

LEGAL EXPERT SYSTEMS: THE END OF JURISPRUDENCE?

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I. INTRODUCTION

The present technological advances in computer science have already had a profound effect on jurisprudence. Some commentators have alleged that specialized computers, legal expert systems, could be used in a “judicial capacity”.¹ In fact, for several years the Internal Revenue Service (“IRS”) has implemented legal expert systems technology in the rendering of administrative decisions concerning areas of taxation that agency personnel formerly handled.² If examples abroad are any indication, other American administrative agencies are likely to follow suit.³ Now, scholars of jurisprudence must seriously question the potential impact that legal expert systems technology will have on the field of jurisprudence. As the eminent Justice

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¹ Indira M. Carr, *Viewpoint: Computers in Law—Some Questions*, 6 ARTIFICIAL INTELLIGENCE REV. 237 (1992). See also Anthony D'Amato, *Can/Should Computers Replace Judges?*, 11 Ga. L. REV. 1277 (1977) (providing a modern version of the *Modest Proposal*).

² Robert L. Rubenstein & William E. Wasserman, *Computers in Taxation: IRS Artificial Intelligence Projects (Close Encounters of an AI Kind)*, 23 TAX ADVISOR 690 (1992).

³ See 13 JOHN ZELEZNIKOW & DAN HUNTER, BUILDING INTELLIGENT LEGAL INFORMATION SYSTEMS: REPRESENTATION AND REASONING IN THE LAW 129 (H.W.K. Kasperson et al. eds., Computer Law Series 1994) (discussing the Australian Social

Cardozo stated, “[T]here remains a percentage, not large indeed, yet not so small as to be negligible, where a decision one way or the other will advance or retard the growth of the law.”⁴

This article presents concepts in jurisprudence and Artificial Intelligence (“AI”), the parent discipline of legal expert systems. It explains a concept of law, ideas on the role of a judge in the American common law system and the conceptualizations of law found in the most prevalent types of legal expert systems, both rule-based systems and case-based systems. Part II discusses some of the developments in the conceptualization of law. Part III explores the role of the judge in the American system of jurisprudence. Part IV describes the field of AI, with an emphasis on legal expert systems. Part V briefly speculates, in Huxlean fashion, the potential impact of this new technology.

II. CONCEPTUALIZING THE LAW

A. ON THE NATURE OF LAW

The debate concerning the origins and nature of law stretches backwards across millennia and has occupied the ideas of numerous renowned philosophers and schools of thought. The ancient Hebrew philosophers acknowledged God as the source of the law. For Aristotle, law sprang from the ideal and could “be determined only in relation to the just.” To the Romans, law found its source in the natural world, and its nature remained discoverable in that realm.⁶ Hobbes recognized only the sovereign who quelled the natural state of war as the source of law and gave to that sovereign the power to dictate its nature.⁷ Locke turned to natural law with an added emphasis on human reason.⁸ Austin returned to the notion of the

Security Expert System). Cf. J. Owen Forrester, *The History of the Federal Judiciaries Automation Program*, 44 Am. U. L. REV. 1483, 1485-8 (1995). Forrester, a believer in the powers of AI technology as applied to information gathering and coordination, provides a brief history of COURTRON case management systems that are now implemented in almost half of the federal courts in the country. COURTRON has collected fines for petty misdemeanors and tracks attorneys and cases.

4. BENJAMIN N. CARDOZO, *THE NATURE OF THE JUDICIAL PROCESS* 165 (1921).

5. CARL J. FRIEDRICH, *THE PHILOSOPHY OF LAW IN A HISTORICAL PERSPECTIVE* 17 (2d ed 1963).

6. *Id.* at 29.

7. *Id.* at 86.

8. *Id.* at 102.

sovereign and characterized law as a set of commands imposed by one habitually obeyed.⁹

In this debate, different lines concerning the source and nature of law, that is the Divine, the natural, the sovereign and human reason, become apparent. In all instances, law has something to do with societal norms, and legitimate authority guides and enforces these norms.¹⁰ In order to assess fully the scope to which the new technology, AI, could discover and implement *law*, in the grand sense of the word, this author would need a near-omniscient frame of reference. Therefore, this article concerns law as it presents itself in a given society.

Societies change over time. The highly technological world that most Americans experience today differs dramatically from the horse-drawn-plow pace that their ancestors in the last century knew. No one can be certain of the exact mix of circumstances that spurs societal changes. Yet, two obvious factors, the introduction of substantial new technologies into a society and the conquest of that society by another society, play a part in causing such changes. Change in a society often spurs changes in the laws of that society, and, on rare occasion, the society's legal system itself. For example, the invention of computers and computer science has led to changes in several areas of the law. These include, among others, intellectual property law,¹¹ tort law¹² and criminal law.¹³ Computers have also changed the ways that legal professionals conduct their research.¹⁴ As to conquest, William the Conqueror's victory at Hastings in 1066 seriously impacted the English laws and legal system.¹⁶

Time and geography form boundaries on the application of a society's laws and the authority of those who administer those laws. Thus, law abiding residents of no state presently face the possibility

⁹ *Id.* at 98. Cf. Edward S. Adams & Torben Spaak, *Fuzzifying the Natural Law—Legal Positivist Debate*, 43 BUFFALO L. REV. 85 (1995). The authors use a dialogue to discuss the implications that using "fuzzy", or indeterminate, logic might have on this age old debate. They recapitulate the Fuller/Hart argument concerning whether or not an unjust law was none the less valid.

¹⁰ FRIEDRICH, *supra* note 5, at 9.

¹¹ See John V. Swinson, *Software Patents in the United States*, 4 J.L. & Info. Sci. 116 (1993).

¹² See John M. Conley, *Tort Theories of Recovery Against Vendors of Defective Software*, 13 Rutgers Computer & Tech. L.J. 1 (1987).

¹³ See NEILL GRAHAM, *THE MIND TOOL: COMPUTERS AND THEIR IMPACT ON SOCIETY* 420 (5th ed. 1989).

¹⁴ See M. ETHAN KATSH, *LAW IN A DIGITAL WORLD* 65 (1995).

¹⁵ See EDWARD JENKS, *A SHORT HISTORY OF ENGLISH LAW* 17 (6th ed. 1949).

of legal enslavement.¹⁶ Nor must they obey the traffic laws of a foreign jurisdiction, unless they travel there.

To sum, law in a society has to do with that society's norms and legitimate authority. A society and its laws have a somewhat intermingled history. Yet time and place restrict the society's authority and power to subject people to those laws. These principles subscribe the boundaries of one of the basic components of law—a body of rules.

B. LAW AS A BODY OF RULES

This discussion does not focus on LAW in its grand sense, but rather plain old law as the person on the street, or as an endowed chair at Oxford might see it. To the casual observer, law appears to be simply a body of rules imposed by authorities. The rules may cover all facets of life, from the cradle to the grave. The mind-set regarding rules appears to be as follows. Break the rules, for example, rob a bank, and the government may seize your person or property; if the rules become too burdensome or too lenient, throw a fit and, with a little luck, someone with authority will change them.

The casual observer may take comfort in the fact that several distinguished legal theorists also have come to the conclusion that law is, essentially, a body of rules. These theorists subscribe to a theory called legal formalism. One of the more preeminent of the modern legal formalist commentators, H.L.A. Hart, maintains that law cannot be divorced from the concept of a rule.¹⁷

What are rules? To begin, every legal process has “a distillation of norms in static clusters and a clustering of directed principles or directives for the future.”¹⁸ Legal systems have rules that relate to present communal expectations, even if the expectations are those of one sovereign, and rules are for applying and changing the rules.

H. L.A. Hart has deemed the former type of rules as *primary*, and the rules for changing the rules as *secondary*,¹⁹ Because rules relate to the obligations imposed by societal norms, dos and don'ts, and the permissive regulation, the how-tos imposed by a particular society, they are important. In the context of obligations, “(t)he judge, in punishing, takes the rule as his guide and the breach of the rule as his

¹⁶ U.S. CONST. amend. XIII.

¹⁷ H.L.A. HART, *THE CONCEPT OF LAW* 80 (2d ed. 1994).

¹⁸ J. JOVAN BRKIC, *LEGAL REASONING: SEMANTIC AND LOGICAL ANALYSIS* 2 (American University Studies Series V Philosophy 1985).

¹⁹ Hart, *supra* note 15, at 81.

reason and justifications for punishing the offender.”²⁰ As Hart pointed out, in order for a rule to be considered a legal rule, it must arise not from some internal guilt mechanism but rather from “obligations when the general demand for conformity is insistent and the social pressure brought to bear on those who deviate or threaten is great.”²¹

For simplicity, let us assume that the legal entity that has the authority to make a given set of rules also enforces them. This assumption permits the avoidance of an ancient rhetorical question, is it a rule if it is not enforced? Such an assumption also becomes necessary in order to allow enough certainty into the law so that, in theory, researchers can formulate presently applicable legal rules.

As Judge Keeton has pointed out, the American system has different categories of rules.²² Essentially, rules are tests. The tests might constitute requisites for determining the individual issues in a single case.²³ The tests also include codified rules systems, such as the Federal Rules of Civil Procedure.²⁴ A rule can be contrasted with a standard, a *bright line* test versus an *evaluative* test.²⁵ This definition of a rule requires a little explanation concerning rules and standards. Legal commentators note that some rules mandate the evaluation of substantial amounts of factual information in their application.²⁶ These are called *standards*.²⁷ Simply put, an obligatory standard is a vaguely written rule that translates, *act reasonably*. The concept of negligence in tort law is an example of an obligatory standard.²⁸ Of course, what constitutes reasonable behavior will vary from time to time, place to place and person to person. Standards provide a measure of flexibility so that judges can apply the rules to new situations.²⁹

Legal rules and standards are written, for the most part, in ordinary language.³⁰ The language implemented in the writing of the rules and standards contain ambiguities, either by accident or intent.³¹

²⁰ *Id.* at 11.

²¹ *Id.* at 86.

²² ROBERT E. KEETON, *JUDGING* 68 (1990).

²³ *Id.*

²⁴ *Id.*

²⁵ *Id.*

²⁶ RICHARD A. POSNER, *THE PROBLEMS OF JURISPRUDENCE* 44 (1990).

²⁷ *Id.*

²⁸ *See id.*

²⁹ KEETON, *supra* note 22, at 71-2.

³⁰ *See* BRKIC, *supra* note 18, at 176.

³¹ *See* POSNER, *supra* note 26, at 263-7. *Cf.* Brkic, *supra* note 18, at 108-110. *But cf.* Alan R. Madry, *Analytic Deconstructionism? The Intellectual Voyeurism of Anthony D'Amato*, 63 *Fordham L. REV.* 1033,1056 (1995). In his critique of D'Amato, Madry takes exception with the notion that law is indeterminate because of the indeterminacy of language.

Therefore, just what the meaning of a particular rule or standard is often becomes the subject of intense debate. Lacking omniscience, humans cannot predict everything other humans will do in a given circumstance. Whether or not a rule or standard applies to particular conduct depends on the regulated activity. “The more dynamic the regulated activity, the less amenable it will be to governance by rules at all as distinct from standards.”³² Often, the shorter rules are appropriate in that they *economize* expected behavior.³³ Judge Posner gives the example of “stop, look, and listen” at a railroad crossing as a rule for a school bus driver, rather than leaving the driver’s judgement, or lack thereof, to determine what is reasonable.³⁴

Legal rules have within them notions of values.³⁵ No matter what kind of case appears before the judge, members of the community will have competing interests in the outcome.³⁶ The values of the community form the balance upon which those competing interests are weighed. With a little luck, the values within the rules of law evolve with the community, or sometimes, in spite of it. Justice Cardozo stated this principle as follows: “The final course of the law is the welfare of society. The rule that misses its aim cannot permanently justify its existence.”³⁸

The process of legal evolution occurs because rules can be bent and flexed or, if need be, tossed out. “From the perspective of persons subject to rule, the fact that rules have fuzzy edges does not make them non-binding. In the hands of rulers, they are so much putty.”³⁹ The modern perspective considers that every rule of law has its “antinomy , and that law is probabilistic ,⁴¹ Only in areas where given legal rules will almost certainly be applied is the law referred to as “settled” .⁴²

32. POSNER, *supra* note 26, at 45.

33.*Id.*

34. *Id.*

35. KEETON, *supra* note 22, at 117.

36.*Id.*

37.*Id.* Cf. Florentino P. Feliciano, *The Application of Law. Some Recurring Aspects of the Process of Judicial Review and Decisionmaking*, 37 AM J JURIS 17 49 (1992) Feliciano points out that in the rendering of judicial decisions, judges must consider underlying community values as a whole, in addition to the community values concerning the legal process.

38.CARDOZO, *supra* note 4, at 66.

39.POSNER, *supra* note 26, at 53.

40.CARDOZO, *supra* note 4, at 28.

41. BENJAMIN N. CARDOZO, THE GROWTH OF THE LAW 44 (1920). Cf Madry, *supra* note 31. at 1056-7 Madry concedes that all cases are to some extent uncertain but appears to attribute this to human factors other than language

⁴² *Id.* at 43.

Because of uncertainty in the law and the need to consider community values, the people who make the rules often have a hard time justifying their creation. Some of the premises involved in deciding a case and the underlying values these premises represent will remain unexplored.⁴³

To sum, *law* as conceptualized for a given place and time is composed partially of rules that regulate conduct, including the changing of the rules, based on societal norms. Rules of law come in several forms but are, essentially, tests. These tests are drawn up with various levels of concreteness and ambiguity, depending on the conduct that they are to regulate. At least on occasion, legal rules cannot be meaningfully severed for analysis and application apart from the community standards that fostered them. Furthermore, the premises behind the rules do not often represent a complete picture of the values behind them. Finally, legal rules are value laden, changeable, and to some extent uncertain. In the American system, the persons in charge of finding, interpreting, and applying the rules in individual circumstances are the judges.

III. THE NATURE OF THE JUDICIAL PROCESS IN THE AMERICAN COMMON LAW SYSTEM

A. THE CHANGING ROLE OF THE COMMON LAW JUDGE

In the constellation of common law legal systems, the judge once reigned supremely, that is, in matters that did not directly involve the sovereign. These wig-wearing, gavel-swinging, black-robed heralds of justice often sat at a table together and created and debated the rules of law that would apply to those who appeared before them in the halls of justice.⁴⁴ For centuries the common law developed thus, although no one really thought the process important enough to write down.⁴⁵

Eventually written treatises covering the law began to be available and the lawyers and judges began following these principles.⁴⁶ Judges also paid closer attention to the comments that various courts

⁴³ Keeton, *supra* note 22, at 113.

⁴⁴ See Julius J. Marke, *Vignettes of Legal History* 2d 176 (1977).

⁴⁵ *Id.* For centuries, the law remained largely an oral tradition.

⁴⁶ See *id.* (discussing the impact of Blackstone's legal treatises on colonial America).

made in previous cases concerning the law. The case reporter developed, as did a heavy emphasis on written precedent.⁴⁷

Although modern-day American judges still, for the most part, wear black robes and use gavels, their ability to create law in a given area is somewhat more restricted.⁴⁸ For one thing, there is a lot more precedent to take into account. In addition, American judges are bound by both federal and state constitutions. Modern legislatures also appear to take their jobs much more seriously, emphasizing quantity of work product.⁴⁹ Still, although some judges have considered their job to be that of “interstitial” or “gap-filling” legislation,⁵⁰ judges have some vestigial power, the remnants of which are housed in massive libraries.

The role of a judge in American society is to determine, through legal means, the nature of the relationships among and the consequences arising from, the status and actions of people whose status or actions fall under the judge’s jurisdiction. If you prefer, the judge must “do justice according to the law and the facts.”⁵¹ The judge’s decisions are based on cases involving real parties who have an interest in the outcome.⁵² The judge presides over a case, or reviews a case over which another judge presided, and finds or creates, interprets and explains, and applies the law.⁵³ Thus American judges create law, within limited contexts, and apply law on a case by case basis.

Judge-made law, in a sense, is a process of experimenting with the composite of the social glue to make it stick in a given time. “Law is a process of retesting and reformulating to bring about just results.”⁵⁴ The judge’s job, as Justice Cardozo sees it, is two-fold: “1) to get the *ratio decidendi*—or precedent—from the law; 2) to determine the path of the law.”⁵⁵ Choice is a primary component of the judge’s job.⁵⁶

47. “An adjudged case or decision of a court considered as furnishing an example of authority for an identical or similar case afterwards arising or a similar question of law.” BLACK’S LAW DICTIONARY 1176 (6th ed. 1990).

48. KEETON, *supra* note 22, at 28-33.

49. *Id.*

50. North Carolina Supreme Court Associate Justice Willis P. Whichard, Speech at University of North Carolina Law School’s Lectures on the Judicial Process (Spring 1995).

51. *Id.*

52. See KEETON, *supra* note 22, at 38-40.

53. *Id.* at 15-7.

54. CARDOZO, *supra* note 4, at 24.

55. *Id.* at 28. Cf. Robert Birmingham, *A Study after Cardozo: De Cicco v. Schweizer, Noncooperative Games and Neural Computing*, 47 U. MIAMI L. REV. 121, 127-130 (1992). Birmingham offers an interesting presentation of this famous case from the judge. However, his application more or less proves that it is almost impossible to formalize such terms as “bias”. Birmingham works around this little difficulty by simply incorporating the term into his rules.

56. KEETON, *supra* note 22, at 1.

Even in the most routine cases, if such things exist, the judge must bear the burden of making choices."

Community standards strongly influence the judge's choices. Citizens of the community will expect the judge to render a decision that corresponds to the general notions of what people in the community regard as just.⁵⁷ One difficulty of this task lies in the fact that in order to realize justice for legitimate expectations of a minority of community members, the judge may have to decide in a manner opposing what the majority views as just.⁵⁸ At other times, the judge will need to change the law entirely, in spite of legitimate expectations, because present social circumstances mandate change.⁵⁹ When the purpose under-

lying the old rule of law disappears, the rule may no longer be valid.⁶¹

Thus, legitimate expectations arise from the *present* community.

To blend the community expectations regarding roles, status and conduct together in a tidy printed format that may or may not be binding on future generations, the judge must produce a reasoned decision.⁶² Considering societal change and competing community interests, this is no easy task. Yet judges must pursue justice.⁶³ "When social needs demand one settlement rather than another, there are times when we must bend symmetry, ignore history and sacrifice custom in pursuit of other and larger ends."⁶⁴ Just how and when to do these things is not the kind of knowledge that lends itself to mathematical formulations or programming language.⁶⁵

B. THE POWER TO DECIDE CASES

At this time, a quick back-step is in order, lest the reader get the wrong idea and begin to view the judge as an all-powerful figure in the creation of law. First, the power of a judge to lay down rules depends greatly on the court in which the judge sits.⁶⁶ As general rules of

57. Cakdozo, *supra* note 4, at 67.

58.1 FA. HAYEK, LAW LEGISLATION AND LIBERTY 115 (1973).

59.*Id.*

60.*Cf.* KEETON, *supra* note 22, at 45-7 (arguing that judges played a role in changing the law).

61.*Id.* *Cf.* Adams & Spaak, *supra* note 9, at 110. The authors note that Dworkin argued against the positivistic position by countering that judges exercise discretion in applying the legal rules and must decide, among other things, if the community values will be embodied in law or remain simply moral obligations.

62.KEETON, *supra* note 22, at 17-24.

63.*See* CARDOZO, *supra* note 4, at 65.

64.*Id.*

65.*See also* Feliciano, *supra* note 37, at 53.

66.KEETON, *supra* note 22, at 28-33.

thumb, appellate or reviewing judges have more power to create law than triers of fact, and federal judges have more power than state judges with the same title.⁶⁷ Judges in higher positions have the power to bind judges in lower positions by setting out principles in cases.⁶⁸

Second, judges do not create law for the future in every case. Few cases warrant the creation of new law. In most cases, the present rules of law that apply are so clear that, once the judge figures out the facts, “[o]ne route and one route only is possible.”⁶⁹ AI researchers refer to these cases as *easy* because the rules applied in them often lend themselves to logical reconstruction.⁷⁰ Other cases challenge a judge’s legal acumen by requiring that she be familiar with complex and contradictory precedents.⁷¹ AI researchers refer to these cases as *hard*.⁷² On a rare occasion, a judge must decide a case that challenges the very core of norms in a society.⁷³ AI researchers call these cases *impossible*.⁷⁴ *R. v. Dudley*⁷⁵ provides an example of an impossible case.⁷⁶ In *Dudley*, two sailors who were stranded in a row boat at sea killed a cabin-boy and ate him in order to stay alive. The Prosecutor charged the sailors with murder. The Court tried and convicted the men; yet popular opinion earned them a pardon.⁷⁷ Thus, judges’ ability to create law or choose law is limited both by the court in which they sit and the fact that not many cases afford judges the opportunity to create law.

C. THE METHODS OF DECIDING A CASE

Judges resort to various methods in bringing the principles of justice to bear on the law and facts of a case.⁷⁸ The methods and procedures involved in fact-finding are the subject matter of areas of the law

⁶⁷*Id.*

⁶⁸*Id.*

⁶⁹ CARDOZO, *supra* note 37, at 43.

⁷⁰ ZELEZNIKOW & HUNTER, *supra* note 3, at 57.

⁷¹ See *id.*

⁷² *Id.*

⁷³ *Id.*

⁷⁴ *Id.*

⁷⁵ 14 Q.B. Div’l Ct. 273 (1884).

⁷⁶ ZELEZNIKOW & HUNTER, *supra* note 3, at 57.

⁷⁷ *Id.*

⁷⁸ Daniel A Farber, *The Inevitability of Practical Reason: Statutes, Formalism, and the Rule of Law*, 45 VAND. L. REV. 533 (1992). Farber explores the concept of practical reasoning injudicial decisionmaking. Practical reasoning, as Farber presents it, is a nebulous concept that basically covers many of the factors listed here, excluding intuition, as a Gestalt.

known as evidence and procedure. As legal expert systems are built on the assumption that the user of their technology will provide the current *facts* to which the legal expert will apply the *law*, this author will focus on the portion of the judge's job that pertains to deciding the law.

Assuming, *arguendo*, that the facts in a case have been supplied and that the judge has authority to hear and render a decision in a case, the judge should take the next step and determine the rules of law that may be applied.^{7*} Usually, a variety of sources point to the applicable rule of law. The judge looks first to the constitutions, next to the statutes and to precedents.⁸⁰ Sometimes rules derived from these sources, even if from the same source, conflict.⁸¹ Also, if a necessary rule of law does not exist, as not infrequently is the case, the judge must create the rule of law.⁸² As noted above, judges refer to this process of creation as gap-filling or interstitial legislation.⁸³ The methods of deciding between equal rules and creating legal rules appear to resemble those of interpretation.

This process of determining which rules should be applied and how they should be interpreted is often referred to as *legal reasoning*. Yet, as Judge Keeton pointed out, the use of the term *legal reasoning* can be misleading because the methods involved in legal reasoning vary greatly depending on whether the judge is in a process of finding and interpreting the law, Steps I and II, or applying the rules of law, once known and interpreted, to the facts of the given case, Step III.⁸⁴ Judge Posner explains that this distinction is characterized by a process that is not itself syllogistic or otherwise deductive; judges extract rules from statutes and previous decisions and then use them as premises to decide cases syllogistically.⁸⁵ Thus, legal reasoning in Steps I and II, finding and interpreting the rule, may have very little to do with logic, whereas legal reasoning in Step III, applying the rule, can be characterized by reference to terms of logic, that is, syllogism and deduction. Still, at all steps of the process, the method of reasoning in the law is ordinary language.^{86*}

79. See also Keeton, *supra* note 22, at 17-24. Keeton presents the role of the judge as occurring in stages in which the judge determines the law that suits a particular case.

80. Cakdozo, *supra* note 4, at 47.

81. *Id.* at 14.

82. Keeton, *supra* note 22, at 55.

83. Whichard, *supra* note 50.

84. Keeton, *supra* note 22, at 112-130.

85. Posner, *supra* note 26, at 42.

86. Brkic, *supra* note 18, at 2.

In theory, a judge's decisions regarding the selection and interpretation of rules of law must be rational.⁸⁷ Often, and this is particularly true for lower court judges, the only rational choice is to apply rules that officials with higher authority have selected and interpreted. The discretion to select or to interpret a rule of law can be severely, if not entirely, curtailed by legislators and superior courts.⁸⁸ "Insignificant is the power of any judge when compared with the bulk and pressure of the rules that hedge him on every side."⁸⁹ Yet judges have some room to experiment with rules of law.⁹⁰

Justice Cardozo identified four *lines of directive force* in the making of a judicial decision. First, the decision may follow a logical progression. Second, the decision may be rooted in historic developments. Third, *customs or traditions* may supply the source of persuasion. Fourth, *contemporary justice and morals* provide the rationale.⁹¹ Perhaps Cardozo lists logic first because of the importance of maintaining symmetry in the law.⁹² As discussed previously, community notions of justice and fairness are important. Logically adhering to that which has been done before is one way to justify legal decisions; the logic of philosophy carries with it its own sense of persuasiveness.⁹³

As to evidencing these other factors, listing examples should suffice. In historical reasoning, the system of feudal tenures provides a classic example.⁹⁴ The landlord-tenant case of *Javins v. First National Realty Corporation*,⁹⁵ which sought to change the effect of the feudal incidents with regard to landlords and tenants, uses primarily the historical method. As to custom, Lord Mansfield transformed commercial law in England through the adoption of mercantile customs as law.⁹⁶ Finally, the civil rights case of *Brown v. Board of Education*,⁹⁷ where the Supreme Court overruled segregation in schools, evidences reasoning in terms of *contemporary justice*.

Keeton, *supra* note 22, at 17-24.

⁸⁸ *Id.* at 33-8.

⁸⁹ CARDOZO, *supra* note 4, at 7.

⁹⁰ See *Javins v. First Natl Realty Corp.*, 428 F.2d 1071 (D.C. Cir. 1970) (overruling a medieval precedent to extend the warranty of habitability to landlord tenant law).

⁹¹ CARDOZO, *supra* note 4, at 30.

⁹² *Id.* at 33.

⁹³ See *id.* at 33-5.

⁹⁴ "No lawgiver meditating a code of laws conceived the system of feudal tenures. History built up the system and the law went with it. Upon these points, 'a page of history is worth a volume of logic.'" *Id.* at 55.

⁹⁵ 428 F.2d 1071 (D.C. Cir. 1970).

⁹⁶ See generally Jenks, *supra* note 15.

⁹⁷ 347 U.S. 483 (1954).

In addition to Cardozo's four methods, reasoning by analogy, which may be of more importance to legal reasoning than Cardozo's factors, deserves brief examination. Although reasoning by analogy is, for many legal scholars, the crux of legal reasoning, Judge Posner produces some valid criticisms of this method. Reasoning by analogy "denotes an unstable class of disparate methods."⁹⁸ "The notion that similar cases should be treated alike forms the basis of and justification for this method." In a more or less rational way, lawyers compare cases from the past, that may or may not be binding, with the present case.¹⁰⁰ By no means should reasoning by analogy in law be confused with more formal logical methods.¹⁰¹ The central problem is that law strives to enforce what is best for a society and there often is no one right answer. When comparing the past cases and the present case, "the existence of a pattern, although it may create an expectation that it will be followed in the future, cannot show that it should be followed."¹⁰² One cannot validly determine that a modern day property rights case regarding natural gas should be handled in the same manner as an antiquated case involving wild rabbits.¹⁰³

Finally, judges sometimes are at a total loss to describe why they decided a case the way they did. "The trained intuition of the judge continuously leads him to right results for which he is puzzled to give unimpeachable reasons."¹⁰⁴ As intuition is a method of reasoning that is more in the realm of instinct than intellect, it may remain beyond the scope of AI for some time.

IV. WHAT IS ARTIFICIAL INTELLIGENCE AND LEGAL EXPERT SYSTEM TECHNOLOGY?

A. DEFINITION OF AI

"Artificial Intelligence is a field of science and engineering concerned with the computational understanding of what is commonly called intelligent behavior, and with the creation of artifacts that exhibit

⁹⁸ Posner, *supra* note 26, at 86.

⁹⁹ CARDOSO, *supra* note 4, at 30-1.

¹⁰⁰ Cf. Posner, *supra* note 26, at 86-90 (discussing the irrationality of the analogical model of reasoning).
¹⁰¹ *Id.*

¹⁰² *Id.* at 88.

¹⁰³ *Id.* at 91-2.

¹⁰⁴ Roscoe Pound, *The Theory of Judicial Decision*, 9 HARV. L. REV. 52 (1936).

such behavior.”¹⁰⁵ The goals of the artificial intelligence field are to understand the human thought process, *computational psychology*, to create theoretical foundations for systems capable of performing tasks at a human level, *computational philosophy*, and to implement designs for intelligent behavior using computers, *advanced computer science*.¹⁰⁶ Information retrieval systems and expert systems comprise the two types of AI applications used in law.¹⁰⁷ An expert system is a system that is “capable of functioning at the standard of human experts in a given field.”¹⁰⁸

B. FUNDAMENTALS OF COMPUTERS AND COMPUTER SCIENCE

Legal expert systems are computer systems. Computer systems are “machines for storing and processing information.”¹⁰⁹ A set of step-by- step instructions, termed a *program*, controls how the computer will operate.¹¹⁰ The tangible part of the computer is called *hardware*.¹¹¹ The hardware of a computer consists of 1) a storage box, 2) a central processing unit, which is controlled by the computer program and which controls the rest of the hardware, 3) memory units for storing electronic data and 4) various devices for the input and output of data.¹¹² Of importance to knowledge representation is the central processing unit, the two major components of which are the *arithmetic/logic unit* and the *control unit*.¹¹³ The arithmetic/logic unit performs the comparisons and logical operations of the machine through

¹⁰⁵ Steven Shapiro, *Artificial Intelligence*, in THE ENCYCLOPEDIA OF ARTIFICIAL INTELLIGENCE 54 (S. Shapiro, ed. 1992).

¹⁰⁶ *Id.*

¹⁰⁷ ZELEZNIKOW & HUNTER *supra* note 3, at 4.

¹⁰⁸ *Id.* at 69. The debate concerning whether or not AI is possible is still ongoing. One focus of the debate concerns the Turing Test where the machine engages a human opponent in the activity of conversation with a third party. Lawrence B. Solum, *Legal Personhood for Artificial Intelligence*, 70 N.C.L. REV. 1231, 1235 (1992). Solum discusses whether or not an AI machine could serve as a Trustee. Solum offers stages for taking over of a trustee position by the AI technology. In stage one, the AI expert would serve as an assistant for a human Trustee; in stage two, the machine would begin to outperform the human on functions involving economic analysis, e.g. trading stocks; in stage three, the machine would replace the Trustee by demand of the settlor. Solum then questions the ability of the AI to discharge the duties of a Trustee effectively, especially the ability of the machine to take responsibility for a breach of duties.

¹⁰⁹ GRAHAM, *supra* note 13, at 7.

¹¹⁰ *Id.*

¹¹¹ *See id.* at 11.

¹¹² *See id.* at 11-15.

¹¹³ *Id.* at 77.

the use of binary code.¹¹⁴ In order for computations to be made, higher level knowledge must be broken down into arithmetic and logic, which is in turn broken down into a code that the computer can calculate.¹¹⁵

The computer also contains *software*. Software consists of 1) programs, which include an operating system that controls other programs, 2) languages, including translators, called language processors, for the computer programmer to make programs for the computer to get it to operate and 3) application programs. ¹¹⁶ For the most part, legal AI researchers develop software.¹¹⁷

In AI, *knowledge engineers* create the expert systems.¹¹⁸ The knowledge engineer works with experts in given disciplines, called *domain experts*, to acquire the information for a given expert system.¹¹⁹ Once the knowledge engineer has acquired the needed information in a given subject area, he begins the process of knowledge representation.¹²⁰ The knowledge engineer usually begins this step with an expert system program called a shell.¹²¹ The shell contains the basic language commands, logical connectors, and the mechanism for reasoning, or inference engine.¹²² In some cases the knowledge engineer creates the shell.¹²³

Then, the knowledge engineer develops a scheme for representing all of the information of a given area. In legal AI, the usual scheme involves representing law either as simplified if-then rules or in *frames*, discrete packets of electronic information.¹²⁴ The programmer orderly arranges the legal information into the shell, along with instructions on how the bits of information will be stored in relation to each other, a second kind of knowledge, and applied during the operation of the system, a third kind of knowledge.¹²⁵ This structure often resembles, conceptually, some convenient hierarchical model.¹²⁶

114. *Id.* at 78.

115. *See id.* at 78-80.

116. *See id.* at 15-17.

117. *See also id.* at 399 (discussing the creations of AI researchers in general).

118. Ziki.e7.nikow & Hunter, *supra* note 3, at 52.

119. *See* Graham, *supra* note 13, at 399.

120. *Id.* at 398-400.

121. *Id.*

122. Zeleznikow & Hunter, *supra* note 3, at 168-73.

123. *See id.* at 240-249 (providing examples of commercial shells).

124. *Id.* at 303. *Cf.* Thomas Earl Geu, *The Tan of Jurisprudence: Chaos, Brain, Science, Synchronicity, and the Law*, 61 Tenn. L. Rev. 933, 954 (1994). Geu claims that common law cases are analogous to complicated if-then statements. If-then statements could be used to give weights to the factors in the case.

125. *See* GRAHAM, *supra* note 13, at 395-400.

126. *Id.* *See also* Zeleznikow & Hunter, *supra* note 3, at 149.

AI programmers represent the third kind of knowledge concerning the application of information as rules. "Each rule has the form: if situation then action or conclusion."¹²⁷ The computer reasons with these rules through a process called inference. "Inference is the process of deriving conclusions from premises."¹²⁸

Once the engineer constructs a machine, a person wanting an answer from the expert system supplies data, or new facts, as directed by the systems program.¹²⁹ The user must often enter this data in a restricted lexicon.¹³⁰ The expert system, if all goes well, computes the user-entered data through a series of formulas, which may include simple mathematical matching, and supplies a response that is within the preprogrammed parameters.¹³¹

C. TYPES OF LEGAL AI SYSTEMS

AI researchers have developed two main approaches to producing expert systems, classical and connectionist. "Classical approaches include rule-based expert systems and logical programming."¹³² They perform their functions serially and have one center of control.¹³³ Connectionist approaches attempt to model the neural interactions which, according to some theorists, occur in the brain through the use of multiple processing units in a decentralized fashion.¹³⁴ To date, classical approaches have been the focus of most of the work in legal AI.

Fundamentally, legal expert systems' designs are categorized as either case-based or rule-based systems.¹³⁵ Often researchers build systems on a combination of the rule-based and case-based approaches.¹³⁶ Rule-based systems are the most prevalent legal AI expert systems. These systems store legal knowledge as rules. The rule-based

¹²⁷ Graham, *supra* note 13, at 395.

¹²⁸ Zeleznikow & Hunter, *supra* note 3, at 101.

¹²⁹ See Kevin D. Ashley, *Modeling Legal Argument: Reasoning with Cases and HYPOTHETICALS* 25-26 (L. Thome McCarty & Edwina Rissland eds., 1990).

¹³⁰ *See id.*

¹³¹ *See id.* at 26-7.

¹³² ALEXANDER E. SILVERMAN, *MIND, MACHINE, AND METAPHOR: AN ESSAY ON ARTIFICIAL INTELLIGENCE AND LEGAL REASONING* 3 (1993).

¹³³ *Id.* at 4.

¹³⁴ Graham, *supra* note 13, at 412-3. *Cf.* Geu, *supra* note 124, at 954. Geu models brain activity as a process and compares the two most prevalent AI systems in his analysis. Classical machines are the most common expert systems. Connectionist machines can learn from experience.

¹³⁵ Zeleznikow & Hunter, *supra* note 3, at 76-7.

¹³⁶ *Id.*

systems reason directly with these legal rules through formal logical deductive and inductive methods.¹³⁷

By contrast, most case-based systems use frames, and some rules, to represent legal concepts in a database. Case-based systems operate by comparing the intersections of facts in a database of past cases, called *exemplars*, with the facts in the present situation.¹³⁸ The case-based system attempts to draw analogies between the exemplars and the present case in order to retrieve the most on point cases.¹³⁹

Beginning at the bottom of the hierarchy, the expert system matches the frames of the exemplars with the frame containing the new information.¹⁴⁰ The most on point exemplar contains the most matches at the bottom levels of the hierarchy.¹⁴¹ The system then continues this process through the consecutively higher levels of the database until it finds the most analogous case.¹⁴² This method of computer reasoning relies heavily on mathematics and formal logic.¹⁴³ The system requires an inferencing mechanism in order to compare the sets of data.¹⁴⁴ Also, case-based systems apply legal concepts in a formal logic manner using if-then rules.¹⁴⁵ Finally, a case-based reasoner applies quantitative reasoning methods to determine analogies.¹⁴⁶

D. COMPUTERS AND FORMAL LOGIC

Formal logic has become the mechanism of computerizing the law.¹⁴⁷ Thus, one will often find that papers written by legal AI experts contain discussions of formal logic as an elementary understanding of the subject is necessary to understand the programs produced by AI researchers.¹⁴⁸ For purposes of this discussion, one need only under

¹³⁷*Id.* at 168. ¹³⁸*Id.* at 77, 117.

¹³⁸*Id.*

¹³⁹ See *id.* at 156.

¹⁴¹ See *id.*

¹⁴² See *id.*

¹⁴³ See *id.* at 156-8.

¹⁴⁴ See *id.*

¹⁴⁵ See also *id.* at 183-5 (discussing the logic used in case based systems).

¹⁴⁶ See *id.* at 185.

¹⁴⁷ 1 PHILIP LEITH, THE COMPUTERIZED LAWYER: A GUIDE TO THE USE OF COMPUTERS IN THE LEGAL PROFESSION 160 (Gareth G. Morgan ed. Applications of Advanced Computer Techniques 1991).

¹⁴⁸ Cf. Expert Systems in the Law (Antonio A. Martino, ed., 1992) (discussing formal logic).

stand that (1) there is a field of study called formal logic that is closely linked to mathematics, (2) the vast bulk of AI expert systems are based fundamentally on formal logic and mathematics, and (3) with regard to legal subject matter, formal logic most often translates into the making of a number of if-then/true-false rules regarding conduct; for example, if a person drives faster than the speed limit, then she will get a ticket.¹⁴⁹ Formal logic sentences contain the logical constants and connectors in addition to symbols for predicates (sets) and individuals. “The validity of arguments and of formulas depends solely on logical form, and this form is exhaustively determined by the logical constants of the language.”¹⁵⁰

In deontic logic, a series of if-then statements form a code of permissive and prohibited conduct that represents legal rules and standards. “Deontic logic is nowadays synonymous with using logical formalism in the law.”¹⁵¹ After breaking down a legal rule or standard into a strictly formal logic sentence, even though it may no longer be a legal standard, one can represent it as a formula in a computer language.¹⁵² Prolog, a shortened form of *Programming in Logic*, remains the chief computer language in legal AI.¹⁵³ In Prolog, formulas are constructed using Boolean Algebra.¹⁵⁴ In order to get an answer from the computer, substitutions of true or false values for the legal rules must occur.¹⁵⁵ One caveat, the newest in AI technology, called *fuzzy logic*, accepts answers of partially true and partially false.¹⁵⁶ Although legal expert systems have not seriously tested fuzzy logic, studies *have* shown that it works in some consumer products, for example, rice cookers.¹⁵⁷

Beginning with a knowledge base that usually consists of deontic predicates or information in frames, legal expert systems solve legal problems through the application of, most often, deductive logic and, sometimes, inductive logic in processes that are, respectively, called

¹⁴⁹ See GRAHAM, *supra* note 13, at 303; Geu, *supra* note 124, at 954.

¹⁵⁰ Jaap Hage, *Reason Based Logic: General Considerations and Some Applications*, in PROCEEDINGS OF THE FOURTH NATIONAL CONFERENCE ON LAW, COMPUTERS AND ARTIFICIAL INTELLIGENCE (Exeter 1994).

¹⁵¹ ZELEZNIKOW & HUNTER, *supra* note 3, at 64.

¹⁵² *See id.* at 99.

¹⁵³ *Id.*

¹⁵⁴ *Id.*

¹⁵⁵ *See id.*

¹⁵⁶ *See* Adams & Spaak, *supra* note 9, at 103-5.

¹⁵⁷ This author has eaten rice cooked in a fuzzy logic machine. *See also id.* at 104 (documenting the impact of fuzzy logic on Japanese consumer goods).

forward chaining and *backward chaining*. Forward chaining applies the various rules to obtain their consequences.¹⁵⁸ Backward chaining substantiates a solution by retracing the paths that could lead to it.¹⁶⁰ AI researchers hope to combine these methods and produce the entire set of relevant solutions for a given legal problem.¹⁶¹

E. LAW AS AI SUBJECT MATTER—
THE JURISPRUDENCE OF LEGAL AI

Most legal AI researchers believe that they will be able to build machines that can replace lawyers and make legal decisions.¹⁶² Still, it is difficult to speak of legal AI as a unified field. A number of AI researchers have yielded to observation and experience and attempted to work around such difficulties as are inherent in the law. Some of these have adopted the case-based approach,¹⁶³ while many still adamantly adhere to the rule-based approach.¹⁶⁴ Regardless of which perspective concerning either the extent to which legal expert machines can, or should, replace humans or the best approach to build legal AI systems, the researchers invariably produce programs that operate under the same theory of jurisprudence, which is formalism.¹⁶⁵ Zeleznikow and Hunter find a jurisprudential foundation for the representation of legal ideas as rules in the theory of H.L.A. Hart.¹⁶⁶

158. Zeleznikow & Hunter, *supra* note 3, at 156-9. See also Carlos E. Alchourrdn, Stefano A. Cerri, Antonio A. Martino, A. Orsi & D. Santangelo, *SRL—A Legal Reasoning System*, in *Expert Systems in the Law* 36-7 (Antonio A. Martino, ed., 1992).

159. Graham, *supra* note 13, at 396-398.

160. *Id.*

161. *Id.*

162. Leith, *supra* note 147, at 158. Cf. Geu, *supra* note 124, at 955-969. Geu supports the prevalent AI position. He goes through an elaborate discussion of how the brain is really just an electric system and points towards the conclusion that it could be modeled.

163. Edwinna L. Rissland, *Artificial Intelligence and Law: Stepping Stones to a Model of Legal Reasoning*, 99 *Yale L.J.* 1968 (1990).

164. Paolo Guidotti, *Use of Precedents Based on Reasoning by Analogy in a Deductive Framework*, in *Proceedings of the Fourth National Conference on Law, Computers and Artificial Intelligence* (Exeter 1994).

165. Zeleznikow & Hunter, *supra* note 3, at 53-4.

166. *Id.* at 127. But see E. Donald Elliot, *Holmes and Evolution: Legal Process as Artificial Intelligence*, 13 *J. Leg. Stud.* 113, 143-47 (1984). It appears that everybody needs to cite to Holmes as the sage of their view of the law. Elliot examines Holmes' *Law in Science and Science in Law* article from the *Harvard Law Review* in 1899 and attempts to reveal that Holmes viewed law as a cybernetic system, or system that interacts with and learns from its environment. In the end, Elliot attempts to draw an analogy between Holmes' view of the law and AI technologies that apply cybernetic approaches.

Many legal AI researchers simply build legal expert systems by translating cases, statutes, standards and principles into sentences that “link conditions to consequences using first order logic, with the additional introduction of deontic operators.”¹⁶⁷ This lends credence to the assertion that legal formalism and AI are connected. Further, all AI systems builders assume that knowledge representation formalisms can adequately represent legal concepts.¹⁶⁸

One of the first realizations that most AI researchers come to is that law is *open textured*, or a concept that requires “background information from a store of contextual information.”¹⁶⁹ Examples of open-textured information would be information concerning territorial jurisdiction limitations and unenumerated exceptions.¹⁷⁰ “There will be exceptions to legal rules and these are often not spelled out in the rules themselves. Further, legal rules are often limited in their scope of application, for example, by territory.”¹⁷¹ Not all legal AI researchers acknowledge the open-textured nature of law.

Many knowledge engineers attempt either to produce models of legal concepts directly from the text of statutes, or program their computers to directly acquire the database from the text of the law.¹⁷² This process of automatic knowledge acquisition rests on the belief that statutes contain all of the necessary procedural and methodological information for rendering a decision.¹⁷³ This process of direct knowledge acquisition has been criticized at AI conferences.¹⁷⁴

In spite of the advances in the theories of many AI scholars, the impetus in the field of AI remains pointed towards the full formulation of legal rules in mathematical and logical terms where “an unambiguous formalization of norms” can be adopted.¹⁷⁵ In part, this

¹⁶⁷ Alchourron, et al., *supra* note 158, at 30.

¹⁶⁸ LEITH, *supra* note 147, at 179.

¹⁶⁹ ZELEZNIKOW & HUNTER, *supra* note 3, at 83.

¹⁷⁰ H.B. Verheij, *Reason Based Logic and Legal Knowledge Representation* in PROCEEDINGS OF THE FOURTH NATIONAL CONFERENCE ON LAW, COMPUTERS AND ARTIFICIAL INTELLIGENCE (Exeter 1994).

¹⁷¹ *Id.*

¹⁷² Vassilis Konstaninou, John Sykes & Georgia N. Yannopoulos, *Legal Reasoning Methodology: The Missing Link*, in PROCEEDINGS OF THE FOURTH NATIONAL CONFERENCE ON LAW, COMPUTERS AND ARTIFICIAL INTELLIGENCE (Exeter 1994).

¹⁷³ *Id.*

¹⁷⁴ “The biggest false assumption made when attempting to model automatically acquired legal knowledge is that methodological and procedural knowledge is also contained in the text of the law . . . researchers in the area of automatic knowledge acquisition are still confident in implementing systems that use only the text of the laws as their main source of knowledge. Knowledge engineers are then forced to make their own interpretations of this knowledge, thus resulting into erroneous and legally unacceptable interpretations of the law.” *Id.*

¹⁷⁵ Guidotti, *supra* note 164, at 1.

may be because of the focus of these AI researchers on Step III of the legal reasoning process, application of rules that have been found and interpreted. Thus, these researchers view legal reasoning as “essentially deductive in character.”¹⁷⁶ But even these researchers acknowledge that in order to apply validly normative concepts, that is law, it is necessary to state *all* premises that led to a given conclusion.¹⁷⁷

F. THE PROCESS IN ACTION

AI researchers employ a variety of methods in order to acquire legal knowledge. Three popular methods include: the use of domain experts, or persons with knowledge of the law; the use of statutes, cases, treatises, and other written legal materials from which the knowledge engineer will directly formulate the rules; and direct machine acquisition from these sources, in which the computer formulates the rules used in rule-based systems.¹⁷⁸ AI researchers primarily represent law as rules of various degrees of applicability and complexity, with case-based systems being the broadest and most complex.¹⁷⁹

In order to bring the judge’s decision-making role and attempts to model this role in legal expert systems into sharper focus, it will be helpful to examine those areas of the process of building a legal expert system that differ most from the processes in the judges’ model of reasoning. Step I of the legal reasoning process, finding the law, more or less occurs in the process of knowledge acquisition. Step II of the legal process, interpreting the law, occurs both in the process of knowledge acquisition and knowledge representation. Although the reasoning aspects of AI applications may be of increasing importance as researchers experiment with alternative processes to model legal reasoning, at the present time, in rule-based systems, this mechanism is exclusively formal logic. Assume that, as Judge Posner states, legal rules, once they have been found and interpreted, are applied in Step III of legal reasoning syllogistically. Then the focus on whether or not a computer can replace a judge turns to the AI process of knowledge acquisition and knowledge representation. This is the biggest contrast between human and AI use of the law.

¹⁷⁶ Carlos E. Alchourron & Eugenic Bulygin, *Limits of Logic and Legal Reasoning*, in EXPERT SYSTEMS IN THE LAW 9 (Antonio A. Martino, ed., 1992).

¹⁷⁷ *Id.* at 25.

¹⁷⁸ ZELEZNIKOW & HUNTER, *supra* note 3, at 167-77.

¹⁷⁹ *Id.*

1. Rule-Based Systems

In developing rule-based systems, legal domain experts may formulate simple legal rules, which the knowledge engineer will later represent in formal logic.¹⁸⁰ Domain experts sometimes supply legal rules derived from cases, statutes and other materials.¹⁸¹ In many instances the domain experts work for the programmers' employers and have interests in computers. For example, the domain expert, an attorney, used to produce the Metropolitan Life's AI program on loan-closing came from Metropolitan's real estate department.¹⁸² The attorney had served as chairman of an American Bar Association committee on the use of computers as a legal assistant.¹⁸³ The Metropolitan program produces a checklist of the essential AI items for closing a loan.¹⁸⁴

In the instance of a tax program used by the IRS, AI valuations of pension plans for taxation purposes was designed by one of the few agents in the IRS who had actuarial experience.¹⁸⁶ The IRS also uses expert systems in the assessment of tax penalties.¹⁸⁶ In the case of late payments, the computer determines whether or not to grant extensions based on the excuse for not filing, including "illness to ignorance."¹⁸⁷ Some agents view human judges' decisions regarding reasonable cause cases as being inconsistent. To them, the unswerving computers symbolize progress.¹⁸⁸

In another acquisition method, AI researchers, who may or may not understand the law, will set about formulating rules directly from legal materials. A relatively famous example of this latter method of acquisition is the British Nationality Act Program.¹⁸⁹ The British Nationality Act Program employs mathematical reasoning, or logic programming, to determine citizenship.¹⁹⁰ The inventors of the program chose the British Nationality Act 1981 because it was a new statute "free of the complicating influence of case law."¹⁹¹ Their goal was to model accurately a statute by using only strict rules of formal

180. *Id.*

181. *Id.*

¹⁸² Paul Clancy, Gerald Hoenig & Arnold Schmidt, *An Expert System For Legal Consultation*, in INNOVATIVE APPLICATIONS OF ARTIFICIAL INTELLIGENCE SOFTWARE 125 (1989).

¹⁸³ *Id.* at 126.

184. *Id.*

¹⁸⁵ See Rubenstein & Wasserman, *supra* note 2, at 691.

186. *Id.*

187. *Id.*

188. *Id.*

189. ZELEZNIKOW & HUNTER, *supra* note 3, at 119.

¹⁹⁰ *Id.* at 75.

¹⁹¹ *Id.* at 119.

logic and the text of the statute. They used Prolog to create rules using small portions of the text of the act. They view the law in this area as being unambiguous and believe that the question of native British citizenship poses few problems.^{11"}

2. Case-Based Systems

Case-based systems continue to develop in the legal AI field. The first such system resembled the rule-based systems in that the *ratio decidendi* of a particular case would often be represented as a series of rules.¹⁹³ One such early program was McCarty's Taxman, which attempted to model and to compute the taxation of corporations during the merger and acquisition process.¹⁹⁴ In McCarty's Taxman II, an expanded edition of Taxman, McCarty attempted to work around the open textured nature of legal concepts by using very concrete logical definitions at the programming knowledge level that would be compared to the higher level terms.¹⁹⁵ In the end, McCarty discovered that the construction of legal theories, and not the mechanical application of rules, formed the crux of legal reasoning. In the process of theory construction there are several plausible arguments, "rather than a single correct answer."¹⁹⁶

The next step to modeling legal programs as cases can be seen in the work of Anne Gardener.¹⁹⁷ Gardener attempted to develop a legal expert model that was capable of dealing with the open textured nature of law in the area of offer and acceptance in contracts.¹⁹⁸ Gardener's system attempts to determine if a case in this area is easy, one in which the legal experts agree as to the outcome, or hard.¹⁹⁹ Gardener formulated rules for the basic principles of offer and acceptance, and for the different stages of the process of negotiation.²⁰⁰ She also formulated rules for necessary definitions of ordinary objects.²⁰¹ In addition, Gardener created a set of simplified fact patterns, called *exemplars*. These have become the prototypes of cases.²⁰²

¹⁹² *Id.* at 119.

¹⁹³ *Id.* at 183.

¹⁹⁴ *Id.* at 117.

¹⁹⁵ *Id.* at 118.

¹⁹⁶ *Id.*

¹⁹⁷ Rissland, *supra* note 163, at 1968-70.

¹⁹⁸ *Id.*

¹⁹⁹ *Id.*

²⁰⁰ *Id.*

²⁰¹ *Id.*

²⁰² ZELEZNIKOW & HUNTER, *supra* note 3, at 183.

Kenneth Ashley and Edwinna Rissland developed *Hypo*, which appears to be “the seminal project in legal case-based reasoning.”²⁰³ *Hypo* evaluates cases concerning trade secrets.²⁰⁴ In *Hypo*, legal knowledge is represented by cases that are a series of connected frames of various complexities in an hierarchical structure.²⁰⁵ The frame at the top of the hierarchy includes: the title of a case, its citation, the date of decision, party names, the winner, the claims, and *dimensions*.²⁰⁶ At lower levels, a series of factors indicates which elements contributed to the winning party’s case. The values at this level are 1) Affirmative, if the factor helped the winning party’s case, 2) Negative, if the factor hurt the winning party’s case, and 3) Nil if the factor neither hurt nor helped, nor was present.²⁰⁷ An example of a representation at this level is: “Plaintiff adopted security measures: Nil.”²⁰⁸ In use, the reader takes prompt from *Hypo* and enters data in a lexicon that is restricted to the terms in the factors.²⁰⁹ *Hypo* then compares the restricted lexicon entries of the user to the exemplars already in memory and, essentially, adds up the number of factors that match, without regards to the weight of each factor, to determine which cases in the database are “most on the point.”²¹⁰ *Hypo* then can present the citations of these to the user.

If a certain affirmative fact is present, and the user is of the same side, plaintiff or defendant, as the party in the case, *Hypo* adds one for the user and displays this result.²¹¹ *Hypo* then computes the issue from the opposite side, calling up the most on point case that conflicts with the user’s case. After the defendant’s position is presented, *Hypo* then calls up a rebuttal for the user.²¹² *Hypo* continues this process of *three tier argumentation* until it has added through the relevant factors of the most on point cases.

²⁰³ *Id.* at 190.

²⁰⁴ ASHLEY, *supra* note 128, at 25.

²⁰⁵ *Id.* at 45-56.

²⁰⁶ *Id.*

²⁰⁷ *Id.*

²⁰⁸ *Id.* at 53.

²⁰⁹ *See id.* at Appendix C.

²¹⁰ *See id.* at 57-65.

²¹¹ *See id.* at 62-68, Appendix E.

²¹² *See id.* at 75-85.

V. FOREBODING THOUGHTS ON THE IMPACT OF LEGAL EXPERT SYSTEMS ON JURISPRUDENCE

Having described the conceptual model of law as a set of rules, the role of judge and legal expert systems, let us speculate on the affects of the supplanting of human decision-makers with computer legal experts—a process that some heartily endorse. For example, persons in search of consistency in the law laud the ability to program into an expert system a consistent interpretation of a legal rule.²¹³ The program would be incapable of adopting other interpretations through flexible methods applied by judges.²¹⁴ Thus, certainty begins to edge toward supremacy. One impact that could readily be anticipated by the broad spread use of expert systems would be a unification of interpretations, possibly without regard to the merits of competing interpretations.

Welcome to the law court of the Administrative Judge of the future.²¹⁶ The Judge refers to the cases that he decides as new data. The Judge, being liberal, accepts new data composed in Legal Speak, a restricted lexicon. Most judges require pleadings to be on a scant-ron in order for them to consider rendering a decision. Otherwise there would be too much ambiguity; judges loathe ambiguity. The Judge also loathes the informal analogical reasoning that parents ambiguity. In the Judge lives the spirit of the Pre-Code pleading system whereby form is greater than substance.²¹⁶

Legal rules by the billions and billions comprise an electronic constellation the size of a quarter. The Judge accesses them all. He manipulates these simplified sets of narrowly written rules using pristine formal logic. Serial applications ensure that no rule appears out of order. The Judge applies the rules to new circumstances through the use of strict logic that allows only one outcome as predetermined by the calculatory indexing of the increments of data in the

213. Such persons may be IRS agents. *Cf.* Rubenstein & Wasserman, *supra* note 2, at 691. Rubenstein and Wasserman sing the praises of the digital agent that decides to which taxpayers to grant extensions.

214. *Cf.* Solum, *supra* note 108, at 1248. Solum mentions several objections to an AI system's ability to make judgements, including the inability of the technology to deal with changes in circumstance, the inability of the systems to make moral choices, and the inability of the system to choose its best course of action in a legal dispute.

215. *Cf.* Alan W. Heifetz, *ALJS, ADR, and ADP: The Future of Administrative Adjudication*, 1 WIDENER J. PUB. L. 13, 32-6 (1992). Chief Administrative Law Judge Heifetz sings the praises of computer technology in administrative courts in the present and near future, including local networks, vast databases, document management and retrieval.

216.H R. 44, 222,172d Cong., 1st Sess. § 2 (2110).

programmed database. The Judge religiously applies the principles of law and economics. Modal salaries extrapolated from IRS databanks dictate the balances of interests and levels of recovery. Most humans are not worth much. The Judge knows and stores every detail of every case.

The Judge's clerk simply enters the new data in Legal Speak and gets the agency position. The Judge classifies the new data according to the old rules. Unending Certainty. Certainty equals justice. The Judge need pay no heed to the ritualistic concerns of lawyers, whose appearances the agency long ago forbade. The Judge requires no consultants; he simply formulates his own rules directly from the text of the applicable statutes using guidelines of a programmer who crashed in the last century. Law equals rules.²¹⁷

Perhaps this example of the Judge goes too far. Legal expert systems have some merit. It remains true that when the exemplar rules in the database contain a sampling of possibly relevant texts and statutes, the accuracy of the system is compromised. Yet to some extent the problems inherent in the direct statutory method of rule construction can be limited by having a domain expert who consults outside resources to supply the necessary information to be formulated. If the domain area is one where the rules are drawn very narrowly and there are a number of consistent and unambiguous instances of the application of the rules, the domain expert may be able to produce a program that could point to the most probable outcome of new cases that provide fact patterns nearly identical to the ones in the database. In theory, this is the extent of what an AI program can do. At given times and places, legal interpretations are viewed as spurious enough to merit the sanctioning of those who put such interpretations forth in a court of law. It does not follow that such interpretations are wrong. All interpretations of law are inherently probabilistic.

Yet a substantial percentage of legal cases provides fact patterns the almost certain outcome of which can be determined by the strict application of narrow, bright-line legal precedents from determined situations.²¹⁸ The accuracy of the application of such rules increases where the decision-maker must on an almost daily basis apply the rules to nearly identical factual circumstances and the interpretation applied has almost universal acceptance. In other words, a substantial amount of cases are easy at a given point in time. In the cases of

²¹⁷ H.R. 1,171st Cong., 2d Sess. § 3 (2111).

²¹⁸ *But see* Farber, *supra* note 78, at 552. Formalism could produce certainty, but only by exponentially increasing the number of bright-line rules. In the end, the user would still be mystified by the result.

governmental agencies that deal with substantial numbers of nearly identical cases in areas of narrowly drawn rules, a properly constructed legal expert system could serve as a prescreening device. Perhaps the device could be built along the theoretical lines of Anne Gardener's offer-acceptance machine, wherein easy cases were identified and decided and harder cases were simply identified as hard and passed on to a human administrator.²¹⁹

The IRS has already implemented legal expert technology. Perhaps their agents have not asked enough questions about using such machines to decide cases. Human decision-makers must decide the hard cases because these often turn on social facts which involve the types of values that AI machines cannot compute.²²⁰ When dealing with terms in which the scope of their applicability changes, legal expert programs can not produce valid classifications. Even in the medical field, the definition of an illness changes. How many people were concerned about AIDS in 1980 or carpal tunnel syndrome in 1988? In order to be valid, a human policy-maker at the agency should make a determination on the effects of these illnesses.

Further, even the easy legal cases are not certain. The moment the machine is in place it begins obsolescing. The database would need continuous monitoring and updating to make sure that the machine's rules remained current with regards to both the interpretations of legal materials and social circumstances.

Another impact of legal expert systems will be an increasing formalization of the law.²²¹ Implementation of legal expert systems requires the dissection of rules and standards into small units that can be mechanistically applied.²²² Even if the lawyers using the systems are creating these rules, this conceptualization may become further imprinted on them. Also, once the lawyers invest the time to formulate laws, they acquire a vested interest in not changing them.

The imprinting of the legal conception of law as a set of rules may occur on the users of legal expert systems in educational contexts.²²³ Developments in computer technology appear to this author to have led to a vast increase in the number of computer-assisted legal educa-

219. See Rissland, *supra* note 163, at 1968.

220. See LEITH, *supra* note 147, at 205. Cf. Farber, *supra* note 78, at 558 (asserting that formalism is not an appropriate method for the handling of hard cases).

²²¹ See D'Amato, *supra* note 1, at 1285; LEITH, *supra* note 147, at 204-5.

²²² See LEITH, *supra* note 147, at 178-9.

²²³ For a more glowing, yet balanced, view of the potentials of AI technology as it applies to teaching and practice see Ronald W. Staudt, *Does the Grandmother Come With It? Teaching and Practicing Law in the 21st Century*, 44 CASE W. RES. L. REV. 499, 524 (1995). Staudt maintains that the new technology will act as a challenge to spur on better teaching methods.

tion tools on the market. The use of these tools will increase the prevalent yet over-simplified perspective that law is a set of rules to be applied logically. This will lead to calcified legal norms in the near future. Practitioners will be less equipped, because of their training, to handle the variety of methods that have been implemented to change law in the past. Also, practitioners will become even less willing, because of substantial increase in their vested interests, to change the law.

As these cyber-trained lawyers advance in the system, the emphasis in legal reasoning shifts from Steps I and II in the process, finding, creating and interpreting the law, to Step III, applying it. The rule of law will resemble, more and more, the deontic logic necessary to perpetuate the machine. Formalistic jurisprudence will be elevated to a position of unprecedented and unmerited importance. The result will be that the rules, the laws governing our society, will be less adaptable to social needs. This will be attended by many problems. The formalist conception of jurisprudence is limited in its ability to reconcile social facts with their underlying normative origins. The conceptualization of law as a set of deontic rules, even broadly written rules, may allow us to articulate legal concepts in a given system at a given time; yet it no more captures the essence of law than Bohr's model captures the essence of the atom.

VI. CONCLUSION

AI approaches can only represent the subset of American law that (1) can be represented in formalist legal terms and (2) can further be reduced to formalist logic and mathematical terms. The role of the American judge in even the most restrained settings requires broader reasoning abilities. Further, AI systems cannot determine which values of a society should be applied to new circumstances. Justice Cardozo recognized the importance of the ability to reconcile such values. "No system of law can continue to develop by strictly adhering to the postulates of *stare decisis*. The sentence of today will make the right and wrong of tomorrow."²²⁴ Therefore, legal expert systems cannot and should not be used to replace human decision-makers. With continuing advances in computer technology, the *Brave New World* of jurisprudence may be ahead just a few flips of the calendar.

²²⁴ Cardozo, *supra* note 4, at 21.