

The

Ecologist

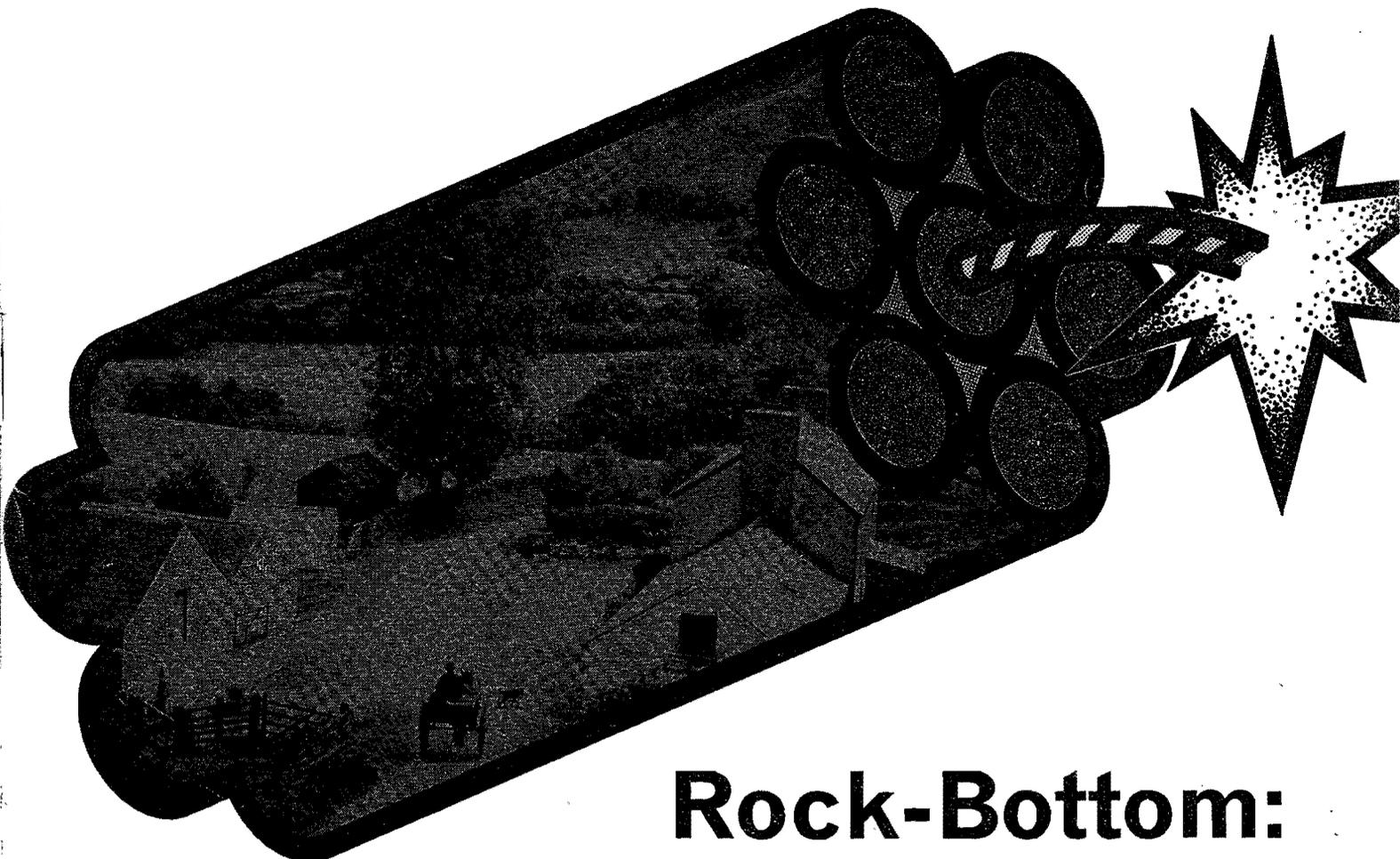
Man and the environment ■ The Quality of life ■ Pollution ■ Conservation

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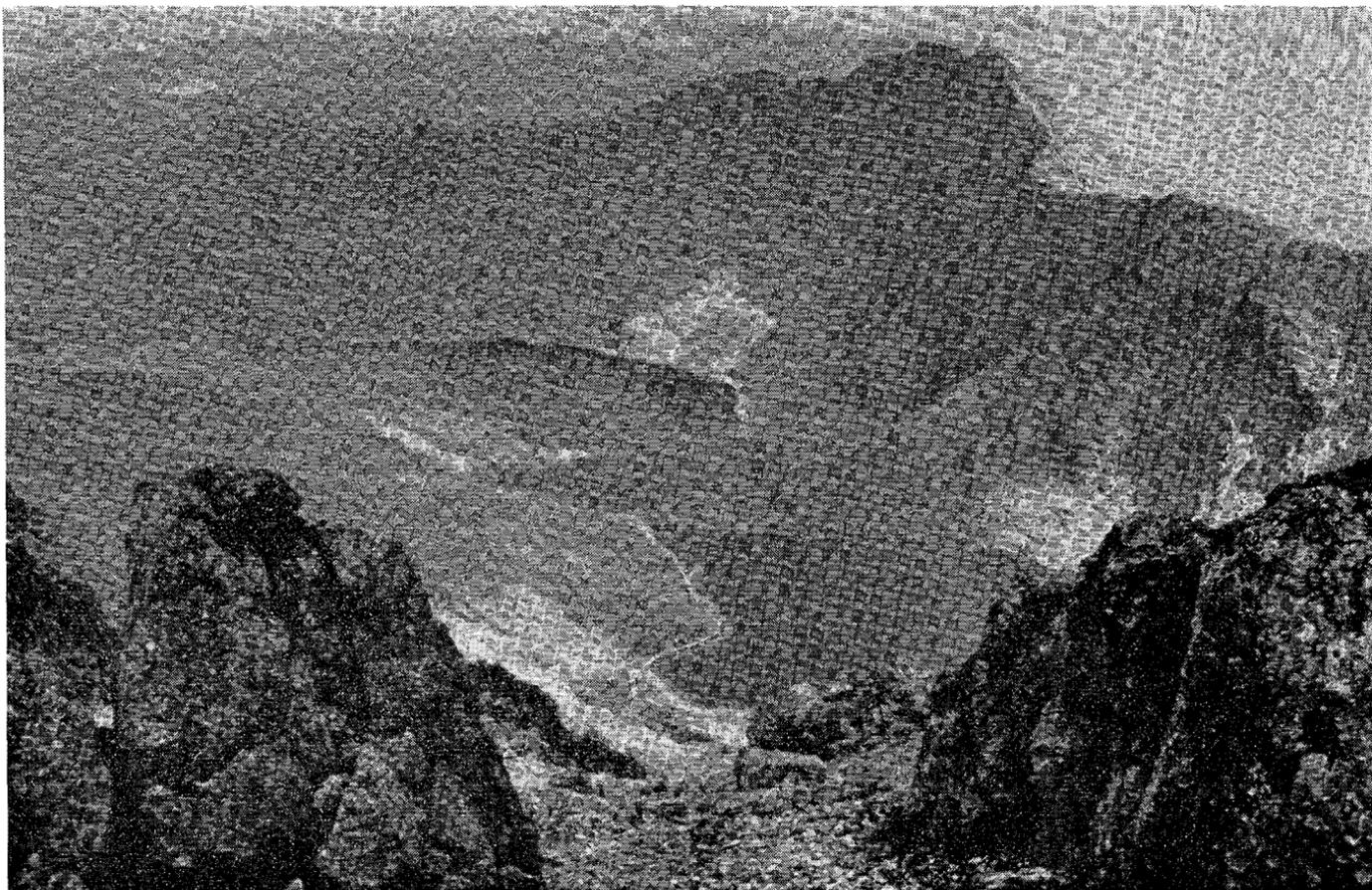
For a mess of motorways ■ The ecology of health and disease

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Rock-Bottom:

Nearing the Limits of Metal-Mining in Britain



Rock-Bottom: nearing the limits of Metal-mining in Britain

"Yes, that's it," said the Hatter with a sigh: "it's always tea-time, and we've no time to wash the things between whiles."

"Then you keep moving round, I suppose?" said Alice.

"Exactly so," said the Hatter: "as the things get used up."

"But what happens when you come to the beginning again?" Alice ventured to ask.

"Suppose we change the subject," the March Hare interrupted, yawning.

—Alice's Adventures in Wonderland

Ten months ago, RTZ and six other mining companies actively prospecting in British wildlands announced that they had set up an "independent Commission on Mining and the Environment" chaired by Lord Zuckerman. This curiously named group (which is not a Royal Commission, and indeed has nothing at all to do with the Government) has since then been taking evidence in confidence from mining companies, trade and professional bodies, Government agencies, and private conservation groups. Its conclusions should be published soon.

In response to an invitation from Lord Zuckerman, Friends of the Earth submitted detailed evidence to the Commission. Agreeing with Kenneth Allsop that this evidence is "obligatory reading", *The Ecologist*

takes pleasure in reprinting it in full, brought up to date by minor revisions.

The evidence is organised thus:

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0. TEXT OF LETTER OF TRANSMITTAL

Dear Lord Zuckerman,

Thank you for your reply dated 23 December (received 3 January) to our inquiry about the terms on which you invited Friends of the Earth to submit evidence to your Commission [on Mining and the Environment].

We are sorry that you feel bound to prefer speed to the deliberation and balance that wider public participation could lend your debates. To produce your report as a *fait accompli*, as you propose, may give the public what the Skeffington Report warned against—a chance only to concur or object, not to discuss and contribute.

We also regret that you cannot at present undertake to make available to the public the evidence underlying your report. *Ex cathedra* conclusions, based partly on facts withheld from public discussion, are unconstructive contributions to the "wide public discussion" your report is supposed to stimulate. We hope you will reconsider your position and seek permission to make your evidence public promptly. We believe that expeditiousness and confidentiality—the principles you have hitherto adopted—are in neither your Commission's nor the public's interest.

We welcome your confirmation that "the evidence your Commission will accept will... be in geographically general terms designed to suggest 'general principles and their future application to particular situations and cases'—without, however, treating in detail any specific schemes or proposals that would more properly be the subject of later Planning Inquiries."

Your letter does not make clear why you cannot make our evidence available to the public. We take it that you are accepting some evidence in confidence, but you need not (and we hope you will not) treat ours in this way.

We take pleasure in submitting six copies of our evidence with this letter,

and we shall send you an advance copy of our book (the case-study of Gwynedd) as soon as we can. Please let us know if we can help your Commission further.

Yours sincerely,

Graham Searle, Executive Director, FOE Ltd.

[Editor's note: Friends of the Earth submitted their evidence to the Commission on 16 January 1972 and published it four days later.]

1. TERMS OF REFERENCE

1.0. Your terms of reference are¹:

In the light of current governmental measures to stimulate the fuller use of national mineral resources in Britain, the general concern for conservation and the environment and the need to establish the way in which these two objectives can be harmonised, to examine the relevant problems of exploration, mining, continuous rehabilitation and subsequent reconstruction of sites and to make recommendations designed to reconcile economic and technical considerations with other requirements of national policy, especially those concerning physical planning and the environment in terms of amenity, recreation and scientific and historical interest.

1.1. Resource Depletion

1.1.0. Before we address ourselves to the questions of mining and exploration technique raised by your terms of reference, we should like to explain why we think it essential that you construe "other requirements of national policy" to include the conservation of mineral resources. We do not see how your conclusions can be useful guides to national policy if you do not consider general arguments of resource depletion. If you were to do this, we agree that your already very hard task would become even harder; but we fear that your conclusions may otherwise be accepted without their underlying assumptions having been questioned. We therefore urge you to consider the following arguments, in order (if they seem cogent) either to study them yourselves, calling extra evidence and co-opting extra members as needed, or to include in your report a caveat urging proper consideration by a special Commission (preferably appointed after consultation, and not

by interested parties). Indeed, we feel there is much to be said for setting up such a Commission before you have reported, for its conclusions must be available before the Government make further decisions on domestic mining.

1.1.1. The rapidly increasing use of mined resources² is, on a finite planet, subject to limits set by diminishing social returns. The time has come for Governments—and mining companies—to consider whether these limits have been reached. As mining increasingly rich ores becomes increasingly common and damaging, we become steadily more doubtful that public policy can justify further large-scale mining to support an economic growth that is not essential to, and is indeed often antagonistic to, growth in well-being³. The sensible alternative, which has not been examined seriously enough, is to use less profigately what we have already mined, and to devote as much effort to closing resource loops as we now devote (in the interest of private profit) to keeping them open⁴. This issue is especially urgent in Britain, an island-within-an-island whose rural habitats are notoriously fragile and whose population density exceeds that of India. As we shall argue in section 3.1, mining literally costs the earth; Britain, even more than most places, has no extra earth.

1.1.2. Your conclusions would be vitiated if you construed your terms of reference so as to beg the question whether large-scale domestic mining is in the national interest. Your terms at their face value (excluding the saving clause of "other requirements of national policy") seem instead to say, Given that one must mine somewhere, how can one use cosmetic solutions to minimise the damage? This view—the assumption on which the extractive philosophy and economy rest—may well be held by the mining companies at whose unilateral initiative you were called together; but we believe it is also outmoded and does not deserve your support. We think history will show that this decade was the time not for cosmetic solutions but for basic alternatives; and we hope this decade will be recorded as the time when the implications of the round-earth theory (now nearly five centuries old) finally began to influence the policies of Governments.

1.1.3. We are not proposing a return

to agrarianism, and we are fully aware of the dependence of modern society upon continued supplies of minerals. We believe that this dependence lays upon Governments a special duty to ensure these continued supplies not merely for decades but for millenia, so far as it lies in human power to do so⁵. Governments that do not fulfil this obligation now will not be able to do so later, for physical law guarantees that our present short-sighted dispersion of concentrated resources is irreversible⁶. Lost time cannot be recycled either; and to encourage continued large-scale extraction, rather than to learn how to husband what we already have, is to perpetuate an ultimately disastrous waste⁷, not only of minerals but also of national time and energy that should be devoted to learning how we can survive for more than a few generations. "History teaches us," Abba Eban said recently, "that men and nations behave wisely once they have exhausted all other alternatives." If men and nations are to survive, they must start doing better than that.

1.14. Last May, Sir Val Duncan (Chairman of RTZ) wrote⁸, "Raw material demands... are entirely essential for rising living standards in a world enjoying [sic] a major population explosion." But the trouble with this argument is that there is no end to it. Sir Val did not explain when what he called⁸ our "growing demand" for metals will stop growing. If, as he said⁸, progress requires us to mine increasingly in "areas which we should prefer to avoid"—to sell to industry our last sanctuaries from industry—perhaps we should redefine "progress" so that it is better attuned to our real needs. Perhaps RTZ's capital and expertise, for example, should be devoted to meeting most of our "raw material demands" through recycling—a more appropriate form of progress than we have been getting lately. Such coming to terms with the capacities of our habitat seems to us an experiment especially well suited to Britain's small size, tight communications, and progressive tradition. It would mean abandoning the chimerical notion⁹ of an ever-rising standard of living, but that cannot be helped: the world is simply not big enough to support us in the style to which many of us are used.

1.15. A reasonable man, observing

the scarcity of many essential metals, would expect Governments to take stringent precautions to ensure the wise husbandry and unhurried use of mineral deposits. On the contrary, he would find that the tax structure of many countries encourages hasty exhaustion of resources. If mining companies get a "tax holiday" for the first few years of an operation, obviously they have an incentive to compress as much of their output as possible into those few years. Poorly planned depletion allowances may have the same effect. So can shamefully low royalties. (In Western Australia, for example, certain consortia are mining millions of tons of iron ore annually; under a "tax holiday" lasting until probably 1980, each ton yields a royalty of about 4.5 cents to the state government and a profit of over four dollars to the mining company¹⁰.) The pressure of the money market can produce a similar rush to depletion. For example, we know of a Canadian opencast mine¹¹ that was dug in order to extract a high-grade orebody. Had the company wanted to maximise total profit, they could have gone on to extract a far larger body of lower-grade ore all round, for the capital overheads were already paid; but since the pit was dug with vertical rather than sloping sides, this full use of the resource was and will remain prohibitively expensive. The company's motive was not to mine as much ore as possible, but only to turn over its capital quickly, make a large profit in a short time, declare a large dividend, and thus attract new investors. This example shows how the structure of existing financial incentives can preclude sensible planning.

1.16. A reasonable man would expect that the fullest possible use would be made of hard-won minerals, and that Governments would take care to prevent the loss or dispersal of essential metals (as was done during World War II). Yet he would find instead that industry is much more interested in mining afresh than in using what it has; and this preference is grounded on dubious economics. It is often said that recycling is hopelessly uneconomic—that recycled materials cost much more than newly mined ones. When this is true, it is invariably true for the wrong reasons. Most non-ferrous metals are now obtained from low-grade ores mined from hard-to-

find deposits in hostile environments in remote parts of the world. It is elementary that such a process is far more expensive in energy¹² (and hence in money) than reprocessing properly designed waste (of lower entropy than the ore) practically at the point of resale; just as, whatever an economist may say, thermodynamics insists, correctly, that it is cheaper to control air pollution at the chimney than to scrape it off the walls and wash it out of the clothes afterwards. In practical terms, scrap brass, as a copper ore, is two orders of magnitude richer than Welsh rock; therefore one needs two orders of magnitude less of it for the same yield; better yet, one knows where to find it, and collecting in cities is less awkward than mining and concentrating in Merioneth. It is thus a sad comment on short-sighted rapacity that all scrap contributed in 1965 only 19.7 per cent of the total UK consumption of copper (cf. 24.5 per cent in 1955)¹³. This pitifully small recycling rate, which is still declining, is much the lowest in industrial Europe—and only half of the 40 per cent recovery rate of both the EEC and the wasteful USA. Yet recycling would be especially appropriate in Britain because her per-capita domestic consumption (1965) of refined copper—11.8 kg/yr, highest of all the OECD nations—is 4x her export and 2.5x her domestic production; thus a lot of copper comes into the UK and most of it stays¹³.

1.17. The price advantage of new over recycled metal, where it exists, is entirely artificial, for three reasons: (a) the price of recycled metal is unnecessarily inflated because most modern wastes are intended not to be recycled, whilst the price of virgin metal reflects (b) neither its true social cost (e.g. in smelter pollution, indirect¹⁴ energy costs, loss of wildlands) nor (c) the irreversible depreciation of a fixed capital asset. In an economic fog that would never be tolerated in any field but resource management, all these three absurd conditions obtain almost universally. In theory, virgin copper whose price took proper account of depletion (i.e. of a running-down of the earth's capital) would be far dearer than it is. In practice, British imported copper would not be cheaper than British recycled copper if a small tariff on the former subsidised technology for the latter—at an im-

mense saving of hidden social costs. This sort of legislative change must obviously come as depletion restricts our options; the only question is when (para. 1.1.8.) and on how parochial a scale. We think it should come now, and preferably on an international scale, e.g. by a regulated world marketing pool or by stricter controls on the world refining rate. (Now, when copper warehouse stocks are the highest ever, many within the industry are calling for curtailed production, and CIPEC, the controlling body of the producing nations, may take action¹⁵ to ensure co-operative regulation of over-production.) It is idle to say that if people want this sort of change they must pay for it. In one way or another, people always pay¹⁶.

1.18. When will we run out of essential metals? Some people say never (given plenty of nuclear energy), or at least not for centuries. But in one section of an exceedingly important and impeccably reasoned report¹⁷, a Club of Rome research team headed by Professor Dennis Meadows of MIT has shown such beliefs to be false. The proof that energy-intensive solutions are impracticable rests partly on thermodynamic⁶ and partly on resource and capital arguments, and we cannot do justice to it in this space. The proof that depletion will occur unexpectedly soon if demand continues to grow exponentially is easier to sketch. Static reserve indices—how long the known world reserves will last at present rates of use—are generally computed from 1970 statistics of the US Bureau of Mines to be about 100 years for aluminium, 36 for copper, 240 for iron, 97 for manganese, 79 for molybdenum, 150 for nickel, 31 for petroleum, and so on¹⁷. (What we are supposed to do after that is seldom made clear.) But projecting probable rates of growth in consumption (typically 2 to 5 per cent per year), in accordance with recent estimates by the US Bureau of Mines, yields corrected indices of about 31, 21, 93, 46, 34, 53, and 20 years respectively¹⁷. Most growth rates are themselves increasing, but at the present growth rate, discoveries doubling the known world reserves of petroleum will delay depletion by only about ten years! If we assume actual world reserves five times those now known, the exponential indices just listed become respectively 55, 48, 173, 94,

65, 96 and 50 years. The dynamics of resource depletion are of course more complex than this, and have been simulated by a detailed computer model¹⁸ that relates size of reserves, grades of ore, production costs, technological progress, consumer demand, and substitution by other resources. The simulation shows that so long as exponential growth in use continues, even if more slowly than now, depletion can typically be postponed for only a decade or two by very large improvements in the extent of known reserves, in mining technology, or in substitutability. Even complete recycling helps for only a few generations. A recent dynamic simulation by Professor Meadows's group suggests a practical copper lifetime of order 50 to 60 years with massive recycling, substitution, and ore discoveries. Thus there is no utopian haven from the rigour of the exponential processes built into economic growth. Growth in demand for basic raw materials will, unless drastically reduced, make most of these materials prohibitively expensive within a century¹⁷. This is not speculation but fact. The only remedy is major change in our economic structures and social priorities. A few generations from now we must have attained an equilibrium population and economy in which total demand does not increase at all. Sooner than that, however, we must prevent total demand from increasing exponentially. And whilst we are working to reduce growth rates, we shall need to institute far more complete recycling of essential metals, in order to buy the time required to overcome social inertia and make more fundamental changes.

1.19. The power of the theoretical argument for resource conservation (as distinguished from the very practical argument of impending depletion) becomes clearer if we use an analogy from biophysics. An open-loop economy uses energy to convert low-entropy matter (resources whose use constitutes depletion) into lower-entropy matter (commodities) plus high-entropy matter (pollution¹⁹), and a vigorous economy maximises the conversion²⁰. (Energy flow is similar: a source—a reservoir of low-entropy energy—is depleted in the manufacture of goods in which energy is bound, and waste heat—high-entropy energy—is simultaneously released to a sink.) This energy-consuming,

entropy-partitioning process is closely analogous to the metabolism of an organism converting food to tissue plus waste—except that metabolic rates regulate themselves rather than increasing until subject to drastic external constraints²¹! The point of the analogy is that in a real ecosystem, the interrelations of many different sorts of organisms²² maximise the ratio of total biomass to energy input by recycling every output of material into an input, every waste into a food; nature never wastes, and therefore never wants. Every potential food is eaten, every niche in a climax community is filled—precisely because nature is always looking for opportunities for cut-price metabolism, for ways to put idle energy sources to use. The result of this pressure to recycle everything is that a stable ecosystem has no waste. But without recycling, we have not an ecosystem but a monoculture, an organism or species in isolation; and it is a fundamental truth of ecology that monocultures do not last. The reason they do not last is that their maintenance needs more energy than the habitat can supply—i.e. that monocultures cannot compete with the more diverse, more stable, more efficient arrangements that need less energy. Thus the survival of monocultures is priced out of the energy market. And this "analogy" between ecological and economic monocultures is more than a conceptual coincidence: we and our works, and all things that live, are as much subject to physical law as are the simplest objects in the laboratory; thus the "analogy" is merely two contexts for expressing the same necessity, the same physical truth.

1.1.10. We believe there is a hard lesson to be learnt from the observed working principles of a world that for three billion years has been patiently designing stable energy-consuming systems in accordance with physical law. If there were a better way to do it, that way would already be here. It is not here because this is the way the world works. We must conform: we must evolve our systems and conduct our affairs within the constraints of the way the world works. Every organism that has overdrawn its accounts of energy and materials is now dead. It is one of nature's rules that those who won't play by the rules won't play at all.

1.2. Wording

1.2.0. Having suggested how you should interpret one phrase in your terms of reference, we want now to query and criticise other phrases.

1.2.1. Your formal terms of reference (para. 1.0) speak of "the need to establish the way in which [mining and conservation]... can be harmonised"; your task includes making "recommendations designed to reconcile economic and technical considerations with other requirements of national policy..." We fear that "economic and technical considerations" are in practice a euphemism for "what mining companies are willing to pay for". We presume it is common ground that there is generally a tradeoff between restoration and profit; and we are firmly committed to the principle that all costs of restoration should in each case be borne wholly by the company concerned—i.e. by the direct consumers of its products—and not (by way of an "amenity grant") by the general public²³. We think it likely that restorative schemes proposed for British mines will be very expensive and will cut deeply into corporate profits. Your terms of reference suggest that you ought to compromise—to seek beauty but (as Sir Val remarks⁸) beauty "in reasonably economic terms". This has already been done far too often. Your report would do a public disservice if, in keeping with the tone of your terms of reference, it merely strengthened the trend towards disastrous compromises between principle and profit.

1.2.2. It is not clear to us whether your terms of reference allow you to conclude, if you wish, that in some circumstances mining and conservation are fundamentally inimical and irreconcilable, or that the interests of mining and conservation in certain areas can in no way be served both at once. But this is what we shall argue. We submit that "to co-ordinate a national programme of mineral development with a national programme for safeguarding the environment"²¹ is an egregious contradiction in terms, akin to proposing in one place simultaneous programmes of poaching and gamekeeping (both under the auspices of the poachers). We hope that if in certain cases you agree with us, your terms of reference will allow you to say so.

1.2.3. Though the context¹ of your terms of reference is "the fuller use of national mineral resources in Britain", the explicit terms apparently do not permit you to explore what happens to mineral concentrates after they leave the mine. Sir Val Duncan⁸ considers it "anomalous to say the least that no [copper-smelting]... complex exists in a highly industrialised country like Britain consuming as much copper as we do". We consider it a blessing, for we know that copper-smelters, with their huge outputs of SO₂, are among the worst of neighbours. Since RTZ have expressed interest in building a smelter "at some suitable location in this country" should they find domestic ore to feed into it—they are now reportedly seeking a smelter site at Swansea—and since domestic mining must inevitably entail domestic smelting if it is to pay, we think it your duty to ensure that the broad environmental issues of smelting various metals are properly explored, with appeal where needed to disinterested sources of scientific information. We trust this important gap in your terms of reference is inadvertent and that you will ask that it be corrected promptly.

1.2.4. A phrase in your Chairman's letter²⁴ puzzles us. He hopes you can "make balanced and fair recommendations designed to reconcile the interests of those concerned that the amenities of the countryside should not be spoilt, with the national economic interest". As we shall explain in para. 3.2.6. and elsewhere, it is one of our theses that these two interests already coincide and hence do not need to be reconciled.

1.2.5. We are also curious about the "modern methods of... continuous rehabilitation... and subsequent restoration of mining sites within areas of attractive landscape" about which you are to become informed²⁴. As far as we know, past large-scale mining in beautiful places has seldom if ever been subject to significant constraints of restoration. We therefore have the impression that the methods your Chairman describes are hypothetical only. We raise this point because his phrasing implies that these "modern methods" are well-known and have been thoroughly reduced to practice. On the contrary, we shall argue in para. 3.1.10 and elsewhere that (in

Britain at least) such methods probably cannot exist.

1.2.6. Your formal terms of reference seem to exclude Northern Ireland. This is strange and regrettable in view of (a) the use of "UK" rather than "Britain" in the preamble¹ to the terms; (b) the industry-designed exploration law recently passed in Ulster—a good case-study of how the balance of conflicting interests has been weighted even more firmly on the side of industry than in Britain (where miners must be content with compulsory-purchase powers, sometimes administered under a legal presumption that mining is in the national interest); (c) the extensive exploration now going on in wild parts of Northern Ireland, especially the Mountains of Mourne. We hope you will seek clarification of your geographical limits, and will investigate Ulster if possible.

1.2.7. It is all very well for RTZ to speak¹ of "facts, problems and issues... authoritatively reviewed by an independent body"; but we are sure you will agree that independence of view, in Commissions as in the judiciary, must not only exist in fact, but must also be seen to exist in theory. We fear your position before the public may be compromised by your having been appointed, without consultation, by a group of mining companies, and called by a name that wrongly suggests you have some connexion with the Government. We suspect it will be all too easy for uncharitable persons to claim that "their points of view" were not adequately "taken into consideration"²¹; and we note that at least one prominent amenity group has already refused to submit evidence to you. We feel that the image of independence so essential to your pursuit of truth would have been better served had you been appointed and supported by disinterested parties, under a name appropriate to your unofficial status.

1.2.8. May we, finally, express our hope that your report will be written in plain words? It is alarmingly easy, as we have found out the hard way, to use vague gibberish out of caution or habit, until we succeed in concealing our meaning even from ourselves. "Amenity", "areas of attractive landscape", "the fuller use of national mineral resources", and the like phrases^{1,24} will not help people to

understand or accept your conclusions. Some words, such as "restoration", are downright misleading. Your report should be more than what Schlesinger called "the bland leading the bland". There has been too much woolly talk of "concern for the environment", too little clear talk of what this means in practice and why it matters. Thoreau put it well: "What's the use of a house if you haven't got a tolerable planet to put it on?"

2. EXPLORATION

2.0. Exploration and mining—which we submit (para. 2.2.0) are inseparable components of a single process—raise serious questions of land-use policy, planning law, and commercial policy.

2.1. Exploration sites and land-use policy

2.1.0. Sir Val Duncan has pointed out⁸ that Britain's wildlands are her most likely sites for deposits of non-ferrous metal ores. Having studied the nature and distribution of the eighty-odd UK sites²⁵ now being prospected by at least 28 companies, we agree that "mineralisation is most likely to occur in the more attractive and remote areas often designated as national parks..."⁸ The issues of land-use policy raised by present exploration seem to us most clearly pointed in the National Parks, to which we shall accordingly devote most of our attention. We hope, however, that you will give full weight to the similar and less publicised problems of Areas of Outstanding Natural Beauty, National Trust sites, Ancient Monuments and Scheduled Buildings, Country Parks, National Nature Reserves, and other designated areas, which, though smaller and less well-known than the National Parks, are more numerous and just as important. Their smallness and diffusion make them easier to erase than National Parks, and their lack of ecological inertia or buffer-zones makes them especially vulnerable to effects of development nearby or in the same watershed. We hope you will also share our concern for undesignated areas, such as certain wild tracts administered by the Countryside Commission for Scotland; for it is there that most of Britain's wildlands are found, and perhaps there that

Britain makes her closest approach to wilderness.

2.1.1. A common misconception of the purposes of National Parks seems, unfortunately, to be shared by some people in the mining industry. Sir Val Duncan has written⁸, for example, of "rocky and hilly country which is not suitable as a living area for a large population and much of it has therefore been set aside as National Parks". That is not the reason at all. National Parks are so designated because of "their natural beauty, and the opportunities they afford for open-air recreation, having regard both to their character and to their position in relation to centres of population"²⁶. Parliament did not feel that wildlands were wastelands, but instead that wildlands have a unique value worth conserving for the nation—a value great enough to justify setting aside in perpetuity 9 per cent of England and Wales²⁷.

2.1.2. It would be quite wrong to suppose that Parliament did not foresee conflicts between mining and the National Park idea—both the second-reading speakers in 1949 and the Hobhouse Committee were well aware of what might happen²⁸. We think it significant, therefore, that the Park boundaries were drawn to include regions known to be comparatively well mineralised, whilst there are also striking examples (such as in Snowdonia) of the deliberate exclusion of areas devastated by earlier mineral workings—even to the extent of omitting a tract that would otherwise be near the middle of the Park. It is a pity that when Sir Val Duncan mentioned that the Capel Hermon copper deposit is "not many miles from the traditional mining area of Blaenau Ffestiniog"⁸ he did not also point out that Blaenau, because it was so derelict, was excluded from the Park to which the hills of Capel Hermon contribute such beauty. The possibility that Capel Hermon—both land and people—may suffer the enormous man-made problems of Blaenau Ffestiniog is exactly what worries us.

2.1.3. In the second-reading debate in the Commons on the National Parks Bill, the then Minister for Town and Country Planning said that circumstances could conceivably arise in which mining in a Park might eventually have to be considered; but he laid down²⁹ these conditions:

... it must be demonstrated quite clearly [he said] that the exploitation of those minerals is absolutely necessary in the public interest. It must be clear beyond all doubt that there is no possible alternative source of supply, and if those two conditions are satisfied then the permission must be subject to the condition that restoration takes place at the earliest possible opportunity³⁰.

This lucid and reasonable statement of principle has been eroded by successive Governments until the first condition (echoing the Hobhouse Committee's "of vital national importance" and "of proved national necessity") has changed from "absolutely necessary" to what, "on balance, the national interest justifies"³¹ or what is merely economically desirable; the second condition has vanished utterly; and the third condition, as a sort of autopsy, remains for you. Even this condition has lost its spine: the present position, according to Lord Sandford³¹, is merely that "every care is taken to require whatever screening and restoration works are practicable". We trust you share our misgivings at "practicable": we observe that the Alkali Act's requirements of the "best practicable means [of abating air pollution]" used quite clearly to mean the best means technically available³², but now seems instead to mean the best means that the polluter is willing to pay for³³.

2.1.4. Recent Governments have apparently come to view National Parks as a holding action—a designation attached to land until a Minister decides he knows a better use for it. This gradual shift from the principle of Parks held in permanent public trust by the will of Parliament to the expediency of Parks existing by grace of Ministerial discretion is, we submit, a matter for national shame.

2.1.5. Parliament set up National Parks "for the purpose of preserving and enhancing the[ir] natural beauty... and... of promoting their enjoyment by the public"²⁶. Yet under present law, various Ministers are authorised to introduce into Parks massive developments clearly inconsistent with Parliament's expressed aims. We do not suppose anyone will argue that large-scale mining furthers those aims; we maintain, indeed, that it is hostile to them. We do not see what

right Ministers have to decide, or that they are competent or appropriate to decide, where the national interest in Parks lies. If Parliament no longer means what it said in 1949 and in the Countryside Act, 1968, it is odd that Parliament has not said so; and until Parliament says so, we must assume Parliament would agree that the National Parks, now becoming more overcrowded every year, are already inadequate to the nation's present and future needs, and must be not less stringently protected but more so. (More stringent protection would have the advantage, too, of helping to raise Britain's National Parks to the minimum standard required for inclusion in the United Nations List of National Parks and Equivalent Reserves.)

2.1.6. In short, we feel that under present or foreseeable conditions, any pretence that large-scale mining can be justified in a British National Park is a disgraceful evasion of the declared purposes of the National Parks Act. We think there are other excellent arguments against mining in the Parks, and we shall mention some below³⁴, but we believe that a civilised nation must first of all be bound by the intent of her own laws.

2.1.7. We also cannot understand how any Government can contemplate direct subsidies to the mining industry³⁵ to help it seek mineable deposits in National Parks. Neither allegations of some ill-defined "national interest" nor cries of "This is a development area!" can remove a basic inconsistency. With one hand the Government are giving public money to private corporations in the hope they will find ores in what are generally "white areas" for planning purposes; with the other hand the Government are spending more public money to protect the same areas from erosion by careless or too-numerous visitors and from unsuitable small-scale development by commercial exploiters. Are we to conclude that the bigger a development, the less unsuited it is to a National Park? To permit the substantial development of a "white area" (one in which there is a strong presumption against this) is deplorable; to encourage it seems gratuitous folly. We cannot help thinking that to a disinterested observer such behaviour must seem fundamentally insane; and this is not the way we think our country or our Government should look. If our

Government use our money to oppose the interests of our National Parks, we shall have to agree with Pogo that "We have met the enemy and they are us."

2.2. Exploration methods

2.2.0. Despite the organisational requirements of this evidence, we do not accept that mineral exploration—from preliminary surveys to, say, prospect drilling—is severable from extraction. Certain formal differences—e.g. that exploration is more likely to cause temporary nuisances than permanent devastation, and that its scale is altogether different than that of extraction—conceal the interdependence—logistic, economic and political—of the two processes. As Wool J. remarks³⁶, "There can be no subtle distinction... between the two halves of an umbrella."

2.2.1. Neither do we accept that scout and prospect drilling are innocuous. In a completely uninhabited area, properly conducted drilling might directly harm nobody—though in such an area the drillers are unlikely to be as good housekeepers as they must be when closely observed. But in a more typical setting in rural Britain, drilling may well be a substantial nuisance to many people. The view put forward by John Williams of RTZ³⁷ that scout drilling does not "lead to any substantial interference with the owner's enjoyment of his land" is in no way shared by the residents of Capel Hermon.

2.2.2. Even where one bore-hole is tolerable, the cumulative effect of dozens together may not be. If you have paid an unannounced call upon a drilling rig, we think you will agree that the noise is louder and more penetrating than that of a large bulldozer, let alone of a farm tractor (with which it is often compared); nor do tractors roar and whine continuously for twelve hours at a time. It is sometimes impossible for drillers to avoid diverting and polluting watercourses, blocking roads, cutting trees, or endangering livestock; and though the disturbance of drilling is far less severe and permanent than that of mining, we do not think it can be entirely written off. We are not happy about proposed legislation³⁸ that would give licensees power to explore (with scout drilling) throughout large tracts without landowners' permission. What may be

only a slight nuisance in one's back meadow may be intolerable in one's back garden, and the law must take account of such potential inequities.

2.3. Exploration and planning law

2.3.0. The direct disturbance caused by mineral exploration, however intense at the time, is relatively localised and does not last for more than a year or two in a given area. The main danger of exploration, we think, lies instead in the piously maintained fiction of severability from consequent extraction, and hence in the tendency of planning authorities to creep from one grant of permission to another without giving anyone a chance to do much planning. (There is a presumption that this tendency may be aggravated by the Government's new direct incentive³⁵ to allow mining in order to be able to recover its exploration subsidies, which are only recoverable out of revenues from mining the sites explored.) Lord Sandford³¹ has laid great stress on the protection of National Parks by strict planning controls, but we have seen little evidence of strictness in recent years³⁹. We believe that the present system of planning controls will continue to be successful for permitting domestic mining (and indeed for patching-up after the wrong decisions have been made) but quite unsuccessful for enforcing the protection of the Parks—which are especially vulnerable because they suffer from government by chaos⁴⁰.

2.3.1. We believe that present planning procedures are fatally defective. Briefly, the main flaws are:

a) There is no ordinary mechanism for obtaining interlocutory advisory rulings on points of law; thus even on a point that seems perfectly clear, such as whether a programme of scout drilling requires planning permission, a mining company is free to take formally whatever view it pleases—perhaps under form of alleged vague legal advice⁴¹.

b) Developers can seek permission for large projects in discrete, artificially severed phases (e.g. preliminary exploration, intensive exploration, extraction, concentration, transport, smelting, refining) in such a way that the whole project can never be examined at once, even if fairly com-



plete plans have already matured and if each stage entails the other (cf. Shell's separate proceedings for the offshore moorings, onshore storage tanks, submarine pipelines, and overland pipelines for the proposed Amlwch oil terminal).

c) Planning authorities must take into account "any material considerations", but in practice have absolute discretion in deciding what is "material". This discretion has devolved on them because the courts are reluctant to determine what is "material" (since this might require a court to become a tribunal of fact). The result is frequent abuse of the option mentioned in (b).

d) Public Inquiries' formal terms of references are sometimes settled in advance by a private conference between applicant and authority. The industry's view of the value of this sort of cozy co-operation may be reflected by Sir Andrew Bryan's remark⁴² that many of the smaller planning applications probably ought not to go to an Inquiry at all. "That they do so is often the result of a failure of communications between the applicant and the local planning authority." What about communications with the public?

e) Prerogative remedies are in general not available if planning discretion is abused, e.g. if an authority errs on a point of law.

f) Legal standing to pursue the substituted statutory remedy is extremely restricted (by bad case-law).

g) No official transcript or tape-recording is normally made of planning Inquiries, even those of the greatest national importance.

h) There is no statutory requirement that Inspectors' reports to Ministers be published in certain sorts of Inquiries, e.g. non-statutory advisory ones.

i) The statutory requirements of public notice for Inquiries are loose enough to permit their intent to be easily evaded.

j) Despite common-law principles to the contrary, there is no legal obstacle to a developer's seeking planning permission to continue what he has already been doing unlawfully without it⁴³; nor can a planning authority be compelled to restrain (by an enforcement order or stop notice) a continuing breach of planning control within its sole jurisdiction.

k) Assurances given at Public Inquiries are not binding in law, and

apparently are not always considered binding in fact.⁴⁴

l) There appears to be no penalty for giving false information in a Public Inquiry.

m) Normal judicial procedures for eliciting evidence, e.g. discovery and subpoena, are not available even in those Public Inquiries that amount to adversary hearings, and Inspectors have considerable latitude in excluding evidence.

n) Applicants are free to withhold information that would contradict their own testimony; the burden is on private objectors to obtain it. Nobody is required to tell the truth, nor the whole truth, nor nothing but the truth.

o) In some sorts of Inquiries, the disclosure of the needed facts is illegal by statute or by order⁴⁵.

p) It is open to large corporations with permanent legal staff to exhaust the resources of private objectors through prolonged Inquiries, perhaps on a series of applications only trivially different.

q) The success of planning procedures depends not on equitable principles or on statutory requirements of justice, but on honesty and goodwill that are not always displayed.

r) The great discretion given to local executive authorities not subject to significant judicial review may tend to encourage corruption where permission for very large projects is being sought by non-statutory undertakers.

s) Poorly framed regulations make it possible for a planning authority to exclude the evidence of its own Planning Officer,⁴⁶ or indeed to act against the wishes of the entire constituency.

2.3.2. Planning Inquiries are often befuddled by the absurd argument that since mining is fixed by nature it must take precedence over all other forms of land-use—as though National Parks were not fixed by nature and could be put just anywhere. Many activities are fixed by nature, such as the dumping of high-level radioactive wastes in sea-trenches, but that has nothing to do with whether they are a good idea. Likewise, there is no logic in the argument that mining would increase national security. If copper, for example, is a strategic metal, then plainly squandering our domestic reserves of copper in peacetime would decrease national security⁴⁷.

2.4. Exploration and the Government

2.4.0. Apart from the planning issue of where exploration should be allowed, there is the basic question of who is to do the exploring. Those firms benefiting from the licences, concessions, and subsidies for mineral exploration offered by the previous and present Governments often point out that the geological knowledge thus gained will be a national asset. If one accepts this argument, we think one must then follow one's own logic by assigning the task of exploration to the appropriate research organisation, namely the Institute of Geological Sciences. When such an official body exists, we think it improper for its duties to be transferred to private corporations, which, under present arrangements for confidentiality, can then benefit enormously from five years' exclusive use of the information they have obtained with the help of funds raised by public taxation. (In opencast mining, when extraction must work quickly before the market falls⁴⁸, five years' lead is a long time.) Furthermore, this impropriety will be still greater if new legislation³⁸ allows

Ministers to license exclusive options for large areas. Were the IGS to get the £50 million that the Government are now making available to mining companies³⁵, the IGS would then be able to perform the functions for which it was set up. The public deserve an explanation of why the Government think it necessary for the private sector, which has often complained that the risks of domestic exploration are too high for commercial groups to undertake, to supplant the national agency set up for this very purpose. Exploration by the IGS alone would have a further advantage: since it has no commercial or competitive interest in the outcome, the IGS would be unlikely to arouse much local ill-will, and would have no reason to use the high-pressure salesmanship and distressing tactics sometimes employed by mining companies seeking options. A shift from commercial to academic exploration—if and where one wants any exploration at all—would benefit everyone.

3. MINING

3.0. In the past decade or two, the nature and the technique of base-metal mining have been completely transformed. New technology, and especially the development of huge semi-automated machinery, has made it possible for the first time to mine on a large enough scale to make low-grade ores highly profitable, as at Palabora⁴⁹; at the same time, as we scrape closer to the bottom of the barrel, low-grade ores are increasingly the only ones we have left. The trend toward larger-scale mining of leaner ores is illustrated by US data: the proportion of copper mined by opencast methods rose, between 1936 and 1964, from 45 per cent to 75 per cent of the total, while crude copper-ore production trebled and copper-metal production doubled⁵⁰.

3.1. What does it cost the earth?

3.1.0. Base-metal mining in Britain used to consist of following isolated rich veins or lodes, but these were few and soon exhausted. It is now possible to mine the much larger and poorer deposits remaining; and it is essential to realise that this mining will be *unlike any seen in Britain before*, and indeed of such a new sort that *traditional concepts of restoration are not applicable to it*. Britain has no Mesabi

Range; her ores are likely to be poor; her mines would therefore have to be large, and usually opencast. This new style of mining opens up wholly new possibilities for devastation: as Aldo Leopold wrote⁵¹, "The Lord giveth, and the Lord taketh away, but He is no longer the only one to do so."

3.1.1. We note Sir Val Duncan's assurance⁸ that "natural resource companies have special responsibility... not to destroy the environment." RTZ's Bougainville operation in New Guinea has removed 40 million tons of overburden (formerly supporting a jungle, which was removed with herbicides and high-lead logging) and dumped it in a neighbouring valley. Two-fifths of all material mined, i.e. over 400 million tons, will end there. The river gradient will go from 8 per cent to 1 per cent⁵². RTZ's Palabora operation in the Transvaal, after six years, has a pit 4,500 by 2,800 feet in size; eventually it will reach a total depth of 1,600 feet to remove more than 300 million tons of ore. Over 42 million tons of ore and waste are mined each year; 130,000 tons of ore are blasted free daily; every 40 seconds, day and night, a 65- or 100-ton truck dumps a load of ore into the crusher⁵³. If this is not destruction of the environment, it will do until the real thing comes along.

3.1.2. The scale of modern opencast mining renders the disturbance of land irreversible: the topography is completely changed, the drainage altered, the ecosystem obliterated, and the soil replaced by mineralised wastes (para. 3.1.10). As John Williams remarks³⁷, "...if open-pit methods were proposed, the economics might prevent the pit being filled in after the orebody had been exhausted." We would go further than "might": it seems a good approximation⁵⁴ that filling and regrading the pit would cost about as much as digging it, and we doubt whether a mining company would like its profits to be spent in this way⁵⁵. Williams suggests³⁷ that "in these circumstances the mining company would have to show an alternative use which paid due regard to the interests of amenity—for example, for water conservation, pump storage, a marina, or perhaps for tipping purposes."

3.1.3. This is a very curious use of "amenity"⁵⁶. "Water conservation"—

which we take to mean allowing the pit to fill with water and then (if the water is not poisonous) using it as a reservoir—is an alternative use, albeit an odd one in upland Britain, where there are already a great many natural lakes (more than 250 in Snowdonia, for example). But such a use does not seem to us to have much to do with either amenity or conservation. It is well-known that artificial alternatives to water retention by the natural ground cover (such as grassland or forest floor) accelerate leaching and erosion by altering runoff rates and storage times. "Pump storage" is again an alternative use—one so inconsistent with "amenity" that it is being fought right now in several parts of Britain; and we think there are attractive alternatives to this form of electrical storage. It is not clear that the use of a flooded (and land-locked) opencast working as a "marina" would succeed in competing with existing natural lakes or with the seacoast, far less that it would be more desirable than the recreational use made of the original habitat (with its greater diversity, resilience, and carrying capacity) destroyed by the mine. We note that flooded pits lack good circulation and drainage and often cannot support aquatic life; they therefore foul easily. Most British wildlands already have a very high density of natural lakes better suited to recreational use. Finally, we fail to see how even the most elastic imagination can stretch far enough to admit the use of a pit for rubbish-tipping as an example of "paying due regard to the interests of amenity"; and we think this idea is so impractical, and so out-of-place in wildlands far removed from the waste-producing cities, that it is simply not on. We can only conclude that Williams has at best a strange notion of "amenity" and at worst a tendency to careless thinking. He simply has no idea what to do with that big hole in the ground. Of course he would be willing to remove the buildings⁵⁷—they are worth money. But he cannot, alas, remove the hole as well.

3.1.4. Though we think the ecological and cultural effects of large-scale mining are more far-reaching than its local effect on beauty, we must share with you our misgivings at the use of such words as "rehabilitation" and "reconstruction" in reference to

hypothetical opencast mines in Britain. We believe that the scale such mines would have to assume, coupled with the toxicity of the spoil they would create, would make each site into a virtually permanent biological desert, as has happened at all the analogous smaller sites we know of in Britain. (We hope you have inspected Parys Mountain in Anglesey.) We have seen no evidence suggesting this desert-making would not happen, and we think the burden must be on those seeking leave to mine to prove very convincingly in advance that their methods of "restoration" will work. Such proof must be empirical, not merely theoretical.

3.1.5. The time-scale of mining makes it very hard to ensure that subsequent cosmetic works (required as, say, a condition of the grant of planning permission) will actually be carried out. The only prudent method appears to be the mandatory posting of a performance bond, though it is not clear whether there is any legal way of requiring this⁵⁸. Obviously one must guard against the independent company that goes bankrupt and is unable to meet its commitments; but in vertically integrated companies, mining may be carried out by a subsidiary that transfers its revenues to the prosperous parent company, folds its tents, and disappears, leaving a mess behind. Such shifting of corporate responsibility—for which there is at least one British precedent—is difficult to prevent without injustice, and we do not think the public interest is adequately protected by merely assuming that all companies will be anxious to comply with the spirit and letter of cosmetic requirements in order to safeguard their putative future UK mining interests. Experience with existing mineral dereliction in Britain suggests that cosmetic works are generally more costly than expected⁵⁹, and that, in fact, "restoration" is rarely done even when promised. In the West Riding, for example, planning permissions have been given for 12,000 acres of surface workings since 1947. Of this area 6,000 acres have been worked but only 500 to 600 acres satisfactorily restored and little landscaping done⁶⁰. 3.1.6. We are at the disadvantage of not having any specific mining proposals before us, though we should be glad to give our urgent attention to

studying any proposals that mining companies may care to submit to us. Meanwhile, all we can do without data is order-of-magnitude calculations. But even these suggest a scale altogether inconsistent with concealment, restoration, or tolerability. The essence of open cast mining is to move very large amounts of rock. A British opencast copper-mine, for example, would probably remove (on average) of order 20 to 30 million tons of rock a year for of order 15 to 20 years. This cannot be done quietly or discreetly; it is a brute-force operation. Simple sums suggest that such a mine cannot be expected to look nice afterwards, far less at the time; on a clear day it would be visible to the naked eye from a satellite more than 500 miles up.

3.1.7. If we make a generous allowance for the depth of overburden (which would normally be dumped in an adjacent valley) and for the degree of concentration, we find that our hypothetical mine must send thousands of tons of concentrate a day to the smelters. This is a substantial transport problem, and it is naïve to suppose it can be solved without disturbing a very large area extending far from the mine itself. We find that in an operation of this size it is inevitable that very harmful amounts of the powerful frothing and collecting agents used in selective flotation will escape from closed-loop concentrators into the watershed. (If closed loops are not technically possible, several hundred tons of reagents will escape annually.) Other forms of water pollution are likely as well—sulphides, silt, lime (used in quantities of thousands of tons a year), oil, and others; and crushing mills often produce air pollution. Mill tailings are very prone to escaping as an unpleasant airborne dust⁶¹.

3.1.8. We find also that despite the best precautions, and making optimistic assumptions about the forms in which metals are bound, the mobilisation of soluble metal ions is capable of sterilising large areas of watershed: as the Conwy oyster-bed disaster⁶² showed, heavy metals are exceedingly toxic to many organisms, are readily concentrated in food chains, and are easily leached by the heavy rainfall prevalent in upland Britain. This metal-mobilisation problem probably has no technical solution; it is bound

to happen if you dig up large amounts of mineralised rock and leave them lying in the rain or sitting in pit-water (which you then pump out into the watershed); and of course once the metal has been leached away you cannot control where it goes, either as surface- or as ground-water. We note that many of the areas now being explored for the more toxic heavy metals (such as zinc, copper, lead, and nickel⁶³) control large and fertile watersheds draining into important estuarial spawning grounds of e.g. shellfish and anadromous fish.

3.1.9. We are confident that you will not be influenced by artists' impressions of neat little mines surrounded by tall trees and happy tourists; the ecological effects of large-scale mining are extensive, complex, and disquieting, and deserve the closest attention of all of us. Sadly, mining companies are no more competent than we are to evaluate these problems, and may be reluctant to call your attention to them. You should therefore seek carefully researched evidence from appropriate statutory and academic bodies. This will take time, but we think it must be done if you are to meet the demands of your terms of reference. We must also ask you not to rely on bland oral assurances, as experience (e.g. with the Anglesey Aluminium Company⁴⁴) has shown that assurances sometimes cannot be honoured. The potential dangers of opencast mining to the ecology of large tracts of land and water justify your seeking the best impartial advice to be had—and acting conservatively upon it, since the effects of mistakes may be irreversible⁶⁴.

3.1.10. We hope you will also look very critically at any plans for revegetating mined land. Before mining, the soil has definite layers and horizons, with a stable physical, chemical, and microbiological composition evolved though aeons of weathering. After mining, the substituted wastes have no structure and are just unorganised masses—they are really not soil at all. The highly acidic mill-tailings and other by-products of ore-processing (as opposed to mere overburden) are by their chemical nature quite intractable. Acidic products cannot be neutralised except in a superficial surface layer, and the use of ammonia-based fertilizers usually remobilises metal ions that, at low pH,

would have remained bound. It is thus impossible to restore ecologically stable vegetation to a surface-mined area until most of the normal weathering has taken its very slow course—which no amount of scientific study will accelerate. More often it is impossible to restore anything at all because of the high concentrations of soluble metal ions, most of which are highly toxic to plants at concentrations of order 10^{-5} to 10^{-7} . Where mutant metal-loving strains of grass can be made to grow, there are still problems—as in the Carneddau, where it is said that though mutant grasses (adapted to lead-rich spoil) flourished, the grass poisoned both the sheep that ate it and the people that ate the sheep. Metals are conserved by nature if not by us. Finally, there is the very serious fundamental problem of stabilisation—a problem aggravated by heavy rainfall and by the difficulty of revegetating. A British opencast copper-mine can be expected to produce of order 200–500 tons of waste per ton of copper; and as Aberfan and Appalachia bear witness, storing this much waste material stably (rather than metastably) on steep hillsides often proves impossible, no matter what technology is applied⁶⁵. In Appalachia, the Tennessee Valley Authority consider slopes steeper than 28° “unmineable” for coal for just this reason⁶⁶.

3.2. What does it cost people?

3.2.0. We take a broad view of “environment”; to us it is not just scenery, nor even land plus wildlife, but the whole complex of man in his surroundings—a much broader concept than those fond of cosmetic solutions would like to embrace. We are therefore concerned with the impact of mining not just on land but on people and cultures, which are often more fragile and less readily healed. This view is, we submit, wholly consistent with your terms of reference, which mention “other requirements of national policy”: for policy, like the economy, exists to serve people, not as an end in itself.

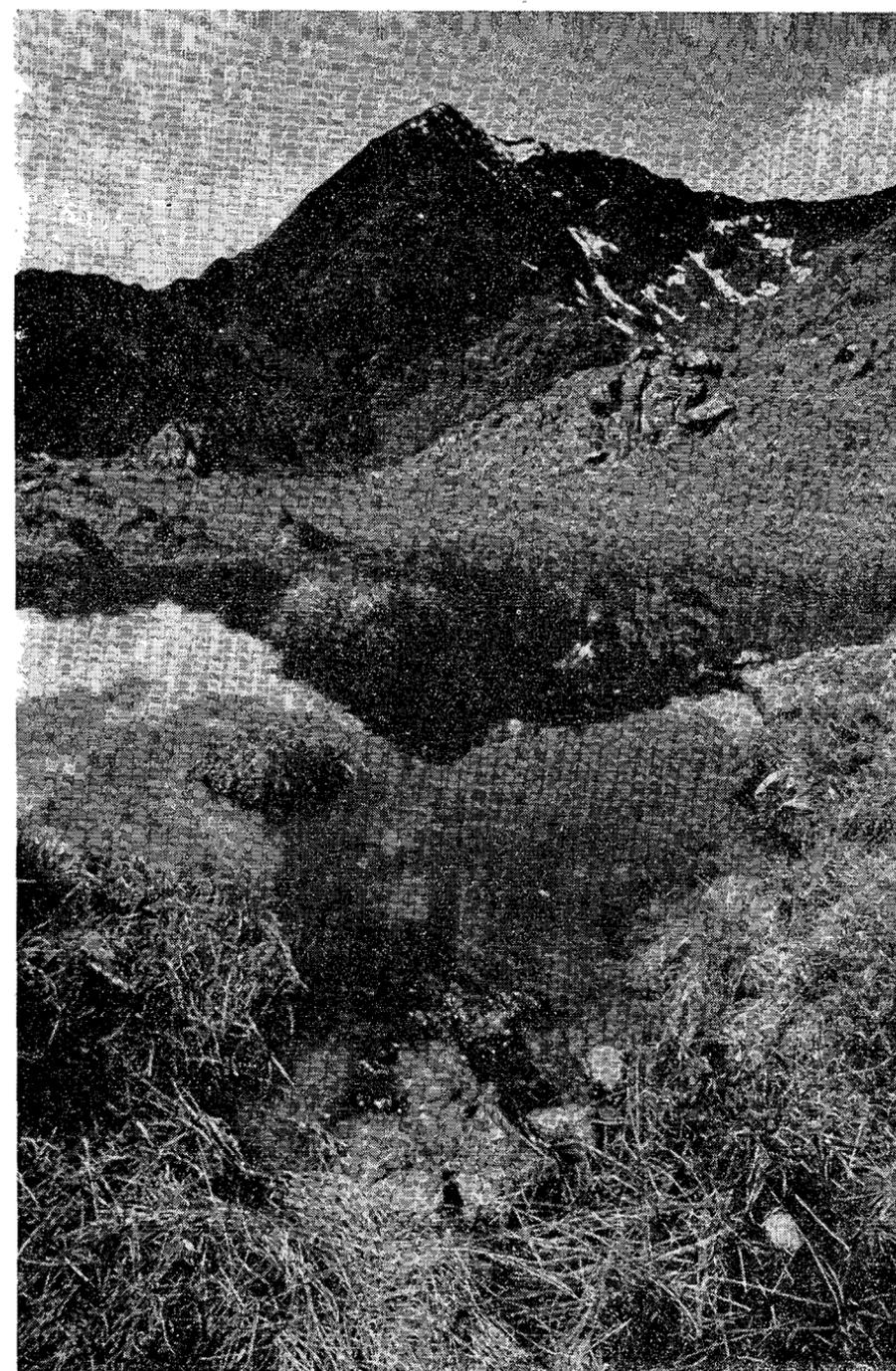
3.2.1. We believe Britain's rural cultures are an essential part of her diversity and add greatly to her strength. Most of these cultures are traditional, distinctive, tenacious, and economically marginal; most of our wildest areas are economically

depressed, mainly because the agricultural productivity of hill-farms with rough climate and topography cannot compete with that of mechanised lowland farms which, because of modern communications, sell into the same markets. By a peculiarity of bureaucratic thought, many of our “white areas” are also in or near “development areas”; yet history shows that the life of “white areas” is in units no larger than the village, and that any form of heavy industry is fatal to the village structure.

3.2.2. We are persuaded that extractive heavy industry is not the kiss of life for such regions, but on the contrary the *coup de grâce*. If the past history of the extractive sector in this country teaches us anything, it is that the boom-and-bust economy is in the long run disastrous to the rural economy; it destroys traditional livelihoods based on permanent resources, leaving behind embittered ghost-towns with a heavy welfare burden. This has happened too often and too consistently for us to suppose it is a coincidence. We think this sort of aftermath is inevitable, is inherent in the nature of the industry, and cannot be avoided by any novel features of a particular extractive scheme.

3.2.3. Especially worthy of your attention are the intricate and delicate interrelationships of man and land, economy and ecology, in hill-farming areas. We suggest you examine in detail (as we have done in a case-study to be published soon⁶⁷) what makes such areas work, with special reference to the nature of income, mobility and employment.

3.2.4. The temporary employment offered by large-scale mechanised mining is generally unsuitable for the sorts of unemployed persons found in rural Britain, unattractive to local school-leavers, and destructive of existing stable employment. Large-scale mining in such areas is also irreversibly antagonistic to the bases of the two most important sources of income that can be expected to last indefinitely (given proper nurture), namely agriculture and tourism. Certain rural areas of Britain in which mining is now being contemplated have nearly the highest per-capita tourist income in the world—and yet the potential for such income has barely been tapped. The mere existence and repute of large-scale mining there, even without its



drastic side-effects on scenery and ecology, would prejudice tourism over a much wider area than that of the immediate operation, since it is well-known that most visitors to such areas seek there the solitude, quiet, and integrity that cities lack. It is important to note, too, that these visitors are not generally the rich preservationists some people like to think; they are, on the contrary, mainly working-class and lower-middle-class people who cannot afford to go abroad.

3.2.5. Darling's illuminating example⁶⁸ of the sea-loch with a track on one side and a road on the other points up very clearly the vulnerability of rural cultures and rural

husbandry to contact with competitive cash-based urban economies, such as mining would import. We do not think it in the long-term interest of a country that cannot feed half her people to encourage the destruction of hill-farming. Sooner or later, as Ehrlich points out⁶⁹, the time will come when food for importation is no longer to be had abroad, and when that time comes Britain “will find... money rather indigestible”. The traditional skills needed to run her domestic agriculture—and her hill-farms are among the most extensive and efficient components of it—must not be lost.

3.2.6. Thus we do not see how the

national interest in unspoilt countryside fails to coincide with its maintenance in roughly its present state, farmed by the same stable and individualistic people who live there now. It is important to remember that after decades of rural depopulation, most people who still live in such areas do so by choice, because they do not want to be in cities. We think their choice must be respected. And we think the national economic interest in rural land lies in its wholeness and its health. It is no good snatching a short-term mining profit at the expense of a permanent social debt—the debt, of course, to be the business of other generations; nor would this short/long-term dichotomy stand up to rigorous accounting of diseconomies. Britain has too little land left to be able to tear the fabric of any more; every such decrement reduces forever the patrimony of which we are stewards. History will judge us harshly if we, who inherited a living and regenerating land, pass it on diminished and despoiled, as an industrial site no longer able to heal itself or to support its people.

3.2.7. The argument⁸ that mining will “produce new wealth and employment for the country” is a dangerous fallacy. New wealth is created only at the expense of some form of new poverty elsewhere; wealth, like debt, is never created, only distributed. Thus “primary producer of raw materials” is a euphemism for “exploited country”. The disintegration of a stable Melanesian culture, the physical destruction of its subsistence-base, and their replacement by alien ideas of economic expansion can hardly be construed as “contributing to the development of the economic and social fabric” or as “prosperity and welfare that should materially assist the Territory”⁵².

3.2.8. As for employment, any “brought” by mining is generally just that, bringing men from one job to another. To think large-scale mining can help the unemployment problems of rural Britain is to reveal complete ignorance of who is unemployed there and why—and to ignore the lessons taught by the history of every large civil-engineering project carried on there in recent years.

4. CONCLUSIONS

4.0. We hope you will introduce to

British planning a new and desperately needed approach—the practice of asking, when faced with a proposal for more high technology, not “How can we do this thing?” but instead “What if we simply didn’t?” If we have got along without the metals so long, why not forever? What would happen if they weren’t there? Are we as competent to weigh the wisdom of mining them as we are to discover them? Need we go to rock-bottom? What alternatives are there? If we will be forced to alternatives later, why not now? Once we begin to enumerate the positive advantages that flow from not doing (or rather from doing something wiser), once we count the blessings of renunciation in favour of conservation, we see more clearly the difference between what benefits the private economy and what benefits the nation. We see, to paraphrase Newton Drury, that Britain is neither rich enough to be able to sell her wildlands, nor poor enough to need to.

4.1. The Zuckerman Report on Mining and the Environment will be published in the centenary year of the National Park idea and the twenty-first year of Parks in Britain—and one year short of the centenary of the parent company of your principal sponsor. You have a grave duty. If your Report says that cosmetic solutions are what matter, you must bear much of the responsibility for the erosion not just of one National Park for a decade but of all British wildlands for all time; and we, mindful of what our children will say, should not like to bear such a burden. Yet since RTZ have said they will be bound by your Report, you also have it in your power to begin turning British mining companies towards a more far-sighted, constructive, and socially responsible view, towards an ethic more likely to encourage the continuing hospitality of the world that they (as well as you and we) must live on. You are called on to help decide whether Britain will have protected wildlands for ten more years, let alone for another hundred; and to the extent that you decide the time has come not to exploit but to conserve, to that extent Britain, and civilisation, will be the more likely to survive.

5. NOTES

1) “Mining Companies Set Up Independent Commission on UK

Mining and the Environment”: press release, The Rio Tinto-Zinc Corporation Ltd., 6 St James’s Square, London SW1; embargo date 22 July 1971, 1500 hr.

2) For example, it is estimated that by 1980 the total US consumption of minerals will double, with the use of aluminium and copper rising by factors of three and two-thirds respectively. *Proceedings of the Second Mineral Waste Utilisation Symposium*, Chicago, IIT Research Institute and US Bureau of Mines, 1970; pp 126, 216, and *passim*. The global growth rate of all mining is about 5 per cent per year, equivalent to about a 14-yr doubling time (*Man’s Impact on the Global Environment*, SCEP, MIT Press, 1970, p 117). Reference 17 thoroughly demolishes the notion that such growth rates are sustainable for more than a few decades at most.

3) This point is thoroughly discussed by Mishan, Boulding, Galbraith, *et al.*, and by H. V. Hodson in *The Diseconomics of Growth* (Earth Island Ltd., London, April 1972).

4) The symposium quoted in note 2 reported that automotive scrap in the US alone is accumulating at the rising rate of 1 million tons of ferrous and 0.5 million tons of non-ferrous metal a year—though it is said that industry has the capacity to accept all ferrous scrap produced. Evidently such capacities are not always used. In the US in 1968, according to the same source, 300,000 tons of aluminium were used in lids, caps, and cans, and none reclaimed. In New York City, 25,000 tons of tin are thrown away annually in the form of coatings on cans—the same amount salvaged from all secondary sources. Even the reactionary report cited in reference 64 concedes that “it seems unlikely that [continued] exponential growth in demand can continue to be met for all metals and minerals. An eventual reduction in the growth of supply of some therefore seems inevitable, whatever the demand. . . . [I]t is highly probable that economic and political pressures will lead to a need to mine large low-grade deposits in settled areas.” It is remarkable that even those expecting to be allowed to mine in “settled areas” still do not feel able to meet future demand. Evidently they accept that mining must eventually stop, but they would like to mine every possible site first.

5) It is customary and tempting to suppose technology will find substitutes for everything we run out of. To some extent this can be done, though it is difficult when one runs out of everything at once. (The present and projected growth rates of demand for aluminium—respectively 8.1 per cent per year and 6.4 per cent per year according to the preliminary and published drafts of reference 17—show the results of increasing substitution *now* of aluminium for iron and copper; but how long can this go on?) But for most non-structural applications (copper in electrics, platinum in catalysis, mercury in temperature/pressure control, and silver in photography are classic examples) it is unlikely in the extreme that satisfactory substitutes can be found; and this can be shown by fundamental arguments.

6) It is naïve to argue that since in theory any high-entropy state can be reduced to low entropy by a sufficient expenditure of energy, therefore in practice any ore can be used, however poor (cf. *Resources and Man*, W. H. Freeman & Co., San Francisco, 1969, at pp 122-3); just as it is naïve to suppose there is or can be any “clean” source of energy. We can evade the Second Law locally but not everywhere at once; it guarantees that all the energy we generate or use, no matter how, will end as heat in the biosphere. The heat now being released in this way can be expected, at anything close to present growth rates, to cause drastic instabilities in world climate in rather less than a century (Amory B. Lovins, “Thermal Limits to World Energy-Use”; *Nature*, 1972, to be published; also *Inadvertent Climate Modification*, SMIC, MIT Press, 1971). Furthermore, there are grave unsolved problems in nuclear fission technology—emergency core cooling and the isolation of high-level wastes—that are at best intractable and at worst may have no technical solutions. This is not the place for a paper on the subject, but we think you would be ill-advised to rely on any energy-intensive solutions now or in future. Future technology, however clever, cannot evade physical law.

7) Reference 17 cogently argues that continued mining of low-grade ores makes the eventual onset of depletion far more sudden, i.e. industry has perhaps a decade in which to learn to do without the material.

8) Speech to the Annual Meeting, RTZ, 19 May 1971. Text available from RTZ; also reproduced as an advertisement in *The Times*, 21 May 1971, p 23, and in other principal newspapers.

9) “Can We Afford To Be Rich?”: first leader, *The Times*, 20 November 1971; and replying letters 25 November. The leader was based largely on the Rutherford Lecture by the Bishop of Kingston.

10) Simon Millar, personal communication, December 1971, referring to a book by Jeff Carter.

11) G. S. Headley, personal communication, October, 1971.

12) The *direct* energy input per metric ton of output from US copper-mines in 1965 was a staggering 3.8×10^7 BTU (about 11 MW-hr). This energy cost does not include overheads (e.g. machinery, research, exploration), yet is still roughly $1.9 \times$ the direct per-ton energy cost of smelting and refining, and $0.67 \times$ that of semi-manufacturing. Calculated from data on p 159, *Gaps in Technology: Non-ferrous Metals*, OECD, Paris, 1969; available from HMSO.

13) OECD, *op. cit.*, pp 50, 140, 146. Cf. *Annual Abstract of Statistics* 1971 (no. 108), HMSO, p 173.

14) “Indirect” means not what the mining company pays for e.g. a barrel of oil, but what the oil costs everyone else in depletion, marine spills, ugliness, air pollution, etc.

15) *Mining J* 22 October 1971, p 371.

16) This phrasing is due to Anthony Tucker: *The Toxic Metals*, Earth Island Ltd, London, March 1972.

17) D. H. Meadows, D. L. Meadows, J. Randers, and W. W. Behrens III, *The Limits to Growth*: Potomac Associates, Washington DC, and Earth Island Ltd, London, both March 1972.

18) W. W. Behrens III, “The Dynamics of Natural Resource Utilisation”: *Proceedings*, 1971 Computer Simulation Conference, Boston, Mass.; also W. W. Behrens III and D. L. Meadows, personal communications, February 1972, and, by the same authors, “The Determinants of Long-Term Resource Availability”, AAAS paper, January 1971, Philadelphia.

19) “Pollution” in the ecological rather than the anthropocentrically biological sense: the direct ecological effects of some “pollutants” may be

small, e.g. when they are chemically inert and are made from materials obtained from outside the biosphere.

20) For example, moderately complex petroleum molecules are converted, at an energy cost, into more highly ordered (lower-entropy) polymers plus highly disordered (high-entropy) by-products. The raw plastic is converted, at an energy cost, into a specially shaped (more highly ordered) toy plus fumes, scraps, etc. The toy is eventually discarded and, as a pollutant, increases the entropy of a pile of rubbish. It slowly decomposes—perhaps very slowly—and thus seeks the maximum entropy promised by the Second Law.

21) The cogently argued thesis of reference 17 is that human economies must seek equilibria, starting now, if they are to survive: it seems that nature (as usual) knows best.

22) Different because it is axiomatic that no organism can live by metabolising its own wastes; cf. the thermodynamic absurdity of the cat-rat farm.

23) Hansard, Commons (817) 128: “It is the view of the Government that the polluter must pay the costs [of restoration].”

24) Letter from Professor Lord Zuckerman to Graham Searle, FOE Ltd, 24 September 1971.

25) J. Bugler and R. Thomas, *The Observer*, 3 October 1971.

26) National Parks and Access to the Countryside Act, 1949, section 5 (12, 13, 14 Geo. 6, Ch. 97). The 1949 government accepted (Hansard, Lords (164) 881) the Dower Report’s definition of National Parks, which specified that “for the nation’s benefit and by appropriate national decision and action . . . the characteristic landscape beauty . . . [be] strictly preserved.”

27) Mining in National Parks leads to a curious irony: the increased standard of material welfare that mining is supposed to produce will give more people more leisure, but the mining will give them fewer places to spend it in.

28) See the Hobhouse Report (“Report of the National Parks Committee (England and Wales)”, 1947-7) and these far from exhaustive Hansard references: Commons (463), 1461, 1613, 1630, 1652; Lords (164) 881-2, 891-2, 899.

29) Hansard, Commons, (463) 1484,

31 March 1949. Cf. 1461, 1485-6, 1501-2, 1504-6: Sir Arthur Salter’s prophecies are coming true.

30) Of course, the Minister’s remarks about “restoration” must be interpreted in the light of the mining technology known or conceived in 1949. If there existed then, as there do now, power shovels capable of scooping up 220 cubic yards at a bite, and if the scale of opencast mining made it virtually impossible in 1949 (as it does now) to do effective restoration, one suspects the Minister would have phrased his requirement differently. To suppose otherwise is to imitate the Kentucky courts in their patently absurd construction of the broad-form mineral lease (*N. Y. Times*, section 6 (*Magazine*), pp 30+, 12 December 1971).

31) Letter from Lord Sandford to Michael Fidler MP on behalf of Mr D. S. Gibbs, 27 October 1971.

32) “Wherever it is technically possible complete elimination [of effluents] is required.” Beaver Committee on Air Pollution, *Report* (1954), p 15.

33) “The problems of air pollution control are mainly economic. If money were no object there would be very few unresolved problems, for the technical solutions to prevention are almost all known. . . . The chief reason why we still tolerate a degree of pollution is economic. . . .” Chief Inspector of Alkali, 1970, *106th Annual Report on Alkali, etc. Works* 1969, pp 5, 7.

34) See also our review in *The Ecologist*, June 1971, pp 4-8.

35) Mineral Exploration and Investment Grants Act, 1972. An interesting line of argument about the potential abuse of Government intervention in mining will be found in Hansard, Commons (825), 1073-4.

36) *Rex v. Haddock*: A. P. Herbert, *Uncommon Law*, Methuen, London, 1969, at p 419.

37) “Proposed Changes in Mineral Legislation in the United Kingdom” in *Trans Instn Min Metall (A)* 80:48 (1971).

38) Legislation proposing *inter alia* a shift from judicial to executive supervision of grants of compulsory rights, and in our view much reducing the protection of private landowners, is being prepared by the Department of Trade and Industry (in consultation with the mining industry) for introduction in Parliament in 1972 or 1973.

39) The more conspicuous examples of failure of planning controls include the approval of an early-warning system and of potash-mining in the North York Moors National Park, motorways in the Chilterns and in the Lake District National Park, china clay workings in and near the Dartmoor National Park, military exercises on Dartmoor, fluorspar and limestone quarrying in the Peak District National Park, a nuclear power station and mineral exploration in the Snowdonia National Park, oil refineries next to the Pembrokeshire National Park, and an aluminium smelter next to the Area of Outstanding Natural Beauty in Anglesey. This list is by no means exhaustive, and represents the response of several recent Governments.

40) Sir Jack Longland, "Report on the Administration of the National Parks", June 1971.

41) For example, RTZ have formally maintained the view that their drilling of 48 scout and prospect holes near Capel Hermon, over a period of 23 months, did not require planning permission (which it did not have). This view does not seem to be supported by the precedents, sources, and authorities (e.g. the Ministry of Technology) that RTZ have cited; is not shared by the Department of the Environment, the Welsh Office, the Merioneth County Council, or any of our Counsel; and is hard to reconcile with RTZ's actions, e.g. in requesting prior permission for shallower and less extensive drilling in the open country of the Mawddach Estuary.

42) *Trans Instn Min Metall (A)* 80:A70 (1971). Sir Andrew Bryan was the Mining Assessor who sat with the Inspector at the Public Inquiry (Dolgellau, 15-18 December 1970) into RTZ's application for permission to drill in Coed-y-Brenin and the Mawddach estuary.

43) Indeed, things have come to such a pass that Mr J. S. Sheppard, the Crown Estate Mineral Agent, felt impelled to express his admiration for John Williams of RTZ for admitting "that they [RTZ] had just about finished looking into one particular Crown area and would then like to take out a prospecting licence! He [Mr Sheppard] could not feel aggrieved about such a minor misdemeanour for he took the view that

if they found anything, then it was for the benefit of the community as a whole..." *Trans Instn Min Metall (A)* 80:A142 (1971).

44) The Holyhead smelter of the Anglesey Aluminium Company, for example, now emits several times the amount of fluoride promised at the Public Inquiry; *The Ecologist* (June 1971) raises some interesting points at pp 3, 9, 33.

45) For example, the Alkali Inspectorate follow a policy of non-disclosure; also cf. Rivers (Prevention of Pollution) Act, 1961, section 12 (9, 10 Eliz. 2 Ch. 50), and the Official Secrets Act. Under the former Act, together with sections 2, 7 of its 1951 predecessor (14, 15 Geo. 6 Ch. 64), the maximum first-offence penalty for polluting a river is a £200 fine—but for "disclosing any information" about who is putting what into a river, the penalty can be a £100 fine and three months' imprisonment!

46) Anglesey County Council did this in their Amlwch debate: *The Ecologist* (December 1971), p 5.

47) Kenneth Allsop, letter to *The Sunday Times*, 12 December 1971: "The varied approaches employed by mining companies... include spreading the impression that they are engaged upon a Government survey to chart the nation's 'strategic reserves' as provision against enemy attack... [This] is twaddle. The mineral extraction now gathering momentum is a business deal of miniscule financial benefit to the nation, of none whatever to the locality but producing lovely profits for the companies." Mr Allsop obliquely raises an important question: in exactly what sort of notional national emergency would unmined reserves be useful if several years' preparation were needed before they could be mined?

48) "The time lapse between the beginning of stripping and actual production [of copper] may be quite long and could become a definite handicap if market conditions change for the worse during the development period... Once exploitation is begun, a high rate of operation is needed to secure the most favourable unit costs." OECD, op. cit., at p 83. (Reference: 12.)

49) This huge RTZ opencast copper-mine produced in 1970 87,602 metric tons of anode copper from 18.9 million metric tons of milled ore. In 1968

alone, after-tax profits were £17.4 million; shareholders received dividends of £12.4 million on their investment of £38 million. Palabora Mining Co Ltd, 1969 *Annual Report and Accounts*; The Rio Tinto-Zinc Corporation Ltd, *Annual Report and Accounts*, 1970.

50) E. Pfeider, *Surface Mining*, Amer. Inst. Min. Metall. Petrol. Engineers, New York (1968), *passim*.

51) *A Sand County Almanac* (Sierra Club/Ballantine or Oxford University Press).

52) "Bougainville Copper... an Introduction": pamphlet by Bougainville Copper Pty Ltd, about 1969.

53) "Palabora Mining Company": brief undated pamphlet by PMC in English and Afrikaans.

54) In *Trans Instn Min Metall* 80: A 140, the oral report, Williams is reported as saying that opencast pits are (not might be) "uneconomic to fill".

55) The industry's position seems to be expressed in reference 50: "[Opencast mining] ideally... results in the exploitation of a mineral resource such that the optimum return on the investment to exploit it is attained compatible with maximum recovery of the contained economic metals."

56) It is suggestive that in Williams's rough draft, the clause "which [paid]... due regard to the interests of amenity" was apparently added as an afterthought.

57) Reference 37: "Positive undertakings could be given to remove the... buildings..."

58) House of Commons, Standing Committee B, Mineral Exploration, Etc. Bill, 7 December 1971, at 99-101, 109-10, 130-2.

59) According to reference 60, simple landscaping of Yorkshire dereliction costs £1,000 to £5,000 an acre, comparable to costs in the North Wales slate districts; cf. the Gilfach Goch project in Glamorgan, which will cost £2,650 an acre. According to reference 58 at 119, "It is impossible to predict the cost of any restoration measures, even 20 years ahead" (Sir John Eden, Minister for Industry); but the Ironstone Restoration Fund and others work on the assumption that it is possible.

60) B. F. Dixon, *Quarry Managers' J* 54:220 (1970).

61) Reference 2 (*Proceedings*) at pp 128, 140.

62) Reference 16 gives an annotated

account of this leaching problem, which was caused by old and relatively small workings. Cf. *Marine Pollution Bull.* 2:3 (1971).

63) For these metals the estimated ratios of man-induced global mobilisation rate to rate of discharge in natural runoff are respectively 10.6, 11.9, 13.0, and 1.2. SCEP report (*q.v.* reference 2) at p 116.

64) However, M. J. Calahan's working party, reporting in *Trans Instn Min Metall (A)* 80:16, felt that "... in the long run the environment is renewable, whereas the mineral deposit is not. Possibly, therefore, conservation of minerals may be of greater ultimate significance than the conservation of the environment."

65) This is a huge problem. According to the symposium cited in reference 2, the US mineral industry is now producing over 1.6 billion (10⁹) tons of waste per year, 45 per cent more than in 1965.

66) See *N. Y. Times*, 7 December 1971, for details of new TVA waste regulations. The same source reported on 25 February 1972 that the 28° TVA slope limit is to be reduced to 24° and that the Federal Co-Chairman

of the Appalachian Regional Commission does not want spoil left on slopes steeper than 14°. How much of upland Britain is flatter than 14°? 67) A. B. Lovins and P. H. Evans, *Eryri, the Mountains of Longing*; introduction by Sir Charles Evans. A Friends of the Earth co-publication with Saturday Review Press (McCall), New York, 15 November 1971, and with George Allen and Unwin Ltd, London, late May 1972. The text, heavily illustrated with four-colour lithography of the highest standard, is an interpretation and case-study of the Snowdonia National Park and its problems.

68) *West Highland Survey* (Oxford University Press, 1955) at p 323: "We can think of a sea loch in the north-west Highlands where there is a road on one side and a track on the other. The living conditions in the townships on either side are different. Those on the road side are served by vans and are able to buy Glasgow bread (untouched by hand) and expensive packeted goods of all sorts. I have even seen tinned porridge on the vans during the thirties. The communities are heavily dependent on the vans which

come from as far as 70 miles away, and their standard of husbandry is low. On the other side of the loch more cows are kept; cheese and butter are made; home-made porridge and oat-cakes are the cereal staple rather than bought bread; the men fish more and the standard of husbandry is higher. The folk of the roadless side often join in the lament for a road, but what has the road done? It has brought the roadside townships into the commercial web of the east and south more completely than the roadless people have been brought in. But it has not so reorganised the habitat that the so-called higher standard of living can be paid for out of a larger quantity of produce exported. Indeed, quite apart from the loss of social health and skills, these people are in a worse economic plight [because they must support not only themselves but also the middle-men in the cities]. On the roadless side there is a self-reliance and self-sufficiency, competence, and a realisation that the croft must be well farmed."

69) P. R. Ehrlich, *The Population Bomb*, Ballantine/Friends of the Earth, London, 1971, paperback, at p 7.

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