Concerning the Control, and the Defence, of ENVIRONMENTAL POLLUTION

by Geoffrey Dobbs

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THE people who are called in as consultants and treated as 'experts' on questions of pollution and its effects are usually either industrial chemists, or sometimes pathologists who are accustomed to the traditional approach to specific disease in terms of its diagnostic symptoms and predominant cause.

But when we are dealing with contaminants broadcast into the environment this sort of approach is not of the first relevance and is frequently misleading. The proper approach is that of the ecologist who considers injury or disease in terms of the whole environment, and pathology as essentially a branch of ecology.

It has been said that there are two sorts of scientists: those who are impressed by their own knowledge, and those who are impressed by their own ignorance. When it is a question of paying large fees for a consultant or an 'expert witness', it is, of course, the first sort of scientist who is wanted—someone who can make impressive, firm, confident assertions; though it seems probable that the survival of any sort of tolerable society will depend upon the influence of the second sort of scientist, who is more interested in the limits of human knowledge, or at least more aware of them.

There is a tendency for the laboratory scientist, dealing as he does with his tiny artificial 'universe' of controlled factors, rigged to produce high levels of probability, to belong to the first category, and to be prepared to pontificate in terms of virtual certainties; while the ecologist, dealing with the infinitely complex world outside the laboratory, cannot help realising that he is not in a field of exact science at all—not even if he collects quantitative data and puts them through a computer—but in a field of massive ignorance and speculative assumptions concerning the multiple factors operating. And a guess, based on a speculative assumption is still a guess, even though it has been computerised.

The main difficulty which has to be faced in any attempt to control or eliminate pollution is that most of the Big Money and political influence is likely to be on the 'pollutionist' side; and this means also that the high-powered public relations professionals, the impressive consultants and expert witnesses, and the top legal talent will also be where the money is. Not that they would agree for a moment to being described as 'pollutionists'. As they would not be slow to point out most waste materials have a value, and therefore their interest is the same as that of those who object to the emission, namely, to keep it to a minimum.

But in practice this 'minimum' is determined by financial and technical convenience, and not by ecological considerations. What happens in real life is that the people who are causing, or openly proposing to cause, the pollution, employ their considerable resources to justify their action, and to discredit those who raise objections. In this sense, therefore, 'pollutionist' would appear to be a perfectly fair and accurate term to designate those who are prepared both to create pollution and to defend it publicly, so long as it is not understood to imply any malicious intention or preference for pollution *per se*.

The one example of deliberate pollution

There is, in fact, at present, only one example of a type of pollution deliberately promoted and imposed on an important part of the human environment, and that is the fluoridation of public water supplies. But this is a very dangerous precedent indeed which has done much to undermine and weaken the attempts to control pollution generally, since it places the public health services in a wholly false position, on the wrong side in the struggle to control pollution, and involves them in the promotional use of the standard arguments which are always used in defence of any type of general broadcasting of toxic substances at a level which does not produce obvious or distinguishable injury.

It is particularly unfortunate that the pollutant here defended, on the grounds of a claimed beneficial side effect on children's teeth, the extent of which is largely a matter of the presentation of statistics, should be one of the most dangerous of industrial pollutants, which is currently increasing owing to the growing use of fluorine compounds in industry. Children have been reported to drink about 0.04 per cent of the public water supply, so that the remaining 99.96 per cent of the fluoride added is pure pollution with nothing to recommend or justify it except that, like all forms of pollution, it is convenient for some specialised purpose.

As it happens, the safety and efficacy of this procedure, in public health terms, are of so dubious a nature that, even after 24 years of acute controversy, only in Britain, Eire and Holland, out of the whole of Europe, have the Health Departments adopted it as official policy. But, in any case, minor 'beneficial' side-effects from the broadcasting of toxic substances are not infrequent (e.g. the elimination of rusts, mildews and some other fungus diseases from plants in districts with air polluted by sulphur oxides); but to defend the pollution on such grounds is thoroughly dangerous as well as perverse.

But of course, the public health officials who promote or defend fluoridation so passionately do not view the matter in these broad terms. Usually they are neither statisticians nor ecologists, but are entirely concerned with the extremely narrow and specialised purpose to which the pollution of the entire water supply is merely incidental. They are unduly impressed by percentaged figures for caries reduction, and unimpressed by the inconclusive evidence of injury among the population at large, without realising the impossibly massive investigations which would be necessary to produce conclusive proofs. They therefore feel justified in defending the procedure, and place the onus of producing conclusive proof of injury upon objecting members of the public, who thus have thrust upon them the duty of defending the public health against an increase in environmental pollution which is being promoted by the Health Department—a shocking reversal of roles.

Once on this slippery slope, the average medical officer, for instance, however vehemently he may assert his commitment to the cause of the public health, is almost bound to find himself on the same side as industrial pollutionists who are quite certain to use the same arguments in defence of low-level pollution which does not produce blatantly distinguishable effects. And so we see the unhappy spectacle of public health officials and industrialists standing shoulder to shoulder in defence of environmental pollution, against those who take a wider, ecological view of it.

The Anglesey smelter—the forces aligned

As an example of the forces aligned in this matter, let us take the case of a very large aluminium reduction plant, now being erected near Holyhead, in Anglesey. This is one of three similar plants sanctioned by the Government in pursuit of a purely financial policy (i.e. an improvement in our balance-of-trade figures) under pressure from its foreign creditors. The plant itself is to be operated by a holding company, formed by a consortium of powerful business interests, namely the Rio-Tinto-Zinc Company, British Insulated Callenders Cables Ltd., and the Kaiser Chemical Corporation of America. These have the necessary support from a wide range of banking institutions to be able to borrow the money to finance the operation, while as Anglesey is a Development Area, a development grant of something like £40 millions plus a specially reduced price for current from the Wylfa Head Nuclear Power Station (now approaching completion) will represent the public contribution. Naturally enough, with sums of this order in prospect, the local councils, local shopkeepers, and local trades union representatives are all in favour. In the face of such financial inducement the fact that the smelter must broadcast fluorides over an agricultural area in which, moreover, the water is already artificially fluoridated, will appear of little importance. While nobody will want this for its own sake, if it is essential to the monetary gains in prospect (whether as wages, profits or trade figures) it will be tolerated and defended.

As against this formidable grouping of interests, what sort of

opposition could there be to the proposed act of pollution? In Anglesey this came mainly from one of the bodies representing local farmers, a small Residents Association, the Council for the Preservation of Rural Wales, the Director of a local Marine Biology Station, the British Lichen Society, and a number of resident individuals. A somewhat unequal contest; yet despite this, something was achieved. At the Public Enquiry, the Company had nine days in which to present its case, aided by an eminent Q.C. with an experienced colleague, and another lawyer employed by the Anglesey County Council, which, far from remaining neutral, was openly supporting the Company's case. The objectors and others who wished to comment then had two days in which to do so, after which the Company had a final half-day in which to reply.

Naturally enough, since these Enquiries take place at the planning stage, the only data on which any judgement can be made are those provided by the Company, and these, more often than not, are more of the nature of hopeful speculations than facts. Moreover, though the later consequences of the establishment of the plant may be of far greater importance than any effects produced by the plant itself, the Enquiry is of course limited to the consideration of the particular case before it. For instance, the establishment of a large aluminium smelter in North Anglesey was made possible by the building of a nuclear power station there; but when permission was sought for this, and the question of radioactive pollution was considered, no one could take account that this was going to lead also to additional fluoride pollution from a smelter, since this, at the time, could have been no more than a remote, speculative possibility.

The Holyhead application was for a smelter of 120,000 tons, and in fact permission has been given for one of 100,000 tons output. But a distinct possibility had been mentioned that this may be enlarged later up to 300,000 tons, which presumably would cause three times the pollution. There is also the possibility of a bauxite plant. It has also been claimed that much subsidiary industry may be attracted to the neighbourhood. But these considerations, which may well outweigh all others in their effect on the environment, are mere possibilities which can be considered only one at a time, should they arise. This is typical of the pollution situation.

Speculative assumptions

Even if we restrict ourselves to considering the threat to the environment which may arise from the particular aluminium reduction plant now being erected near Holyhead, we find we are still in a field of speculative assumptions. All we know is that there will be a complex emission of gaseous and particulate matter, this last largely of unknown composition, containing a range of substances of widely varying toxicity. The Company has given various estimates of what they hope will be the maximum emission; and it is also hoped that the Alkali Inspector will insist on its being kept within this maximum, on the assumption that he will be given legal responsibility for controlling fluoride emissions, which, curiously enough, he has not at

present in England and Wales. But when we come to estimate the distribution of this emission, we are in Cloudland, if not in Cuckooland!—bearing in mind that this complex will be emitted at varying rates into the atmosphere, at varying heights above ground, and under exceptionally variable local weather conditions. And then we have to estimate its biological effects on the incredibly complex collection of forms of life within the largely unknown range of the emission; and we have to do this even though some of the same substances may already be present from other sources, and in the face of large random variations in health and morbidity, the causation of which is already too complex to analyse.

The defence of pollution always requires that firm, confident assurances should be given that no harm will result from the emission to any form of life whatever; but those who make such assertions cannot be aware of the complexity of the situation, or they would realise that they would be laying claim to a divine omniscience.

The fact is that the effects of a pollutant, broadcast into an environment in which multiple and unanalysed, and to a large extent unknown, factors are operating, cannot be isolated from the effects of such other factors, except under two circumstances:

1. If the effects of the pollutant are so qualitatively distinctive as to be recognisable and distinguishable on inspections from all other effects.

2. If they are quantitatively so large as to be statistically significant in the presence of large variations due to other causes.

These are relatively rare and extreme situations. In all others harm attributable to the emission cannot be proved or conclusively demonstrated, even though suspected, and even though there may be indications, or circumstantial evidence, which support such suspicions. *But there is no way in which the part played by a single factor in such a variable multiple-factor situation can be accurately or scientifically determined.*

This does not mean that it is logical or reasonable to assume that a new or additional factor, such as a factory emission, can be introduced into the situation without any resultant effect; all it means is that the effect is obscured by the large variations already existing; and that therefore any inconclusive indications which may appear must be accepted as a basis for the control of the emission, since, short of a blatant catastrophe, they are the most that can be expected under the circumstances.

Now the defence of pollution always involves the fragmenting of the pollutant situation into pieces so small that none of them, taken in isolation, is likely to produce a demonstrable effect. The argument is then essentially that of the alcoholic: "Another little drop won't do us any harm!" And another—and the next—and the next! And at each step the idea of 'normality', the state of affairs from which one is looking for a distinguishable deviation, attributable to the latest step in pollution, changes imperceptibly for the worse.

The 'key' assumption to challenge

The typical assumption here, which it is essential should be challenged, is the assumption that, if the effects of a particular act of pollution do not dominate the scene, standing out in distinguishable isolation from those of all other factors, then they do not exist.

This is largely a matter of the misuse of words. The fact, accurately stated, is that scientific studies cannot isolate and identify the effects, harmful or otherwise, of the act of pollution in question. This enables it to be stated that no harm has been found, attributable to the pollutant, despite careful studies. This easily becomes: careful scientific studies have shown that no harm can be attributed to the emission in question. Finally, on the basis of this it can be said that: the complete harmlessness of the emission has now been conclusively proved by the most exhaustive studies under reputable scientific auspices. We then move on to 'prove' the harmlessness of the next dose of pollution in the same way!

The most fantastic, almost incredible, example to date of this technique is the use made of the Bartlett Study to justify the pollution with fluoride of public water supplies. Bartlett is a township in Texas which was selected in 1943 for study by the U.S. Public Health Service, because of its high-fluoride water supply (given as 8ppm F). Another place, Cameron, nearby, was chosen as a control (0.4ppm F). A comparative statistical study was made of health differences between the two places, based upon samples of about 120 people from each. There were wide variations of no obvious relevance, but the biggest difference was in mortality during the ten years of the study, during which 14 people died from the Bartlett sample against only four from the control town. These numbers are so small that it is not surprising that the authors found that, after age-correction, there was one chance in about 19 that the difference might have been merely random, and not connected with the real difference between the towns, which was supposed to be, predominantly, the amount of fluoride in the water supplies. This does not quite meet the arbitrary convention of statisticians which requires odds of at least 20 to 1 against randomness for what they call 'statistical significance' (i.e. reasonable certainty that the difference is not random).

So, although the sample from the high-fluoride town had a mortality $3\frac{1}{2}$ times that from the control, it could nevertheless be said that there was 'no significant difference' between them. Thus, the Bartlett Study showed 'no difference', even at 8 ppm F attributable to the high fluoride. And so, if fluoride is proved to be 'harmless' at 8 ppm, how completely safe it must be at 1 ppm (the fluoridation level)! Nobody seems to have enquired just what—if 'safety' is demonstrated by a Study of such exquisite scientific accuracy that a mere $3\frac{1}{2}$ times greater incidence of a symptom like mortality is quite insufficient to give even a suspicion of anything undesirable—just what *is* required to do so?

This Study was quoted by the members of the British Mission which went to the U.S.A. to study fluoridation as "the strongest evidence" of safety (*B.M.J. 1*, 667, 1955). Before its publication they had recommended that medical studies at all ages should be conducted in

Britain, but in view of this 'evidence' the Ministry of Health dispensed with these studies, as it was unnecessary in their view, to verify so conclusive a proof that fluoridation is safe. Those who doubted it were denounced as cranks. But even this does not end this tale of imbecility. For in 1957 a Committee of the American Medical Association reported that it had re-investigated the statistics of Bartlett mortality by more accurate methods, and found that, after age-correction, it was just 'significant' at the five per cent level (i.e. one chance in about 21 of randomness). So since then we have had the Gilbertian situation that the 'strongest evidence' for the 'safety' of fluoride pollution of drinking water is a study which demonstrated a statistically significant increase in mortality!

These facts have been published (e.g. in the *British Dental Journal* and *The Lancet*) but have not drawn the slightest acknowledgement, retraction, or defence, or made any difference to the 'plugging' of the Bartlett Study to the 'lay' public as evidence of 'safety'. To such absurdities is a bureaucracy driven by its total inability to retract or admit error! But this cautionary tale remains a most useful example, if an extreme one, of the sort of thinking and verbal tactics which tend to be used in the defence of pollution.

Toxicity—the rational basis for resistance to pollution

If, then, we are unable to isolate the effects of a particular emission of pollutant except when they reach crude levels, what basis have we (if any) for opposing or attempting to control such an emission? The answer is, our reason and our commonsense, operating upon whatever scientific information we have about the nature and biological effects of the pollutant. These mental qualities are an essential part of science, and their use is all the more necessary, the less adequate or conclusive are the factual data available.

In the case of fluoride, for instance, we know that it is a powerful enzyme-inhibitor, and can produce potentially toxic effects well below the 1 ppm level, in the laboratory. We also know that it is cumulative, and that therefore every addition to the fluoride intake must be an addition to the toxic hazard. Commonsense and caution therefore tell us that fluoride pollution is a bad thing, which should be reduced rather than increased. Similar considerations apply to sulphur dioxide, which is toxic both to plants and animals. *The only sensible assumption is that every dispersal of such a substance into the environment is inflicting a proportional injury, whether or not it is identifiable.*

When toxic pollution is crude, the results are catastrophic and create a scandal, e.g. the 1952 London smog, which is said to have killed about 4,000 people. But supposing the smog is less intense, and kills only 10 people. Such a number would probably not be detectable in London. Does that mean the smog is harmless? Supposing it is not bad enough to kill anyone? Does this entitle us to assume that a sudden discontinuity occurs, so that the smog has changed its nature, and become non-irritant and harmless to bronchitics, asthmatics, and others whom it can kill if it is thicker or more persistent? Of course not! Yet this is the assumption which we are

always expected to make by the defenders of pollution.

Much of the trouble arises from the crude, over-simplified, legalistic conception of causation which is liable to prevail, even at public enquiries, if not challenged by someone with an ecological outlook. The principles adopted seem to be those applicable to a personal assault. Not only must there be clear evidence of injury, but also witnesses that it was inflicted by a blow struck, or a shot fired, etc., by the accused. But with pollution the situation is very different, and more analogous with that which would obtain if the accused were in the habit of firing a machine gun at random over the neighbourhood, except, of course, that the 'bullets' are much too small to be individually visible or injurious, but are emitted in vastly greater numbers, and can become dangerous or even lethal, collectively.

Here the simple legal conception of determining the facts—Did A shoot B, or did he not?—breaks down. A bullet either hits and visibly injures, or misses and doesn't. Environmental pollution never 'misses', but its impact may be anything from negligible to lethal. The legal mind is liable to take the view: Either it injures, or it doesn't—and 'injury' means visible and provable damage traceable to the pollutant emission in question and to that alone, or at least, to that as the major and predominant cause. But in real life this simple causation applies only in the crudest cases. When multiple factors are operating, the pollutant can only be one of them; that is, if not clearly the *predominant* factor in causation of any injury it must be accepted as a *contributory* factor.

Pollution as a contributory factor

It is rather important, if we are to get away from the crude thinking outlined above on the subject, that these terms: *Predominant Factor Level* (P.F.L.) and *Contributory Factor Level* (C.F.L.) should be generally used in relation to pollution levels. Of course, even at P.F.L., a pollutant is still making only a contribution towards the observed damage, but it is a major one. What is really important is that it should be realised that, wherever pollution exists, it is making a contribution to the sum total of damage and disease which occurs in the environment. What we have to do is to try to determine the nature and extent of this contribution. Is it major, minor, or negligible? How is it related to the other factors? Where we are dealing with a poison, i.e. a substance commonly used for its lethal properties, or for which toxic potentialities have been found in the laboratory even at low levels, we are never entitled to assume that this contribution to damage is wholly absent.

It may well be thought that this is a mere truism, a glimpse of the obvious fact that pollution with a poison is a bad thing, and the less there is of it the better! Yet it is a fact that pollutionist industry dare not admit, although, if it were wise enough to do so, we might have not only a much cleaner environment, but much less waste of quite valuable chemicals such as sulphur and fluorides. Usually, it is insisted that the only damage is that which is blatant (i.e. at the P.F.L.). This occurs only above a certain estimated tolerance or threshold level at which it is recognisable and attributable to the

emission in question. Below this threshold it is said to be 'safe', merely because its effects cannot be isolated with any certainty without excessive expenditure and labour.

In recent years, some of the scientists who are supported by industry have developed an ingenious, but quite erroneous, argument to supplement this point of view. It is a variant of the common exploitation of the continuity of the Universe used to abolish inconvenient distinctions. According to these scientists, there are no such things as poisons or substances distinguished by their toxicity, because every substance, even water or vitamins, becomes toxic if you take enough of it. All that matters in the case of environmental pollution is the concentration of the pollutant. Below the 'threshold value' for toxicity, the substance may be not only harmless but beneficial, or even essential to life. This indeed is true of many substances, but it is not true of those which are commonly called 'poisons', which are distinguished by their toxicity even at the lowest levels at which any effects at all can be detected.

This argument, of course, appeals to those in the drug industry, since most drugs are toxic, though having valuable side-effects in cases of specific disease; which is the reason why they have to be administered carefully and under medical supervision. But the existence of such useful side-effects has no bearing on the question of the toxic properties of a substance. Mercury compounds used to be used in the treatment of syphilis, but this does not make them non-toxic. A two per cent fluoride solution applied to the teeth of children is claimed to reduce the incidence of dental caries, and a similar claim is made for the use of drinking water containing fluoride at 1 ppm although fluorides at and below this level are known to inhibit enzymes (e.g. lipase at 0.2 ppm.). Rust and mildew diseases of plants are largely eliminated in an atmosphere polluted with SO_2. In individual cases it may be thought worth while running the risk of low-level toxicity to secure one of these useful side-effects; but this does not alter the fact that mercury, fluoride, and SO_2 are all poisons, and that, so far as the environment is concerned, the less we have of them the better. There is no 'threshold' below which they change their nature and become 'beneficial'.

We have to remember that every act of pollution is 'justified' by some excellent motive, whether it is preventing dental caries or producing aluminium. But add them all together and we get a more and more polluted environment.

It is the business of the ecologist and the conservationist to make it very clear to everyone concerned that no item of pollution may be considered in isolation, as if it occurred in a vacuum; for it does not occur in a vacuum. It is always an addition to the totality of pollution, and other pathogenic factors, from other sources, and must always be considered as such. Moreover, the addition sum is by no means a simple one, since poisons act in so many different ways, and their interactions are largely unstudied. For instance, in a letter to medical officers dated 16th November 1964, the Chief Medical Officer, Ministry of Health, argues that fluoridation of water may be added

to even "exceptionally heavy pollution" of the air with fluorides without any hazard, because the actual weight of fluoride taken into the body via the lungs is but a fraction of that contained in the diet. As if inhalation and ingestion were the same thing, and he, or anyone else, has any precise idea of their interactions!

Resistance worth while

It may well be asked whether, in the face of such devoted rallying to the cause of official and industrial pollutionism by our health authorities, the common or garden citizen can achieve anything by his opposition. The answer is—yes, a great deal. In a useful article in the *Sunday Telegraph* ('Planners' Blight, How to beat it'—20.4.69) Angus Maude M.P. pointed out that even a 'defeat' in one place may cause enough trouble to the 'blighters' to persuade them to concede the contested point on a later occasion, and to make them more generally co-operative with the conservationist point of view.

Even the unequal contest over the Anglesey aluminium smelter resulted in a very definite gain for those who stuck to their guns and presented their case for objection to the whole project despite constant attempts to persuade them to withdraw it. Before the Enquiry opened the two farmers' unions (National Farmers' Union and Farmers' Union of Wales) were offered a compensation agreement covering cattle fluorosis only. This was accepted by the N.F.U., which withdrew its objection, but rejected by the F.U.W. On the eve of presenting its case the F.U.W. was publicly told by the lawyer representing the Company, that it must withdraw its objection by 10 a.m. the following morning if it wished to have any compensation agreement at all.

This did not deter these Welsh farmers who presented a very strong case for retaining Anglesey as an agricultural area without large-scale industry. They produced evidence along the lines of this article to show that the broadcasting of pollutants, including a cumulative one such as fluoride, could produce far more widespread and serious losses or damage than merely cattle fluorosis, which happens to cause distinguishable symptoms: e.g. injury to trees or crops, acidifying of the soil needing more liming, and especially 'ecological damage' to the grass sward by the eliminating of the more sensitive and higher-yielding strains of grass (e.g. Aberystwyth strains of rye-grass) giving a poorer sward and making re-seeding impracticable or uneconomic. According to evidence quoted from a paper by Dr. J. K. A. Bleasdale in *The Effects of Pollution on Living Material* (Inst. Biol. 1959) such damage from industrial air pollution was estimated to be inflicting annually a loss of £2.6 million on farmers in East Lancashire. It could lead to radical and expensive changes in farming practice, and to losses in capital or rentable value which might be far more serious than anything which might be expected from cattle fluorosis.

Although the Queen's Counsel engaged by the Company vehemently rejected and ridiculed these considerations, and although the objectors did not succeed in getting planning permission withheld for the smelter, the Inspector's Report contained a recommendation that compensation should cover *all* types of loss, and not merely cattle fluorosis.

This could scarcely be ignored by the Company, which has now offered an appropriately amended compensation agreement and is engaged in setting up a joint committee with the F.U.W. to keep a watch on the situation. Moreover, relations are now much more amicable!

Now this represents a very considerable gain for the farmers, and indeed, for the whole neighbourhood. As was made very clear by the Secretary of the Anglesey F.U.W. Branch, their aim is not to extract compensation from the Company, but to have no cause for wanting compensation. The whole purpose of the smelter undertaking is financial, and the control of the emission, at least below any level which may be insisted upon by the Alkali Inspector, is largely a matter of what expenditure is deemed to be justifiable. And the wider the grounds agreed for compensation, the stronger is the case for limiting the emission to a genuinely negligible level.

Benefit of the doubt to the environment, not the polluters

This article may well end with the most important point made in evidence at the Anglesey Enquiry. When persons, firms, or other organisations take it upon themselves to broadcast a toxic substance into the environment, they are raising the toxicity of the environment and are certainly inflicting an injury upon it in relation to which any blatant or distinguishable injury is like the tip of an iceberg, most of which, though dangerously real and solid, is invisible. Since the symptoms of chronic, low-level toxicity are usually indistinguishable as to cause, and since they have mixed their toxic pollutant inextricably with all the other pathogenic factors operating in the environment, they habitually 'get away with' inflicting this damage on their neighbours by insisting that they will accept no responsibility unless that conclusive proof is forthcoming which they have largely made impossible.

Not only the certain damage, but the uncertainties of the situation have been created by the polluters, and not by their victims, and therefore they should be held responsible for their action. It is therefore quite essential, in the public interest, and also in the interest of public confidence, that where the evidence is doubtful or conflicting, where it suggests harm even though this may not be conclusively proven, by reason of the multiple causes operating, the benefit of the doubt which is created by the act of broadcasting pollution should be given to the potential sufferers rather than to those who are responsible for this situation.

It will be protested that we cannot make such speculative assumptions; but with broadcast pollution we have to make speculative assumptions, one way or another. If a substance is known to be harmless, then the correct assumption is that its effects are harmless unless shown to be otherwise; if it is known to be toxic, then the logical assumption is not that its effects are harmless, but that it is a contributory factor in any condition of injury or disease which may be found. This is not merely simple common sense, it is socially necessary if we are ever to control the increasing pollution of our environment.

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