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LAW AND LOGIC

P. J. Fitzgerald

Introduction: the lack of progress in law

Contrasting law with certain applied sciences, Wigmore once wrote:[1]

> It has long been my belief that the applied science of law is capable of equal achievements with those of medicine and engineering. Its concepts are as definite and their logical operation is as sure. What has been lacking is first a complete realistic analysis of those concepts and secondly an apt and consistent terminology that will permit accurate discussion of the concepts.

There are several possible reasons for this relative lack of progress, one of which is that Wigmore's own analogy is far from convincing. It is highly questionable to claim that law is in fact a science, whether pure or applied. For the task of the pure scientist is, by and large, to explain puzzling phenomena of the physical world and he does this by the development of causal laws, which are in essence general descriptions of behavior patterns in this world. The function of applied science is to derive from such causal laws methods and techniques for the solution of actual particular problems. Now it is hardly the function of the lawyer to elucidate and describe the workings of society or even — if we imagine him as an applied scientist — to derive from such elucidations legal techniques for solving social problems. Although the suggestion has been made[2] that legislation should be experimental and proceed by analogy with science, statutes being advanced by way of hypothesis for verification, this would seem in the first place to confuse the notion of pure science and applied science. More important, however, this suggestion fails to face up to the fact that insofar as there is a science concerned with society this is not law but sociology. The person whose job it is to seek for explanations of social behavior is not the lawyer but the social scientist. While law may be regarded as part of such a science, it is only a comparatively minor part of it. Still more significant, when it comes to the question of applying the fruits of such scientific discovery, again the role of the lawyer is comparatively subsidiary. This is partly because social change may be brought about by non-legal means such as education, reorientation of public spending etc. It is also due to a highly important difference between social and other sciences as far as concerns the question of ends and means. In other applied sciences the ends in view are generally a matter of common agreement. For example in medicine there is general consent that disease should be destroyed, health promoted and invalids cured; and the function of the doctor is to supply the means to achieve those ends. When we turn to social science, however, we find far less general consensus as to what the ends are. We may, it is true, claim

1 In KOCOUREK, JURAL RELATIONS (2d ed. 1928) Introduction at xxiii.

2 BEUTEL, SOME POTENTIALITIES OF EXPERIMENTAL JURISPRUDENCE AS A NEW BRANCH OF SOCIAL SCIENCE (1957). See also review by the writer in 73 L.Q. REV. 417 (1957).

general agreement that social ills must be remedied and the good society be promoted, but this only serves to conceal the fact that we are far from agreed about what the good society is and what would necessarily qualify as a remedy for our social ills. Here the main question is not *how* to produce, but *what* would be, a desirable society. So while the question of means to this end still remains, the vital question of ends is the all-important one, and is a question not merely for lawyers or other "social engineers" but one for society as a whole. The lawyer's role is the secondary one of providing rules to embody the changes already decided upon at quite another level, the level of politics.

Another reason for lack of progress is that today we are inclined to use the physical sciences, and in particular physics itself, as the standard. But the success of such sciences has been largely due to their increasing use of exact measurement and of mathematical techniques. Sociology is at a disadvantage here on account of the nature of its subject matter. The objects of sociological study are far less amenable to quantitative analysis, and moreover in the context of sociology experiment and verification are far less easy to obtain. So even if we choose to look on law as part of social science, we can hardly in all fairness expect the same sort of progress as has been made in certain other sciences.

Granted all this, however, there remain in the law certain features which so far have constituted an obstacle to the sort of progress Wigmore desired, features due neither to the subsidiary role of law nor to the nature of its subject matter. Legal rules, it is well known, are beset by ambiguities. Law is particularly susceptible to complexity and lack of clarity. There is furthermore a striking absence of simplification and unification in the field of law, as compared with certain other disciplines. Such features might well be eliminated by using techniques already found valuable in other disciplines. The purpose of the present paper is to investigate how far the techniques of modern symbolic logic may provide the lawyer with the solution to these particular problems.

Ambiguity in legal drafting

In present times an increasingly large proportion of the law is contained in statutes, regulations, and other types of legislation. Now it is commonplace that such legislated rules suffer from what is sometimes termed *semantic* ambiguity.[3] For example, in English law it is a criminal offense to drive a motor vehicle on the highway without a road license in force for the vehicle. At once we can see that problems may arise as to what precisely is to qualify as "driving," as a "vehicle" and as a "highway." While steering a motor car along when it is propelled by its engine clearly comes within the connotation of "driving," what about steering a car that is towed by another car?[4] What about steering a car downhill without the engine running?[5] Obviously a motor car is a vehicle, but what about a motorized toy, a model car?

3 For a full treatment see HART, CONCEPT OF LAW 121-50 (1961).
4 This is not "driving" according to Wallace v. Major, [1946] K.B. 473.
5 But this is "driving" according to Saycell v. Bool, [1948] 2 All E.R. 83.

This sort of ambiguity arises not from anything in the nature of law but from something basic to the nature of language itself. It arises from what is sometimes called the *open texture* of language.[6] Many of the words used to describe things and actions apply clearly to certain objects and certain behavior. Equally clearly they have no application to other objects and actions that are obviously outside the scope of the description. In between, however, there lies a sort of no man's land where borderline cases arise. Here we are in doubt whether the term rightly applies or not. In such cases little difficulty arises in ordinary speech since no decision is called for. In law, however, a decision must be made. Where day ends and night begins is of little importance in ordinary conversation, but in law it is highly important in such contexts as the law of burglary, since, if the prohibited conduct takes place at night, the offense assumes a different complexion. In this case a decision in English law has been made by statute which has defined "night" arbitrarily as the time between 9 p.m. and 6 a.m.[7] But in many cases no decision has been made at the statutory level and the decision has to be taken by the courts as and when the problem arises.[8] Indeed the great achievement of realist jurisprudence was to stress the fact that courts are constantly required to make creative decisions of this kind.

For the law this type of semantic ambiguity is far from valueless. Apart from the fact that it seems humanly impossible for a legislator to foresee all possible situations and to legislate for them in advance, there is the further fact that even if this were possible it is by no means clear that it would be desirable.[9] The present technique allows for borderline cases to be dealt with as and when they arise, and one advantage of this is that the empirical approach allows for the fact that when a borderline case does arise, it may throw new light on the rule and manifest that society's present attitude to the existing rule is no longer the same as that of the original framers of the rule. Our present system provides for flexibility and allows courts to interpret rules of law in accordance with the changing needs and attitudes of society.

Legal rules are, however, subject to another quite different kind of ambiguity. This second arises not from the open texture of language but rather from the ambiguities of certain important formal terms and from ambiguities in the combination of ordinary words and phrases. For this reason it has sometimes been termed *syntactic,*[10] to distinguish it from *semantic,* ambiguity.

Foremost among formal terms subject to ambiguity are the words "or" and "and." The word "or" is often used exclusively. For example, the expression "x or y" may be used to mean "either x or y but not both." On the other hand it may equally well be used inclusively, and the above expression would then mean "x or y or both." Suppose an ordinance gives magistrates a power to determine a dispute and, on finding that the accused is guilty of

6 See Waismann, *Verifiability* in ESSAYS ON LOGIC AND LANGUAGE 117-30 (ed. Flew).
7 Larceny Act, 1916, 6 & 7 Geo. 5, c. 50, s. 46.
8 *E.g.,* "breaking" in the crimes of burglary — housebreaking has been gradually defined by the courts so as to cover entry through a chimney. Rex. v. Brice, Russ. & Ry. 450, 168 Eng. Rep. 892 (1821).
9 HART, *supra* note 3 at 125-30.
10 Montrose, *Syntactic (formerly Amphibolous) Ambiguity,* M.U.L.L., June, 1962, p. 65.

the offense specified, "to impose a fine or a term of imprisonment." This could mean that they may impose one or the other but not both, if "or" takes the strong exclusive sense; or it could mean that they may impose one or the other or both, if "or" takes the weak inclusive sense. Likewise "and" may be used severally or jointly. "Objects of type A and type B fall into class X" may mean that class X consists of two types of member, *i.e.* objects of type A and objects of type B — "and" being used severally. Or it may mean that class X consists of one type of member, *i.e.*, objects belonging to both these types at the same time — "and" being used jointly. For example, if a statute exempts from tax "persons who are aliens and wives of aliens," this could mean that the exemption is enjoyed by two categories of persons: (a) aliens and (b) wives of aliens (though these latter need not themselves be aliens). Or the provision may mean that the exemption only extends to one category of person, viz. those women who are themselves aliens and who are also married to aliens.

Where the ambiguity is not that of a formal term, but arises from the conjunction of words and phrases, the conjunction usually follows one of two different patterns. Either we have an expression of the following kind:

adjective A — adjective B — noun

and it is unclear whether adjective A qualifies the noun or whether it merely qualifies adjective B. For instance the phrase "light brown car" is of this type. It could refer to a car light in weight and brown in color. Or it could refer to a car of light brown color. Lewis Carroll's mock turtles are the result of a wilfully mischievous misreading of the expression "mock turtle soup."[11] The other pattern is where we have expressions of the following kind:

noun A, noun B and noun C — adjectival phrase

and it is unclear whether the adjectival phrase qualifies merely the last noun or whether it qualifies all three. For example the constitutions of many states that emerged into statehood by becoming independent of the British Crown contain provisions as to the application of English law in the new state. A common formula is that "the substance of common law, the doctrines of equity and the statutes of general application in force in England on date x shall apply in the territory."[12] One interpretation is that all rules of common law and equity shall apply, but that when it comes to statutes then only statutes in force in England at the relevant date shall apply. An alternative interpretation is that in order for any rule to apply henceforth, be it common law or equity or statutory, it must have been in force in England at the relevent date.

A dramatic illustration of syntactic ambiguity is provided by *The King v. Casement*.[13] During the first world war, Casement, a British subject, visited prisoner of war camps in Germany and urged Irish prisoners of war to throw off their allegiance to the crown and fight for Ireland against England. He was subsequently indicted under the Treason Act of 1351 which prohibits *inter alia* "adhering to the king's enemies in his realm, giving them aid and comfort in the realm or elsewhere." If a conviction was to be sustained, it had to

11 Montrose, *supra* note 10.
12 See Elias, *Colonial Courts and the Doctrine of Judicial Precedent*, 18 MODERN L. REV. 356 (1955).
13 [1917] 1. K.B. 98.

be shown that treason could be committed even though the accused actually adhered to the king's enemies outside the realm. The argument for the defense was that the words "or elsewhere" qualified only the phrase "giving them aid and comfort in the realm." If this were so, then the giving of aid could take place outside the realm but the adhering must be within it in order for the conduct of the accused to qualify as treason. This would cover such conduct as sending radio messages from England to German troops abroad or signalling from England to German ships on the high seas. It would not, however, extend to cases where the accused was not himself in the realm. The alternative interpretation, for which the crown contended (successfully, as it turned out), was that the words "or elsewhere" qualify the whole phrase "adhering to the king's enemies in his realm, giving them aid and comfort in the realm." Such an interpretation would mean that not only the giving of aid but also the adhering could occur outside the realm and the accused might still be guilty of treason. The fact that the original French version of the statute contains a comma after the first occurrence of "realm" only and not after its second occurrence suggests that the first interpretation is the correct one and that "or elsewhere" qualifies only the phrase "giving them aid and comfort in the realm." The courts, however, declined to attach any significance to the presence or absence of commas in a statute of such antiquity[14] and after considering weighty arguments of policy supporting both interpretations, upheld the conviction.

Since syntactic ambiguity (unlike its semantic counterpart) seems to have nothing to recommend it, the question arises whether this kind of difficulty could be avoided by using techniques of modern logic. In recent years modern symbolic logicians have made considerable strides in devising languages free from ambiguity and imprecision. Indeed one way to deal with the problem of the ambiguity of the word "or" would be to adopt an arbitrary rule, as do logicians, to the effect that "or" is always used inclusively. "A or B" would then always mean "A or B or both." "A or B but not both" must then be written "A or B but not A and B." Translation of the proposition "aliens and wives of aliens are exempt" brings out very clearly the two different interpretations arising from the ambiguity of the word "and" — (1) "for all x, if x is an alien and x is the wife of an alien then x is exempt" (joint use); (2) "for all x, if x is an alien, then x is exempt, and if x is the wife of an alien, then x is exempt" (several use). Here by arbitrary definition and by setting out clearly the possible meanings of propositions, our logical symbolism highlights ambiguities we might otherwise overlook, and so assists us in avoiding them.

This is not to suggest that statutes should be written necessarily in symbolic logic. Legislation has to communicate with the ordinary citizen, and as Chief Justice Cooley remarked, the law ought to be commonplace. A recent writer in this field has gone on record as pleading that lawyers will not dis-

14 Compare Lord Esher in Duke of Devonshire v. O'Connor, [1890] 24 Q.B.D. 468: "[I]n an Act of Parliament there are no such things as brackets any more than there are such things as stops." Originally punctuation and marginal notes were not included in the Parliamentary Role. MAXWELL, INTERPRETATION OF STATUTES (11th ed. 1962) pp. 41-42.

regard the necessity of communicating with the rest of society in the ordinary vernacular.[15] On the other hand, it may well be that some acquaintance with and use of logic at a preliminary stage could clearly have some value for statute drafting. A draftsman trained in symbolic logic would be the more able to avoid falling into just this sort of syntactic ambiguity that we have described. Moreover it could well prove exceedingly useful when preparing a draft to make some use of logical symbolism, in order to clarify what is ambiguous and in order to study the form of the legislation abstracted from its content. Further, there is no reason why law should not (within limits) follow the example of those who devise logical languages and specify that for future use words such as "or" and "and" should always have one fixed meaning.

When we turn to the problem of interpreting a statute, the question arises how far logic is of assistance to the lawyer. Are statutory ambiguities detected by virtue of a training in logic or are they first detected by acuteness of understanding of ordinary language?[16] There is no doubt that logic is not and never can be a substitute for the acuteness of understanding of language that is necessary for detecting such ambiguities. On the other hand, one virtue of a training in logic is that it gives the student practice in detecting ambiguities and increases his awareness of the fact that seemingly simple propositions of ordinary language are often logically quite complex. Clearly such training could not but be beneficial for the lawyer, whether for drafting or for interpretation. Moreover, logical symbolism is extremely useful for explaining an already detected ambiguity and for making it explicit to oneself and others. As an aid to drafting (at some stage) and as an instrument of use in interpreting statutes, logic could well prove of service to the lawyer.

Complexity in statutes

Statutes and regulations are also notorious for their tendency to become at times quagmires of jargon and incomprehensibility. All lawyers are only too familiar with legislative paragraphs consisting of long sentences unbroken by even a comma, so that the words seem to dance before the eye and the mind loses the overall sense of the passage. Tradition is partly at fault, for originally laws were written without punctuation. Commas and full stops, when inserted, were regarded by the courts as the additions of irresponsible persons. Secondly, legislators, understandably, used to attempt to envisage every possible contingency with the result that statutes have tended to contain enormous lists of particular words or expressions before ending with some catch-all phrase. Thirdly, the draftsman has in general been concerned with achieving unambiguity to the exclusion of readability.

This can be remedied by careful use of punctuation, by legislating by example (as for instance in the Occupiers Liability Act, 1957[17]) and by paying increased attention to the goal of readability. On the other hand, in statutes, rules, regulations and contracts, difficulty may arise from the fact that the draftsman may be dealing with such a complex situation that innumerable

15 Loevinger in LAW AND ELECTRONICS 281 (Jones ed.).
16 See Dickerson in LAW AND ELECTRONICS 246 (Jones ed.).
17 5 & 6 Eliz. 2, c. 31.

contingencies have to be provided for. In such a case there are two dangers: (a) that he may entirely overlook some possible contingency and (b) that he may provide contradictory results for the same contingency. For instance, suppose an insurance company has a contract to insure the policyholder against injuries of various kinds, that for each kind of injury a different sum of money is to be fixed, that any one of these injuries may occur in conjunction with any one or more of the others, and that a specific sum must be fixed for each possible combination. To take a hypothetical example, imagine that the injuries allowed for are injuries to the eye, ear, nose, stomach, hand and foot. Now if in addition to the compensation for individual injuries, different awards have to be fixed for each possible combination, then it is obvious that there is a danger that the draftsman may overlook one of the possible combinations. In this sort of problem we need to resort to elementary mathematics to ascertain how many possible combinations can be derived from a set of six items. Using the formula "$C_r^n = \frac{n(n-1)\ldots(n-r+1)}{r!}$" we can easily find that the total number of possible combinations or subsets is sixty-three.[18] In addition to one subset of six injuries and six of one single injury, there will be fifteen possible combinations of two injuries, fifteen of four injuries, twenty of three injuries and six of five injuries. With this knowledge the draftsman can then proceed to work out for each grouping (for each value of r) the different possibilities. Now the greater the number of contingencies that must be provided for, the more complicated the problem becomes. Recently insurance companies have been employing logicians to check their contracts to ensure that no contingencies have been overlooked and that no contradictory provisions have been made.[19] In such cases the tools to be brought to bear on the problem are not so much specifically tools of logic as of mathematics, but the example above shows that in drafting this type of composite provision mere legal technique is not sufficient.

A rather different type of case, where different provisions of the same legislation may come into unenvisaged conflict, occurs with the 1925 property legislation in England. Among other things this legislation sought to replace the old rule, viz. that priorities in mortgages depend on whether the second mortgagee is a bona fide purchaser of a legal mortgage without notice of the prior interest, by a new rule, viz. that priority should depend on registration. Where neither mortgage is protected by deposit of title deeds, then section 97 of the Law of Property Act of 1925 provides that such mortgages shall rank according to date of registration. Now if a mortgage is registered, this is conclusive notice to all subsequent purchasers; but if it is not registered, then it is void against a subsequent purchaser whether he has actual notice of it or not. This is the effect of section 13 (2) of the Land Charges Act of 1925. Where both mortgages are registered as soon as created, or where neither mortgage is registered, no difficulty arises. But suppose the following sequence of events takes place:

18 n = the number of items involved (in this case — six); r = the number of items in a subgroup for any particular grouping.

19 See Pfeiffer in SCIENTIFIC AMERICAN, Dec., 1950, pp. 22-24.

1. mortgage (1) created
2. mortgage (2) created
3. mortgage (1) registered
4. mortgage (2) registered

Section 97 leads to the result that mortgage (1) takes priority, whereas section 13 (2) to the result that mortgage (2) takes priority. This resolution of this conflict is, to say the least, doubtful. An even more difficult problem arises where after the registration of mortgage (1) but before the registration of mortgage (2) in the above example mortgage (3) is both created and registered. In such a case clearly mortgage (1) takes priority over mortgage (3). Equally clearly mortgage (3) has priority over mortgage (2). But the general view is that in such a case (2) would have priority over (1), so that the priorities now run in a circle.

Now if originally these provisions, being both part of the same composite legislation, had been symbolized and checked against each other, the contradiction could have been made manifest at the drafting stage. We could symbolize as follows:[20]

A. $(x)(y)\ [(xRt_1 \,.\, yRt_2 \,.\, t_1 > t_2) \rightarrow (x>y)]$ — section 97

B. and $(x)(y)\ ([xMT_1 \,.\, yMT_2 \,.\, T_1>T_2 \,.\ (t_1)(xRt_1 \rightarrow T_2>t_1)] \rightarrow (y>x))$ — section 13 (2)

Clearly we can add the two hypotheses thus:

C. $(x)(y)\ [(xMT_1 \,.\, yMT_2 \,.\, T1>T2 \,.\, xRt_1 \,.\, yRt_2 \,.\, t_1>t_2 \,.\, T_2>t_1) \rightarrow (x>y)(y>x)]$

Here if we add the two conclusions we get:

"x precedes y and y precedes x" — an obvious self-contradiction.

This kind of symbolic checking by elementary logic would put the draftsman on his guard and assist him in avoiding this kind of trap.

Unification and Legal Theory

One mark of progress in mathematics and the physical sciences is the increased unification of the subject. As the discipline develops, what were previously regarded as separate water-tight compartments turn out to be merely different facets of the same thing.[21] Geometry for example, which was at one time reckoned a completely different study from that of algebra, has now been shown to be reducible to, and explicable in, terms of algebra.

In law too there is a comparable phenomenon. What were at first sight nothing but a "wilderness of single instances" and a host of particular rules are gradually reduced to coherency and consistency and the underlying general principles begin to emerge. So in England the manifold situations giving

20 In ordinary language: A becomes:—
"for all x and for all y, if x is registered at time t_1, and y is registered at time t_2 and t_1 precedes t_2, then x takes priority over y."
B becomes:—
"for all x and for all y, if x is made at T_1 and y is made at time T_2 and T_1 precedes T_2, and x, if registered at all, is registered at time t_1 subsequent to T_2, then y takes priority over x."
C is the addition of A and B.

21 For an elementary account of this, see SAWYER, PRELUDE TO MATHEMATICS, ch. 5.

rise to a duty of care in negligence were to a large extent subsumed and generalized under the wide principle enunciated in *Donoghue v. Stephenson.*[22] The value of such generalization and unification is obvious in that it produces simplification. It may well be, however, that this process could be carried much further. It might be that the rules (or some of the rules) in one area (*e.g.* tort) could be demonstrated to be reducible to, or derivable from, those of another branch (*e.g.* crime). Or again, perhaps certain fields of one country's law might prove to be to some extent deducible from analagous fields in the law of another country (*e.g.* French law of contract might be deducible from English law on the same topic). While this is purely in the realm of speculation, the advantage, if it could be done, is obvious. In logic and mathematics one method for dealing with this kind of problem is to attempt to axiomatize one theoretical system in terms of another that is well-known, *e.g.* set theory.[23] If this can be done — and the first system is then said to be isomorphic to the second — all the theorems we know to be true of our well-known second theory can now be applied to the first theory, for which we now need not work out special theorems. Analogously, in law such a procedure would mean that to the extent that such axiomatization were possible we could work adequately with one rather than two or more sets of rules. In an age of increased communication giving rise to a mounting number of problems in the conflict of laws, in an age of modernization and streamlining, it is surely at least worth inquiring whether legal study can escape from its eighteenth-century strait jacket and achieve further unity and simplification; and this is a task that would call for the service not only of comparative lawyers but of lawyers sufficiently acquainted with logic to be equipped for this sort of project.

This is, of course, bound up with the study of the nature of law and legal systems. The findings of logicians in relation to different types of logic, especially relevant here being modal and particularly deontic logic, can throw light on the nature of legal rules and the status of legal propositions. There is also work to be done here on the problem of providing a logical analysis or description of a legal system, on which investigation is already being made.[24]

The lawyers distrust of logic

Logic, then, we can see, has considerable value and relevance for the lawyer. Why then should lawyers on the whole be so hostile to the teaching and use of symbolic logic? There is of course a legal conservatism that is suspicious of anything new and especially distrustful of logic. This stems partly of course from the lawyer's training. After all he has been brought up to believe that "the life of the law has not been logic but experience," that "a page of history is worth a volume of logic" and so on. Indeed the realist movement was largely a reaction against the notion that law consisted of calculations.

22 [1932] A. C. 562.

23 See SUPPES, INTRODUCTION TO LOGIC 246-91 (1957).

24 *E.g.*, Oppenheim, *Outline of a Logical Analysis of Law,* 11 PHILOSOPHY OF SCIENCE 142 (1944); Tammelo, *Sketch for a Symbolic Juristic Logic,* 8 JOURNAL OF LEGAL EDUCATION 277 (1955) and reply by Clark, *id.* at 491. Extensive bibliographies on logic for lawyers interested in the subject are given in 59 M.U.L.L. and subsequent issues.

But this hostility to logic is not peculiar to the lawyer. It is an attitude very common in Anglo-Saxon thinking — the view that an ounce of practice is worth a pound of theory, the desire to proceed empirically by trial and error rather than systematically according to a blueprint. The choice is often represented as one between flawless theory proceeding by rigorous and unassailable logic to totally unrealistic conclusions, and illogical practice that should not work but does. In fact, however, it is trite learning that it is a fallacy to argue that a thing is all right in theory but not in practice. Good theory must take practice into account; consequently, if a thing is bad in practice it is also bad in theory.

Moreover, there is a certain apprehension that the idea is that logic might be used to solve fundamental legal questions. There is, however, no serious suggestion that such ultimate problems could be settled by symbolic logic. These are things to decide not calculate.

But if the role of logic is a limited one, then the objection arises that time does not allow the addition of logic to an already overburdened curriculum. With the solid core of common law subjects, with certain important modern statutory subjects and subjects with an international or comparative flavor, the student is harassed enough, it may be argued, trying to bar the entry of such clamoring outsiders as criminology, economics and psychiatry, without making room for yet another newcomer, especially of considerable difficulty and limited value.

The view here advanced is tentative. It is that the amount of logic that a lawyer needs to derive benefit is in fact comparatively small. Modern logic is concerned mainly wih constructing different sorts of logical calculus and deriving theorems from axioms by deductive procedure. Now the lawyer has little need to go into all this in any detail. He need not learn to develop that particular flair and imagination necessary to construct logical proofs of theorems, nor need he proceed to such abstruse matters as say Goedel's Proof.[25] All he needs is, first, some elementary understanding of what logicians are trying to do and, second — and more important — an ability to work with logical symbols. Now the number of symbols he will need to work with is very small indeed. A short course teaching him how to operate with the propositional symbols of propositional logic and of the logic of propositional functions would suffice and would constitute very little addition to the syllabus.

This study of formal logic could profitably be supplemented with what might be called informal logic — this does not so far seem to be envisaged in this connection. By this is meant the study of the meaning, analysis or logical grammar of concepts. Many of the difficult problems of jurisprudence have proved intractable partly owing to a lack of technique to deal with questions that are framed in certain ways. Some of the new techniques used by philosophers to deal with this problem would well repay study. The process of asking for the use of a word (in contexts and expressions) instead of its meaning (in isolation) could well assist the lawyer in his own field. The beauty

25 In 1931 Goedel showed that given any consistent set of arithmetical axioms, there are true arithmetical statements that cannot be derived from this set. For the layman an excellent account is to be found in NAGEL & NEWMAN, GÖDEL'S PROOF (1960).

of this is that this type of informal logic can be studied without leaving the context of law. While the philosopher tackles questions like "what is existence, reality? etc.," the lawyer can apply these techniques to questions like "what is a right, what is possession, etc.?"[26] Instead of battering his head against the question by asking "what do you have when you have possession?" he may find it valuable to proceed to splitting this question into several subquestions,[27] *e.g.* under what circumstances is it ordinarily said that a person has possession? on what criteria does the law ascribe possessory rights? what are possessory rights? do different criteria obtain for the ascription of possessory rights in the different fields of land law, trespass to goods, the law of larceny and so on? and what social and historical considerations have led to such divergences?

An instructive example is provided by the recent prosecution in England of nuclear disarmers who planned to enter and immobilize an air base as a demonstration against nuclear weapons.[28] They were charged with conspiring to commit a breach of the Official Secrets Act of 1911 which makes it an offense to enter a prohibited place "for any purpose prejudicial to the safety or interests of the state." One of the defendants' contentions was that their purpose was to persuade people to abandon nuclear weapons and so save the country from the danger of nuclear war, and that this could not be a purpose prejudicial to the safety and interests of the state. This raised the problem of what is meant by "interests of state." The court attempted to deal with this by ascertaining the meaning of the term "state." One lord of appeal thought that the state meant neither the government nor the inhabitants of the country but something like the organized community.[29] Another thought that it meant the organs of government of a national community.[30] A busy appeal court with a crowded docket is clearly not the place to expect a learned disquisition on the nature of the state, but this is a problem that should be investigated somewhere and surely in the law school. It is after all a problem of jurisprudence. The techniques of informal logic might well assist us here. Instead of inquiring what the interests of state are the interests of, we might valuably begin by examining the whole phrase "interests of state" and by asking what things we designate as interests of state as opposed to private interests and other public interests. We could then proceed to examine the criteria for this classification and inquire how far the division is a rational one.

In conclusion the study of modern logic, supplemented by informal logic (as outlined above) has a useful part to play in developing, clarifying and rationalizing the law. Though its chief value may perhaps be found in the law school rather than in the courts or in law offices, yet its use is far from marginal and the amount of logic that would benefit the lawyer is comparatively small and easy to master. It is to be hoped common law countries will eventually follow the example of Poland in this regard and find a place for logic in the curriculum of the law school.

26 See Hart, *Definition and Theory in Jurisprudence,* 70 L.Q. REV. 37 (1954).
27 OXFORD ESSAYS IN JURISPRUDENCE (Guest ed. 1961) attempts to apply such techniques to jurisprudential problems. See especially Harris' essay on "possession."
28 Chandler v. Director of Public Prosecutions, [1962] 3 All E.R. 142.
29 *Id.* at 146.
30 *Id.* at 156.