SCIENCE AND LAW AS CONFLICT-RESOLVING INSTITUTIONS - informality and discretion in the construction of policy authority

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I INTRODUCTION - Convergence and confusion

> "Without doubt one of the oldest notions of Western Civilization was that just as earthly imperial lawgivers enacted codes of positive law to be obeyed by men, so also the celestial and supreme rational creator deity had laid down a series of laws which must be obeyed by minerals, crystals, plants, animals, and the stars in their courses."(1)

In an essay from which the above quotation is taken, Joseph Needham has shown how even to his breadth of learning, the historical roots of the relationship between science and law are tangled and obscure. The terms, "natural law" and "positivism" are common currency in both fields, indicating as does Needham, some important confluence and interaction on the past - indeed law has modelled itself as 'moral science'. Yet just as the historical dimensions of that relationship are obscure, so too are its contemporary ones. As one academic lawyer rather colourfully put it :

> "The anvil of the law has always resounded to the striking iron of science. Some tough metal has been beaten out there, sometimes into curious shapes, and few members of the populace can have failed to hear the reverberating blows or to see the cascading sparks which fly from those impacts. Despite all this, there is a mist of uncertainty, an obscuration of terms, a lack of sharp definition which tend to invest vital aspects of law-science correlations with a curious mystery."(2)

This obscurity is mainly due to the fact that the room for detached analysis and discussion has been largely filled instead by little more than apologia and polemics from the committed. Lawyers tend to elaborate variations on the theme expressed by one judge(3), that "there are three kinds of liar : common liars, damned liars and scientific experts"; or they bemoan the typical scientist's lack of precision and clarity. Scientists on the other hand tend to contrast "Truth or Power" - "Science is a problem-solving subculture whose main value is truth"; the ethic of law on the other hand "is to win cases rather than to solve problems. The lawyer's "problem" is not to produce testable propositions but to win the case".(4) The scientists tend to see law only as a corruption of truth since, like base politics, in their view, its only concern is conquest.

Roger Smith has examined 19th century interactions between medical expertise and the courts via the insanity defence plea in murder trials and has shown how these local tensions reflect important underlying conflicts of a broader kind[5]. These conflicts and dilemmas ultimately focus upon questions about proper modes of expression of social values and constructions of social authority, yet obscured by the rhetoric, they remain unexamined, let alone resolved. Thus one of the few books devoted to the topic has its introduction entitled "the obligations to cooperate" (of scientists and lawyers), yet the whole book focusses on "the reasons why scientists and lawyers can't talk to each other"[6], as seen by each side.

In modern times we have seen a trend towards more and more intensive interaction between science and legal processes, on several fronts :

(i) The recent fuss over psychological evidence and interpretation in the Yorkshire Ripper case in the UK, and the John Hinckley case in the US, indicates how strongly this area of interaction continues, and how confused and controversial it remains. There are also other criminal cases where the validity and meaning of scientific evidence has been a point of more than immediate controversy to the case in question, for example those involving the Home Office forensic expert who was recently alleged on several occasions to have falsified evidence which was critical in convicting people charged with murder.

(ii) In addition to criminal cases which involve conflicting scientific perspectives and which raise wider social issues, there are an increasing number of civil cases which, although formally couched in terms of traditional individualised litigation, in reality express a conflict of wider social dimensions. Thus for example the attempt by two families near a busy road junction in London to sue Associated Octel which puts lead in petrol, for health damage to their children drew in conflicting scientific evidence to be resolved in a legal setting, yet was clearly a conflict over government policy on the acceptability of lead in petrol. Likewise the legal suits over the alleged damage caused by the drug Debendox carry a general social conflict over drug safety testing and standards, in the medium of

formal litigation between individual parties.

Even in the UK, where the scope of judicial intervention on matters that might impinge on policy has been much more restricted than in the US, these trends towards legal channelling of policy related conflicts appear to be growing. The element of scientific conflict as a crux of the issue also seems to be growing in prominence. The Solicitor to the Supreme Court of Scotland has observed that "there is no doubt that the part played by scientific evidence in our courts is increasing. This fact tends to emphasise the problems which surround the giving of expert evidence."(7)

(iii) This tendency towards greater focus on scientific conflict in the courts has been complemented by a parallel development in quasi-legal settings such as (prospective) public inquiries into developments such as power stations, mining, motorways and gas terminals; and (retrospective) tribunals of inquiry into disasters such as Sea Gem, Flixborough, Summerlands and Bantry Bay. Such inquiries have intensified in broader social significance, in scientific content, and in legal formality, despite administrative attempts to reverse this. Even in relatively small inquiries, such as that into the Brighton Marina, elaborate, scientifically pretentious, quasi-Newtonian gravity models of shopping patterns have become an almost obligatory, ritual currency of authority. In both formal court cases and public inquiries the very fact that the issue now bears direct implications beyond a pair of opposed private parties means that more emphasis has to be placed upon "getting the facts right". When the judicial function was only to resolve private conflicts, in the words of an American judge "although it was as well that particular disputes should be fairly settled, there was comfort in the thought that the consequences of the settlement should be confined to the individuals involved" ... "a casual attitude" was thus adopted towards factfinding. If this ever was justified, it has largely disappeared in the modern era, where widespread litigation of policy issues with general social consequences "demands a more visibly reliable and credible procedure for establishing the fact elements in the litigation".(8)

As expert conflicts regarded as crucial to a whole range of policy issues have become increasingly important and increasingly difficult to resolve, attempts have been made to control expert debate by formalising it, on the assumption that conflict was really due to the lack of formal structure of much scientific debate. Significantly, the model of control to which people have turned has been that of law, with its well-entrenched and often elaborate rules of standing, evidence and procedure. Thus there has grown a significant movement on behalf of so-called "Science Courts"(9), which are supposed to resolve such policy-related expert conflicts by subjecting them to a legal type of process. The fact that no such issue has yet been resolved by such a process in real life is less significant than the fact that this idea should have originated and continues to be advocated by the important sectors of the policy establishment and the US Congress.

I shall return to the Science Courts question later, but here it is relevant only to point out : how problematic the resolution of scientific uncertainties and conflicts has become for the policy process; how strongly exists the almost automatic reaction that greater formalisation is required; and the faith that the legal process offers such definitive structuring to produce resolution. In this paper I want to discuss some of the assumptions which appear to be widely held about the nature of scientific consensus (and by corollary, of scientific conflict) and which appear to be most deeply institutionalised in the law. From what is really only an exploratory discussion, the only conclusions I will draw are that the assumptions about scientific knowledge and consensus held by law are falsified by sociological and historical examination of science, that the consequences are important especially when wider social issues hinge upon resolving an expert conflict, and that because of these false underpinnings, legal processes are not adequate means for resolving scientific disputes. It is not farfetched to say that an entirely new philosophy of scientific expertise is needed in the law, though I must emphasise that here I am not pretending to make any contribution to that effort of reconstruction.

II Legal assumptions about science

Science and law represent different systems of authority. Although

which by definition are multidimensional, often indirectly connected and entangled. Social discourse has to be a shorthand form of communication, condensing several meanings and messages into single actions or utterances, whose symbolic or rhetorical aspect is thus inevitably important. The judicial approach denies the existence of such a world, and for its own limited practical purposes eradicates it by the artificial - if functional - process which it employs to refine issues into discrete, one-dimensional technical questions[15].

A striking example of judicial empiricism was given in a review of US legal cases where claims had been made for compensation for cancer deaths of various kinds[16]. These fell into two broad categories : those where a traumatic physical impact had been involved (e.g. a fall, or piece of equipment hitting the eventual cancer victim) at the site of the cancer; and those involving a record of chronic low level exposure to agents known to be carcinogenic. The latter type of case normally involves only probabilistic evidence, but this has come to be treated in highly sophisticated manner by scientific experts with (to the court's decision about allocating responsibility) relatively small ranges of dispute over risk magnitudes. Nevertheless the cause-effect mechanisms involve stochastic processes, which are highly abstract concepts to grasp. Although there are no scientifically accepted mechanisms to explain cancer formation by physical trauma, in immediate concrete empirical terms the cause effect relationship is "obvious". Significantly, the proportion of physical trauma claims upheld was far greater than that of low level exposure claims, even though accepted scientific knowledge would have militated the opposite. In other words an apparently concrete, empirical relationship was trusted even though it could not be explained or justified by science, whereas an abstract, scientifically accepted relationship was more often than not rejected.

Another example occurred during the Windscale Inquiry when questions were raised about the level of research, monitoring and scientific understanding of environmental contamination at Ravenglass, a complex estuary near the Windscale discharge pipe to the Irish Sea[17]. Objectors, as part of their general case about lack of proper control, were trying to point out that such research and understanding was inadequate, especially with a major expansion being projected, and were pursuing this course in questioning a

government scientist in detail about research. When they asked whether certain measurements had ever been made (to a negative reply), Parker dramatically adjourned the Inquiry, asserting that serious allegations were being made about unsafe levels of air-contamination at Ravenglass, and these should be measured forthwith "so as to put the matter beyond mere opinion" (18). Even government and industry scientists were staggered by this unrealistic demand and the assumptions that lay beneath it. Not only was a complex, projective and sociological argument (though involving empirical evidence) being converted into a crude concrete empirical test, but even the difficulty of this empirical test - especially how to interpret results obtained - was completely underestimated. In the end, however, Parker had his way and the social argument was duly submerged without trace as rushed measurements were made, contamination was found to be well below official limits, and as a final insult objectors were thus roundly accused of scaremongering!

This particular case deserves wider recognition and discussion, especially with another major legal set-piece on nuclear power in the offing, and I have written it up at greater length elsewhere. However, the empiricism of judicial rationality is generally well recognised(19), and I would like to turn to other, related aspects which help to understand the implicit judicial model of scientific consensus, indeed of conflict and consensus generally.

Evidence and reductionism

Egglestone has discussed the artificial character of the judicial fact-finding process :

> 'the exigencies of the legal process require that somewhere in the search for truth a halt must be called, otherwise litigation would become interminable ...
>
> What differentiates judicial decision-making is the fact that the courts have laid down rules, which differ in important respects from those followed in the ordinary affairs of life, for the control of the fact-finding process /i.e. how an issue is defined and resolved/

He gives the example of the Similar Facts rule. In the courts, 'If the question is whether a person has been negligent on a particular occasion, evidence that he has been negligent on other occasions will not be admitted'[21]. Yet this would be precisely the kind of evidence which in 'the ordinary affairs of life' and even in science, would influence assessment of an issue. Likewise the question of previous conviction; the judicial fiction is that the issue can be definitely decided by fact alone, yet in reality, such informal circumstantial factors and questions of trustworthiness, credibility etc. play an important role in deciding because the facts alone are hardly ever sufficient. In other words, in the judicial moulding of an issue, historical and sociological categories of thought and judgement - the complex stuff of real social affairs - are excluded. This is extremely important when judicial institutions are asked to trespass into social and political issues.

Egglestone has also discussed how most if not all legal judgements are based upon factual knowledge which is inadequate in at least two respects :

(a) it may be simply impossible to verify or refute with much confidence; and
(b) it may be inextricably bound up with tacit aspects of judgement which cannot be fully specified and cross-checked.

The first aspect is self-evident, but Egglestone illustrates what is meant by the second one. When a witness testifies, for example, to a party's intoxication, or exhaustion, elements of factual description and evaluation enter into together. Legal examination demands total specification of all the factors in that witness's observation. But witnesses will not be able to recall and explicate all the precise physical signs by which the vision at the time was taken to mean intoxication or exhaustion.

In other words, the role of non-explicable, tacit factors in judgement is much more influential than commonly recognised, even in apparently straightforward factual observations. This has been recognised for scientific observation too[22]. The general point which Egglestone makes of these insights is that such informal, tacit aspects of 'factual truths' are not acknowledged in the law, whose judgements are always couched in terms of false certainties and absolutes; in judicial analysis conditional, partial or qualified truths are unknown; yet in reality, those verdicts are based upon a complex interaction of probabilistic and intuitive

judgements and associations, whose logical rules are uncertain and insecure. For example the well-known though not formally recognised resort to 'the demeanour of the witness' as a way of assessing the credibility of evidence is an inevitable necessity in the many cases where the bare facts are inconclusive. Significantly, many sociological studies of scientific conflict have documented similar ad hominem methods of assessing competing beliefs(23).

Reflexive reasoning

A further point which undermines the idea of rule-bound certainty or inevitability concerns not only the fact-finding process, but also the employment of the evaluative rules from which a decision is supposedly deduced. In the official version of judicial reason, the relevant interpretive principles are obvious and clearcut. The judge supposedly sees the relevant rule, finds the facts, objectively applies the objective rule to those objective facts and declares an objective verdict. In practice, however, not only are the facts often ambiguous both in their relevance and truthfulness, but also the relevant legal rule is often a matter of choice. So too is the way in which it may be applied to the particular case in hand(24).

What appears to happen most often, therefore, is that the judge first apprehends a verdict on the basis of intuition; this is sharpened of course by evidence and logic as well as by moral outlook and experience. He then seeks a structure of reason which justifies that verdict in terms of objective principles, logical rules, and facts. This reconstructed rationality lends the judgement a spurious air of non-arbitrariness, objectivity and empirical inevitability and certainty. Balances of probability, margins of credibility, and other open choices in judgement are converted into a public language of black and white, inevitably determined truths. This is of course a successful ritual for gaining wider authority.

Holmes was an early confessor of this complexity underlying the apparent certainty of judicial reason :

> 'The fallacy of the logical form ... flatters that longing for certainty and repose which is in every human mind. But certainty generally is illusory, and repose not the destiny of man. Behind the logical form lies a judgement as to the relative worth and importance of competing legislative grounds, often an inarticulated and unconscious judgement it is true, and yet the very root and nerve of the whole proceeding. You can give any conclusion in a logical form'(25).

Another judge, Chancellor Kent, was even more frank in his description of his own method :

> 'I saw where justice lay, and the moral sense decided the court half the time. I then sat down to search the authorities /i.e. the standard reference works on legal principles and precedents/ ... I might once in a while be embarrassed by a technical rule, but I almost always found principles suited to my view of the case'(26).

It is in this endemic inadequacy of the rules to dictate 'for themselves' an objective application, or decision, that the whole question arises of judicial 'creativity' in political or social affairs. Whereas their judgements are expressed in terms of apolitical objectivity, this conceals the points at which tacit choices have had to be made, between competing principles and premises, or between competing parties' credibility. Often these choices and assumptions entail moral or social values, e.g. assumptions. as to where authority resides in society, what constitutes 'the reasonable man', or 'what is customary' etc.. Thus as many analysts of the judiciary have noted, behind the facade of objectivity there is ample scope for the inadvertent influence of social values and presumptions - "the known or experienced facts of social, economic and political life of the time and place ... become processed into judgement"(27).

It appears that the complex and delicate tissue of theoretical activity in which scientists operate, and which is usually ambiguous and open-ended, is not recognised by the legal mind. There are practical reasons why this might be so - it is easier as a non-scientist to control a scientific expert in court by keeping to concrete facts where one might be able to question them, rather than allowing them to roam where they

cannot be followed, into their own specialist theoretical world. However, the more fundamental reason must be connected with the judicial craving for rule-bound certainty in analysis. Recognising the ambiguous and theoretically incomplete nature of all scientific fact, observations and principles, would be tantamount to its recognition for legal knowledge too, given the great extent to which law cultivates its own social authority by reference to empiricist positivist models of scientific knowledge.

It is true that judges sometimes make great emphasis of the inadequacies of scientific evidence in specific instances, but this is not inconsistent with loyalty to the general ideological principle. It is a common judicial theme that scientists have to be helped to express the true state of affairs by the rigorous, precise discipline of legal examination, because (although science may in principle by precise and objective) individual scientists are often biassed or woolly-headed, and cannot disentangle objective fact from their own opinions as purely as they should be able to[28].

Facts emptied of value

Not only is the active interpretive infusion of facts unrecognised by judicial thought, but there is also a corresponding confidence in the complete separability of facts from 'mere argument', values or emotions. This is enshrined in the legal process where there is the stage of evidence, fostered by proofs of evidence; then the completely separate stage of submissions as to the correct interpretive principles to apply that evidence. Time after time this fiction was impressed upon bemused objectors at Windscale, innocent of legal traditions, when Parker asserted that they were indulging in 'mere argument' rather than in finding facts. Indeed Parker made his approach plain at the preliminary meeting, in which he emphasised that he had no decisions to make, and had only to find the facts.

It is not only in strongly political issues where this positivistic belief leads to confusion or worse. An illustration is taken from the use of psychiatric knowledge in the courts. The American Judge Bazelon has been involved in many cases where evidence has been given as to the mental

state and criminal responsibility of the accused, even when it had been accepted that they had committed a criminal act[29]. This has been a vexed problem ever since the earliest uses of expert evidence on the question. The 1843 M'Naghten Rules required psychiatrists to testify to whether or not defendants could know they were acting criminally. The psychiatrists felt that this rule begged important questions. It also left their role restricted yet at the same time controversial because their testimony under this rule inevitably trespassed upon the sacred right of the jury to decide the moral issues of guilt. Their expertise was supposed only to speak to the facts. Assuming this distinction between facts and moral evaluation to be categorically achievable, in 1954 Judge Bazelon revised the rule in the Durham case. The Durham rule held that if the defendant's act was the 'product of mental disease or mental defect', then he or she must not be declared guilty. Bazelon assumed that this rule would allow psychiatrists to advance a wider range of scientific facts relevant to the case. On the strength of his positivist judicial assumptions, he also believed that this freedom to offer a range of facts would remove the psychiatrists' difficulty in separating facts from opinions and assertions which trespassed on the jury's evaluative role. In reality it did precisely the reverse, because unrecognised by the court, the new facts so opened up were all, like all other scientific facts, couched in theoretical frameworks which in the very process of giving them meaning also lent them implications which inevitably tended to imply guilt or innocence and thus continued to trespass on the court's authority. They could not exist as facts without these interpretive constitutions. The judicial approach assumed that there exist - or can exist - pure empirical facts, of solf-contained meaning independent of any such interpretive constitution ('mere opinion' as the law would call these). This kind of confusion and conflict has characterised the use of expert evidence from all fields in the courts. The assumption that fact and opinion are strictly separable continues to survive as a practical myth despite regular falsification as witnessed in the chronic difficulty over the use of expert evidence.

A further enlargement upon this point is necessary. Scientific facts may be suffused with interpretive life, but when this is indicated in the courtroom, it is usually immediately taken that such theoretical

interpretation is individual in origin, rather than the result of a very great deal of social interaction - often informal - between the experts in a field. Built into 'a scientific fact' may be a little empirical observation, and a great deal of social negotiation between those experts, as to the meaning of those observations. Even what is an empirical observation may be the subject of a great deal of negotiation between scientists. The result is that scientific truth is much more a fragile achievement of collective interaction, negotiation and social consensus than is recognised in the idea inherited from more empiricist times, of truths dictated by the inherent logic and meaning of revealed facts. When this elaborate, socially rooted, and informal interpretive edifice is revealed by legal processes which unrealistically demand absolute empirical proof, the assumption of the judiciary tends to be that since it is not empirical proof it must be mere individual opinion, rather than the arduously refined collective opinion of many specialists. It may be that sometimes such testimony is indeed based upon an idiosyncratic interpretation of the evidence in a given scientific field, but the courts appear to assume that that is all there ever is beyond the hard facts.

On this assumption about science, therefore, any criticism that scientific knowledge might be infused with social factors can only be interpreted as an allegation of individual bias and corruption. It is significant that this is precisely how Parker treated such criticisms at the Windscale Inquiry, asserting that :

> 'I have no doubt as to the integrity of those concerned in all of (the controlling authorities) and I regard the attacks made upon them as being without foundation. Such attacks did nothing to further the cases of those who made them and at times reached a level of absurdity which was positively harmful to those cases'(30).

Yet virtually all these attacks were made not upon the integrity of the people in those institutions, but on the structural integrity of the system - an entirely different matter. The arguments were that without a pluralistic structure of research and cross-criticism, and a completely open standards setting process, especially with so many ex-nuclear industry personnel the controlling bodies would inevitably tend to develop their

knowledge - their interpretations of incomplete and ambiguous evidence etc. - in directions which portrayed nuclear energy in a favourable light. On the interpretive model of science, this structural bias can be recognised without implying anything about personal integrity. It just acknowledges that the social contexts within which scientific knowledge is produced, have some influence upon that knowledge. The positivist judicial model of science on the other hand, has to treat any bias as more or less deliberate, and usually (because of its traditions of individualism) as individual bias. The positivist accounts of science in philosophy have tended to exactly the same fallacy, by assuming that the only alternative to absolute, objectively determined scientific knowledge is rampant subjectivism and relativism(32).

Formal and informal certification of knowledge

One can see further results of the positivist assumption in several places. For example there has been little or no discussion as far as I know, of the problem of hearsay evidence in relation to expert witnesses. Yet given that scientific knowledge is developed and diffused not so much by independent testing but by social transmission via established authority patterns, informal hearsay evidence is an essential component of scientific knowledge. Important work has often not even reached the formal literature, so that direct personal citing is usually necessary too. All this is a form of hearsay, which is prohibited in lay testimony, and which has not been adequately clarified in the legal role of expertise because the false model of science employed does not even recognise the problem. A vivid example of this was given at the Windscale Inquiry, when an American expert radiobiologist sent his scientific testimony, based upon work which had not yet then reached the formal literature. Expecting to engage in a scientific debate with the Tribunal's expert assessor in radiobiology on his recent research, he was shocked to find his testimony dismissed because of its informal up-to-date grounding. What could be negotiated as acceptable knowledge within a scientific subculture could not necessarily be acceptable to utterly formal legal demands for documented empirical proof. A further more general example of this misfit between the informal nature of science and its vulnerability to formalistic legal assumptions about scientific

proof was given in a paper by legal counsel who displayed the almost limitless points where accepted forms of authority and meaning within a scientific specialty could be made to look arbitrary when ruthlessly pursued for their empirical or logical support(32).

The point is that scientific knowledge is built more upon social processes and tacit judgements which develop and change formal rules and scientific norms rather than mechanically reflect them. It is thus an elaborate social achievement of informal processes, which are concealed by the formal logic and rational invariant rules of which public accounts of scientific knowledge are created. In this, scientific knowledge is identical to judicial decision-making. The key distinction must be that the law operates in an inevitably public setting which is long-established, and formalised. It therefore employs utterly depersonalised languages and norms. Scientific knowledge is created in relatively very small, informal social groups with fuzzy boundaries, and the knowledge is created for that informal subculture. It can afford to retain a degree of ambiguity and social reference which legal decisions cannot. This is true until the scientific knowledge 'goes public', when the problems of social meaning and credibility arise. In legal processes, scientists are subjected to formal cross-examination, judged by unrealistically empiricist, formal and positivist expectations. No kind of knowledge could sustain its credibility when subjected to these criteria. Judges and their reasoning are not exposed to such a radical sceptical scouring, and as the earlier discussion shows, their credibility would also be destroyed if they were. This institutionalised freedom to destroy any scientific testimony is useful for the authority of the judiciary over science, because if all sides have been conquered, it allows whichever scientific knowledge fits the overall view of the judge to be reconstructed in justification of the verdict. Egglestone and Tribe both underline this ritual element of the use of scientific expertise and rational-logical justification when they suggest that it is used more for collective reassurance in the authority of judgements than for judgement per se(33). As Arnold has also put it more generally, "the function of law is not so much to guide society as to comfort it" with the pretence of order, certainty and reason(34).

The Adversary Process

The deliberately adversary nature of legal processes is probably their most widely criticised and least understood property, yet it is also their most central principle. It is often most strongly despised by those scientists who have experienced the rigours and frustrations of having their expertise dissected in another context of interpretation beyond their control, by good legal cross-examination. "Science" asserts Boulding[35], "is a problem-solving culture whose main value is truth", where "controversy is supposed to be settled by some kind of appeal to the facts or observations rather than the character or interests of the disputants. Arguments ad hominem are considered very bad form in the scientific community, and there is a strong ethic of truth-telling and veracity." As already noted, however, this polarisation into truth-telling or ad hominem judgement is too simplistic.

In one sense the adversary process should be attractive to scientists, at least according to the traditionally dominant view of scientific conduct. This view has it that scientists thrive on criticism and open attempts to refute each other's and indeed their own work, as the quintessential safeguard of objectivity and constant self-correction. As already noted, however, scientists do not seek out conflict in this fashion; they tend to shun it and instead orient themselves socially and intellectually to more comfortable fellow-believers. They are therefore much less at home in an environment dominated by pure scepticism and criticism than might be supposed. Furthermore, when, as often does happen, adversary conditions do arise within science :

(a) these are generally less public;
(b) they are less stylised and formal;
(c) they are within the control of the social groups of scientists involved, and interpretations of the conflict can be managed within their own reasonably coherent and familiar traditions.

None of these properties remain when the scientific conflict is transferred into a legal process. Thus even although social analysis of scientific debates has shown that ad hominem argument - supposedly the corruption unique to legal (and political) processes - is routinely used

there also[36], its necessary use can often be controlled and interpreted by the informal cultural norms and traditions within the specialty concerned. It is not, therefore, felt to be such an explosive form of argument as it is when employed by an alien controlling culture (law) which does not share the specialty's informal-cultural understandings and is not subject to its sanctions and controls.

Conflict and credibility

The foregoing outline of the social nature of science beneath its formalistic public images also explains another common aspect of scientific conflicts in legal settings and elsewhere. A central part of the modern sociological account of science is that what scientists believe is not the result only of their own independent research, but also of what they are told. If conflicting views are advanced, the scientist may have inadequate data to make a confident judgement in favour of one school of thought or the other. This may be true even for his own specialism where the judgement may be effectively already made according to which school of thought it was in which he was socialised, and is even more true for judgements about other specialisms from his own. It is even more strongly true for the non-scientist who may have to judge between competing claims from science, neither of which can be independently checked against nature. In such cases the decision-maker is forced to rely upon credibility-indicators, such as formal status, e.g. being Professor, FRS, rather than a research student; having been wrong in previous conflicts even if unrelated; appearing reasonable and detached rather than emotional or over-bearing; having unpopular political or religious affiliations; or being associated with other experts of high or low repute.

Thus one finds that, although the formal public account of science does not recognise it, scientific judgement entails such credibility-factors mixed in with 'objective' appraisal of evidence. In tacit recognition of this, scientific conflicts often very quickly focus upon such 'extraneous' points of reference. Likewise the legal process often uses such credibility indices in making judgements, and cross-examination is often directed to that end. However, neither of these are recognised in the public self-image

of the law, again because to do so would be to recognise the impossibility of achieving an absolutely objective way of knowing and deciding. The existing means of social authority would thus be lost.

A final implication concerns beliefs about the nature of conflict and how it should be resolved. Inherent in the view of science which I have attributed to the judiciary, is the belief that where there is conflict between experts, this is the result of one side (or both) being imprecise, incompetent, ideological or otherwise biassed, and deviating from what is taken to be a single precise truth in principle discoverable beneath conflict. Consensus is taken to be natural, because the facts, once seen clearly, 'speak for themselves'. Many scientists and indeed the public take this idea for granted too, since the public image of science portrays this myth(37). It is often argued, when scientists are involved in public conflict, that if only they could be left to debate with one another untrammelled by the emotive interest of pressure group contacts etc., they would find 'the' consensus without difficulty. However this may be true only when the issue is disconnected so severely as to be posing a technical problem no longer the same as the one which was in the middle of a social conflict, and thus no longer relevant. More frequently, though not always, the increased mutual contact of experts in such social issues has only polarised and developed conflict, much to the chagrin of scientists and others whose mythology about natural consensus has thus been challenged. The response to that counterevidence has usually been to elaborate the mythology, for example by offering various ways of further 'purifying' the process, such as science courts. The legal setting is one such process, wherein cross-examination is supposed to expose whichever expert party is concealing its incompetence, bias etc. and thus lead directly to resolution of the conflict. Note that this belief justifies the widespread cross-examination of experts on personalistic and other 'extraneous' grounds. It is significant, too, that the adversary process for experts is staunchly defended by many judges on the grounds that if the alternative of exchanging expert documents before a case were taken too far, then the necessary opportunity of exposing the incompetence of an expert by surprising him in cross-examination before the judge and jury would be lost. Mr. Justice Parker is an advocate of this view(39).

Most of the issues involving technical expertise at Windscale only proliferated the technical conflict, something which appeared to surpise and annoy Parker. Thus he heard day upon day of evidence and cross-examination on radiobiology for example, presumably in the expectation of its reaching a conclusion. Yet even after such prodigiously expensive effort under his legal discipline he was forced to abandon the pursuit of consensus and advance principles which left radiobiology open-ended yet which allowed him to reach a decision on THORP. Likewise for energy demand and (less so) for economics. From statements made after his Windscale experience, all Parker appears to have felt from this further substantial challenge to the myth that a properly structured confrontation would expose the natural truth, is that scientists, especially on passionate issues like nuclear power, are more difficult to force into clarity of thought, impartiality etc., than he had previously believed, but not that the founding assumptions about scientific thought may be wrong(40).

There was no recognition that scientific conflicts may entail differences even as to the existence and status of facts, because they only become facts within an interpretive framework, and these are subject to legitimate variation. Thus the judicial model of authority in science assumes it to be naturally monolityic and objectively determined. This is a direct analogy with the judicial model of moral knowledge and authority in society. If conflict is viewed as pathological, then decisions are inevitably declaratory, based on expert discovery, rather than compromises based upon negotiation and mediation.

Rationalism and precision

A final basic aspect of judicial thought which is relevant to our consideration is its rationalism. Shklar refers to this as an unrealistic obsession for definitional clarity; believing the rules of thought and judgement to be precise and unambiguous, the law has created 'ever more refined and rigid systems of formal definitions (which have) served to isolate law completely from the social context within which it exists'(41).

Following the positivist belief that empirical facts can and do mirror reality, in precise and pure form, legalism attributes residual

conflict to temporarily imprecise definition of a concept or rule; it is taken for granted that clarification and greater precision will expose greater truth, and thus dissolve the conflict. In its institutional role the judiciary more or less has to exercise the belief that the social reality over which it presides is indeed unambiguous, and that the norms embodied in verdicts will have unproblematic meaning and application.

In the process of justification of judgements, as we have already described, ambiguous and contestable terms and principles are often given particular meanings to suit the judgement in hand, and then presented as if that were their absolute ontological meaning - their exact representation of an objective truth, rather than a meaning chosen for the specific purposes in hand, or simply reflecting social values taken for granted by the judge. A good example is the reference to particular models of 'the reasonable man' issued in judgements. Another is taken from the English Court of Appeal, in a case where an employer had appealed against the decision of an industrial tribunal in favour of an employee who had complained of unfair dismissal(42). The employer's case rested on the ground that the plaintiff had left his complaint until over three months after dismissal, and the issue was whether three months had been a 'reasonably practicable' period in which to submit a formal complaint to the industrial tribunal. Clearly the term is legitimately contestable, open to conflicting interpretations. Yet the Appeals Court's assertion was that 'It is axiomatic that what is or is not reasonably practicable is in essence a question of fact to be resolved by ascertaining the facts'(43). Thus the operating fiction that the crucial meaning and thus the decision is discovered and not chosen, leads to the reification of such terms and definitions, and to the corresponding belief that reality is totally comprehended by, or subordinate to, the imprint of such 'precise' discovered definitions.

The four case studies which Horowitz analyses illustrate the point clearly, especially his example of the distribution of educational resources between the affluent white and poor black areas of an educational authority in New York(44). This case was tried in the courts when the authorities were sued to equalise resources. The judge issued a verdict enforcing equalisation, assuming that the definition was precise and unambiguous. The decree failed to achieve any significant change, because social reality

proved to be far more complex than the simple decree had supposed. The first definition of equalisation involved per capita expenditure. But what if the best teachers, e.g. the ones with most experience, went to the white schools ? In addition to the qualitative differences, this meant higher aggregate salaries, so did one cut down the number of teachers per capita proportionately in the white schools, or define equality of educational resources in terms of staff-student ratio, and conceal the problem ? How could one legislate educational equality ? The issue returned to the courts for a further determination and the 'rational' definition of educational equality was further refined on the assumption that it could be precisely and unambiguously specified as a set of norms to be obeyed. Yet again it proved inadequate and yet again it was returned to the courts. This process exemplifies the analogy between legal scientism and bureaucratic rationalisation recognised in classical sociological understanding.

As Horowitz recognised, this process of repairing broken down definitions occurs in political legislation too, but from that sphere it is recognised as a normal fact of life. Furthermore, in that sphere arrangements exist to allow a reasonably flexible and wide social negotiation of those normative definitions and the social values which they embody. The judiciary's mode of conceptualising and judging issues proposes otherwise. Reality can, it believes, be precisely and factually described, and can therefore be comprehended by definitions and rules which are sufficiently precise. If they are falsified it is not because reality is inherently multiplex, and sometimes beyond single precise formulation, but because the concepts need further elaboration and precision. The task of lawyers and other experts, is to <u>reveal</u> objectively true meanings not to negotiate or encourage the negotiation of them. Hence this mode is also inherently antipathetic to wider participation.

III <u>Mediation or Declaration as styles of knowledge</u>

One distinction which has been drawn around the process of judgement is its basic difference from a more mediative decision-making process. Most comment has attached to what has been regarded as the extravagantly <u>adversary</u> nature of judicial proceedings, which as one author typically lamented

'only hardens the bellicose arteries of the contestants' in a gladatorial combat[45]. Less attention has been given to the authoritarian, ex-cathedra nature of judicial ways of resolving conflicts. Anthropologists such as Gluckman and Eckhoff, for example[46], have noted that in relatively undifferentiated societies, where legal institutions (like professionalism and specialisation in general) have not clearly split themselves off from other social institutions and roles, the courts frequently have to act more as mediators and conciliators between conflicting parties, rather than as ex-cathedra declarers of the law. There is also less structural possibility to fence issues off into confined questions, separated from their related historical and wider social questions, so that investigation of a case may frequently involve, say, the examination of distant social or historical relationships etc., which would look utterly irrelevant from the ahistorical, insulated perspective of our courts. Because the issues are more integrated into the everyday social and political world, bargaining, negotiation and compromise become necessary and accepted parts of the process. Authority is not to be found in a ritualistically defended, artificial objectivity and distance from social affairs as is the case for our judiciary. As noted earlier, a central part of the judicial ethos in our society is its supposed contrast to the smutty bargaining and compromising of the political process.

It is interesting that developments in advanced societies and primitive societies seem perhaps to be going in opposite directions. Thus some authors have noticed that as differentiation and professional specialisation of legal institutions develops in primitive societies, so the style of judicial decision changes away from mediation and more towards absolutist declaration with which we are familiar[47]. At the same time, in the advanced societies, especially in America, it has been noted that as the courts have played an increasingly accepted and aggressive role in social policymaking via broadened litigation proceedings, they have begun to develop some limited means of tempering the declaratory style with informal negotiation and compromise between parties[48]. Whether this is a satisfactory method of democratic legislation remains in doubt, but it is interesting that a changing social role should be forcing a corresponding cognitive and practical) change in the way in which the judiciary defines and resolves issues. Such judicial policymaking is far less openly practised in Britain, for reasons outlined in Chapter 4. Windscale was an exception in this respect, and any possible mediative structure which was arguably

required by the broad political nature of the issue was very strongly suppressed by the absolutist, declaratory style of the judiciary.

One useful way of looking at the political nature of the judicial style of conflict resolution is suggested again by anthropological work. Bohannan has argued that a mediative style is necessary where the power system is multicentric[49]. Political processes, for example, usually recognise multiple centres, and they are accordingly characterised by negotiation and compromise, and a continual openness to further bargaining. Judicial processes on the other hand, imply a unicentric power structure, they assert a single authority, one which is reinforced by the objectivity myths that are cultivated in judicial circles. This monopolistic authority is possible when an issue is severely reduced and separated from politics and society at large as are most court cases, but it becomes more problematic as the issue becomes more obviously one with a broader social or political dimension to it.

Bohannan offers an interesting analogy when he discusses the distinction between different situations of pluralism in which legal institutions have operated. The first type involves stateless societies, which exhibit the mediative, compromising style of conflict resolution described earlier. The second type of pluralism, however, involves that of colonialism, where colonial intervention has meant the attempted subordination of alien cultures and values (including their own proto-legal system of the coloniser usually imported with little adaptation from the coloniser country. In this latter case, the colonial law system does not recognise the rationality or legitimacy of the colony's traditional culture, and attempts to operate instead in the usual declaratory mode. To the (often large) extent that the traditional culture has resilience in the face of colonial supression, and to the extent that these cultural values clash with those of the colonial power, then a pluralistic power system prevails, yet is not recognised as such by the party with greater formal power.

This could be a fair model of the recently emerged structure of decision-making in the nuclear debate. Until the 1970s, there was virtually private decision-making, and no visible opposition to recognise as an alternative centre of power. Relatively very rapidly an opposition has

developed, with substantial political drive. Its inspiration, though often obscure, and by no means uniform, is largely based upon different social values from those in authority. As a result of years of freedom from any such opposition, i.e. used to a strongly unicentric form of power, and reluctant for obvious reasons to recognise a competing centre of power, the powers that be more or less automatically resort in a crisis such as that developing in late 1970 over THORP, to an inadvertently authoritarian unicentric style of decision-making. Whether this mode is appropriate depends upon whether one believes the opposition to be legitimate (which is a different question from that of whether its case should be heeded).

The social psychology of certainty

Perhaps the most important feature of judicial reasoning relates quite closely to the habit of simplification to precise causal factual questions, namely the quest for certainty. As the English judge, Lord Jessel, remarked : 'I may sometimes be wrong, but I am never uncertain'(50). As Morrison has expressed the general view, the British legal process especially operates as if 'there is a single, right answer to a particular question'(51), and that 'in any dispute one side is right and the other side is wrong'(52).

In order to secure authority, a decision must either be based upon the supposed infallibility of the decision-maker, or appear as untouched by human choice, only revealed as an independent truth. As Eckoff has noted, infallibility is difficult to sustain in the modern world :

> 'To maintain a belief that certain persons are infallible can, nevertheless, present difficulties, especially in cultures characterised by democratisation and secularisation. To reduce or conceal the human factor in decision-making will therefore often be better suited to strengthening confidence in the decisions. Letting the judge appear as 'the mouthpiece of the law', who cannot himself exert any influence worth mentioning on the outcome of the cases, tends to remove the fear that his own interests, prejudices, sympathies and antipathies may have impact on his rulings ...

> Many techniques have been used in the various judicial systems for the purpose of eliminating, reducing or concealing the influence of the judge ... /for example/ ... the technique of judicial argumentation which gives the decisions the appearance of being the products of knowledge and logic, and not of evaluation and choice.'(53)

It appears to be precisely when judges are caught in situations of conflict that they most ardently resort to the shelter of formal, objectified rules including those of logic, i.e. to 'verbally formulated rules which seek to disguise and to minimise the need for choice'(54). This habit is followed when the judicial framework is employed in inquiries and commissions outside normal court cases.

IV Conclusions - rituals of authority

I would like to introduce this final section with an anecdote which seems to raise some of the central problems. Whilst visiting Cornell University recently I read a press report of the Court of Appeal verdict of the District of Columbia Circuit, that Environmental Impact Statements submitted by the proposed developer under the Natural Environmental Protection Act for nuclear power plant licensing hearings would in future be obliged to consider and even quantify potential psychological damage to residents near such plants. This was of course a consequence of the great fuss following the Three Mile Island accident, especially the uncertainty and fear generated by public conflict and chaos amongst those supposedly in charge of the emergency. A new field of law - "psychoenvironmental law" - was said to have been created.

Having thought and written quite a lot about the empiricist extremism of the judiciary, I immediately took this to be a supreme example of that extremism - as if psychological damage were an objective entity "out there" in the environment which could be demarcated and measured without having to make grossly contestable assumptions that would fatally flaw any remote semblance of objectivity. Like previous introductions of psychology, it seemed to be a recipe for endless conflict and incoherence. It also appeared to me to be empiricism taken to absurdly unrealistic lengths, and I observed to friends (also colleagues in this field) that if a judge could seriously

make such declarations it only indicated the fantastic social insulation of the judiciary, and the exaggerated inculcation of the empiricist fiction. Being more familiar with US judicial affairs, however, their reflex reaction was quite the opposite, that the judge concerned was routinely exercising his own political interests in placing yet another burden on the nuclear industry and the regulatory-cum-promoting authorities. Whilst I was aware that judicial interpretation of laws, rules, and precedents is tantamount to political influence, and that the US judiciary plays a far more prominent and explicit role in this regard than say that of the UK, I was nevertheless taken aback at the automatic way in which this important judicial action was taken to be deliberately political, yet quite unremarkable.

In this particular case, the empiricist framework of judicial reasoning caused extra obstructions to the nuclear industry. In the case which I had studied in detail, that of the Windscale Inquiry's adjudication of environmental risks associated with a new type of nuclear fuel reprocessing, identical empiricist assumptions by the Judge had led in the opposite direction, to quash opponents' arguments by misinterpreting them then showing the misinterpreted assertions to be empirically unfounded. Although it would be easy to see this too as deliberate but covert political manipulation, this time by a pro-nuclear judge, I had, perhaps naively, preferred to begin by assuming good faith all round, and see where that would lead to. Attribution of a sincerely held but extreme and unrealistic empiricism/Justice Parker seemed entirely defensible from close examination of his utterances throughout the Inquiry and from wide reading in the literature about legal reasoning generally.

For the present discussion, however, the point of relating these experiences is that they raise important questions about truth, falsehood and authority which parallel similar questions debated in the sociology and philosophy of science. Furthermore the judicial cases in which I have taken an interest have involved conflict between experts, and corresponding pressure upon the judicial process to resolve that conflict in order to be able to pronounce an authoritative social verdict. The question is whether we should view such explicit judicial reasoning as a kind of rhetoric concealing social interests which have been deliberately exercised in making the decision (or, to put it another way, in creating public

knowledge in this sphere) or whether we should view this empiricist language as a natural, mechanical reflection of a certain kind of socialisation, social position and experience ? (The further question is - does is make any difference how we view it, if the consequences are indistinguishable ? I am tempted to believe that the key concepts here, of "deliberately" and "mechanical", are too vague to be able to support such a clean dichotomy, and that unless one wants to pass moral judgement on judges, it does not matter anyway.)

It is clear, however, that law holds a view of science which justifies its own control of scientific knowledge in legal and quasi legal settings - science is ultimately monolithically rational, empirically controlled, and exposes singular natural truths. But scientists themselves cannot manage to produce these results in socially relevant issues, so that legal precision and discipline is needed in order to discover them. At the most pragmatic level, law can control and manipulate science to produce apparent coherence. Natural law can be interpreted to correspond with whatever further law the judicial system may be disposed to 'discover'.

Yet there appears to be a curious and difficult circularity that reflects basic problems in the cultivation of legitimate social authority, especially in areas involving esoteric expertise. The traditional British system of policy-making in such areas has been the expert advisory committee, selected by private means, deliberating in private and issuing consensual conclusions, backed by all the ritual authority of the state apparatus and of the scientific establishment. More recently, channels of criticism, so-called "critical science", have emerged to challenge in public the authority of such committees; their success has been based often upon the simple claim to uphold the traditional scientific virtues of open information, free mutual criticism and debate between equals[55]. Unused to such strictures, the entrenched official committees have sometimes undermined their own authority by patronising or ridiculing critics before examining their arguments properly, by refusing to divulge information fully, and generally transgressing the supposed norms of science and rational debate[56]. In a word, science has begun in a sense to secularise itself as its own image is now the reference point underlying the crumbling credibility of institutionalised scientific expertise. With the trembling of this

References

1. Joseph Needham, "Human law and laws of nature", in The Grand Titration, London, Allen & Unwin, 1979, pp.299-331.

2. H.W. Smith, "Scientific proof", Southern California Law Review, 16 (1943), pp.120-60.

3. W.L. Foster, "Expert Testimony - Prevalent Complaints and Proposed Remedies", Harvard Law Review, 11, 1897, pp.169-85.

4. K. Boulding, "Truth or Power?", Editorial in Science, 190, 31 Oct.1975, p.689.

5. Roger Smith, Trial by Medicine, Edinburgh University, Press, 1981.

6. W. Thomas (ed.) Scientists in the Legal Process : essential contributors or tolerated meddlers?, Ann Arbor Science Publications, Michigan, 1974.

7. A.R. Brownlie, "The presentation of scientific evidence in Court - Great Britain", Journal of the Forensic Science Society, 14, 1974, pp.183-97.

8. A. Chayes,"The role of the judge in public law litigation", Harvard Law Review. 84, 1976, pp.1281-1316.

9. A. Mazur, "Science Courts", Minerva, 15, 1977, pp.1-15 : D. Nelkin, "Thoughts on the Proposed Science Court", Harvard Newsletter on Science, Technology and Human Values, 18, 1977, pp.24-30.

10. N. MacCormick, Legal reasoning and legal theory, Oxford, Clarendon Press, 1978.

11. Smith, op.cit., note 5.

12. J. Shklar, Legalism, Harvard University Press, 1964.

13. M. Gluckman, The judicial process among the Barotse of Northern Rhodesia, Manchester University Press, 1955.

14. I have documented this in a forthcoming book, "Rationality or ritual ? The Windscale Inquiry and unclear decisions in Britain", London, British Society for the History of Science.

15. V. Aubert, "The structure of legal thinking", in F. Castberg (ed.), Legal Essays, Oslo, 1963, pp.41-63; Lon Fuller, Legal Fictions, Stanford University Press, 1963.

16. O.E. Tilevitz, "Judicial attitudes towards legal and scientific proof of cancer causation", Columbia Journal of Environmental Law, 3, 1977, pp.344-81.

17. Wynne, op.cit., note 14, chapter 8.

18. Windscale Inquiry transcripts, Day 48.

19. E.g., notes 10, 12 and 15.

20. R. Egglestone, Evidence, proof and probability, London, Weidenfeld & Nicholson, 1978, p.4.

21. Ibid, p.44.

22. Especially by Polanyi, The Tacit Dimension, London, 1956, and Ravitz, Scientific Knowledge and its Social Problems, Oxford, 1972. But much recent social analysis of science has enlarged on these original formulations. For example, H.M. Collins,"The seven sexes : a study in the sociology of a phenomenon, or the replication of experiments in physics", Sociology, 1975, ix, 205-24. B. Latour & S. Woolgar, "Laboratory Life; the social construction of scientific facts", Beverley Hills, California, 1979. See also the special edition of Social Studies of Science, 1981, i, H.M. Collins (ed.), for a collection of papers on this and related themes concerning non-explicit social factors in the formation of scientific knowledge. The paper in that volume by T.J. Pinch, "The sun-set : the presentation of certainty in scientific life", pp.131-58, is especially relevant to this chapter.

23. See note 22.

24. M. Douglas (ed.), Rules and Meanings, Penguin, Harmondsworth, 1973; W. Twining and D. Miers, How to Do things with Rules, London, 1976.

25. O.W. Holmes, "The path of the law", Harvard Law Review, 57, 1897, pp.460-73.

26. Quoted by J. Frank, Courts on trial : myth and reality in American Justice, Princeton, 1973, p.47. See also M.L. Cohen & F. Cohen (eds.), Readings in Jurisprudence and Legal Philosophy, Boston, 1963, pp.441-576.

27. J. Stone, "Reasoning in judicial or juridical argument", in Castberg, op.cit., note 15, pp.170-97.

28. Mr. Justice Parker expressed these views at a meeting of the Science, Technology and Society Association in Harlech, Wales, August 1978.

29. D.L. Bazelon, "Psychiatrists and the legal process", Scientific American, 230, June 1974, pp.18-24.

30. Mr. Justice Parker, The Windscale Inquiry, London, HMSO, 1978, p.55.

31. I. Scheffler, Science and Subjectivity, New York, 1967. See also the debate between Bloor and critics, British Journal for the History of Science, August 1979. This is also the point of comments that Feyerabend's philosophy of science is in important respects Popperian.

32. J.S. Oteri et al, "Cross-examination of chemists in narcotic and marijuana cases", Journal of Contemporary Drug Problems, 2, 1973, pp.225-38.

33. Egglestone, op.cit., note 20. J.H. Tribe, "Trial by mathematics : precision and ritual in the legal process", Harvard Law Review, 84, 1971, pp.1329-93. Discussion, pp.1801-20.

34. T. Arnold, "Law as Symbolism", in V. Aubert (ed.), Sociology of Law, Penguin, Harmondsworth, 1969, pp.46-51.

35. K. Boulding, op. cit., note 4.

36. See note 22.

37. Y. Ezrahi, "The political resources of scientists", Science Studies, 1, 1971, pp.117-33; Ezrahi, "The authority of science in politics", in E. Mendelsohn and A. Thackray (eds.), Science and Values, New York, Humanities Press, 1974, pp.215-51.

38. Mazur, op.cit., note 9.

39. Parker was the member of a minority group dissenting from the Law Commission's main report, Expert Testimony, London 1972, which advovated that opposing experts should be enjoined to engage in private and produce agreed evidence before the case. Implicit in this may be the alternative view, that the legal adversary process generates artificial scientific conflict.

40. Parker, op.cit., note 28, and "The major inquiry - some practical considerations" in R. MacRory (ed.), Commercial Nuclear Power - Legal and Constitutional Issues, London, Imperial College, Centre for Environmental Technology, 1981, pp.47-56.

41. J. Shklar, op.cit., note 12, p.13.

42. The Times, Court of Appeal Law Reports, 24 Oct. 1974, "Walls Meat Co. Ltd. vs Khan".

43. Ibid..

44. D. Horowitz, "The Courts and Social Policy", Washington, Brookings Institute, 1977.

45. H. Street, Justice in the Welfare State, London, 1975, p.19.

46. M. Gluckman, op.cit., note 13. T. Eckhoff, "The mediator, the judge and the administrator in conflict-resolution", Acta Sociologica, 10, 1966, pp.158-66; P. Gulliver, "On mediators", in I. Hamnett (ed.), Social anthropology and law, London, 1977.

47. Ibid.. See also S.A. Roberts, Order and dispute, Harmondsworth, 1979, and R. Redfield, "Primitive law", in P. Bohannan (ed.), Law and Warfare, London, 1976, pp.3-24.

48. Horowitz, op.cit., note 44.

49. P. Bohannan, "The differing realms of the law", in Bohannan (ed.), op.cit., note 47, pp.43-57.

50. Quoted in "Paragons of tact and silence?", The Listener, 17 August 1978, p.198.

51. F. Morrison, "The courts and the political process in England", London, 1978.

52. H.C. Bredermeier, "Law as an integrative mechanism", in W.M. Evan (ed.), Law and sociology, New York, 1962, 73-88.

53. Eckhoff, op.cit., note 46, p.163.

54. Ibid..

55. For example in the controversy over whether official traffic forecasts could be subjected to cross-examination in motorways inquiries, and the increasingly

successful arguments against the CEGB for witholding its reasoning on energy forecasts and economics from review and criticism.

56. For example the Pesticides Advisory Committee's official advice on 2, 4, 5, - 7 has been virtually totally abandoned by previous users of this pesticide, including Government agencies.