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## Axiomatic Method and the Law

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## Axiomatic Method and the Law<sup>1</sup>

*Abstract: Whether an axiomatic approach to law is possible and useful today has to be perceived as unanswered. Perception of the axiomatic method among lawyers, however, is clouded by misunderstanding. Clarifying them may generate new discussion about the axiomatization of legal theories.*

*Keywords: axiom, axiomatic method, law, legal theory, David Hilbert, Jürgen Rödig, Eike v. Savigny*

### I. Overview

My following remarks concern the question: Should we reopen the debate on the axiomatic method in the field of law?

More than any other, the mathematician *David Hilbert* propagated the modern axiomatic method.<sup>2</sup> A paper Hilbert published in 1918 provides a concise overview of this method:<sup>3</sup>

“When collecting the facts of a [...] field of knowledge we soon recognize that we can bring them into order. We do this with [...] the help of a *framework of terms* such that each object [...] corresponds to a term [...] and each fact [...] corresponds to a logical relation between terms. The framework of terms is nothing but the *theory* of this field of knowledge.”<sup>4</sup> “Taking a closer look at a [...] theory, we find [...] that the framework [...] is based upon some distinguished propositions of the field of knowledge that suffice to develop the whole framework by means of logical principles.”<sup>5</sup> “We can

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<sup>1</sup> A German version of this paper was presented at the IVR World Congress in Frankfurt am Main, Working Group 1 (Logics, Epistemology, Philosophy of Science, Legal Informatics), Session 2a, August 19<sup>th</sup> 2011. I would like to thank the participants in the discussion for their valuable remarks and Prof. Dr. Sharon Byrd for her help in preparing the English version.

<sup>2</sup> Concerning his predecessors see esp. H. C. Kennedy, *The Origins of Modern Axiomatics*, *The American Mathematical Monthly*, vol. 79 (1972), 133 ff. and Christian Thiel, entry „Axiomensystem, Peanosches“, in: *Historisches Wörterbuch der Philosophie* (=HWP), ed. by J. Ritter, vol. 1, Darmstadt 1971, 751, both with further references. Hilberts probably most influential show case for this method was his book *Grundlagen der Geometrie* (1<sup>st</sup> ed. Leipzig 1899).

<sup>3</sup> David Hilbert, *Axiomatisches Denken*, *Mathematische Annalen* 78 (1918), 405 ff.

<sup>4</sup> „Wenn wir die Tatsachen eines [...] Wissensgebiets zusammenstellen, so bemerken wir bald, daß diese Tatsachen einer Ordnung fähig sind. Diese Ordnung erfolgt [...] mit Hilfe eines gewissen *Fachwerks von Begriffen* in der Weise, daß dem einzelnen Gegenstände [...] ein Begriff [...] und jeder Tatsache [...] eine logische Beziehung zwischen den Begriffen entspricht. Das Fachwerk der Begriffe ist nichts Anderes als die *Theorie* des Wissensgebietes.“ (l.c. p. 405; italics in the original)

<sup>5</sup> „Wenn wir eine [...] Theorie näher betrachten, so erkennen wir [...], daß der Konstruktion des Fachwerks [...] einige wenige ausgezeichnete Sätze des Wissensgebiets zugrunde liegen und diese dann allein ausreichen, um aus ihnen nach logischen Prinzipien das ganze Fachwerk aufzubauen.“ (l.c. p. 406)

view these basic propositions [...] as the *axioms of the individual fields of knowledge*.”<sup>6</sup> “Everything that can be an object of academic thought passes to the axiomatic method, when it is mature enough to develop a theory.”<sup>7</sup>

The axiomatic method soon became the dominant methodological standard in the field of mathematics and proved useful in theories of physics, e.g. in Albert Einstein's general theory of relativity of 1916.<sup>8</sup> No later than when John von Neumann und Oskar Morgenstern published their axiomatization of game theory in 1944 did it reach economics.<sup>9</sup> In many other sciences and humanities it had varying, but sometimes remarkable success.<sup>10</sup>

The debate about the axiomatic method among German lawyers experienced its heyday in the 1970s. It then ebbed without result.

## II. The German debate in the 1970s

Among the proponents of the axiomatic method were Ulrich Klug, Jürgen Rüdig, Elmar Bund, Eike von Savigny and Ilmar Tammelo.<sup>11</sup> Among its sceptics were Karl Engisch, Claus-

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<sup>6</sup> „Diese grundlegenden Sätze können [...] als die *Axiome der einzelnen Wissensgebiete* angesehen werden.“ (l.c. p. 406; italics in the original)

<sup>7</sup> „Alles, was Gegenstand des wissenschaftlichen Denkens überhaupt sein kann, verfällt, sobald es zur Bildung einer Theorie reif ist, der Axiomatischen Methode [...]“ (l.c. p. 415)

<sup>8</sup> See Albert Einstein, Die Grundlage der allgemeinen Relativitätstheorie, *Annalen der Physik*, 4<sup>th</sup> series vol. 49 [1916], 769 ff.

<sup>9</sup> John v. Neumann/ Oskar Morgenstern, *Theory of Games and Economic Behavior*, 3<sup>rd</sup> ed., New York 1953

<sup>10</sup> Note e.g. Karl Bühler, Die Axiomatik der Sprachwissenschaften, *Kant Studien* vol. 38 [1933], 19, 22; idem, *Die Axiomatik der Sprachwissenschaften*, 2<sup>nd</sup> ed., Frankfurt a.M. 1976; Carl Friedrich Graumann/ Theo Herrmann (ed.), *Karl Bühlers Axiomatik*, Frankfurt a.M. 1984 and Eberhard Rogge, *Axiomatik alles möglichen Philosophierens*, Meisenheim/Glan 1950. Impact and perspectives of the modern axiomatic method as propagated by Hilbert were discussed at the conference “Perspektiven axiomatischen Denkens” organized by Peter Bernhard and Damir Smiljanić at Erlangen 10.-11. 2. 2009.

<sup>11</sup> Esp. Ulrich Klug, *Juristische Logik*, 4<sup>th</sup> ed., Berlin et al. 1982, § 3 2.c) (pp. 16 f.), § 17 2. and 3. (pp. 192 ff.), § 18 (pp. 196 ff.); (also concerning Klug:) Karl Engisch, Aufgaben einer Logik und Methodik des juristischen Denkens, *Studium Generale* vol. 12. (1959), 76, 86; Jürgen Rüdig, Axiomatisierbarkeit juristischer Systeme, in: *Münchener Ringvorlesung EDV und Recht*, ed. by A. Kaufmann, Berlin 1973, 49 ff., reprint in: J. Rüdig, *Schriften zur juristischen Logik* (ed. by E. Bund/ B. Schmiedel/ G. Thieler-Mevissen), Berlin et al. 1980, 65 ff. (also in DVR 1972, 170 ff.); idem, Logische Untersuchungen zur Makrostruktur rechtlicher Kodifikate, in: *Studien zu einer Theorie der Gesetzgebung*, ed. by J. Rüdig, Berlin et al. 1976, 592 ff.; idem, *Einführung in eine analytische Rechtslehre*, Berlin et al. 1986, 3.1 (p. 89); Elmar Bund, Die Verteilung des Versteigerungserlöses bei relativem Vorrang axiomatisch begründet, in: *Gesetzgebungstheorie, Juristische Logik, Zivil- und Prozessrecht – Gedächtnisschrift für Jürgen Rüdig*, ed. by U. Klug/ Th. Ramm/ F. Ritter/ B. Schmiedel, Berlin et al. 1978 [=GS Rüdig 1978], 211 ff.; idem, *Juristische Logik und Argumentation*, Freiburg 1983, § 9 IV. (p. 104), § 16 (pp. 157 ff.); Eike v. Savigny, Zur Rolle der deduktiv-axiomatischen Methode in der Rechtswissenschaft, in: *Rechtstheorie* [the book, not the journal], ed. by G. Jahr/ W. Maihofer, Frankfurt a.M. 1971, 315 ff.; idem, Topik und Axiomatik: eine verfehlt Alternative, *ARSP* 59 (1973), 249 ff.; Ilmar Tammelo, Möglichkeiten und Perspektiven des formalen Rechtsdenkens, in: *GS Rüdig 1978* (see above), 191 ff.; idem, *Modern Logic in the Service of Law*, Wien et al. 1978, Part I I.1., pp. 10 f.

Wilhelm Canaris, Karl Larenz and Theodor Viehweg.<sup>12</sup> Their debate revolved around whether an axiomatic approach to law was possible and useful.

To a remarkable extent the two opponents wrote at cross-purposes. The supporters' main thrust was that the axiomatic method in the sense of Hilbert (and Ackermann)<sup>13</sup> can be used in every science and humanity and therefore also in the area of law. The main argument of their opponents was that legal questions cannot be solved *more geometrico* in the sense of Aristotle and Euclid.<sup>14</sup>

Promoters and detractors basically referred to different notions of an axiom, namely promoters to Hilbert's (and Ackermann's), detractors to Aristotle's and Euclid's. The latter notion presupposes generally accepted, eternal truth. Natural law doctrine and "Begriffsjurisprudenz" (which was a conceptual approach to legal interpretation<sup>15</sup>) were oriented toward this notion of an axiom. The detractors' criticism of the axiomatic method oftentimes was predicated upon fear that natural law doctrine and "Begriffsjurisprudenz" would experience a revival. Modern axiomatics, however, refers to axioms in the sense of Hilbert and Ackermann. They are more or less arbitrary and exchangeable assumptions. They have nothing to do with natural law doctrine or "Begriffsjurisprudenz".<sup>16</sup> No party in the debate claimed that axioms in the Aristotle and Euclid sense exist in legal doctrine, and no party refuted axioms in the Hilbert and Ackermann sense in the law.

Similar problems surrounded the discussion regarding utility: The proponents stressed that it is useful to report existent knowledge according to its logical structure and verify its consistency. The opponents did not dispute this point, but argued that many important legal questions cannot be resolved in this way. However, nobody insisted that the axiomatic method should become the only method to deal with the law. Axioms of a theory can never be motivated by applying the axiomatic method to these very axioms; the whole point of axioms is that they cannot be deduced from within the very theory that is based on them. Yet also for

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<sup>12</sup> Karl Engisch, *Wahrheit und Richtigkeit im juristischen Denken*, München 1963, 18; idem, Sinn und Tragweite juristischer Systematik, *Studium Generale* vol. 10 (1957), 176 f.; Claus-Wilhelm Canaris, *Systemdenken und Systembegriff in der Jurisprudenz*, 2<sup>nd</sup> ed., Berlin 1983, 21 ff., 27 ff.; Karl Larenz, *Methodenlehre der Rechtswissenschaft*, 6<sup>th</sup> ed., Berlin et al. 1991, I. Teil 5. Kap. 7. (p. 166); Theodor Viehweg, *Topik und Jurisprudenz*, München 1953, § 7 III f. (p. 58 ff.).

<sup>13</sup> David Hilbert/ Wilhelm Ackermann, *Grundzüge der theoretischen Logik*, 6<sup>th</sup> ed., Berlin et al. 1972, § 8, p. 22 (1<sup>st</sup> ed. 1928).

<sup>14</sup> See e.g. Aristotele, *Analytica posteriora* I, 2 (72a17 in: Aristotelis Opera, ed. by Bekker, vol. 1, Berlin [Berolini] 1831); idem, *Topica* VIII (159a3 ff. in the Bekker-ed., printed as p. 155 due to false pagination); Euclid, *The Elements* (στοιχεῖον), about 300 b.c. (Die Elemente, ed. & transl. by C. Thaer, Ostwalds Klassiker vol. 235, 236, 240, 241 u. 243, Leipzig 1933-1937, reprint Frankfurt a.M. 1997) passim; see also L. Oeing-Hanhoff, entry „Axiom, II. Geschichte“, in: *HWP* (Fn. 2), 741 ff.

<sup>15</sup> For more details and a critical discussion of this pejorative denomination see Jan Schröder, entry „Begriffsjurisprudenz“, in: *Handwörterbuch zur deutschen Rechtsgeschichte*, 2<sup>nd</sup> ed., vol. I, Berlin 2008, col. 500-502.

<sup>16</sup> Cf. Elmar Bund, *Juristische Logik und Argumentation*, Freiburg 1983, § 9 IV. (p. 104).

an axiomatized theory of an area of law – that is an axiomatized legal theory – the motivation of its axioms would still be the main topic of legal dogma.

I do not want to claim that no real controversies arose. Yet the analysis reveals that the core positions were in no real conflict.

As a result, the debate treated the basic question – whether the axiomatic method, which had been very successful in other sciences and humanities, should be applied in the field of law – at most superficially. *Eike von Savigny* and others alluded to that superficiality in the 1970s.<sup>17</sup> Most discussants, however, seem to have been more interested in their own positions than in discussing a common question. The discussion waned without having made any real progress. Today lawyers ignore axiomatics; logicians of the law at most silently regret that and work on other problems.

### **III. Should we care?**

Every vendor has to put up with lack of demand for his or her products. Lawyers are not obliged to make logicians happy. Nonetheless we need to consider a problem here that is common to all sciences:

Time and again the methods of one science have been adapted and successfully applied to others. This is why we have specialists for questions of method – esp. logicians. They develop prototypes of methods independent from subject sciences. Only experience in applying a method to real cases, however, can tell whether the method is useful – that is effective and efficient. Generally scientists are uninterested in importing new methods because they already have their own methods and prefer to adhere to the proven and tested. Hence progress in terms of method is mainly left to fate. Fellow scientists will usually not hinder someone who happens to be an expert in two sciences from transferring a method from one to the other in a personal showing of strength, but apart from that scientists can be quite hostile against progress in terms of method.

To assess whether that is good or not, let us consider the four possible basic cases: 1. A method is tested and proven useful. That is fine. 2. A method is not tested and would not have proven useful. That is fine as well. 3. A method is tested and does not prove useful. That is a pity, because effort was spent without benefit. 4. A method is not tested but would have proven useful. That also is a pity, because science misses out on the benefits of the method.

The common approach avoids detriments of the first kind (case 3) but accepts detriments of the second kind (case 4) practically without limitation. That is inefficient. Still to limit both

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<sup>17</sup> L.c. Fn. 11.

kinds of detriments, one must accept some risk of incurring each of them. To require a proven and tested method – that is positive experience in applying this very method – before even considering giving it a try, prevents progress in terms of method from occurring. On the other hand, nobody can spend unlimited effort on testing methods that might just flop. As a general rule it will be most advantageous to decide incrementally basing each decision on indicators: first evaluate whether a new method should be published, then whether it should be tested in small projects and later decide whether to conduct larger test projects. Broad application or ultimate rejection can then be based on meaningful test results, while a preliminary rejection remains possible when (and as long as) there is not sufficient indication that the method would prove beneficial.

#### **IV. Common misunderstandings**

I regard the success of the axiomatic method in a number of different sciences and humanities that have much in common with legal scholarship as sufficient reason at least to clarify some common misunderstandings about this method among lawyers:

**1. Aims and Utility:** The axiomatic method orders existent knowledge according to its logical structure and detects contradictions, ambiguities and gaps in rationale. It does not generate new knowledge, but provides indications of where to delve deeper. The axiomatic method is useful because logical structure clearly arranges knowledge without relinquishing completeness. This form of clarity is quite different from one created by selecting some issues to consider and neglecting others (which has its own costs and benefits).

**2. Interpretation and Analogy:** Consistency is the prime characteristic of an axiomatic system. Axioms should also be complete and independent, but lawyers tend to misunderstand these features. Independency merely avoids redundancy. An axiomatic system is complete once all intended propositions can be derived from it. Completeness does not mean that the theory answers all legal questions; it does not forbid interpretation and analogy. When a lawyer applies an axiomatized theory to a case and finds it does not solve the case, he or she is free to extend the theory by means of adding ad hoc premises (limited perhaps by rules that designate the relevant sources of law but not by the rules of the axiomatic method). Thus the axiomatic method can be appropriate for both civil law systems and common law systems.

**3. Convertibility of Axioms and the Sources of Law:** Axioms can be changed leading to new theories based on these new axioms. Modern axioms need not contain guaranteed truths and are in no way absolute; therefore modern axiomatics is principally different from – but still consistent with – natural law doctrine and “Begriffsjurisprudenz”. Guaranteed truths (or binding law), on the other hand, need not be expressed as axioms. Statutory law, binding precedents and other sources of law generally are not, without more, a suitable basis for a consistent legal system. It is rather the function of a proper legal theory to develop the content of the relevant sources of law, thus clarifying them and delineating their scope.

**4. Limited Field of Application:** The axiomatic method does not account for the axioms of a theory but rather presupposes them. Axioms need to be motivated, but the axiomatic method cannot be applied to do so.<sup>18</sup> Therefore the axiomatic method neither poses a threat nor attempts to dominate legal reasoning.

**5. Formalisms:** Axiomatized theories need not be presented in a formula code. Whether axiomatizing a theory or formalizing it is worthwhile, are two different questions. Both can be true at the same time, but need not be.

**6. Value of Preliminary Efforts:** It is certainly impossible to axiomatize an entire legal system in the short term. Moreover, nobody can know today whether that would be at all beneficial. Yet certain preliminary efforts are useful at any rate. This is especially true for disclosing one's own premises and clarifying one's terms. Today it is quite common in legal argumentation to engross other positions. Engrossment works by coating both one's own and someone else's premises and applying rhetorical camouflage to the terms used. To build proper theories, however, one needs to reveal the intended application of the terms and discuss their boundaries (which is far more important than defining them, because definitions are not safe from rhetorical camouflage themselves). Also, the premises of the decisive arguments need to be made explicit. Both are necessary first steps before the development even of small deductive theories can become possible. Yet both steps deserve to become the methodological standard regardless of whether or not the axiomatic method should be pursued in the field of law in the long run.

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<sup>18</sup> Of course the axiomatic method can be applied when creating a larger theory that contains the old axioms as derived propositions. Still this merely transfers the burden to motivate the axioms to the new axioms of the larger theory.

## **V. Result**

The question whether axiomatizations can be useful in legal dogma today has to be perceived as unanswered. For lack of sufficient testing there is no basis for large projects to axiomatize legal theories now. But perception of the axiomatic method among lawyers is clouded by misunderstanding that needs to be clarified. This in turn may generate new discussion about the axiomatization of legal theories.

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