March 2016

Legal Interpretation by Computer: A Survey of Interpretive Rules

Eric Engle

LEGAL INTERPRETATION BY COMPUTER: A SURVEY OF INTERPRETIVE RULES

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I. INTRODUCTION

A. Computers in Law

Computers in law have been used to present mainly for computer-aided legal instruction (programmed instruction)[1] and automated

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1. *See, e.g.*, Dan Hunter, *Teaching Artificial Intelligence to Law Students,* 3 LAW TECH. J. 3 (Oct. 1994), *available at* http://www.buscalegis.ufsc.br/revistas/index.php/buscalegis/article/viewFile/5268/4837 (discussing

research[2] (e.g., Westlaw, Lexis). Computers can, however, also be used for representing legal decision-making.[3] This article presents a survey of legal interpretive rules. The rules presented in this survey are used as the rule base in the computer program accompanying this article, an expert system.[4] The computer program models legal decision-making and uses the rules presented to make legal decisions, generating a report to justify the decision reached. Legal interpretation is chosen as a model for computation representation because understanding interpretive methods is useful for any jurist seeking creative arguments. This survey of legal interpretive rules is of both a theoretical and practical interest. Theoretically, this survey shows that, while the formalist/realist dichotomy is sometimes useful, sometimes it breaks down: certain interpretive methods could be characterized at times as either formalist or realist. Formalists argue for classical methods of logic such as induction and deduction using bright line tests. In contrast, "realists" argue for flexible "standards," policies and teleology to guide the law. Other similar dualistic splits exist: between originalists and interpretivists, in constitutional law; between holists and monists; between cognitivists and skeptics; and other paired opposites that express various philosophical schisms, such as epistemological realism, or noetic eidetic reality, versus epistemological materialism, or empiricism. However, as the formalism/realism split is best documented and most influential, at least in contemporary American legal scholarship, the article focuses on it as a representative type of the sort

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the methodological problems involved, especially the problems of developing syllabi for teaching law and AI).

2. *See, e.g.*, Sandip Debnath et al., *LawBOT: A Multiagent Assistant for Legal Research*, 4 IEEE INTERNET COMPUTING ONLINE (Nov.-Dec. 2000), http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=895013&tag=1 (requires subscription); *see, e.g.*, Jeffery S. Rosenfeld, *Nuts & Bolts: Legal Research*, THE ADVOCATE (Md. State Bar Ass'n Young Lawyers Section), Fall 2002, at 3 (discussing the benefits of automated research tools such as Eclipse and Westclip).

3. *See generally* John Aikin, *Computers and Human Reason*, WASH. ST. ASS'N OF DATA PROCESSING MANAGERS NEWSL., Info. Processing Mgmt. Ass'n, Olympia WA, July 1, 1977 (reviewing JOSEPH WEIZENBAUM, COMPUTER POWER AND HUMAN REASON: FROM JUDGMENT TO CALCULATION (W.H. Freeman & Co. 1976) (discussing the use of computers to automate judicial decisionmaking), http://www.ipma-wa.com/news/1977/197707.htm (last visited Oct. 19, 2004).

4. Previous efforts at developing artificial intelligence for law have also focused on expert systems. *See* G. Greenleaf, A. Mowbray & A.L. Tyree, *The Datalex Project, International Conference on Artificial Intelligence and Law* (1987), *available at* http://portal.acm.org/citation.cfm?id=41737; James Popple, *Shyster,* Australian National University, *available at* http://cs.anu.edu.au/software/shyster/; JAMES POPPLE, A PRAGMATIC LEGAL EXPERT SYSTEM (1996), *available at* http://cs.anu.edu.au/software/shyster/book/.

of meta-theoretic debates which apply to determine the selection of a legal interpretive method.

The program accompanying this article presents the jurist with a series of questions, and from those questions determines a legal outcome. This shows that automated decision-making is possible, even in abstract cases where we are not dealing with substantive legal rules but rather with "meta-rules": rules for deciding rules. Computer modeling of law can serve as a diagnostic tool and memory aid, forcing the jurist to consider possible arguments she might otherwise omit by reminding them of some of the more obscure general points of law that may not be immediately addressed in the relevant cases in her area of specific practice. Formalization of the law by computer also forces jurists to explicit enthymematic premises, revealing otherwise weaknesses in their arguments, or their opponent's. Thus, artificial intelligence in law can serve practical purposes. This survey is practically useful since it sets out the various interpretative arguments in one place. This survey is also theoretically interesting since it shows that the realist/formalist dichotomy is not always adequate: some legal interpretive methods can be characterized as either formalist or realist depending on the facts of the case at bar and judicial fidelity to the rule of law. This survey is also theoretically interesting because it shows that the interpretive rules are internally consistent and can be presented as a formal system and applied by a computer program. The inference engine developed using this rule base hopefully will serve to inspire other efforts at modeling law computationally.

B. The Limits of the Formalism/Realism Dichotomy

This survey reveals the limits of the formalism/realism dichotomy. An attempt to categorize legal interpretive methods as either formalist or realist soon breaks down in several regards:

> 1) Axiologically: Both the realists and their opponents were moral cognitivists: they believed moral values existed, but disagreed bitterly about what they were. As a result, moral cognitivism has been largely replaced by neutral moral relativism; not because of the strength of relativist arguments,

but rather due to the mutual exhaustion and opposition of contending moral cognitivists.[5]

2) Epistemologically: The formalist/realist split can also be only partially analyzed as a split between those arguing for empirical materialism (the realists) as opposed to noetic idealism ("pure theory").[6] We could describe this split using the shorthand of "Marx vs. Plato." However (neo)platonic noetic theories have more or less been universally abandoned in favor of materialist arguments, which range from Richard Posner on the right to Karl Marx on the left. Plenty of "classical" legal scholars are, like realists, materialists.

3) Politically: We could argue that realists and realist methods are "left'" and "reform'" oriented in contrast to the "right" "conservative" methods of formalists. We might thus think that the realists would embrace arguments allowing the extension of rules so as to effectuate legal reform, and that the formalists would adhere to formal logic which would conserve and apply existing rules. In fact however, many classical methods of interpretation, such as inductive ampliation, allow the development of new rules out of old ones.[7] Teleological arguments are as old as Aristotle, yet are considered, at least here, as "realist" because they enable legal reform by opening the scope of judicial discretion.

4) Economically: The realist/formalist dichotomy also ignores reality. Conservative judges have not had much difficulty adopting economic arguments. Yet economic arguments are clearly not an element of classical logic, though they are one form of phronesis, that is practical reasoning. Economic analysis of the law is in fact a very recent phenomenon. While we can say that formalists and neo-formalists have had no trouble adopting economic arguments because they are conservative, economic analysis is not the monopoly of the (neo)realists.[8] But "policy arguments," a typical realist

5. Engle, Eric, Artificial Intelligence and Law Using Rule Based Expert Systems (Oct. 21, 2008) (unpublished Master's thesis, Universitaet Bremen) (manuscript at 43), *available at* http://etdindividuals.dlib.vt.edu:9090/346/1/msc.doc [hereinafter Engle, *Artificial Intelligence*].

6. *Id.*

7. Engle, Eric, Legal Interpretation by Computer: Are Legal Rules Predictable? (Sept. 15, 2008) (unpublished manuscript at 7), *available at* http://ssrn.com/abstract=1270073 [hereinafter Engle, *Legal Interpretation*].

8. Engle, *Artificial Intelligence*, *supra* note 5 at 44.

> method, are often in fact economic arguments. Similarly, balancing tests, the flagship of realism, also often reduce to economic arguments due to the question of how to evaluate the weights of competing interests.[9]

Consequently, the interpretive methods could be classified as either: (1) formalist rules of statutory construction; (2) formalist methods which constrain interpretation; (3) realist methods of interpretation that favor development of new legal rules; and (4) economic and policy arguments. Here, we analyze interpretation following Savigny's schema,[10] and then try to see if the methods can be classified as either realist or formalist and conclude they cannot. Some interpretive methods could be called formalist in some regards, or realist in others.

II. INTERPRETIVE METHODS

A. Formalist Rules of Statutory Construction

1. Text

a. Literal or "Plain Meaning" Interpretation

We start this survey by considering the interpretive rules courts would use in their likely order of application. Since Savigny legal interpretation is seen as moving from text, to context and structure to history and teleology, goals and policies of the law, even in U.S. law.[11]

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9. Engle, *Legal Interpretation*, *supra* note 7 at 7.

10. FRIEDRICH KARL VON SAVIGNY, SYSTEM DES HEUTIGEN ROEMISCHEN RECHTS, 206-330 (1840), *available at* http://dlib-pr.mpier.mpg.de/m/kleioc/0010/exec/bigpage/%22199236_00000256%22; *see, e.g.*, Raul Narits, *Interpretation of Law in the Estonian Legal System*, I JURIDICA INT'L 1996, 11-16, *available at* http://www.juridicainternational.eu/index/1996/vol-i/interpretation-of-law-in-the-estonian-legal-system.

11. In the hierarchy of interpretive tools, of course, the statutory language comes first. Only when that language is ambiguous is it necessary to examine first the statute's structure and purpose, and then lastly the legislative history, which is last and least authoritative because it ultimately matters what legislators do, i.e. enact, not what they say about what they do. What various legislators say about a statute is often contradictory, unclear, ambiguous, or merely an expression of one of many competing views of a statute not necessarily shared by others who voted for it. In some instances, however, as here, unambiguous, clear, uncontradicted, and specific legislative history can serve as a reliable interpretive guide.

McDow v. Smith, 295 B.R. 69, 78, n.18 (E.D.Va., 2003).

Plain meaning arguments state that the law means what it says, nothing more or less: statutes should be interpreted to implement the will of the legislator, not the judiciary. Literal or literalist interpretation is a somewhat pejorative synonym for interpretation according to the plain meaning of the text. The critique is that plain meaning arguments are tautological and provide no criteria to determine whether and when a meaning is "plain."[12] Furthermore, courts are sometimes, in the interest of justice, willing to ignore the plain language of a statute.[13] A court may reject a literalist interpretation where such interpretation does not conform to "the circumstances surrounding their adoption, or for that matter, with the context, subject matter, historical background, effects and consequences, spirit and purpose, or any other factor to which courts advert in determining a statute's meaning."[14] Courts sometimes reject the literalist interpretation for those reasons. A literal interpretation of a statute is not admissible where it would lead to "an absurd result."[15] This rule is obviously formalist, and is the first line argued in any statutory interpretation. It is also fairly easily formalized computationally, as is the case of most formalist arguments. If the plain meaning of the text resolves the interpretation then we need not look to other interpretations.

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12. *See, e.g.*, Anthony D'Amato, *Counterintuitive Consequences of "Plain Meaning*," 33 ARIZ. L. REV. 529 (1991); Michael S. Moore, *Plain Meaning and Linguistics—A Case Study*, 73 WASH. U. L.Q. 1253 (1995); Arthur W. Murphy, *Old Maxims Never Die: The "Plain Meaning Rule" and Statutory Interpretation in the "Modern" Federal Courts*, 75 COLUM. L. REV. 1299 (1975); Stephen F. Ross, *The Limited Relevance of Plain Meaning*, 73 WASH. U. L.Q. 1057 (1995); Frederick Schauer, *The Practice and Problems of Plain Meaning: A Response to Aleinikoff and Shaw*, 45 VAND. L. REV. 715 (1992); David A. Strauss, *Propter Honoris Respectum: Why Plain Meaning?*, 72 NOTRE DAME L. REV. 1565 (1997).

13. *See* Davis v. Department of Labor, 317 U.S. 249 (1942); s*ee also* Director, Office Of Workers' Compensation Programs, United States Dep't of Labor v. Perini North River Assoc., 459 U.S. 297, (1983).

14. *See* Hurley Trucking Co., Inc. v. Arizona, 39 P.3d 527 ¶ 22, (Ariz. Ct. App. Jan. 29, 2002), *rev. denied and ordered depublished*, Hurley Trucking v. Arizona, 46 P.3d 408 (Ariz. May 21, 2002) (citing Zamora v. Reinstein, 915 P.2d 1227, 1230 (1996)).

15. "Although we must give effect to the statute's plain and ordinary meaning, the General Assembly's intent and purpose must prevail over a literalist interpretation that leads to an absurd result." Lagae v. Lackner, 996 P.2d 1281, 1284, (Colo. 2000).However plain the ordinary meaning of the words used in the statute may be, the courts will reject that meaning when to accept it would lead to a result so plainly absurd that it could not possibly have been intended by the Legislature or would defeat the plain legislative intention. Kiriakids v. United Artists Communications, Inc., 440 S.E.2d 364, 366 (S.C. 1994).

b. Maxims of Legal Interpretation

Several maxims of interpretation can be used to determine the plain meaning of the law.

i. Expressio Unius

Expressio unius est exclusio alterius is a specific type of grammatical interpretation.[16] It is synonymous with inclusio unius est exclusio alterius.[17] It is a rule of statutory construction. It holds that "the express mention of one thing implies the exclusion of another."[18] Thus "where a law expressly describes a particular act, thing or person to which it shall apply, an irrefutable inference must be drawn that what is omitted or not included was intended to be omitted or excluded."[19] Further, expressio can also be applied to other similar statutes: "explicit direction for something in one provision, and its absence in a parallel provision, implies an intent to negate it in the second context."[20] Where the legislator gives a list of exceptions to a rule that list shall be considered exclusive.[21] However, expressio unius is subject to legislative intent: where the legislative intent is clearly contrary, expressio unius will not apply.[22] Thus some of the interpretive rules are explicitly hierarchized, this does not however appear to be the case for all the interpretive rules.

ii. Exceptio firmat regulam in casibus no exceptis

Exceptio firmat regulam in casibus non exceptis (an exception affirms the rule in cases not excepted).[23] This maxim appears to be a reformulation of expressio unius.[24]

16. Burgin v. Forbes, 169 S.W.2d 321, 325 (Ky. 1943); Newblock v. Bowles, 40 P.2d 1097, 1100 (Okla. 1935).

17. *See Burgin*, 169 S.W.2d at 325.

18. Manchin v. Dunfee, 327 S.E.2d 710, 712 (1984); *see also* Riffle v. Ranson, 464 S.E.2d 763, 770 (W. Va. 1995) ("*Expressio unius est exclusio alterius* (express mention of one thing implies exclusion of all others)").

19. People v. Aarons, 305 A.D.2d 45, 51 (N.Y. App. Div. 2003) (quoting McKinney's Cons. Laws of NY, Book 1, Stat. § 240).

20. Clinchfield Coal Co. v. FMSHRC, 895 F.2d 773, 779 (D.C. Cir. 1990).

21. *See* People v. Municipal Court 574 P.2d 425 (Cal. 1978).

22. *See In re* Joseph B., 671 P.2d 852 (Cal. 1983).

23. Wyer v. Bd. of Envtl. Prot., 1999 Me. Super. LEXIS 135, 15, n.2 (1999).

24. *See* Bankers Sec. Life Ins. Soc. v. Kane, 689 F. Supp. 1164, 1172 (S.D. Fla. 1988).

iii. Ejusdem generis

Where specific words enumerate persons or things, general words following them are not to be construed in their widest sense but rather are limited to apply only to persons or things of the same class specifically mentioned.[25] The general words following the specific words shall be interpreted no more generally than the specific preceding words.[26] Thus ejusdem generis is a type of syntactic argument. In fact it closely resembles "expressio unius" but appears to refer to contracts rather than statutes.[27]

iv. Generalibus specialia derogant

Where two hierarchically rules of law conflict with each other, one using specific terms, and the other general terms, any conflict in interpretation resulting is resolved by determining that the special section is controlling. This is summarized in the maxim Generalibus specialia derogant (special provisions derogate from general ones).[28] Generalibus specialia derogant seems to be a variant of expressio unius. Similarly, where the special statute is enacted after the general statute, the applicable maxim of statutory interpretation is 'generalibus specialia derogant' (special things take from general).[29]

At an even broader level, "The general principle to be applied to the construction of acts of Parliament is that a general act is not to be construed to repeal a previous particular act, unless there is some express reference to the previous legislation on the subject, or unless there is a necessary inconsistency in the two acts standing together."[30] Because,

> [T]he legislature having had its attention directed to a special subject, and having observed all the circumstances of the case and provided for them, does not intent [sic], by a general enactment afterwards, to

25. General Roofing Company v. Borough of Belmar, 187 A.2d 16, 17 (N.J. Super. Ct. App. Div. 1962).

26. *See* U.S. v. LaBrecque, 419 F. Supp. 430, 434 (D.C. N.J. 1976).

27. *See id.*; Aleksich v. Indus. Accident Fund, 151 P.2d 1016, 1021 (Mont. 1944).

28. *See* Holloway v. Henderson, 82 So. 344, 345 (Ala. 1919); McFountain v. State, 83 So. 53 (Ala. 1919), and cases cited; Herring v. Griffin, 100 So. 202 (Ala. 1924).

29. *See* Bank of Montreal v. Signet Bank, 193 F.3d 818, 833 (4th Cir. 1999); Blue Mountain Serv. Corp. v. Zlateff , 769 P.2d 883 (Wash. Ct. App. 1989); Brown Paper Mill Co., Inc. v. Commr. of Internal Revenue, 255 F.2d 77, 79 (5th Cir. 1958).

30. *Ex Parte* Kan-Gi-Shun-Ca, 109 U.S. 556, 570 (1883) (quoting Thorpe v. Adams, L.R. 6 C.P. 135 (Bovill, C.J.)).

> derogate from its own act when it makes no special mention of its intention so to do.[31]

v. Lex posterior derogat legi priori lex posterior derogat anterior/lex posterior derogat priori

The maxim "lex posterior derogat priori" states that "between an earlier and a later law, the later prevails."[32] At first this may seem to be in conflict with the maxim "expressio unius." That is not in fact the case.

One argument against the authority of legal maxims is that they are contradictory.[33] However the author's research reveals otherwise. Several methods at first glance do seem redundant, but not contradictory. These include Ejusdem generis, Generalibus specialia derogant, Exceptio firmat regulam in casibus no exceptis, and Expressio unius est exclusio alterius, or inclusio unius est exclusio alterius. All appear to say the same thing: a posterior general statute must be contextualized by the prior specific statute such that the general instances in the second statute (or contract, in the case of ejusdem generis) may not be interpreted more generally than, or in conflict with, the prior statute absent express legislative intent. The maxim of lex posterior derogat priori might at first appear to be in conflict with the maxim expressio unius. But we must remember that just as we read statutes so that they are not in conflict with each other or with the constitution so must we also read maxims in that way. Lex posterior states that a later law will supplant an earlier law.[34] It expresses the general case. Thus a true example of "lex posterior" is the case where the prior law is simply abrogated completely. Expressio unius is then the special case where the prior law addresses the subject with specific terms and is followed by a later statute that expresses the subject in more general terms.[35] Further, this can be seen as a fair interpretation when we see that expressio unius only applies where no specific legislative intent can be found to overturn the earlier law.[36] Finally, these maxims all serve to implement the democratically elected legislature and operate according to predictable

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31. *Id*. at 570-71 (quoting Fitzgerald v. Champneys, 30 Law J. Ch. 782; 2 Johns. & H. 31-54).
32. Gouveia v. Vokes, 800 F. Supp. 241, 250-51 (E.D. Pa. 1992).
33. Engle, *Legal Interpretation*, *supra* note 7, at 13.
34. *Id.*
35. *Id.*
36. State v. Crawford, 39 185 P.3d 315, 317 (Kan. Ct. App. 2008).

rules of formal logic. Thus, though the maxims do not always have express hierarchies, such hierarchization can be derived.

vi. Actor Incombit Probari

This argument is merely the statement of the general principle that the moving party must bear the burden of proof.[37] Sometimes, however, that fact will decide the issue.

vii. Dura lex, sed lex

This maxim is positivist and formalist. It holds that that the law is the law and must apply regardless of its consequences because the function of the court is merely to adjudicate and not to make law.[38] This argument will not carry much weight in modern courts.[39]

2. Context and Structure

a. Syntactic Interpretation/Grammatical Interpretation

If the plain meaning interpretation does not resolve the statutory argument we must then look to the context and structure of the statute. Syntactic arguments parse each term of the statute carefully and the syntactic position of each within the sentence to resolve linguistic ambiguities.[40] For example, does "and" mean "both/and" or merely "either/or?" Does "or" mean "either *A* or *B*, but not both," or instead "either *A* or *B*, and possibly both?" In other words, must cruel and unusual punishments be both cruel and unusual to be unconstitutional or merely cruel or unusual? In syntactic interpretation, the position of the word within the sentence, punctuation, conjunctions, and any other syntactic clues are taken as evidence of the legislator's intent. [41] Syntactic interpretation must not reach an absurd result.[42]

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37. Engle, *Artificial Intelligence*, *supra* note 5, at 98.

38. *See In re* Cobos, 994 S.W.2d 313, 316 n.3 (Tex. App. 1999) ("The law is harsh, but it is the law.").

39. *See id.*

40. *See* L. Allen & M. Caldwell, *Modern Logic and Judicial Decision Making: A Sketch of One View*, LAW & CONTEMP. PROBS. 213, 226 (1963) (on syntactic argument).

41. Sears Roebuck & Co. v. Murphy, 511 N.E.2d 515, 517 (1987).

42. For example, where a counterfeiter argued that a word modified only the word immediately preceding it and not the entire group of words, the court held through syntactic argument that the criminal's exculpatory argument was no valid defence. United States. v. Stanley, 23 F.3d 1084, 1086 (6th Cir. 1994).

Grammatical arguments likewise parse the sentence structure looking for clues as to the legislative intent. Here however the focus is not on individual words and their positions in the sentence but rather on phrases, clauses, and parts of speech.[43] Objections to syntactic and grammatical interpretation are that they search for a non-existent and unrealistically precise legislative intent within a statute that was either badly drafted or even intentionally ambiguous. In the case where the ambiguity can be shown for political reasons to be intentional, the judicial function has every right to intervene to clarify the law. Again, if the context and/or structure of the statute resolve the conflict the interpretation is unambiguous and we need consider no other arguments. Syntactic arguments are a literalist form of legal reasoning.

b. Contextual Interpretation/Systematic Interpretation

Contextual interpretations, also known as systematic interpretation,[44] interpret the particular law as an expression of a general law and thus determine the law according to the superior hierarchical norm.[45] No new rule is inferred; rather the existing rule is expanded or contracted so that it is congruent with hierarchically superior norms.[46] In systematic interpretation, the

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43. J.R. Harris v. Commonwealth, 128 S.E. 578, 579 (Va. 1925).

44. [I]n German jurisprudence, contextual interpretation is called systematic interpretation. Under this approach, ambiguous words are eliminated by reference to other related provisions or concepts in which the same word or term appears. For example, if, in the abortion question, one has to determine whether the term "life" in the constitution comprises unborn human life, one can search for the meaning of "life" in other legal texts to discover what protection "life" has received on the constitutional level. The main goal of contextual interpretation usually is the furtherance of the consistency and coherence of all relevant legal norms, that is, legal certainty. If possible, legal terms or concepts should have consistent meanings in all the places where they are being used. At the very least, their meanings should not conflict!

Winfried Brugger, *Concretization of Law and Statutory Interpretation*, 11 TUL. EUR. & CIV. L.F. 207, 237 (1996).

45. "In systematic interpretation, one attempts to clarify the meaning of a legal provision by reading it in conjunction with other, related provisions of the same section, or title, of the legal text, or even other texts within or outside the given legal system; thus, this method relies upon the unity, or at least the consistency, of the legal world." Winfried Brugger, *Legal Interpretation, Schools of Jurisprudence, and Anthropology* 42 AM. J. COMP. L. 395, 396-97 (1994).

46. For an application of the principle of systematic interpretation see *Case Concerning Border and Transborder Actions (*Nicar. v. Hond.*)*, 1988 I.C.J. 69, 94 (Dec. 20, 1988); Advisory Opinion No. 13, *Competence of the International Labor Organization to Regulate, Incidentally, the Personal Work of the Employer*, 1926 P.C.I.J. (ser. B) No. 13, at 23 (cited in Karsten Nowrot, Emily

legal interpretation is determined not by reference to legislative intent but squarely within the legal text itself.[47]

Systematic interpretation of the law is exceptional in the common law because, for example, "courts are constitutionally limited to resolve only those issues brought before the bench, a comprehensive, systematic interpretation of the Loft Law is not to be expected."[48] It is however more often found internationally. Thus, for example, systematic interpretation of the U.N. charter interprets a rule "in the general structure and scheme of the Charter [of the United Nations]."[49] The legal rule is thus determined by comparing it with other rules established in the treaty or by referring to the entire structure of the treaty.[50] Again, these are forms of structural interpretation.

c. Synthetic interpretation

Synthetic interpretation synthesizes a new rule through ampliation of existing rules.[51] In synthetic interpretation rule one, two . . . to rule *n*, whether or not hierarchically equal, imply together a new rule, rule *n+1*. Rather than interpreting rule one in the light of rule two through *n*, hierarchical interpretation derives a new rule.[52] Thus synthetic interpretations "focus on the aims of the treaty and its institutional objectives."[53] This is still a form of structural interpretation, but the most open one and could be characterized for that reason as more realist than formalist. According to synthetic arguments, we should view the law in question as one thread in a larger tapestry; the individual law

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W. Schabacker, *The Use of Force to Restore Democracy: International Legal Implications of the Ecowas Intervention in Sierra Leone*, 14 AM. U. INT'L L. REV. 321, 341 (1998)).

47. [L]ogical-systematic [interpretation]... does not seek to discover the (purely subjective) intention of the legislator, but rather seeks the logical objective meaning of the statute, as an expression of the law. According to this second approach, legal texts have a meaning of their own, implicit in the signs of which they are composed, and independent of the actual or presumed will of their authors.

Eduardo Garcia Màynez, Introducción al estudio del derecho [Introduction to the Study of Law] (33d ed., 1982) *translated in* Robert S. Barker, 30 U. MIAMI INTER-AM. L. REV. 131, 141 (1998).

48. Franmar Infants Wear, Inc. v. Rios, 491 N.Y.S.2d 975, 998, (N.Y.City Civ.Ct., 1985).

49. *Certain Expenses of the U.N.*, 1962 I.C.J 6, 11.

50. "Under the systematic method of interpretation, the meaning of the norm is ascertained by comparison with other norms set forth in the treaty and by referencing the entire structure of the treaty." Nowrot and Karsten, *supra* note 46, at 341

51. Engle, *Legal Interpretation*, *supra* note 7, at 10.

52. Engle, *Artificial Intelligence*, *supra* note 5, at 64.

53. MICHAEL H. LANE, INTERNATIONAL TRADE CUSTOMS MODERNIZATION AND THE INTERNATIONAL TRADE SUPERHIGHWAY. 95-96 (1998).

cannot be interpreted in a vacuum. Rather we must consider the other laws flanking it in order to understand the meaning of this law within that context. Synthetic interpretation can open up the interpretations of laws that might otherwise be plain facially. For example, reading the Nineteenth Amendment's alteration of the Fourteenth Amendment so that their combined force is to ensure constitutional equality for women is an exercise in "synthetic interpretation" of the Constitution.[54] Namely, the interpreter synthesizes two or more legal texts into a whole, which in fact may be greater than the each part because those two parts work together synergistically.[55]

d. Concretization

Concretization is essentially a principle of administrative law interpretation according to which the judge takes a function of "filling gaps" to help realize the legislative scheme for the administrative agency.[56] Concretization views laws, particularly laws which determine administrative procedures, as foundational bricks and regards the decisions of administrative courts as being the mortar which fills in the open texture of the foundational laws.[57] Concretization is a form of structural argument. One judge states:

> I view the process of administrative rule-making that sharpens the line between acceptable and nonacceptable conduct as akin to what jurisprudence does in concretizing the norms of a statute by judicial decision-making that addresses itself to specific case scenarios. The term is derived from Hans Kelsen's *General Theory of Law and State* (citation omitted). Kelsen explained the concept of concretization in the following passage: 'From a dynamic standpoint, the individual norm created by the judicial decision is a stage in a process beginning with the establishment of the first constitution, continued by legislation and custom, and leading to the judicial decisions. The process is completed by the execution of the individual sanction. Statutes and customary laws are, so to speak, only semi-manufactured products which

54. *See* Bruce Ackerman, *Constitutional Politics/Constitutional Law*, 99 YALE L.J. 453, 459 (1989).

55. *See* Allen & Caldwell, *supra* note 40, at 226.

56. Engle, *Legal Interpretation*, *supra* note 7 at 13.

57. *Id.*

> are finished only through the judicial decision and its execution. The process through which law constantly creates itself anew goes from the general and abstract to the individual and concrete. It is a process of steadily increasing individualization and concretization.'[58]

e. Legal Completion (Rechtsergaenzung)/Legal Interpretation

This type of interpretation seeks to cure lacunes in the law by examining a phrase in the law with respect to that same phrase as elsewhere defined in the law.[59] It is a form of structural interpretation.

3. History (Historical/Genetic Interpretation)

If the text, context, or structure of the statute do not resolve the interpretive conflict we must then consider the statutory history to see the legislator's intent. Historical interpretation examines the legal history surrounding the creation of the statute in a search for legislative intent, an example of the will-theory of law.[60] The usual argument against historical interpretation is that the legislative intent is ambiguous or even non-existent, particularly when the case at bar is one of first impression and not within the imagination of the legislator at the time the legislation was enacted.[61] Here the interpretation starts to open up. The historical interpretation could be seen as a legal realist method or as more literalism depending on how serious the research into discerning the legislative intent, which may be unclear or conflicted, is taken. It is less easily generally formalized since the legislative history depends on each statute in question.

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58. Ethics Comm'n v. Keating, 958 P.2d 1250 (Okla. 1998)*; see also* Federal Trade Comm'n v. Ruberoid Co., 343 U.S. 470 (1952) ("The right or obligation results not merely from the abstract expression of the will of Congress in the statute, but from the Commission's completion and concretization of that will in its order."); State v. Martin*,* 532 P.2d 316, 323 (Alaska 1975) (holding that "absent judicial concretization, the ordinary citizen desiring to comply with the law would be forced to speculate" about the laws impact on him); *In re* Grayson-Robinson Stores, Inc.*,* 321 F.2d 500, 502 (2d Cir. 1963) (holding that concretization uses the specific facts of a particular situation to give appropriate meaning to judicial decisions); United States v. Articles of Drug Labeled Colchicine, 442 F. Supp. 1236, 1241 (S.D.N.Y. 1978).

59. Engle, *Legal Interpretation*, *supra* note 7, at 9.

60. "In historical analysis, the interpreter attempts to identify what the founders of a legal document wanted to regulate when they used certain words and sentences; here, both the specific and the general declarations of intent are of crucial importance." Brugger*, supra* note 45, at 397.

61. Engle, *Artificial Intelligence*, *supra* note 5, at 62.

4. Teleology "Realist" Methods of Interpretation that Favor Development of New Legal Rules

The following arguments can be considered "realist" as many of them, such as probabilistic reasoning, have only come to be accepted in the last century and further because they tend to "open up" the interpretation to allow application to new cases or even to create new rules altogether.[62] As such they are more difficult to model algorithmically, but nonetheless are tractable.

a. Probabalistic Reasoning

The classical problem in torts of probabilistic reasoning occurs when we have several potential tortfeasors and a definite victim of an instrumentality common to all tortfeasors. For example, consider three manufacturers of a carcinogenic product, and it is unknown which of the three produced the defective product in the case at bar.[63] The idea is to argue that each potential tortfeasor should be held proportionally liable according to market share, even though causation cannot be proven, to avoid the absurd result of non-liability that would otherwise occur. This is sometimes referred to as "market share liability."[64] Probabilistic arguments are also made in cases of multiple causation or mutual causation, for example, in comparative negligence regimes, where the plaintiff and defendant both partially contributed to the resulting accident. Probabilistic reasoning looks at stochastic processes in order to determine what is most likely to have happened.[65] For example, if a plaintiff has 90% of the market share of a product, say asbestos.[66] The defendant suffers from injuries resulting from exposure to asbestos. A probabilistic argument would hold that, if the actual source of the asbestos could not be proven, due, say, to multiple exposure to various potential sources over several years, then the defendant should be held liable in proportion to the likelihood that their product caused the injury. Supposing that there was an 80% likelihood that the injury was in fact caused by asbestos. Then the defendant would, using probabilistic reasoning, be liable for 72% of the damages to plaintiff (90% of 80%).

62. Engle,, *Legal Interpretation, supra* note 7, at 18.
63. *See, e.g.*, Sindell v. Abbot Laboratories, 607 P.2d 924 (Cal. 1980).
64. Abad v. Bayer Corporation, 563 F.3d 663, 670 (7th Cir. 2009).
65. *In re* TMI Litigation 193 F.3d 613, 640 (3d Cir. 1999).
66. *See, e.g.*, *Sindell*, 607 P.2d at fn. 28.

Thus the strength of the argument is proportionate to its probability.[67] A probabilistic proof need not, as illustrated above, be 100% certain. "Proof of a material fact by inference from circumstantial evidence need not be so conclusive as to exclude every other hypothesis. It is sufficient if the evidence produces in the mind of the trier a reasonable belief in the probability of the existence of the material fact."[68] Inferences are determined as valid or not depending on whether the inference is "so unreasonable as to be unjustifiable."[69] That is, an inference may be merely supported by the evidence and does not need to be compelled by the evidence as the only possibility.[70] Juries are permitted to "chain" several inferences into a series of inferences leading to a conclusion which would not be supportable if the inferential chain's elements were viewed separately.[71] A jury is free to make inculpatory as well as exculpatory inferences.[72] This method could be seen as formalist because the market shares are determinate *or* as realist since it is not a clear bright line test that will lead to a certain foreseeable result.

b. Comparative Argument

The essence of comparative argumentation is that the courts of this jurisdiction should be willing to compare the decisions of other jurisdictions in making their determinations as to what the law is or should be.[73] For example, in *Geddes Lawrence v. Texas*, the U.S. Supreme court considered decisions of the European Court of Human Rights in reaching the decision that criminalization of homosexual acts was unconstitutional.[74] The Supreme Court also used comparative method in *Eastern Airlines, Inc. v. Floyd* to determine the interpretation of the French words "lésion corporelle" in a treaty to which the U.S. was a signatory and in which French was the official language.[75] Similarly the Pinochet cases in Britain cited extensively to U.S. decisions as

67. Goldhirsh Group, Inc. v. Alpert, 107 F.3d 105, 108 (2d Cir. 1997).

68. State v. Copas, 746 A.2d 761, 782 (Conn. 2000) (citing Service Road Corp. v. Quinn, 698 A.2d 258 (Conn. 1997)); *accord* Pierce v. Albanese, 129 A.2d 606 (Conn. 1957).

69. State v. Ford, 646 A.2d 147 (Conn. 1994).

70. *Copas*, 746 A.2d at 782.

71. State v. Crafts, 627 A.2d 877, 882 (Conn. 1993).

72. *See* State v. Stanley, 613 A.2d 788, 792 (Conn. 1992).

73. Engle, *Artificial Intelligence*, *supra* note 5, at 75.

74. 539 U.S. 558, 560, 573 (2003).

75. 499 U.S. 530, 536-547 (1991), *see also* Eric Engle, *European Law in American Courts: Foreign Law as Evidence of Domestic Law*, 33 OHIO N.U. L. REV. 99, 104 (2007), *available at* http://www.law.harvard.edu/students/orgs/hela/Europa/Foreign.htm.

persuasive evidence of British law as to immunity, comity and other common law doctrines relevant to international law.[76] It can be characterized as a realist method because it opens the scope of interpretation to judicial discretion.

c. Teleological Argument (also called logical interpretation)

Once text, context, structure, and history are exhausted interpretation looks to the ends, or goals, of the law. Teleology, also known as final causality,[77] is the idea of Aristotle that objects contain within themselves the blueprints of their own ultimate development. For examples, the teleology of an acorn is a mighty oak; the teleology of a boy is a man. Legal teleology argues that law serves intermediate ends as means to the ultimate end of justice,[78] whether distributive, also known as "geometric" or "social" justice,[79] or commutative, also known as "arithmetic" or "transactional" justice.[80] A teleological argument of criminal law would hold that the purpose of a criminal law is not merely to deter and punish but also to correct so that the criminal reaches their full human potential. Teleological arguments have appeared, for example, in areas of law as diverse as equal protection jurisprudence and banking law.[81] Teleological argument can trump literal arguments.[82] Teleological argument could be considered realist in that it leaves a large scope to judicial discretion.

d. Multi-Factor Interest Balancing Tests

One of the preferred methods of legal realist jurisprudence is multi-factor interest balancing tests.[83] In such tests the court weighs the interests of all relevant parties, not necessarily merely the interests of the

76. *See* Eric Engle, *Alien Torts in Europe? Human Rights and Tort in European Law*, ZERP Discussion Paper, DP 1/2005, *available at* http://works.bepress.com/eric_engle/23.

77. Book Review, *John Courtney Murray And The American Civil Conversation* 10 J.L. & RELIGION 589, 594 (1993/1994).

78. U.S. v. General Dynamics Corp., 644 F. Supp. 1497, 1500 (C.D. Cal. 1986).

79. *See* Aristotle, NICOMACHEAN ETHICS, Book V. (c. 350 B.C.).

80. *Id.*

81. Kite v. Marshall, 661 F.2d 1027, 1030 (5th Cir. 1981).

82. Fidelity Sav. and Loan Ass'n v. Federal Home Loan Bank, 689 F.2d 803, 813 (9th Cir. 1982).

83. *See* James G. Wilson, *Surveying the Forms of Doctrine on the Bright Line-Balancing Test Continuum*, 27 ARIZ. ST. L.J. 773, 773 (1995); T. Alexander Aleinikoff, *Constitutional Law in the Age of Balancing*, 96 YALE L.J. 943, 945 (1987).

plaintiff and defendant.[84] The court then determines the relevant weight of these various interests and then determines which group of interests is predominant and uses this preponderation to determine whether and how the law applies.[85] Multi-factor interest balancing tests, however, can be easily manipulated and thus suffer from the same critiques made by realists of the methods of formalism! The ambiguity in weighting factors can be rendered objective by use of economic arguments. This partly explains the rise of law and economics in U.S. jurisprudence.

e. Economic and Policy Arguments

i. Economic Argument

Economic arguments are extremely popular in the United States "[T]he common law is best explained as if the judges were trying to maximize economic welfare . . . . Common law adjudication brings the economic system closer to the results that would be produced by effective competition–a free market operating without significant externality, monopoly, or information problems."[86] One can criticize law and economics as suffering from reductionism, for it reduces complex transactions to one fungible standard, money. Of course in fact not all transactions are fungible. Not all values are quantifiable, nor is there a market for all possible transactions. Thus, the reductionist position of economic arguments can lead to theoretical absurdities.[87] Naturally, there is a place for qualified economic arguments, namely where those arguments are contextualized by other values that are not transferable or quantifiable. However the singular success of economic arguments in the United States has led to a commodification of law which ignores non-market values causing injustice and was probably in no small part the result of the collapse of the idea of objective morality due to competing versions of morality posited by realists and formalists undermined simultaneously by moral relativists claiming to be following the ideas of Hume and Nietzsche.[88]

84. *See, e.g.* Rhode v. Adams, 957 P.2d 1124, 1127 (Mont. 1998).

85. Engle, *Artificial Intelligence*, *supra* note 5, at 76.

86. RICHARD POSNER, THE ECONOMICS OF JUSTICE, p. 4-5 (1981).

87. Engle, *Artificial Intelligence*, *supra* note 5, at 78.

88. *See, e.g.*, FRIEDRICH NIETZSCHE, ANTICHRIST; BEYOND GOOD AND EVIL. *See* DAVID HUME, A TREATISE OF HUMAN NATURE, Book III, Part I, § 1.

ii. Policy Arguments

Arguments from policy are a sort of teleological argument and can be seen as realist in that they open argument to judicial discretion. Policy arguments look at the goals served by the laws in order to interpret the meaning of the law.[89] However, if policy arguments are to avoid question begging then we need to determine what the exact policy or policies are that justify the interpretation. Legal certainty, judicial economy, conservation of scarce resources, preservation of a free market, and the encouragement of the production of wealth are all examples of broad ranging policies used to guide interpretation of law.

B. Argumentation: Methods which constrain Interpretation

Realist and interpretivist methods tend to open up interpretation to allow creative lawyering and judging; formalist and originalist arguments reduce the possible range of applications of a legal rule. Rightly or not, just as realism is seen as left wing, formalism is seen as conservative.

1. Deductive Argument (Syllogism)

Deductive Argument reasons from general principles to specific instances.[90] For example, the statute provides a general rule and the specific facts of the case are argued as fitting the rule. In common law courts that is about the extent of deductive argument, and indeed, courts sometimes make errors in logic.[91] However, in civil law courts deductive reasoning plays the principle role. In civil law courts it is possible to argue deductively from generally recognized principles of law to determine outcomes in specific cases.

2. Bright Line Tests

Bright line tests are merely "either-or" binary tests of a sort "either guilty or innocent" dependent on fixed objective indicia.[92] To a realist, they are the perfect example of elevating form over substance. To

89. Engle, *Artificial Intelligence*, *supra* note 5, at 78.

90. People v. Martinez, 51 P.3d 1046, 1050 (Colo. App. 2001).

91. For an example of clearly erroneous misapplication of the U.S. federal appeals court see, *Miller v. Champion Enterprises Inc.*, 346 F.3d 660, 679 (6th Cir. 2003). The court in *Helwig v. Vencor*, 251 F.3d 540, 554-55 (6th Cir. 2000) makes the exact same error!

92. Engle, *Legal Interpretation*, *supra* note 7, at 15.

the formalist, they are the bulwark of the rule of law, for law must be foreseeable to be valid both in the sense of its own legitimacy and in the sense of an effective admonition to potential law-breakers prior to the fact. All of the rules of statutory construction described above can be considered to be "bright line tests."

3. Analogical Argument

Arguments by analogy hold that the decision in case A should apply to case B because cases A and B have several facts in common and the points which they do not have in common are essentially irrelevant to the applicability of the decision. The argument of analogy is that likes should be treated alike. However:

Logicians teach that one must always appraise an analogical argument very carefully. Several criteria may be used: (1) the acceptability of the analogy will vary proportionally with the number of circumstances that have been analyzed; (2) the acceptability will depend upon the number of positive resemblances (similarities) and negative resemblances (dissimilarities); or (3) the acceptability will be influenced by the relevance of the purported analogies.

For Appellants to draw a proper analogy, they had the burden in the district court, as they do here, of showing that the similarities in the facts of the two cases outweigh the differences.[93]

4. Reductio ad absurdam Proof

Reductio arguments are elegant and powerful in simplicity but in the author's opinion, and that of some courts, are somewhat risky as they depend on the truth of all presumptions in the argument.[94] Essentially, an argument by reductio presumes the opposite of what is to be proven, and shows that that presumption leads to a logical impossibility, in

93. *See In Re* Linerboard Antitrust Litigation, 305 F.3d 145, 157 (3d. Cir. 2002) (citing Irving M. Copi & Keith Burgess-Jackson, *Informal Logic* 166 (3d ed. 1996)); *see* Arthur L. Goodheart, *Determining the Ratio Decidendi of a Case*, 40 YALE L.J. 161, 179 (1930); JOHN H. WIGMORE, WIGMORE'S CODE OF THE RULES OF EVIDENCE IN TRIALS AT LAW 118 (3d ed. 1942); JOHN STUART MILL, A SYSTEM OF LOGIC RATIOCINATIVE AND INDUCTIVE 332-33 (8th ed. 1916) ("Two things resemble each other in one or more respects; a certain proposition is true of one; therefore it is true of the other.").

94. "*Reductio ad absurdum* arguments frequently are untrustworthy, and this one should be examined with care." Cf. J. Parreco & Son, 567 A.2d 46 (D.C. 1989) (warning against judicial overeagerness to invoke the "absurd result" doctrine as a guide to construction)." Richardson v. Nationwide Mutual Ins. Co., 826 A.2d 310, 352 (D.C. 2003) (dissent).

theoretical terms, or to an absurdity, in practical terms.[95] Vulgar forms of this argument can be criticized as conclusory, merely asserting that the position of the opponent ludicrous. However, well-formed reductios grant the opponent's major premise but show that that premise entails a conclusion that is either logically impossible or practically ridiculous. That is the risk of the reductio: one grants an opponent's premise, an undesirable move generally, but here as a gambit. If the gambit succeeds the argument is won. If it fails, it will likely be lost, although arguing in the alternative may save the day.

5. Inductive Argument

Arguments by induction, the principal engine of common law reasoning, are similar to arguments by analogy.[96] Inductive logic, reasoning from particular instances to general rules, is the opposite of deductive logic, which is reasoning from general rules to particular cases.[97] Both are admissible forms of reasoning in the common law, though deduction generally corresponds to statutory law and induction to case law.[98]

In an inductive ampliation we infer a general rule to govern a series of similar cases from the fact that that series of cases had both a similar rule and similar facts.[99] Sometimes the common law is presented as being ampliative. Inductive ampliation and reasoning by analogy are similar but not the same. In ampliation we infer a new rule from an existing set of cases and rules. In reasoning by analogy we apply the rule in one case to determine the rule in another case due to their factual similarity.[100] No new rule is inferred in the case of reasoning by analogy, unlike inductive ampliation.

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95. Engle, *Artificial Intelligence*, *supra* note 5, at 72.

96. The engine of the common law is inductive reasoning. It proceeds from the particular to the general. It is an experimental method which builds its rules in tiny increments, case-by-case. It is cautious advance always a step at a time. The essence of its method is the continual testing and retesting of its principles in "those great laboratories of the law, the courts of justice" (Smith, Jurisprudence, p. 21).

Hearst Corp. v. Clyne, 409 N.E.2d 876 (N.Y. 1980).

97. Dunn v. State, 454 So.2d 641, 646 n.5 (Fla. Dist. Ct. App. 1984).

98. "[E]vidence can be either direct or circumstantial; that we can establish truth via inductive reasoning, as well as by deductive reasoning." Wilson v. Piccadilly Cafeterias, Inc. 739 So. 2d 802, 802, (La. Ct. App. 1998) (Fitzsimmons, concurring opinion).

99. Engle, *Artificial Intelligence*, *supra* note 5, at 73.

100. *See* United States v. Tapia, 309 F.3d 1283 (10th Cir. 2002); *In Re* Linerboard Antitrust Litigation, 305 F.3d 145, 158 (3d. Cir. 2002).

III. THE COMPUTER PROGRAM

The rules exposed above are used as a rule base for a computer program to model legal decision-making that accompanies this article. The computer program serves as a sort of legal compendium, a checklist if you will, not of various forms to be made out but rather of arguments that could be made. The computer program applies algorithms that determine the strength of the argument to be computed. The strength of the argument can either be predetermined by the user or by comparing the facts of the case to the conditional that triggers the rule. If the conditional that the rule expresses is satisfied then the method will be applicable and will determine the likely outcome of the case. The program limits itself to the practical legal question whether a legal method would or would not apply. The program only implicitly considers the theoretical debates discussed in the paper as part of the structure of the source code of the program. To do otherwise would make the program open-ended, and thus less determinate and of questionable use in practice. Further, such considerations would require a great deal of effort for little tangible reward in terms of scientific explanations and predictions of the law. Finally, that would take an already somewhat ambitious program and threaten it with greater complexity, larger file size, and would essentially bring it outside the range of a law review article.

IV. CONCLUSIONS

This survey shows that economic thought pervades Anglo-American legal discourse. It also shows that the law is fundamentally conservative: not merely through burdens of proof weighing against moving parties, but also in the economic evaluation of the weight to be affected to different variables used to represent particular legal methods. Seeing the extent and limits of modeling law by computer reveals the extent of objectivity in the law.

Individual legal methods can be readily formalized, while the choice of which legal methods to apply are less so. Thus, that aspect of legal interpretation was not modeled. Interpretive rules are decidable, self-consistent, hierarchically structured, and at times defy the formalist/realist dichotomy. Formalist rules are easiest to model computationally, because the results are most predictable; the lament of "mechanical jurisprudence." However, realist rules can also be modeled, and modeling them reveals the enthymematic presumptions of

realism. We see clearly the problem of multi-factor interest analysis when we ask ourselves exactly which factors are chosen and then what weights are to be given to the varying interests. Courts generally "duck" the question of exactly how they weight the interests. When pressed, they tend to rely on economic evaluation as an objective metric for weighting of interests. Economic theories, due to quantification, lend themselves well to computational modeling, however teleological ones do not since goals are abstract. Modeling policy considerations is only possible very generally and abstractly and does not lead to an algorithm that generates a certain definite outcome across a broad class of cases. Nevertheless, the self-consistent hierarchical nature of interpretation enables the elaboration of the clearest and simplest rules. First, black letter "plain meaning" arguments, then grammatical and structural arguments, followed by historical arguments seeking legislative intent and finally, at the most abstract level, teleological/policy arguments.[101] The formalist/realist dichotomy then emerges as a spectrum with the initial arguments as most formal, and the final arguments as most realist; though the study shows the dichotomy is not always apt, it also reveals the spectral character of that dichotomy.

101. "Savigny distinguished, in modern parlance, textual, verbal or grammatical interpretation, systematic, structural or contextual interpretation, and historical interpretation." Brugger, *supra* note 45, at 396-97.