, peace and other movements. Without compromise, they will have no real impact on political outcomes, at least for the time being. Hamburg and Hesse are current test cases. In both Hamburg and Hesse, the Greens came out in 1982 elections with the balance of power in their hands. In Hamburg, the Green Alternative List (GAL) engaged in long negotiations with the SPD. The GAL was not prepared to compromise on issues such as the Brokdorf nuclear power station, the extension of the Hamburg port, destroying one of the last villages and pastoral idylls near the town, and the high degree of pollution of the Elbe river. The negotiations failed and a new election was called for in December 1982 in which the SPD managed to regain its majority. In Hesse, Greens and Social Democrats are also far from reaching any form of stable understanding. It appears likely that the SPD minority government may look for new elections in the near future.

The only alternative to a the present government would be a sound and stable arrangement between the SPD and the Greens. Such an understanding seems, at present, unlikely to be forthcoming. The Greens would not want to enter any coalition, but prefer to decide independently on any single policy. If there is not at least some firm understanding with the Greens on major policies a SPD minority government is unlikely to inspire much confidence in its ability to govern. A possible compromise would be difficult to work out; it would consist, for example, of a curtailed, but not cancelled nuclear programme together with the major energy conservation efforts and R&D into alternative energy sources; a stiffer stance on

the stationing of cruise missiles, while remaining an integral part of the NATO alliance; backing of a programme to cut government spending provided certain benefits for the Greens' electorate are excluded from those cuts. Such a compromise would be very difficult for the SPD to accept. Its left wing is currently advocating an understanding with the Greens, but may find it difficult to convince the party leadership and trade unions. Such a compromise would, however, almost certainly be rejected by the Greens and particularly their more radical adherents who see the party as part of a social movement with a commitment to fundamental social change. From that point of view, any compromise would be nothing less than co-option and integration. The system of rotating political representatives is especially designed to avoid the formation of a party elite which could successfully be co-opted by the "system".

The SPD will thus find it very difficult to form a majority with the Greens, to the left of the CDU. In their present form, the Greens' mainly seem to see their role as that of a social movement committed to widespread social change in which, in their own understanding, parliamentary politics can play only one, probably minor, role. The Greens at present seem unprepared to sacrifice their own political credibility by allegiance to those extra-parliamentary movements which provide their political base. Whether any such compromising takes place might not in the long run make much difference to the political outcome. So much indeed is reminiscent of the early history of the workers' movement, and the Greens' further political options are well illustrated by the different routes that movement has taken. There is the danger of a serious split occurring between those parts of the Greens who are prepared to make compromises and those who see their political function in fundamental opposition.

For the time being the Greens are left off the hook and do not have to make up their minds. But it is quite clear that the party is there to stay, and that the other parties, in particular the SPD, have to come

to terms with it. Never in their entire history have the social-democrats won an outright parliamentary majority or are they likely to do so in future. To return to government they have to think seriously how a viable and stable understanding with the Greens can be achieved. The Greens, on the other hand, will have to learn that they have to adapt their policies to the possibilities of "Realpolitik" at some stage. Such a reformist turn at the moment would be suicidal for the party in view of their sources of political support. But after some years in opposition, there might be some change in the attitude. At the same time, the Greens must work hard to keep up the momentum. The post-war record of small parties in Germany as well as the experience of green parties in other countries is hardly encouraging. The New Zealand Values Party won parliamentary representation in 1975 but has since lost out badly in elections. The French ecological candidates saw their vote drop drastically after having previously achieved outstanding results in the municipal elections of 1977 and a good showing in the presidential elections of 1981. Nonetheless Germany is not lacking in vital issues that the Greens could continue to capitalize on.

The Greens' failure to acquire a more powerful position at this stage could be a blessing for them. To have found themselves holding the balance of power might have put intolerable pressure on them and thus put their future in the Bundestag at risk. Instead their present position enables them to promote public discussion on a whole range of policies and problems that have been previously neglected by the established parties. The Greens now have ample time and opportunity to consolidate their own programme, organisation and public support with a view to represent an even more credible political alternative at the next general election.

Wolfgang Rüdiger

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Ecology and Politics in the United States

Eco-anarchist Murray Bookchin, who is perhaps more famous abroad than in his native United States, is fond of distinguishing between environmentalists and ecologists. In his frequent attacks on the former, he exhorts them to reach beyond narrowly defined economic and materialist concerns and urges upon them a radically emancipatory movement that integrates ecology, feminism and community control, in a non-hierarchical society. For Bookchin, the domination of nature is an inevitable outgrowth of the domination of people.

Bookchin defines "environmentalism", as opposed to the ecology movement, as a managerial approach to the natural world: anti-pollution, scientific analysis and problem-solving, enforcement of laws and regulations. It is a system that does not challenge existing authorities but rather tries to help them do their job better. By trying to "make the system work", American environmentalists do not examine whether their support for better laws and enforcement is not, by its reinforcement of existing bureaucracy, actually exacerbating the problem.

The history of the American environmental (as opposed to ecology) movement goes back to the 19th century and ranged then as now from the ultra-pragmatic approach of Gifford Pinchot to his arch-enemy (and, like our contemporary Dave Brower, archdruid) John Muir. Stephen Fox *John Muir's World: The American Conservation Movement* is an accurate depiction of the early conservationists: wealthy people of leisure out to protect their mountains and wild hunting preserves. It was not until the mid-20th century post-Vietnam period that young Americans of all classes and strata began to question why American values necessitated the plunder of the natural world and to relate these to the pressing social and economic problems of the day. The entrance of young dissidents into the battle broadened the context of debate but

also changed the flavour and direction of much of the movement.

The early activists coalesced into large national groups (actually John Muir had started the Sierra Club back in the 1890s) who dedicated themselves to emphatic lobbying and legislative action, mostly in the nation's capital. They also branched out across the country but as many as a dozen now have their main headquarters in Washington D.C. They range from the stolidly mainstream pro-hunting National Wildlife Federation to the elegantly elitist National Audubon Society, whose mostly-male board reads like a directory of corporate America, to the activist upstarts like Friends of the Earth to the specialized professionals like Natural Resources Defence Council. Meanwhile, out in the boondocks there arose the volunteer grass-roots groups fighting backyard and bread-and-butter fights against toxic wastes in their water, leaking landfills, nuclear reactors, superhighways through their neighbourhoods, dams, transmission lines, and all the other acts of corporate and government insolence.

But while environmental causes have deep and broad public support, they lack a constituency, which is to say a group of people for whom environmental issues are the compelling ones of the day, around which the rest of politics and ethics revolve and from which they take meaning. With the onslaught of Reaganism and Wattism, this concern is, at least at election time, translated into some kind of change. But is anything really changing? If one uses the measure of European ecologists and the various "Green" parties across the globe, there is little basic change in either the goals of American society at large or in its institutions. Reformism is the order of the day, exemplified by electing a "better" Congressman (who is usually only marginally better and often not on all of the issues), enforcing Federal statutes, or enacting a seemingly

momentous piece of legislation. But real political change that takes power away from its illegitimate wielders and returns it to people and communities is as remote as ever. Efforts go towards holding the line, piecemeal legislative reform, *ad hoc* coalitions working on a single issue without any prospect of a meeting of minds on just what the underlying causes of ecological social and economic problems might be, whether they might in fact be the same, and whether an uncompromisingly different new direction is needed instead of the usual liberal politics of pragmatism, personalities, parties, and pressure groups.

For American politics is peculiarly unidealistic and unintellectual, leftist splinter groups notwithstanding. Few activists stop to wonder why things are the way they are or whether they are doing something that deals with root causes instead of symptoms. Nor are Americans much involved with ideas about the visions of the future (Futurists of course are always with us; they don't change much) or for that matter the past, or with the concept of planning one's destiny or the possibility that the future could be any different from the one being planned for them by others. They do not see, or do not want to see, how their personal, professional and organizational acts may be contributing to a strengthening and legitimizing of precisely those processes and institutions that are destroying the natural world, their community, their health, their progeny, or, most important, their chance to empower themselves in a different kind of system that exploits neither nature nor people.

This kind of ultra-pragmatism distinguishes Americans in general, not only environmentalists, from non-Americans, for whom the distinction between the political-economic system and the ecological disruptions and degradations has never existed. For non-Americans, environmental and economic problems are not accidents but inevitable results of conscious choices imposed by the empowered and privileged on those who lack power and privilege. America has representative government, not participatory; moreover, its two-party system, which is really one, moulds choices by presenting narrow or identical ones, none of which

challenge existing authority. When the American mass media depict the German Green Party as anti-materialist and anti-authority it is as much with contempt as disbelief, incredulous that the judgement of those in control, whether it be the political, scientific or judicial elite, could be challenged.

One example is instructive but it is by no means the only one. Dick Netzer is the prestigious director of New York University's Urban Research Centre. Until recently he supported the proposed Westway, a giant boondoggle of a Federally subsidized superhighway that would rip through the west side of Manhattan, place a six-lane superhighway there, and not incidentally create vast new acreage for real estate development, including land owned by the Sulzbergers, publishers of the New York Times who devote weekly editorials to pushing Westway. However, the business-oriented Wall St. Journal recently reversed its support for Westway, mainly because Lewis Lehrman, the Conservative candidate for New York State governor, came out against it and because the Democratic candidate, Mario Cuomo, favours it.

Netzer backtracked on Westway, as reported by the *Village Voice*, which also quoted him as condemning "crusaders . . . who reject the only workable process for deciding on public policy in a democratic society . . . (they take) actions analogous to warfare . . . that paralyze and destroy the institutions and procedures that make representative government work".

I dropped Netzer a note to say that he had things backwards, inasmuch as the anti-Westway people had utilized all legal, non-violent means of appeal and recourse (public education, lobbying the courts), whereas Westway supporter NYC Mayor Edward Koch, had run on an anti-Westway platform, was elected, and then reversed himself, making a mockery of democratic institutions and the electoral process. Netzer took the time to reply and his response is worth noting: "I believe that representative government is the only proper, as well as the only practicable, form of democratic decision-making, save for very small groups of people, and . . . is likely to be more reflective of citizens preferences than the decisions that emerge from allegedly more participatory practices. I am

convinced that most Americans prefer to live in a society in which contention about public issues is less, not more . . . that they are happy with a division of labour in which all the energies of a few people—the chosen representatives—are devoted to this balancing, so that the rest of us can be part-time, not full-time participants in government . . . for most Americans, government is not a very important part of everyday life, and indeed, the notion of limited government is at the foundation of American history and American society".

Netzer is totally wrong in his definition of "limited government"; in this country it means limitations on the extension of government powers over private lives and conduct. Yet there is a grain of truth in what he says with regard to Americans and politics, for in fact they have deferred to "experts" in government, science, law and corporate life but have yet to recognize that their discontent is a product of political impotence, and a trade-off in exchange for economic freedom and security. Yet environmentalists, by their detachment from history and culture, have let these important issues—big government and centralization, freedom and personal liberty, self-sufficiency, localism and home rule—be pre-empted by the New Right. Instead of defining those issues accurately as ones of populism vs. elitism, traditional liberals have promoted what they thought would produce equity: busing, curing racism, moving blacks out of ghettos, when what they really should have been doing was working to assure urban, poor and minority communities of the powers taken for granted by the suburbs: the powers of zoning and taxation, of planning and oversight, of investment and public benefit, all of which could truly empower citizens in participatory and legitimate structures. The 1960's cry for "community control" led to token gestures of elected school and planning boards without a shred of real power being given back, while the issue of neighbourhood *government* never got off the ground.

That the environmental crisis is a direct and inevitable result of such political impotence is beyond a doubt. Thomas Jefferson spoke eloquently of "the public life" of which Netzer speaks with such

scorn, but it is the creation of this life that enables an educated citizenry to control its destiny, in that self-governing township which is, as Ralph Waldo Emerson said, "the unit of the Republic and the school of the people". That Americans are cynical about and withdrawn from a debased process is not surprising; it is simpler to pursue profit and pleasure. Nor is it surprising that the Netzer brand of cynicism can be articulated without apology or shame; he is far from alone in this rationalization of the existing power arrangement.

So much for the process; what about the normative issues? While no neat categories or divisions exist, there are several strands that represent genuinely different intellectual attitudes about power. The New Right, neo-conservative, Moral Majority side has a vision dominated by the concept of human benefit from progress, growth, and scorn for any notion about biological necessity, ecological concerns or the rights of non-human species. In fact the attitudes are strikingly similar to some of those of the American Left. Both sides fervently believe in progress via technology; the New Right, however, wants to use these to defend existing power and privilege while the Left wants to turn control over to workers and the presently unprivileged. The parallels, and the parallel dangers, are striking and need no further elaboration. Much of the American Left, or at least its more visible spokesmen, (e.g. the conservative or Marxist left that does not yet embrace true neighbourhood government or massive decentralization) is, on examination, quite close to the New Right, for it accepts the tenets of growth, human control of nature and resources, better living through technology, but would change the people and the ways to control it. Many American leftists used to be quite hostile to environmentalists and ecological issues; while less hostile now (mostly because of the anti-nuclear movement), they still tend to pay lip service to the issues or exploit them only insofar as they help them promote their particular *a priori* ideology.

Thus, Barry Commoner, who attracted a small "green vote" in his presidential campaign, can candidly admit (in an interview in *Neighbourhood*, May 1981, published by the New York Urban Coalition) that:

"Basically, I don't believe in environmentalism. In other words, in the sense of, let us say feminism, you know, a political interest group . . . my attitude toward the environmental interest group is that it is important not so much in order to take care of that sector of life, you know, clean air and so on. Its real importance is that it reveals the faults in the system of production that supports everything . . . my interest in environmental issues is only as they illuminate the basic problems that are of concern to labour, to Blacks and other minorities, to women, to urban problems, and so on. In other words, it reveals a problem around which all people can organize".

Should anyone consider him a non-growthnik, Commoner takes pains to dispel this notion: "... I'm not an eco-freak. My interest in environmental issues comes out of my interest in social progress . . . a proper and environmentally sound understanding of environmental and energy issues leads to the conclusion that solving them will lead to economic growth. I am not a no-growth person . . . The issue is that there's something terribly wrong at the root of the whole system when you cannot have further growth, and there are ways of doing it by reorganizing the system of production which were illuminated by our analysis of environmental energy concerns". A clearer articulation of the fascination of many of America's leftists with growth and progress—and their rejection of the rights of the natural world or the concept of ecological systems and imbalance—could hardly be made.

An interesting and highly revealing politico-scientific squabble is now going on in the U.S. regarding sociobiology, as personified by Harvard entomologist Edward Wilson. Wilson and his field of study have come to be regarded by the American Left as reactionaries *par excellence*, but less for Wilson's statements and thesis (the indisputable contribution of genes to human behaviour and therefore culture) than for the false assumption that human genetic traits are socially and politically determinant and compelling and therefore totalitarian and hierarchical. Interestingly enough, his strongest critics are the Boston group *Science for the People* who, although vehemently against nuclear power and genetic engineering,

seem troubled in the extreme by the thought that human beings may contain animal (read: base or violent) tendencies . . . a concern which when translated really means a conviction that the human species, by virtue of its brain and behaviour, somehow transcends nature and is therefore justified in placing human cultures and institutions above and beyond the influence of Nature. (As the English lady said upon hearing there was a theory abroad that said humans are related to apes: "My dear, let us hope it is not true. But if it is true, let us hope it does not become generally known".)

Examined closely, it becomes easy to see how in fact *anti-sociobiology*, rather than the object of its attack, lends itself more readily to authoritarianism. For if human institutions and culture need not defer in any way to Nature, then societal control by those who happen to be in power will be completely arbitrary at any given moment in history, and will be absolute and total.

So the American Left continues to define issues not as part of the relationship of humans to the natural world but in narrow economic and materialistic terms which are far from both Thomas Jefferson and John Muir, and closer to the Buckminster Fuller and Rene Dubos vision of a world managed—better and healthier of course—by and for humans.

Clearly, neither the romance of the left with worker control notions, nor the professional environmentalists dream of perfectly operating environmental bureaucracies and laws, builds a movement. Nor does it help shift the course of events towards either ecological sanity or economic equity. What is vitally needed is the unity proposed by Bookchin: "... to replace social domination by self-management, a new type of civic self—the free, self-governing citizens—must be restored and gathered into new institutional forms such as popular assemblies to challenge the all-pervasive state apparatus. Followed through to their logical conclusions, all of these movements challenge not only class formations but hierarchies, not only material exploitation but domination in every form." Only thus, says he, will there be "the achievement of a totally new, non-hierarchical society in which the domination of nature by

man, of woman by man, and of society by the state is completely abolished". The central conflict lies within the movements themselves and the need to discover the "sweeping implications of the issues they raise". The backlash of industry and government against ecological consciousness is the strongest indication we have of their recognition of the radical and dangerous threat of ecology to their way of doing business. Now the movement itself must come to the same recognition.

Lorna Salzman

ECOLOGICAL APPEAL

In the next few months, the Ecology Party wishes to raise the level of ecological and environmental awareness in the minds of politicians and the general public, in the run-up to the General Election, and, to guarantee more publicity for this underrated subject, the Ecology Party (ECO) is planning to advertise in various papers and journals as part of carefully co-ordinated plans to make the most of this, their 10th anniversary year.

If you would like to contribute, and enable ECO to have even better media impact, then you can take action now by sending us a donation.

You don't have to be a member of ECO—most of you may well belong to other parties, or even none at all—but if you wish us well in our endeavour to get ecological subjects debated more widely, then send what you can to the Party c/o 34, Balderton Buildings, (ref 'ET') Balderton Street, London W.1., making it clear that it is for these advertisement purposes, and especially indicating if you would like your money to go towards an ad in a particular paper.

Two final thoughts and suggestions; perhaps you have just come into some money and would like to donate part of it to what we believe is a very worthy cause.

Or, you might wish to consider making a loan for this purpose; if so, please write in with details.

Thank you

Note: The Ecology Party includes within its wide range of policies, proposals for introducing much higher standards of environmental conservation to protect the seas, agricultural land, and other natural resources. It is concerned with the elimination of pollution at source. ECO is a political party with a wide range of policies on all the usual political topics. It is not merely a pressure group. There were 53 candidates in the 1979 General Election.

It must be emphasised that THE ECOLOGIST is not linked to any political party, but we have asked them to publish this in case it appeals to individuals or groups who read it.

Nuclear Power slips into the Background

Make Our Power Station Safe (MOPSS) is a local residents action committee campaigning for the installation of Gas Blast Protection at Hartlepool Nuclear Power Station. To understand the action we are taking it is necessary to outline the background to the case.

In August 1968 the Health and Safety Executive, acting on the advice of the Nuclear Installations Inspectorate, granted a site licence to the Central Electricity Generating Board to build an Advanced Gas Cooled Reactor or AGR Nuclear Power Station at Hartlepool, Cleveland.

Since the granting of a site licence and the beginning of construction many changes have taken place in the area around the reactor site. In 1974 Teeside Borough Council gave permission to Phillips Petroleum to build an oil stabilization and storage plant close to the power station. In 1975, Stockton-on Tees District Council gave permission to Monsanto Ltd to build major extensions to their existing chemical works at Seal Sands, close to the power station. British Titan have recently extended their works on the Tees Road, close to the power station. All of these installations are classified in Local Government reports as 'major hazards' to public safety. The Chief Fire Officer for the area has expressed publicly his doubts in the ability of the fire service to cope with any major outbreaks on these sites. So real are the dangers of pollution, leaks of toxic substances, and possible explosions from those industries, that the nearby village of Graythorp has been evacuated. Not surprisingly perhaps, there are plans to build further hazardous plants in the area currently occupied by the now almost deserted village, including another chemical works for Magnachem. Also, the Tees and

Hartlepool Port Authority, in the face of opposition from several groups including MOPSS, is seeking to allow further industrialisation of the Seal Sands/Tees estuary area around the Hartlepool reactor. Several 'accidents' and 'leaks' in this area have already occurred, including an irritant gas cloud from British Titan, a recent explosion at ICI Billingham and a gas leak near the reactor core at the power station itself in October 1981.

These incidents have been dismissed as 'minor' or 'trivial', but they are minor more by good fortune than because of the efforts of the industries responsible.

In December 1979 it became known, and subsequently appeared in the *Sunday Times*, that outline plans were being made for a second nuclear reactor to be built at the Hartlepool site. In view of the close proximity of the petrochemical complex, which is one of the largest in Europe, the Nuclear Installations Inspectorate began pressurising the CEGB to make provision for gas blast protection in the plans for the 'B' reactor, thus automatically suggesting the need for similar protection to be fitted to the existing reactor. Since that information was revealed, MOPSS has been trying to penetrate the veil of secrecy which surrounds the nuclear industry in order to make clear all aspects of that threat to safety. Early in 1982, East Cleveland Friends of the Earth commissioned from the Political Ecology Research Group (PERG), an independent technical advisory service, a report on all aspects of the area surrounding the power station. This report, copies of which are available from MOPSS, gives detailed facts and figures, and includes references to previous explosions in the petrochemical industry.

One particular incident referred

to was the huge explosion at Flixborough in June 1974, caused by the ignition of a massive cloud of cyclohexane vapour, which resulted in the deaths of 28 people and the injury of 36 others, and substantial damage to 1,000 houses in the town of Scunthorpe, almost 3 miles away from the plant. Cyclohexane has similar properties to petrol, and Phillips Petroleum storage plant is less than one mile from Hartlepool reactor.

The parallels to be drawn with the Hartlepool situation are obvious, and as a result of those findings an independent residents' action group was formed to ensure that gas blast protection was installed at the Hartlepool reactor. All approaches to the nuclear authorities have been met with evasions and excuses. The Committee of MOPSS have therefore obtained the services of Steel and Shamash, 'a firm of Solicitors based in London, to bring a court action against the NII to revoke the site licence of Hartlepool Power Station, until sound assurance is given that essential gas blast protection is provided.

In the event that MOPSS loses the court case it may be faced with a legal bill for thousands of pounds. In spite of such daunting figures the solicitors have been instructed to proceed.

MOPSS is now in urgent need of funds to finance the action. Approaches are already being made to sympathetic organizations in this country and abroad, and money is already coming in. The eventual repercussions of our action may not just be local, but national, and possibly international. MOPSS therefore needs outside support for the first legal action against the Nuclear Installations Inspectorate.

In 1920 the Tees Conservancy Act granted powers to the Tees Conservancy Commissioners to

reclaim land adjacent to the river Tees for industrial development. Since 1920 the Tees Conservancy Commissioners now known as the Tees and Hartlepool Port Authority have, at regular periods, had to seek an extension of the time available to them to reclaim the land.

The area of land which they seek to reclaim (Seal Sands) is 430 acres in size. In 1977 the Secretary of State for the Environment modified the Teeside Structure Plan to zone the whole of the remaining 430

acres of Seal Sands for port and port related developments.

The authority thus intends to develop port facilities and allow the construction of petro-chemical installations directly opposite to the power station. If so, the external dangers posed to the power station would be increased significantly. The Bill in support of the authority is still to have its second reading in the House of Commons, having been opposed on three occasions. If the Bill does receive its second reading then it

will go to the opposed Bill committee were petitioners like MOPSS will represent evidence against it. MOPSS will seek to convince the committee of the Port Authority's intentions and will point out to the committees attention that any such development means that Hartlepool Nuclear Power Station will breach UK siting criteria. To support that point MOPSS will seek to persuade the committee to subpoena the NII to give evidence.

D.P. Muir

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Hierarchy and Freedom

THE ECOLOGY OF FREEDOM, by Murray Bookchin, Cheshire Books, Palo Alto, California/Prism Press, £6.95.

There are two traditions within socialism. The minority libertarian tradition (as represented by the anarchists, council communists and others) is seen as strong on action, emotion and morality but weak on theory, logic and practice. Marxism, the chief representative of the more popular authoritarian tradition, is believed to provide a more comprehensive and scientific picture of social structures. For this reason, it is usually considered as a better guide to action.

Events since the second world war have shaken that assumption. Ideas from the libertarian tradition that stand in direct contradiction to classical Marxism have reappeared though their libertarian ancestry has usually not been acknowledged. Outstanding examples include the assignation of a predominant revolutionary role to the peasantry and the recognition of 'superstructural' factors such as sex, ethnicity, consciousness, as being of equal weight in comparison to economic matters. Within the libertarian 'ghetto', the investigation of such matters as ecology, the nature of the so-called socialist regimes and the class nature of modern societies is, in fact, far more advanced than it is within the mainstream of the left. The problem is that such work is little known outside of the anarchist milieu.

Many radicals, despite the fact that their ideas contradict much of the Marxist ideology, cling to Marxism because of its all-encompassing nature. Anarchism, even at its theoretical height in the works of Kropotkin, has failed to produce such a totalizing system. Murray Bookchin is probably the best known of living anarchists, and he is a logical

candidate for the producer of such an alternative. Readers of his latest book, *The Ecology of Freedom*, can have little doubt that this is indeed his intent.

In his previous writings on ecology and revolutionary thought, Bookchin has focused on the idea of an ecologically sound and diversified community, basing his critique in the intellectual tradition of anarchist communism. A secondary theme running through all of his work has been a personal 'coming to terms' with Marxism. At times this theme becomes dominant as in *Listen Marxist* and *Marxism as Bourgeois Sociology*. Yet, up to now Bookchin has done little but point out the more obvious failings of Marxism. *The Ecology of Freedom* moves beyond this to construct an alternative system for understanding human history.

The Ecology of Freedom is not an easy book to read. As Bookchin remarks, "This book does not march to the drumbeat of logical categories, nor are its arguments marshalled into a stately parade of sharply delineated historical eras". True to its project of replacing Marxism, it is comprehensive to the point of excess. Bookchin says that, "anthropology, history, ideologies, even systems of philosophy and reason, inform this book".

Yet a certain number of themes can be traced throughout the book. The first is an attempt to construct a theory of historical change based on the concept of hierarchy rather than class as in 'historical materialism'. Bookchin shows, quite convincingly, that domination and hierarchy preceded class differentiation and that systems of domination were far more important in the rise of classes than any 'means of production'. Bookchin traces the hidden (by Marxism) history of how non-economic modes of domination often had a determining influence on historical change right down to the present day.

In the course of this odyssey, Bookchin takes up three historical eras. The first is the idea of an 'organic society', a 'state of nature', that existed prior to and at the very beginning of the emergence of domination. He sees this organic society as a destination as well as an origin for it contains many elements that a post-hierarchy society would rediscover. These may seem like fairly common ideas, dating all the way back to the French 'Encyclopaedists', but Bookchin adds some very penetrating observations. He claims that organic society has a "non-hierarchical mentality" (he makes it very clear that this is not the same thing as some 'non-linear thinking', a way of thinking that he doesn't believe exists) that precludes the domination of nature. This is because human beings and nature are perceived as one inter-

connected whole. Thus the outlook towards nature is deeply connected to the outlook towards other humans. In his examination of the social interactions, technology and existential positions of so-called primitive people Bookchin does much to flash out an area that Marxism's idea of primitive communism has left very vague.

Two other eras on which Bookchin focuses are the Greek city states and the hidden anti-authoritarian side of Christianity, especially as it came to flower in the heretical sects of the middle ages. As he looks at these two eras, he develops two other crucial aspects of his thought—the concept of an autonomous and social self, a self that is both rational and liberatory, and the superiority of the desire for freedom (the equality of unequals) over that for justice (the inequality of equals). The first idea was touched upon by the young Marx in *The German Ideology*, but Bookchin develops it much further than Marx was capable of. The second theme is a 'non-question' in Marxism.

Bookchin also investigates the nature of technology, situating it in its social context. In the course of this, he attacks Marx's concepts of labour, value and commodity, interestingly enough those aspects of Marxism that neo-Marxists consider most libertarian. He also presents an exhaustive critique of fashionable ecology, showing how an ecological society must be a coherent whole rather than a patchwork of appropriate technologies, decentralizations, simplifications, etc..

Bookchin attempts to recapture the utopian ideal for present day radicalism. Only a reawakening of the utopian vision can, according to him, hope to cope with the crisis that our hierarchical society has brought us to. This utopian vision draws together such disparate themes as morality/ethics/values, need/desire/happiness and work/play, as well as others already mentioned, to form a coherent whole that is more than the sum of its parts.

So how does one evaluate such a book? It is probably the most complete statement of the anarchist vision yet produced. Its arguments are those that every radical, whatever their philosophy, should confront. Bookchin has produced an alternative to Marxism, whatever one might think of his components.

The greatest problem the book has is its style. The subjects which I have barely touched on in this review are only a partial listing of the book's contents. *The Ecology of Freedom* ranges over a far greater territory than say *Capital*. Bookchin's writing style doesn't help matters, which is unfortunate as his previous work has often shown sparkling clarity, and he is a very good speaker.

The book is indeed coherent, but the coherence is not always immediately observable. In an epilogue, Bookchin attempts to rehabilitate teleological thinking as a radical method. Much of the book is like that: you have to take the author on faith until an 'aha' occurs well into his argument. His book can only be viewed as a whole itself, the development of the arguments only (often) make sense in terms of what they lead on to. A previous familiarity with Bookchin's works helps in understanding.

This book is an indispensable introduction to the best of modern day anarchist thought. In addition to coming to terms with Marxism, Bookchin also delivers a scathing critique of new ageism. This diverse and vague trend is criticized for its eclecticism (among other faults) that ends in a reproduction of the hierarchical society that it attempts to replace.

I have my own reservations about much of Bookchin's thought, especially in relation to its practical consequences. Bookchin also avoids a full discussion of the idea of 'human nature' in his theory of organic society, but he is far less guilty in this regard than those who have written on this matter from a Marxist perspective. A more serious failing is the failure to criticize Marxism on its own ground-economics. Much of Marxist economics can be shown to be demonstrably false when it descends from the clouds to making predictions in the real world. Creative Marxist economists have contributed to radical thought only by going outside the bounds of Marxism, though they often stubbornly deny that this is what they have done. An anarchist alternative to Marxist economics has yet to be constructed, but such an alternative is necessary if anarchism is to present an alternative to Marxism.

Bookchin has little interest in either economics or the question of class. This is unfortunate as these questions have great bearing on the matter of practical day-to-day activity, whatever the philosophy one bases oneself on. Bookchin has dealt with managerial radicals in the anti-nuclear movement, but his analysis is hardly as penetrating as that of other anarchists who have studied class dynamics in both Western and 'socialist' societies. An accurate description of present day reality has to re-examine the idea of class (not merely dismiss it as Bookchin is prone to do) if it is to offer a realistic alternative to Marxism and a guide to action.

But this is the work of other anarchists, as the general tone of Bookchin's writings show. Anarchism is unlikely to generate a pantheon of fathers of the Church. The ideas that Bookchin expresses are in the air of

the modern anarchist movement. They are not the possession of one individual. Radicals would be well advised to look into this book as the most complete expression of this development. Anyone concerned with ecology would also find that these pages contain the most coherent expression of an ecological philosophy yet formulated. A difficult read but well worth the effort.

Pat Murtagh

Green Ancestors

BACK TO THE LAND: THE PASTORAL IMPULSE IN VICTORIAN ENGLAND FROM 1880 TO 1914 by Jan Marsh, Quartet, 1982, £12.95.

It's not often that history can throw us a rose, as opposed to a brickbat, but tucked away in the axiom that those who cannot learn from history are doomed to repeat it, is the happy circumstance in which repetition comes upon an uplifting event.

Such was the Victorian pastoral impulse, hosted by the household names of John Ruskin and William Morris and which has some parallel in the Green movements of today.

The similarities are impressive but comparisons are always seductive, providing the run-in to generalisations that will squander what might have been learnt from a study of the differences, rather than the look-alikes.

Fortunately, Jan Marsh does not let her work roar off on this tangent. Fascinating in its own right is her presentation of the scope of the 19th century movement, embracing architecture, politics, fashion and that most invidious Victorian undertaking—the tendency to good works. On this latter theme, the chapter on farm colonies, many of which catered for the unemployed and destitute, is particularly salutary.

Attitudes are typified by the title of a pamphlet, issued in 1904, by Salvationist William Booth: "The Vagrant and the Unemployable: a Proposal for the Extension of the Land and Industrial Colony System, whereby Vagrants may be Detained under Suitable Conditions and Compelled to work".

It appears that righteous certainty was loose in Elysian Fields but it proves that not everything from that era was decked in Morris' prints. Somehow we expect it to be but our nostalgia does a disservice to the movement, as well as misleading our own momentum.

This rose-tinted fault is mirrored for us when Gertrude Jekyll is quoted as complaining that instead of scrubbed flagstones, country houses now had

floors covered with lino, while "the walls have paper of shocking design and are hung with cheap oleographs and tradesmen's illustrated almanacks." Jan Marsh remarks: "To every generation its own nostalgia: these cheap and nasty artefacts—tin boxes, old advertisements, tinted pictures are now eagerly bought and sold by those for whom they hold intimations of an older, stabler age—just as rush lights and Toby jugs did for Gertrude Jekyll."

Like Miss Jekyll, in this instance, our obsessions are often with materials and methods, which are surely peripheral to the search for right life, the origins of which are within human beings, only secondarily in their artefacts. Getting back to basics is not a question of re-tooling the farm, or workshop, with the methods of our grandparents but of coming to terms with the contradictions within ourselves.

But then, as now, there was also the fallacy abroad that simply getting back to the land would transform man's nature, willy-nilly. The cart is before the horse, here. Land and its cultivation may well be catalytic to a receptive spirit and many people must be frustrated for want of an acre and a cow. Nevertheless, it is also true that rural populations are forever leaving the land, partially because being born to a way of life blunts appreciation of it. So it is reckless to suppose that land contains an alchemical agent, mere contact with which is sufficient to transform pencil-moustached, used car salesmen into wise old ploughmen. The wreckage of a thousand-and-one communities, founded on no more than good intentions and ten acres, attest to this. Only the resolute and adaptive survive, usually by their ability to accept one another's failings without too much breast-beating. This can be done just as well in an industrial setting and to deny it is to depreciate man's stature.

The architects of the Green movements, past, present and probably future are well aware of this. It is the half-baked among their followers and emulators who cloud the issues with cuckoo-spit. As Jan Marsh points out, even Morris recognised that the enemy was not the machine but the commercial pressures which led to men spending "all their lives cutting martise joints." It was those same pressures that produced the black, industrial waste-land he so hated. Morris' concern was with harmony and although he created a material world in which that was romantically exemplified, he knew well-enough that harmony comes also from within. After all, he was a man of achievement, not a preacher without a practice and that in itself is a hallmark of balance.

Naturally, as the chief exponents of country life, country folk themselves

came in for attention. The rustic was hauled from his ditch and lionised. Jan Marsh puts it elegantly: "As the majority of the population ceased to have any direct link with the land, so popular mythology created, at least among the educated classes, a kind of rustic hero, possessed of qualities hitherto unrecognised."

This vogueish hypocrisy largely missed the point made by serious chroniclers, such as George Sturt, who were at pains to record what they saw as the stoicism and good nature of the countryman. Sturt reports his own shift of attitude in compiling *The Bettesworth Book: Talks with a Surrey Peasant*. From regarding his subject as "something of a comic character 'full of garrulous and good-tempered quaintness'" he eventually recognised "so much silent suffering as to make me wonder and admire, where before I might have laughed."

Jan Marsh remarks on the final irony that Sturt, who saw himself as "lamenting the ultimate loss of the old English 'country' tradition of rural work and leisure, was later discovered and promoted as the authentic representative of that tradition, so that images from a Farnham wagon-builders (as reported in his *The Wheelwright's Shop*) in the 1870s and 80s became for a generation of industrial and urban-educated readers fixed points of moral and literary value, which could never be regained."

This thirst for authenticity and tradition had many happy results. The revival of English Morris dance and the whole folk song tradition is lodged in this period, under the direction of enthusiasts such as Cecil Sharp.

The breadth of Jan Marsh's enquiry is excellent and revealing. Beyond the familiar figures of Morris, Ruskin, George Bernard Shaw et al, were a host of smaller fry exploring the commandments of these gurus and transforming ideas into action. Their activities, in village, field and council chamber are revealed as part of the dynamic that was changing the accepted face of a nation.

It is the virility of the movement that I find astonishing, spawning such prestigious organisations as The National Trust, The National Footpaths Preservation Society and, ultimately, giving rise to the Garden Cities.

Back to the Land is full of tempting mirror images and it is to Jan Marsh's credit that she does not smother her facts with any theory of parallels. To do so would be to blunt a remarkable picture of energetic spontaneity cogently presented.

Mike Hulme

Tribal Rites at Windscale

RATIONALITY & RITUAL: The Windscale Inquiry & Nuclear Decisions in Britain, by Dr. Brian Wynne, British Society for the History of Science, £6.50 (£4.90 members). Available from BSHS, Halfpenny Furze, Mill Lane, Chalfont St. Giles, Bucks.

The Windscale Inquiry closed its doors over five years ago in the summer of 1977. Lest this deter any one from reading the book, let it be said at the outset that this is much more than just another book about Windscale.

Firstly, the book is unique in placing the Windscale Inquiry within its historical context. By tracing the development of British nuclear power policy, the author is able to identify the major scientific and political commitments to nuclear technology *per se* over a thirty year period. Given these commitments, THORP appeared as just another necessary and incremental decision in a programme already well-charted within the policy-making enclaves of the UK.

Secondly, the author presents this historical material from a perspective which stresses those 'ritual' aspects of policy which ensure public quiescence in the face of awesome technological commitments. The ritual processes examined include policy mystification by a combination of entrenched political secrecy and the deployment of public images of science evocative of both transcendent magic and absolute expert authority.

The author considers how the credibility of those legitimating rituals is undermined, only to be replaced by the ultimate arbiter of impartiality 'Judicial Rationality'. This being embodied in the form of a High Court Judge, Lord Justice Parker, presiding over the Windscale Inquiry. The sections on Judicial Rationality demonstrate quite clearly how the reductionist tendencies embodied within this approach mirror and compliment the positivist tendencies within the nuclear paradigm. The political impact of this is demonstrated by reference to the manner in which Parker defined major issues within the inquiry as issues of fact whereas what was in dispute were often points pertaining to wider regulatory processes.

Parker's perception of issues, coupled with the status accorded his views, combined to define the inquiry as a method of discovering 'The Truth' about the objective need for, and safety of, THORP. By proceeding in this manner the fore-going scientific and political commitments to THORP were stoically ignored and

the democratic 'decision making' myth preserved and strengthened.

Thirdly the author further elaborates his consideration of the ritual aspects of the inquiry process by adopting an anthropological approach in considering the relationship between the various world views represented at Windscale. The result is a refreshingly non-partisan overview of a process where polarisation is the norm.

At the centre of this book lies the contention that the nuclear debate is merely the outward manifestation of a much more fundamental schism in society. Ultimately 'authority and governability as such' are at stake and the author argues that the dividing line between apathy, alienation and revolt may be much finer than previously thought. 'Decisions' about big technology, such as THORP, are really beyond our capacity and ritual is needed not only to gain public acceptance but also to prop up the image and morale of the nuclear establishment so that it can continue to function. These themes are skilfully interwoven with a detailed account of the Windscale Inquiry which is the richer for the authors deep involvement as an advocate at the time.

For those who follow the tortuous development of nuclear power in this country, those about to confront the nuclear juggernaut at Sizewell, and those who just want to try and find a more adequate conceptualisation of the nuclear debate, this book is recommended reading. In dealing with the pitfalls of the Windscale Inquiry, the book may help prevent their repetition at Sizewell—though many objectors have already decided against participating in the current round of ritual dressed up as decision making.

This is an absorbing book and one difficult to do justice to in a short review. The potential reader should not, however, anticipate treating it as light reading—if in doubt order for your local library.

Ian Welsh

Two Poisons

LEAD ON THE BRAIN: A Plain Guide to Britain's No. 1 Pollutant. Nick Kollerstrom. Wildwood House, London, 1982. £2.95.

PORTRAIT OF A POISON: The 2,4,5-T Story. Judith Cook and Chris Kaufman. Pluto Press, London, 1982. £2.95.

In the last few years, both leaded petrol and the herbicide 2,4,5-T have become major environmental issues—2,4,5-T largely as a result of the activities of the National Union of

Allied and Agricultural Workers, and leaded petrol through the activities of CLEAR, the Campaign for Lead-free Air. The evidence that both pollutants are significant health hazards is now overwhelming—indeed, it is accumulating at such a rate that both these slim volumes are (through no fault of the authors) already somewhat dated.

That, however, should not deter readers from buying either book—they are quite simply the best popular works to date on their respective subjects. Well-written and well-researched, their greatest strength lies in confronting head-on the seamy politics which have mired the debate on both pollutants—politics which are principally responsible for both 2,4,5-T and leaded petrol remaining on the market. Inevitably, both books raise disturbing questions about the regulation and control of pollutants in Great Britain—and neither do much to encourage the hope that reform will be forthcoming.

For their part, Kaufman and Cook are in no doubt about the root cause of the problem—nor what should be done about it. "For those who have been involved in the 2,4,5-T debate," they write, "it has often been difficult to distinguish between the voices of the spokespersons for the agrochemicals industry and those of the Ministry of Agriculture." That hand-in-glove relationship between the polluters and their watchdogs is well documented, notably in the chapters on 'The Politics of 2,4,5-T' (an eminently readable account of the battle by Dr. Roger Thomas MP to weedle out the true figures on the extent of 2,4,5-T use in Britain) and 'The Human Guinea-Pigs' (which deals with the aftermath of the 1968 explosion at Coalite's 2,4,5-T plant in Bolsover and the subsequent attempt to cover-up cases of 2,4,5-T poisoning amongst workers at the plant).

If pro-industry bias is one problem, the very nature of pesticide poisoning is another. Rarely, if ever, are doctors present at the time of the poisoning and when—often months later—exposure is linked to a side-effect, the link is easily dismissed as coincidental. Cook and Kaufman are well aware of those difficulties but, unlike the Pesticides Advisory Committee (which is responsible for reviewing the safety of 2,4,5-T and other pesticides) they are not hide-bound by the shibboleths of scientific method. Taken separately, the case histories documented in *Portrait of a Poison* may not be enough to justify a ban: taken together, however, they build up into an unassailable case against 2,4,5-T. Small wonder, then, that Cook and Kaufman are strongly critical of PAC. Like 2,4,5-T, they argue, the committee stands convicted and should be scrapped as surely as the herbicide should be banned.

In *Lead on the Brain*, Nick Kollerstrom is no less critical of the authorities. But where Kaufman and Cook see cover-up and conspiracy, Kollerstrom offers a less dramatic explanation. "Scientists are trained to be cautious and conservative in their judgements", he writes. "That caution may be very commendable from a purely scientific viewpoint, but when presented by medical experts to politicians it assumes a different significance. To politicians the negative statement, 'We have no definite evidence that lead is harmful to health'—which is, in fact, the kind of assurance which environment ministers have received from Medical Research Council experts over the years—sounds like a positive assurance that existing lead levels in the environment are quite harmless."

Once an official pronouncement of safety has been made, the government has the tendency to 'dig in'—sticking to its guns, however desperate its case. At that point science becomes mired by politics—a problem Kollerstrom experienced at first hand whilst working for the Medical Research Council. Procrustean science—fitting the facts to the theory by dismissing or ignoring vital evidence—becomes the order of the day, and positions become so firmly entrenched that debate is almost impossible. As Kollerstrom documents with great skill, that procrustean method is well illustrated in the 1980 Lawther report. Together with his chapter on the response of the authorities to the discovery of high lead levels in food (a chapter that contains an amusing exchange of correspondence with officials at MAFF), Kollerstrom's treatment of the Lawther report provides a fascinating insight into the blinkers that prior commitments place on the expert—blinkers that can only operate to the detriment of public health.

Both these books are refreshingly partisan—given their campaigning stance, that is hardly surprising. Undoubtedly they will be dismissed as naive and unsubstantiated propaganda by those who have chosen to sit on the other side of the fence (Professor Mellanby was so upset by *Portrait of a Poison* that he told readers of *New Scientist* that he would 'go out and buy in a good supply' of 2,4,5-T to use with his 'own hands' in the hope that by exposing himself to 'this useful compound' he would persuade others of its safety). For my part, however, I found the authors' commitment a positive strength: indeed, I have no hesitation in recommending both books—even if that recommendation does lead Professor Mellanby to be so foolish as to martyr himself.

Nicholas Hildyard

Pesticides and Poverty

A GROWING PROBLEM: Pesticides and the Third World Poor. David Bull. Oxfam. £4.95.

This succinct report explains the problems of pesticide use in the Third World. It covers the following areas—the pesticide treadmill; resistance; vector control; poisoning; residues in food; environment; cost and benefits; advertising and promotion; integrated pest management; controls and future needs. It highlights a cause for world concern.

Spinning the treadmill—pesticides kill the pests' natural enemies as well, pest populations recover faster than their predators'; new species of pests and weeds become a problem. Spraying increases and so does resistance—7 species in 1938, 25 in 1954, 432 in 1980. As options for new pesticide formulas close, companies can only absorb spiralling research costs in ever increasing sales. Yet experience in Malaria control, for instance, shows the success of returning to old methods with a significant drop in chemical use.

Poisoning—at least 10,000 deaths each year—through poor equipment, illiteracy, 'numb-tongue' testing, exploitation. In 1976, 30 per cent of U.S. exports were products banned on the home market. Co-existence of cattle and cotton has led to high pesticide residues in beef and milk. Spot checks in the U.S.A. indicate between 5 and 7 per cent of food imports contaminated beyond safe levels. However, little information is available for U.K. imports, due to lack of regular or routine analysis.

David Bull illustrates the potential for integrated pest management techniques. Careful ecological analysis, introduction of natural pest predators, selective use of chemicals, can reduce pesticide use substantially whilst maintaining yields. However, the political and commercial constraints on introducing I.P.M. are formidable.

The final chapter details the lack of present controls—how does 'caveat emptor' apply to an illiterate third world farmer?—and summarises Oxfam's policy recommendations. Urgent action is needed—in the Third World on import controls, health care, agricultural services; in the U.K. on export controls, marketing practice, residues in imported food, aid to develop I.P.M. techniques; in the pesticide industry to control its marketing practices;—and worldwide, to implement research in priority areas.

This is excellent work from Oxfam. It is clear and comprehensive. It shows a campaign crying out for action.

Tony Winter

Classified

CONFERENCES

BIO-DYNAMIC AGRICULTURAL ASSOCIATION. Annual Conference open to all: "The Rhythms of Nature and their Significance". July 15-17, 1983 at Hawkwood College, Stroud, Details from: Secretary, B.D.A.A., Woodman Lane, Clent, Stourbridge DY9 9PX.

FOURTH ECO-PHILOSOPHY CONFERENCE, Dartington Hall, 8-10 July "Wholeness and the Ways of being Whole". Eco-Philosophy is an attempt to rethink in philosophical terms our post-industrial heritage particularly as it effects the well-being of individuals, cultures and the entire planet. We will explore the meaning of wholeness; its essential dimensions; its religious connotations; the ways we can acquire it and the difference it can make to our individual lives and the life of the culture. For brochure please write to: Henryk Skolimowski, Elmthirst Centre, Dartington Hall, Totnes, Devon.

MISCELLANEOUS

"Bike for Peace" invites Peace organisations world wide to participate the Peaceride on bicycle in summer 1983 from Moscow, Soviet Union, through Europe, and end up in Washington D.C., U.S. For details write to: 'Bike for Peace', by/Tore Naerland, Asdalsveien 3A, Oslo 11, Norway.

COMET (combined organic Movement for Education and Training) and **WWOOF** (Working Weekends on Organic Farms) have now joined forces. They make available a comprehensive information service to tell you what training and education is available in **ORGANIC AGRICULTURE AND HORTICULTURE**. Details may be obtained by sending a 9 x 4 stamped addressed envelope to: WWOOF, 19 Bradford Road, Lewes, Sussex, BN7 1RB.

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NATURAL HISTORY WEEKEND in the **LAKE DISTRICT** 10-12th June 1983. An informal weekend activity providing an opportunity for the beginner and novice naturalist to develop their interest. The weekend will be spent exploring the basic ecological principles behind the habitats within walking distance of the centre. For further information send s.a.e. to Low Gillerthwaite Field Centre, Ennerdale, Cleator, Cumbria, CA23 3AX.

ENVIRONMENT WITHOUT FRONTIERS launch a new Summer School in August this year. The courses will be of interest to those concerned with our environment, its conservation, management and improvement. Details and brochures from Michael Gee, Brathay Hall Trust, Brathay Hall, Ambleside, Cumbria, LA22 0HP.

BEAUTIFULLY converted, mediaeval, self-catering cottages on trout farm. Free riding, tennis, fishing. Ask for brochures from Dan Parsons, Worthyvale Manor Farm, Camelford, Cornwall, UK. (Tel: 0840-212375).

PUBLICATIONS

SIZEWELL REACTIONS—a new anti-nuclear newsletter with up-to-date information on events outside and inside the Inquiry launched by SCRAM, the Scottish Campaign to Resist the Atomic Menace. Issues will be available on subscription (£5) from East Anglian Alliance Against Nuclear Power (EAAANP), 2 St Helen's Street, Ipswich.

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