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Law and Science in Our Age

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Ours has been called the "age of science". The direct and indirect effects of scientific discoveries and of their application are evident around us. The political and economic structure of our society has been radically changed, the everyday life of each one of us has been affected, our ideas and our conception of the world bear the clear imprint of science; in fact, the survival of humanity itself is now in danger, and this has been made possible by scientific developments. To those who live in highly developed industrial societies, the all-pervading influence of science is evident; but the revolutionary character of the change is probably more clear to the people of the until now stagnant and desperately poor societies who have suddenly become aware of the potentialities for development and welfare inherent in modern technology. Together with other aspects of social life, the legal order has been greatly affected by scientific developments.

In his latest book, Professor Edwin Patterson, Cardozo Professor Emeritus of Jurisprudence at Columbia University, surveys the ways in which science has affected law and the extent to which the utilization of scientific data and methods can further influence the development of the law. The book is based on the author's Carpentier Lectures, delivered in March 1962 at the Columbia University School of Law. As an indication of their quality, it is perhaps sufficient to say that these lectures are fully able to stand comparison with earlier lectures under the same auspices, such as John Chipman Gray's Nature and Sources of Law, or Mr. Justice Cardozo's Paradoxes of the Legal Science.

The influence of science on particular branches of the law or on some specific aspects of the legal order has already received considerable study. Professor Patterson himself had dealt with some of the related problems in his earlier writings. But the present study goes farther; it attempts successfully to view the overall effects on law and legal


thinking of the development of modern science, using, in the author's words, "philosophy as a bridge between science and the law."(2) Professor Patterson brings to this task his broad knowledge and profound understanding of law and legal philosophy, together with his own personal approach which combines realism and concern with practicalities, with theoretical and formal considerations. More than anything else, he brings what can only be referred to by the old-fashioned word "wisdom".

Patterson distinguishes two kinds of scientific influences on law and legal thinking, the "ideal" influences (that is, those pertaining to ideas) and the "material" influences. The latter can be more easily perceived. Like all forms of social, economic or political change, scientific development creates new problems which law is called upon to solve. The invention of the automobile is probably the clearest illustration of this process. The high rate of accidents and the consequent increase in the incidence of personal injury actions, the effects of the constantly increasing needs for traffic regulation on other branches of law enforcement and on the administration of justice, the direct and indirect results of increased mobility of population on the law of property and of domestic relations, these are all problems which would not have existed, or would not have been of the same order of importance, if the automobile had never been invented. Another kind of material influence relates to the use of scientific knowledge in the legal process. More and more, modern science finds its way into the courtroom and the legislative chamber, either in connection with novel situations which have arisen because of scientific developments, or in connection with preexisting problems into which science is providing new insights. Finally, it may be that some legal problems which have arisen in the past are now rendered moot because scientific or technological developments have eliminated the factual situations which gave rise to them.

The material influences of science on the law are evidently of great importance today and there is every indication that their importance will increase in the near future. Professor Patterson cites several well-chosen illustrations of the manner in which scientific developments may affect the law. He discusses at some length the "eugenic sterilization" case, (3) which was the occasion for a celebrated opinion of Justice Holmes, whose scientific basis seems to have been largely discredited by now.(4) He also deals with the Miller v. Schoene case,(5)

(2) E.W. Patterson, Law in a Scientific Age, p. ix (1963).
(4) See Patterson, op. cit. supra, note 2, at pp.20-21. The learned author, however, favours the retention of the related statutes, on the ground that they are still of sufficient usefulness.
where a Virginia statute authorizing, under certain conditions, the
destruction of red cedar trees, was held constitutional by the Supreme
Court of the United States. These trees were hosts to a fungus disease
which, when carried by the winds to nearby apple orchards, destroyed
their crop. The court had in effect to choose between the interests
of the apple growers and those of the cedar-tree owners, and it found in
favour of the former. The case thus illustrates the role of scientific
data before the courts, but it also shows that their presence does not
eliminate the necessity for a policy judgment on the part of the court.
By now, though the statute is still in the books, it is not applied,
because it has been found that spraying the apple-trees with newly-
developed fungicides is sufficiently effective. (6) No more illustrations
need to be cited here; it is clear that there is ample support for
Professor Patterson’s conclusion that "no crevice or cranny of our
legal order is immune from some revision or modification because of the
persuasive influence of newly emerging facts." (7)

To a considerable extent, the problems created by scientific
developments are not basically different from the problems which arise
out of any major economic, social or other change. One of the chief
functions of law is precisely to provide for the solution of such
problems, present or future. However, the high incidence of problems
caused by scientific developments makes necessary certain changes in
the accepted place of science in the legal process and in legal education.
Professor Patterson points out that the rules of evidence with respect
to scientific matters have yet to adjust to modern science and its methods.
"The hearsay rule treats what one medical specialist reports to a
different kind of medical specialist as no more trustworthy that what
"Mrs. Grundy" said to her neighbor over the back fence." (8) Such rules
are obviously inadequate; though scientific dicta should not necessarily
be accepted by the courts as irrefutable axioms, their treatment will have
to conform better to present-day conceptions of science.

These difficulties are a peculiarly acute manifestation of the split
between the "two cultures" which is one of the major characteristics of

(6) Professor Patterson, op. cit. supra note 2, at p.14, again favours the
retention of the statute, on the ground that it might prove useful if
fungicides became ineffective, or, one may add, if their use were more
strictly limited. (The lectures were written before the publication
of Mrs. R. Carson's Silent Spring.) It is interesting to note that
in an earlier article, Professor Patterson in discussing this same
case pointed out that the accepted basis of the court's reasoning was
the "fact" that the destruction of red cedar trees was the only
practicable method of controlling the disease, and he commented:
"This 'fact' ... is not obviously impregnable; it is only empirical,
and therefore tentative in the sense that later experiments in
entomology might overthrow it." Patterson, "Can Law be Scientific?"
25 Ill.L.Rev. 121, at p.138 (1930).

(7) Patterson, op. cit. supra note 2, at p.17.

(8) Id. at p.18.
our times. (9) In order to be able to find better solutions to the substantive and procedural problems created by modern scientific developments, jurists will have to be better acquainted with these developments. In actual fact, of course, some lawyers and judges have often acquired considerable competence in scientific matters which relate to the law. The medical knowledge of lawyers involved in personal injury litigation or the technical information which many patent attorneys possess are cases in point. The consciousness of the need has reached legal education; some law schools (unfortunately, still only a few "leading" schools, those capable of diversifying sufficiently their curriculum) provide courses or seminars in forensic medicine, law and psychiatry or the legal regulation of atomic reactions. It can be argued that courses in such specialized topics are not sufficient and that some of the related basic problems could properly be treated in the general courses of the legal curriculum. But this presupposes sufficient awareness of scientific problems and methods on the part of those teaching the "bread and butter" courses.

The material influences of science occupy a relatively small part of Professor Patterson's study. It is with the ideal influences of modern science on law and legal thinking that he is mainly concerned. The focus of his attention is directed to the natural sciences, not the social sciences, as one might have been inclined to expect. (10) In fact, the author treats social sciences with a marked lack of enthusiasm, contrasting somewhat with his more balanced treatment of them in his Jurisprudence. (11) His main objection seems to be that the social sciences have not been able to reach objective and impartial results and that their conclusions still depend very much on the particular preferences of individual social scientists. (12) However, one may be acutely aware of the shortcomings of the social sciences today and still feel that Professor Patterson's assessment is too severe. (13) In fact, the methods which the "empirical legal science" he favours will have to use, have already been used by the social sciences; their valuable experience should be utilized, even though their methods or conclusions do not have to be adopted in full.

In examining the fascination of jurists with the "scientific analogy", Professor Patterson asks a very relevant question which is not often raised: What is it in science that holds such attraction for jurists? It cannot be its infallibility or its unchanging character, he

(11) Patterson, Jurisprudence: Men and Ideas of the Law, pp.50-65 (1953).
(12) Patterson, op.cit. supra note 2, at pp.44-46.
argues, because modern science does not even profess to possess fully these characteristics. He suggests that it is in fact the universality of science that fascinates lawyers, the fact that science is the same everywhere, that the same questions receive the same answers and the same methods produce the same results. (14) At a later point, he brings in another closely related characteristic, namely, that scientific determinations are "neutral and objectively verifiable." (15) One might add further the element of increased certainty. Even though modern science is founded on probability rather than absolute certainty, even though it does not profess to be infallible, still it does provide a high degree of certainty, that is to say, of correct prediction of future events. This certainty, or appearance of certainty, is especially evident in the technological applications of scientific discoveries. It cannot fail to impress the layman, and particularly the jurist, who is usually not as well versed in philosophy of science as Professor Patterson or Professor Nagel. The law's (or, rather, the lawyers') obsession with certainty has already been described, and denounced, by a long line of modern jurists, from Oliver Wendell Holmes, Jr., to Jerome Frank, so that no further emphasis is needed. But one may note that the quest for universality itself, which Professor Patterson rightly emphasizes, can be seen as being a manifestation of the desire for certainty.

The role and the extent of validity of the scientific analogy in law may depend largely on the angle from which the inquirer is looking at the subject. If we oversimplify the issues a little, we can distinguish three basic points from which the law may be observed; the point of view of the citizen, the subject of the law, the point of view of the judge, who administers the law, and the point of view of the legislator, who makes the law. (16) Each of these hypothetical models has different interests and concerns. The citizen (and his representative, the lawyer) wants to be able to predict the probable outcome of his case before a court, so as to conduct himself accordingly. The judge wants to find the best methods which will assist him in deciding the particular case and in rendering the law clearer and more predictable. The legislator (whose exact office may be, in practice, that of the member of parliament, or the judge, or the adviser of either of these) would like to be able to determine, possibly by the help of scientific methods, the identity and order of the social ends in view of which he is setting legal rules, the most effective means for achieving those ends and the precise ends which existing rules serve, as well as the extent to which they really do so. In his earlier study, (17) Professor Patterson had examined the points of view of both judge and legislator, devoting more attention to the former. In his present study, he appears to be dealing

(14) Patterson, op.cit. supra note 2, at p.6.
(15) Id. at p.24.
(16) For a similar distinction between judicial decision, legislation and legal research, see Patterson, supra note 6, at p.123.
(17) Idem, passim. And see infra text accompanying notes 32-40.
with his subject more from a legislator's angle of vision.

The legislator's is, of course, the broadest and most inclusive point of view. What is the relevance of scientific method in this connection? Scientific thinking is founded on the principle of causality and causal analysis depends on factual statements, not on evaluations. In law, however, we think in terms of objectives or ends and they involve necessarily judgments of value. A legal rule has certain purposes, it is calculated to induce certain kinds of conduct among those subject to it. At the turn of the century, Holmes had expressed the hope that science would ultimately determine the relative worth of different social ends. (18) Patterson is in sympathy with the general aim thus expressed, but he points out that there are severe limitations to the extent to which it can be realized. The evaluative element can never be eliminated from the law, and evaluations cannot be derived from facts. The separation of the "is" and the "ought", "is a fundamentally true and useful distinction." (19) In their private life, people may in fact derive evaluations directly from facts, through intuition or non-reasoned hunches. Such conduct is not admissible in the case of judges, legislators or other officials. They "should be prepared to justify their conduct by stating in logical form the evaluative generalizations and factual statements on which they base their evaluative conclusions." (20)

While upholding the validity and usefulness of the separation of the "is" and the "ought", Professor Patterson is far from asserting that there exists no relationship at all between facts and evaluations. To the contrary, he is convinced that facts may have "persuasive effects". Following, in this as in other respects, John Dewey's formulation of logic in terms of problems, rather than premises, he concludes that "the law is, in general, subject to modification or abolition on the basis of changes in the realm of existence...." (21) Scientific methods can, therefore, play an important role in shaping the ends of the law, even though they cannot fully or predictably determine them. Part of the problem is that legal rules rarely have clear and well-defined purposes; even where they do, these purposes are usually more than one and their exact order of importance cannot be determined by any fixed, abstract method. Assuming that the ends of a particular legal rule can be determined with some precision, it is possible to apply scientific methods in order to find out the extent to which the rule has achieved (or can achieve) its purposes. This is more problematic when we are dealing with the final ends of a rule: it is very difficult to determine whether a particular rule does or does not serve the ultimate purpose of, say, security of transactions. It is more feasible with respect to the immediate results which the rule seeks to accomplish: it is relatively

(18) O.W. Holmes, "Law in Science - Science in Law," 12 Harv.L.Rev. 443 (1899), Collected Legal Papers 242 (1920), cited in Patterson, op.cit. supra note 2, at p.27.
(19) Patterson, id. at p.31.
(20) Ibid.
(21) Id. at p.35.
easy to determine whether a law prohibiting the sale of habit-forming drugs is or is not complied with. Once we are able to compare the conduct actually induced by a legal rule with the conduct it was intended to induce, we have a measure of the rule's success or effectiveness. In the same manner, it is possible to study an existing factual situation in order to determine whether legislation is needed to serve certain particular ends and the best manner in which they can be served.

Both in his earlier article and in the present book, Professor Patterson examines various particular scientific methods and the possibility of their use in law. The best known of the methods employed by science is that of the controlled experiment; it is still the typical method of the natural sciences and the one on which a major part of their success is founded. In legal matters, this method is of limited usefulness. The effects of legal rules are normally felt after a relatively long period of time and, by then, they are usually irreversible. Moreover, it is normally impossible to isolate all related factors, so as to be able to eliminate the effects of other changes, social or technological. Controlled experiments, therefore, would be possible only in a small number of cases. (22) There exist many other methods, however, which have been successfully used in the sciences. In his earlier article, Patterson had dealt at some length with one of these methods, namely, classification, and had shown its usefulness and relevance. (23) He had also pointed out the limited use that can be made of mathematical reasoning as such. (24) In his present study, he deals with other methods, as well. He points out that the "control group" method can be effectively used in legal research, as it has been in some of the natural and social sciences. It would require great care in its application, of course, since the possibly relevant factors are numerous and often not apparent, but this is a caveat that applies to the use of all scientific methods. Statistics can also be of great assistance to the legal researcher; in fact, the utilization of statistical methods is the only point as to which Professor Patterson concedes that social scientists can be of assistance to legal researchers. (25)

The utilization of specific scientific methods, however, is not the most important contribution of the scientific analogy to legal science. These methods point to the basic characteristic of modern science, which

(22) Cf. id. at pp.39-42.
(23) Patterson, supra note 6, at pp.128-32.
(24) Id. at pp.124-27.
(25) Patterson, op.cit. supra note 2, at p.46. But he adds: "To say this much for the social sciences is, perhaps, only to recognize that in the country of the blind a one-eyed man is king." And cf. Patterson supra note 6, at p.126.
can and should be emulated by law, namely, the "responsibility to the facts." (26) The exact manner by which these facts are gathered is not in itself of major importance, but is essential to keep in mind the ultimate dependence of legal rules on the facts they are intended to regulate. Such facts may be gathered in several instances by mere casual observation, without any complicated methodological or institutional apparatus. A jurist should be aware of the possibilities for such small-scale factual inquiries; it would not do to leave the whole field of fact-investigation in law to elaborate foundation-financed projects. The latter's usefulness cannot be contested; though the benefit that will be derived from each of them will necessarily vary widely. Patterson points out that "the planning and execution of a fruitful "controlled inquiry" call for exceptional imagination, insight, and industry." (27) He describes in some detail three examples of inquiries which have employed scientific methods in connection with legal questions. Those three illustrations are the studies by Professor Sheldon Glueck and Dr. Eleanor Glueck on juvenile delinquency and the treatment of youthful offenders, (28) the Jury Project undertaken by the University of Chicago Law School to study the reaction of juries to typical (though hypothetical) cases, (29) and the Columbia University Project for Effective Justice studies on the procedural problems of personal injury litigation. (30)

The scientific analogy does not relate to matters of method only. There is also a basic analogy between the structure of scientific theory and that of legal theory. Scientific theories are based on experimental facts but normally go beyond them; they serve to relate and thus explain separate experimental laws and to suggest further inquiries to extend, complete or even amend the theories themselves. Scientific theories change at a fairly fast rate today, even though the experimental facts or laws may, in many cases, remain valid. Legal theory can provide a similar "normative-logical framework" to legal research; as Patterson points out, "our law has a logical structure which serves to guide and limit the making of new legal evaluations." (31) Legal theories may not be infallible but they are necessary in order to organize the existing particular legal rules, bring out their relationships and their analogies or inconsistencies. Looking at legal theories as working hypotheses, rather than as basic axioms of the legal order, makes it possible to derive from them whatever benefit they can offer, without permitting them to distort or freeze the legal system to conform to their abstract generalizations.

As has been noted, in his earlier study of the scientific analogy, Patterson laid particular stress on its usefulness to (and possible

(26) Patterson, supra note 6, at p.132.
(27) Patterson, op.cit.supra note 2, at p.65.
(28) Id. at pp.65-70, with related references.
(29) Id. at pp.70-73.
(30) Id. at pp.73-74.
(31) Id. at p.56.
utilization by judges. Even though acknowledging the limitations inherent in the judicial function, he still thought that the judge could be a "field worker", if not a "laboratory scientist," and rely on the products of empirical research in the same manner in which the general practitioner relies on laboratory developments with which he usually has nothing to do. (32) He recognized that the real reasons for the choice between alternative decisions would probably have to be stated in tentative or uncertain "approximations of fact or debatable judgments of value." And he went on to state: "If law is to be scientific, we must prepare ourselves for the shock of having judicial decisions grounded upon reasons which do not even pretend to be axiomatic." (33)

In his Carpentier Lectures, thirty years later, Professor Patterson seems more reconciled to the reluctance of judges to state their factual and evaluative assumptions in their decisions. He concedes that "the judicial opinion which relies upon the apodictic certainty of logical syntax may well inspire greater confidence than one that rests upon the more or less probable truth of societal facts." (34) And he concludes: "For this reason and others, the investigation of the consequences of case-law rules will continue to be the work of legal scholars, rather than of judges, advocates or counselors." (35) The viewpoint of the judge is, therefore, studied only when examining the possibility of an impartial inquirer in legal matters. (36)

The scientific analogy remains relevant to the law, as seen from the viewpoint of the judge, even though this may not be readily apparent in the judges' published decisions. (37) The judge can, and does, apply the scientific methods which rely on logic, such as classification, exact definition and the like. When analyzing the situation before him, he formulates several hypotheses as to the legal rule on the matter, some of which he rejects either because they do not fit the facts before him or because they lead to undesired logical or factual consequences. However inadequate it may sound at first, this process of "imagined experimentation" is, in fact, common to all the sciences. The judge is relying on his trained sensibility and, if the need arose, it would be possible to justify a posteriori most of his guesses on more scientific grounds. It is probable, however, that in some cases his "guess" would be wrong, and that it could have been more correct if it were based on conscious and open inquiry into societal facts.

The figure of the scientist as the "by-truth-possessed-inquirer" is common to all of us, and it cannot be contested that the present development of science has been due in large part to the objectivity and impartiality of scientists, to their willingness to test their hypotheses and reject them if they cannot be justified by the experimental or other processes. This famed objectivity of the scientist is a fairly late

(32) Patterson, supra note 6, at pp.134-141.
(33) Id. at p.137.
(34) Patterson, op. cit. supra note 2, at p.60.
(36) See infra text to note 39.
(37) This paragraph is chiefly based on Patterson, supra note 6, at pp.134-
achievement, as Dr. J.B. Conant has pointed out, (38) and it may be that
the crushing moral and political responsibilities with which modern
scientists have been burdened will ultimately affect their ability
(and willingness) to differentiate between their "factual" observations
and their own preferences, between scientific facts and moral or
political value-judgments. However that may be, the question arises
of the extent to which the legal inquirer, and especially the judge,
can emulate the scientist's impartiality. In answering this question,
Patterson adopts a wise, middle-of-the-road approach. He rejects the
view that the use of scientific methods will lead to a fully
predetermined application of legal rules and to the negation of individual
responsibility. But he also refuses to accept that all legal evaluations
depend solely on the inquirer's own preferences and that, therefore, all
generalizations about them are mere a posteriori rationalizations. On the
contrary, it is possible for judges to study objectively a situation while
being aware of their own evaluations of it. This is neither a perfect
situation, nor in all cases a fully consistent one, nor can it be
expressed in "objective" quantitative terms. Nonetheless, it does work
in fact, even if within certain limitations. As Patterson states:

The strict ethical standards that surround the judge and
the deep sense of responsibility that judges in our
society feel are the best guarantees of ethical neutralism
in the making of judicial evaluations that we have as yet
found. I believe that judges in their official conduct are
more unbiased than are scientists in their political
pronouncements, but still not as neutral as natural scientists
in their laboratories. (39)

In this as in other respects, Patterson's present approach is consistent
with his earlier position. His treatment of the same topic in his earlier
discussion of the scientific analogy concluded with a quotation from
Eugene Ehrlich: "There is no guaranty of justice save the personality
of the judge." (40)

From the viewpoint of the citizen (and, for present purposes, of
the lawyer who represents him) the prediction theory of the law is
probably the most valid. For the citizen, the legal rule is a given
"fact", which he cannot change and of whose exact content he is highly
uncertain. He is interested in knowing (and his lawyer in advising him)

(38) J.B. Conant, On Understanding Science 22 et seq. (Mentor ed., 1951),
cited by Patterson, op.cit. supra note 2, at p.38. And see also, on
the evaluative judgment implicit in the scientist's devotion to
"truth", J. Bronowski, The Common Sense of Science 135 et seq. (Pelican

(39) Patterson, op.cit. supra note 2, at p.37. For a different approach,
leading nevertheless to comparable conclusions, see J. Stone, "Problems
Confronting Sociological Enquiries Concerning International Law,"
89 Hague Academy, Recueil des Cours 61, 158-75 (1956).

(40) Patterson, supra note 6, at p.136.
whether his own actual or proposed conduct is or is not in accordance with this immutable rule. The lawyer's task will then be to find the law for him, to prophesy as to "what the courts will do in fact." From this angle, the moral or political "ought" is of relatively minor significance, important only to the extent that it can predictably affect the decisions of the courts. The distinction between the legal "is" and the legal "ought", the law as actually applied or law-in-action, and the law as supposed to be or law-in-the-books, is of far greater importance. Seen from this point of view, legal rules present striking similarities to the laws of the natural sciences. For the citizens, the law-in-the-books is understood to be law, that is, is felt to be binding, to the extent that it may be applied in the future. Present or past practice is an indication of the probability of future application. Scientific methods or, at least, the basic scientific approach are of relevance: one is in fact seeking uniformities of conduct on the basis of which one will deduce that rule A is law-in-action and rule B only law-in-the-books. The anthropologist's approach to the legal rules of past or primitive societies is essentially the same: when he finds uniformities of conduct of a certain type, he concludes that a legal rule did or does regulate the matter.

It has to be admitted, however, that there exists little inducement for the citizen or his lawyer to enter into such investigations to any considerable extent; their inquiry into the facts usually will remain at the stage of casual observation. Certain useful insights may thus be gathered but the inquiry seldom reaches levels of phenomena which are not already fairly obvious. The academic jurist and the legal researcher sometimes do approach the law from a comparable point of view. In most instances, however, they are assisting the legislator rather than the citizen; their investigation of the law-in-action is only part of their inquiry.


(42) This statement, of course, oversimplifies matters. For an analysis of this aspect of the problem, see E.A. Hoebel, The Law of Primitive Men 22-28 (1954)

(43) As far as the academic jurists are concerned, of course, one of the principal tasks should be (and has been) the construction of theory. An examination of the differences in the points of view of jurists of different types - advisers, advocates, researchers, academics - should prove a very rewarding topic of study.
It is the great quality of Professor Patterson's latest book that, in addition to the systematic overview of the problems of law in an age of science and to the innumerable ideas and insights on particular topics that it provides, it also strongly stimulates further thinking on this all-important topic. It is impossible to tell where the process of scientific influence on the law will and, or even where it is leading. That it will continue cannot be doubted. The separation of the two is today still very marked, for most practical purposes. But the more we become familiar with science and the scientific approach, the more we shall be prepared to apply its methods in law. This does not mean that these methods will be adopted without any change or adjustment. In an earlier article, Professor Patterson had already stressed the need for building a law which would be "scientific in its own terms," which will recognize "the contingency and limitations of its own decisions" and will be inspired by a passion for facts and by a faith "in the improvement of results by using facts." He had concluded: "Law can be scientific if it have this faith and these works, and if it receive a little charity."(44) In his Carpentier Lectures, he has now provided a first model for this quest. And no charity is needed to appreciate his achievement.

(44) Patterson, supra note 6, at 147.