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The Handbook of Rationality

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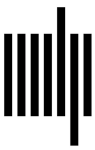

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11.3 Legal Logic

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Summary

Although the basic method in use for the application of law can be characterized as a form of "legal syllogism," the decision-making procedures raise much more difficult and complex issues, which are debated in legal theory and legal methodology. Formal logic plays virtually no role here; sophisticated types of logic such as deontic logic have so far only found an audience in legal theory. Legal logic should therefore not be understood as the theory of drawing valid logical conclusions but rather as the theory of methods of legal analysis and decision making. These decision-making methods exist along a continuum, with rule-based decision making at one end and the weighing of legal interests at the other end. Uncontrolled "weighing" sometimes threatens to supersede ordinary rule-based decision making.

1. Lawyers and Logic

Nowadays, legal logic is usually understood as a subject in legal theory or legal methodology. It ties in closely with conflict resolution in everyday life, by clarifying and structuring the forms of argument that can be found there.[1] Without this close connection between legal logic and our understanding of everyday life, the law would not be able to regulate and resolve social conflicts. Application of the law is always an exercise of power; this may explain why the persuasiveness of legal logic is ever being tested. Its practical orientation constitutes a central difference between legal logic and the (often highly formalized and thus otherworldly) logic that is practiced and taught mostly at philosophical faculties.[2]

"Legal logic" can be defined as the sum of all forms of argument and rules that lawyers orient themselves toward, or at least ought to orient themselves toward, in their legal activities (e.g., legal analyses or judicial decision making). This proposed definition opens up a wide range of applications for legal logic. It is not surprising that terms like "judicial logic" (Klug, 1982; Neumann, 2016), "legal logic" (Hage, 2005; Joerden, 2010; Weinberger, 1970/1989), "normative logic" (Kalinowski, 1972), or "deontic logic" (Gabbay, Horty, & Parent, 2013; Joerden, 2017; Navarro & Rodríguez, 2014; von Wright, 1977)[3] are used in a variety of different ways today, sometimes employing irreconcilable definitions. For a very long time, the extreme positions between which debates on legal logic were held have been, on the one hand, the notion of strictly formal logic-based reasoning and legal decision making using the "legal syllogism" and, on the other hand, "free judicial determination" (*freie Rechtsfindung*), which exempts decision makers from any obligation to comply with rules or requirements of law previously conceived.

The way lawyers think is considered particularly "logical"; legal texts are often extolled for their "logic." Nevertheless, (deductive) logic, understood as a philosophical discipline, hardly plays any role in legal science and law. Even "deontic logic" was received only in legal theory and only to a limited degree. Together with general propositional logic and predicate logic, it has been made the subject of some interesting research during the renaissance in legal theory (Hilgendorf, 2005) in the 1960s and 1970s (Horovitz, 1972; Kalinowski, 1972; Koch & Rüßmann, 1982; Rödig, 1980; Tammelo, 1969; Wagner & Haag, 1970; Weinberger, 1974, 1979), without this work, however, being able to exert any relevant influence on legal practice. It is particularly noteworthy how lawyers, including almost all lawyers at university law faculties, keep their distance from any form of symbolic or mathematical logic. The same seems to be true for Anglo-Saxon countries. The rule *judex non calculat* still applies. Even a theory as committed to logical structures as the *Pure Theory of Law* by Hans Kelsen can dispense with formal logic (Kelsen, 1934/1960; cf. also Kelsen & Klug, 1981).

However, there are some indications that such reservation with respect to formal approaches to logic will no longer be sustainable in the future. Particularly in view of the progress made in the development of artificial (machine) intelligence, the question arises as to whether, and to what extent, legal norms can be represented in

such a way that they can be processed by computer programs (Ashley, 2017). Such legal algorithms could be of great importance in practice. This would be true, for example, for automated driving: in the context of driving using automated systems, it is being increasingly discussed how traffic rules could be transformed so that they become "computer-readable." Cars could then be programmed with the applicable traffic law, rather than relying on the vehicles themselves to detect traffic instructions to drivers (e.g., street signs) via optical sensors, as has been the case up to now. An "algorithmization of the law" would presuppose, however, that legal rules could be structured and represented using formal logic to a far greater degree than has previously been done, so that computers can process them.[4]

The task of the law is to regulate conflicts and create legal certainty and predictability. Social conflicts should be resolved according to rules in an intersubjectively understandable manner, and there seems to be a fundamental human need for equal constellations of facts to be treated equally. For that reason, legal decision making right from the start has something inherently conservative about it. The search for consistent solutions to social conflicts requires that decision makers have a methodological tool at their disposal to help analyze conflicts, identify key issues, and develop solutions that correspond to the degree of consistency our sense of justice requires. This methodological instrument is "legal logic."[5]

The special reputation lawyers have of being able to argue logically is due to several factors: in order to analyze and solve a legal case in a systematic, rule-based manner, one has to ignore many peculiarities of the specific situation and instead focus on the abstract (and legally relevant) features of the case. This process of abstraction distinguishes the methodology of lawyers from unreflected conflict resolution, which seeks to intuitively settle individual cases. Legal reasoning consists in concentrating on what is legally relevant for coming to a decision, ignoring "purely subjective" issues. The lawyer, according to a widely held view of good legal practice, should "withdraw behind the law."

Rules of law used for dealing with social conflicts consist of a general abstract description of a factual situation (e.g., person *X* killed a human being) and a legal consequence (e.g., person *X* should be punished with life imprisonment).[6] The two elements, "factual situation" and "legal consequence," are linked in an "if–then relationship": "If situation *X* exists, then legal consequence *Y* should occur." Within the abstractly formulated situational description, several individual elements can be distinguished, for example, a description of the actor (a person), a description of the target (object) that was affected by the actor's behavior (a human being), and a description of the action in question itself (here: killing). For legal assessment, only the elements of the offense(s) at issue are relevant; all other elements in the description of the facts are generally ignored as immaterial and irrelevant. Not giving consideration to nonmaterial facts can be interpreted as the special "objectivity" of legal factual analysis.

The judicial determination of the existence of individual elements of criminal offenses ought to be made in accordance with a system of evidence, which is described in detail in the rules of procedure, or, in some legal systems, in special rules governing the proceedings of the court. Violation of the rules of logic, which, in contrast to modern formal logic, are mostly understood as the "laws of sound thinking,"[7] makes a court decision *per incuriam* ("through lack of care") and is considered a ground for appeal. This expresses the special appreciation of logic in lawyers' thinking. However, it is not absolutely clear what "logic" is supposed to mean here. What is clear is that it includes deductive logic; errors of this kind of logic make a judicial decision *per incuriam*. But the conception of "legal logic" proposed in this chapter will be wider than the concept of logic employed by appellate courts.

Astonishingly, the concept of truth, that is, the idea of what it means to be "true," is little discussed in law. Lawyers follow, as a matter of course, the correspondence theory of truth (see, e.g., David, 2002/2016), which shows again the close connection between law and the concepts and methods of everyday life. More recent theories of truth, such as the "consensus theory of truth," have at best found an audience in legal philosophy and legal theory.[8]

Other topics from logic and the theory of science, which are also usually discussed in connection with theories of argumentation and reasoning, have so far received little attention in legal methodology. This applies, for example, to the analysis of counterfactual reasoning (Evans, 2017, pp. 46ff.),[9] to the use of heuristic methods,[10] and above all to the study of typical errors of reasoning, which include, for example, confounding causation and correlation (Evans, 2017, pp. 44ff.),[11] the distortion of rationality standards in argument by the inadvertent influence of stereotypes and cognitive biases (Evans, 2017, pp. 38ff., 54ff.),[12] and the notoriously error-prone use of statistics and probability (Evans, 2017, pp. 60ff.).

Any analysis of "legal logic" faces the difficulty that, unlike the patterns of argument of natural scientists or even mathematicians, patterns of argument of lawyers

differ markedly according to the jurisdiction where they were trained. At least two major legal traditions, each with characteristic patterns of argument, can be identified around the world, namely, the civil law legal tradition (Germany, France, Italy, Spain, in a broader sense continental Europe, Russia, Central and East Asia including Japan, South Korea, and China, as well as Latin America), on the one hand, and the common-law legal tradition (England and many of its former colonies, including most of Canada, India, and the United States), on the other hand.

While positive law predominates in countries following the civil law legal tradition (i.e., statutes, codes, regulations according to our usual understanding), common-law countries rely much more on case law (precedents), also referred to as "court jurisprudence."[13] This chapter has been written by a lawyer trained in the civil law tradition. Learned colleagues trained in common-law jurisdictions will probably miss something or other and may also see things a bit differently. It needs to be made clear, however, that the differences between civil law and common-law legal reasoning are in many ways far smaller than is sometimes thought.

In the next section, the essential forms and structures of legal argumentation and reasoning,[14] the observance of which is regarded as a necessary condition of legal rationality in civil law legal systems, are presented. The German legal system, as one of the core legal systems of the civil law legal tradition, has been used for the purposes of illustration and comparison. The discussion is supplemented by references to the common-law legal model as well as to some subject areas that, in the author's view, have so far often been neglected in the literature on legal logic, such as research on "thinking and reasoning,"[15] the history of legal thinking, and the social and political significance of legal reasoning and argumentation.

2. The Legal Syllogism

The rules according to which lawyers deal with social conflicts today basically have the structure of "if–then" sentences: if *X* is the case, *Y* should happen. The first part of the sentence is the description of the relevant facts, and the second part refers to the legal consequences. In civil law jurisdictions, both the relevant facts and the legal consequences are fixed in positive law. Since the Enlightenment, lawyers and judges have been required to follow the written law; this was intended to restrict the judicial arbitrariness that was widespread in the early modern period, often accompanied by great cruelty, especially in the criminal law (Shaffern, 2009, pp. 203ff., 209). The obligation to follow the law is to be ensured via a logically derivable relationship: a legal decision must be represented in the form of a syllogism with the law as its major premise, a description of the facts as its minor premise, and a concrete legal decision as its conclusion.

This concept of application of the law spread in Europe as early as the 16th century[16]; Thomas Hobbes (1588–1679) explicitly referred to the principle of the application of a general rule to the individual case (Hobbes, 1651/1841, pp. 193, 245). In Germany, the model of deductive legal analysis (*deduktive Rechtsdarstellung*) was discussed in the context of Christian Wolff's (1679–1754) rationalism. The logical structure of the process of application of the law was described in detail by Heinrich Köhler (1685–1737), a student of Wolff. Since then, it seems to have become the common intellectual property of legal philosophy, legal methodology, and practical philosophy.

The classic German-language treatise on legal logic, as it is understood to this day, is by Karl Engisch (1899–1990). His *Logische Studien zur Gesetzesanwendung* (*Logical Studies on the Application of Law*, 1963), first published in 1943, is still a standard work on the application of the law. According to Engisch, the goal of every application of the law is "to obtain concrete judgments on compliance with the law, linked with consequences for failure to comply" (Engisch, 1943/1963, p. 3). Engisch understood these judgments as being conditional statements of fact that have a truth value, that is, they can be verified as true or false (*Sollensurteile*). Thus, they are not commands (imperatives), which cannot be judged to be "true" but are merely "just" or "purposeful" statements.

Engisch's reconstruction attempt operates completely in the context of propositional logic. The logical structure of the application of the law can be represented as a syllogism:

If someone kills a human being, he should be punished.
Person *A* killed a human being.

∴ Person *A* should be punished.

Engisch's logical model of the application of law has been examined and restated several times; among these works, the treatise *Juristische Logik* (*Legal Logic*) by Ulrich Klug (1982) has attained special prominence.[17] In the 1980s, Hans-Joachim Koch and Helmut Rüßmann sought a more precise explanatory model using formal language (Koch & Rüßmann, 1982, pp. 31ff.). Their explanations, however, were hardly taken notice of outside legal theory. The same applies to prominent non-German legal theorists of the time, such as Aulis Aarnio, Carlos

Alchourrón, Eugenio Bulygin, Neil MacCormick, and Jerzy Wróblewski.

3. Legal Interpretation

Within the description of the relevant facts of a given legal norm, it is possible to further differentiate individual elements, for example (in criminal law), the perpetrator, the victim of the action, and the manner in which the action (killing, assault, insult, etc.) was performed. Where law is in written form, the elements are sometimes extremely complex. For example, the offense of theft in German criminal law is defined as follows: "Whosoever takes chattels (i.e., movable property, E.H.) belonging to another away from another with the intention of unlawfully appropriating them for himself or a third person" (§ 242 German Criminal Code [StGB]). This legal rule includes the following elements: "property," "belonging to another," "movable," and "takes away." To these objective elements are added the subjective elements "intention to appropriate" and, as an unwritten element, intention (*Vorsatz*) to steal (i.e., to "fulfill" all the objective elements).

By contrast, in the common-law legal tradition, the relevant rules are to a large extent not fixed in writing by the legislature but must be sought out by the lawyer through the analysis of previous case decisions made by judges with the help of "their own sense of fairness, reasonableness, custom, and good policy" (Schauer, 2012, p. 104). Special emphasis is placed on not deviating from the fundamental rules established in earlier cases (the principle of *stare decisis et non quieta movere*). Structurally, therefore, the difference between legal systems based on written law and those based on case law is far smaller than it might seem at first sight.

After determining what the individual elements of the applicable rule of law are, the next question is whether in the present case all elements of the offense are present, that is, whether person *A* killed person *B* or whether person *A* took from person *B* a movable object that was not his own property with the intention of claiming it for himself. Most difficulties in conducting the legal analysis of a practical case are to be found in this second step, that is, in the determination of whether the elements of the offense are present, rather than in the (ultimately trivial) logical structure of the application of the law.

In civil law systems, the interpretation of the law—or, better, the interpretation of the individual linguistic elements of the law—generally takes place using four methods, typically done in succession, which are usually called "canons of interpretation" (Larenz, 1991, pp. 320ff.). The first step is to interpret the words in the legal norm in question according to their normal meaning. The second method is an analysis of the legislative history of a statute. The third method, usually referred to as "systematic interpretation," is used when the lawyer tries to gain information from the interpretation of other legal norms in order to interpret the statute at hand. The last method is the interpretation of the law according to its "sense and purpose," also known as "teleological interpretation." The wording of legal texts can usually be interpreted in a number of different ways. If the range of possible interpretations is not restricted by the historical or systematic methods of interpretation, then the lawyer is faced with the decision of choosing a particular interpretation. One rational way to choose would be to look at the expected consequences of the decision, to evaluate those consequences, and to make a decision in the light of that assessment. Legal interpretation thus presents itself as a kind of "social technology" (Albert, 1968/1991, pp. 207ff.).[18]

By means of the methods of legal interpretation, the application of law can be structured. These various steps and methods of interpretation have heterogeneous methodological sources. For example, while the interpretation of the wording (including its interpretation according to legal usage) can be seen as an essentially hermeneutical activity, historical interpretation is a historical-empirical procedure, namely, the examination of source material for information on a particular topic. This, in turn, needs to be differentiated from the systematic-interpretation approach, which requires a linguistic analysis of the relevant law and its associated interpretations in other legal statutes, court jurisprudence, and legal doctrine. The teleological-interpretation approach contains, on the one hand, a significant element of subjective interpretation; on the other hand, this subjective interpretation can be structured rationally, for example, on the basis of prognoses about the expected effects of certain interpretative approaches. In light of these prognoses, it is possible to make rational decisions on which interpretive approaches are preferred.

The process by which law is applied, as it has developed in the most important jurisdictions following the civil law legal tradition, does not allow for the law to be applied in a purely deductive way. The same is true for the Anglo-Saxon legal systems. It certainly does not seem possible to algorithmize the process by which the law is applied on the basis of current legal rationality and argumentation standards. All the same, the instruments used for the application of the law permit individual elements of the application process to be differentiated, the overall

process to be structured, and the individual steps in decision making to be made transparent and thus criticizable and controllable. Therein lie the significant advantages of rational (i.e., systematic) legal decision making over chance, "gut feelings," or spontaneous emotions.[19]

4. Weighing of Interests

"Weighing" plays a special role in legal analysis and legal argument today, and its relevance even seems to be growing (Klatt, 2013). The concept of "weighing" is nearly omnipresent in law and legal science today. At the same time, the concept lacks a clear methodological structure; what the lawyer does when he "weighs" is therefore often unclear (also and especially for the lawyer himself). Therefore, from a "rule of law and not of men" perspective, a logical analysis of "weighing" is very important in order to better understand, predict, and control current practice.[20]

The focus of such a weighing process is the decision between two conflicting interests. In many cases, the "weighing" concerns rights. "Rights" may be defined as "legally protected interests": Should this chattel belong to person *A* or to person *B*? When a decision is being made on planning permission for a new construction project, does the public interest or do private interests prevail? Whose interests, those of patient *A* or those of patient *B*, get priority in a decision on the allocation of medical resources? Such questions can be decided by a weighing of interests.

In some cases, weighing of interests is required by law. A well-known example of this can be found in § 34 German Criminal Code (StGB), which states that an action is not unlawful in an emergency situation (i.e., based on necessity), "if upon weighing the conflicting legal interests, in particular the affected legal goods (*Rechtsgüter*) and the degree of danger facing them, the protected legal interest substantially outweighs the one interfered with." So, if a person takes the walking stick from a pedestrian in order to defend a child against a dog attacking the child, that person does not act unlawfully because the protected interests (the physical integrity and possibly even the life of the child) are more important ("weigh more") than the impaired interest (the interest of the pedestrian in having the use of his walking stick at this moment).

When a weighing of interests is conducted, however, what is compared are not simply the legal interests in themselves but also the probabilities with which a violation of those legal interests might take place. The parallels to classical decision theory are obvious.[21] Thus, a situation could exist in which one legal interest would almost certainly be violated, while the infringement of a different legal interest appears possible but unlikely. An example would be a situation in which a motorist swerves to avoid hitting an injured person lying on the street, thereby opening up the possibility of hitting a pedestrian, injury to whom, however, seems unlikely. In such a situation, and taking into account the low risk of hitting the pedestrian, there is much that speaks in favor of choosing to swerve in order to save the injured person on the ground from an (almost) certain death. The result of the weighing of interests would therefore be that the swerving maneuver should be carried out in preference over killing the injured person.

A particularly difficult category of cases are situations in which life must be weighed against life. The debate about what to do in such situations can be traced all the way back to antiquity. The most famous example showing this weighing of interests is called the "Plank of Carneades" (Aichele, 2003). After their ship has sunk, two shipwrecked seamen are adrift on a wooden plank floating in the Mediterranean. As the plank becomes sodden with seawater, they can foresee that, at some point, it will not be able to carry both men any longer. May person *A* push person *B* into the water to save himself? Or is it person *B* who is allowed to push person *A* into the water? Is there any relevant difference between *A* and *B*? Maybe it is better that both drown? And what is the logic behind such decisions from a more theoretical perspective?

There are more recent variations of the problem of weighing life against life: the cases of cannibalism on the high seas in the 19th century (for example, the much-discussed English case referred to after the name of the ship as the "Mignonette Case"[22]); the hypothetical "Switchman's Problem," formulated by the German criminal lawyer Hans Welzel (which the British philosopher Philippa Foot transformed into the "Trolley Problem," generating through her writings a wide response in the academic literature in English[23]); and the decision of the German Federal Constitutional Court on the Aviation Security Act (2006),[24] where the question was whether the police could shoot down a passenger plane that has been hijacked by terrorists, causing the deaths of many innocent passengers, in order to save the lives of a significantly larger number of innocent people on the ground.

Such "life-against-life" constellations could also be resolved in principle on the basis of formulated rules of law (e.g., "If in a life-against-life situation only one person's life can be saved, then the person with characteristic *X* should be saved"). Apparently, it was already difficult for ancient ethicists and lawyers to agree on what characteristic *X* should be. In contrast, a weighing

of interests is much more flexible and allows consideration of a wide variety of factors, such as the specifics of the individual case but also the specific preferences of the individual who is doing the weighing.

Solving such weighing-of-interests problems is a controversial issue. In most civil law countries, a justification for the killing of innocent people has been rejected and instead attention has been drawn to the possibility of lack of culpability (*Entschuldigung*) on the part of the perpetrators. Such inculpability presupposes, however, that the perpetrators themselves were in a desperate predicament (i.e., under duress), so that they cannot be held personally responsible despite having committed an unlawful act. In countries with less developed logical (or "structural") models of legal analysis (lawyers trained in continental law refer to this as "legal dogmatics" or "legal doctrine"), the distinction between justification and culpability is not (yet) made,[25] and the actor is simply held not to have incurred criminal liability, which, however, leaves unanswered the question as to whether the action as such is considered to be in conformity with the law, that is, "lawful," or whether the judicial system merely refrains from holding the actor to be personally blameworthy, that is, "culpable" of committing the offense.

Like hardly any other instrument in the lawyer's toolkit, the concept of the weighing of interests is based both on historically developed practice and on a more or less commonly accepted foundation of values and general societal preferences. It is obvious that with the pluralization of society, this common ground may become increasingly unstable. Weighing of interests is a competitive alternative to rule-based decision making in conflict situations. This is particularly problematic because there is no consensus about the basic rules and criteria for weighing interests. The sheer amount of individual subjective evaluation is very large. Therefore, the results of balancing-of-interests exercises are often extremely difficult to predict. In consequence, the often quite unreflected weighing of interests is regarded by many—and not without reason—as a severe threat to rule-based, reviewable, and thus also criticizable, legal decision making (Rückert, 2011).[26]

Along a hypothetical continuum with rule-based legal decision making at one end and legal decision making by means of the weighing of interests at the other, there is a wide range of specific forms of legal argumentation. This includes *argumentum e contrario* (argument from the contrary), *argumentum a fortiori* (argument from the stronger), and *argumentum ad absurdum* (argument to absurdity). None of these forms of legal argument is compelling from the perspective of logic.[27] Rather, their value lies in the fact that certain patterns of argumentation that are accepted and used not only in law but also in day-to-day life can be structured more clearly and thus made reviewable.

5. Analogy

Analogy, meaning "comparison based on similarity," plays a special role as a legal argumentation method. Common lawyers will be reminded here of *persuasive precedent*.[28] Analogy may well be the most important method of legal reasoning. Assume there is a rule of law according to which the legal consequence *R* should occur if elements of the offense T_1 to T_n are present. In a second case constellation, the existence of the elements of the offense T_2 to T_n is established, but instead of T_1, T_1' is present. In such a situation, the question arises as to whether the legal consequence *R* should also occur. If one wishes to argue by analogy, this depends on whether T_1 and T_1' are sufficiently similar to each other. This way of argumentation seems to be acceptable not only in everyday practice but also in most fields of the law, even though from a theoretical perspective, the concept of "similarity" is extremely vague.[29]

In criminal law, however, under most legal systems, the argument by means of analogy to the detriment of the accused is prohibited. In order for criminal liability to be incurred, the exact elements of the offense required under the (written) criminal legal provisions must be met. This close connection between criminal liability and the precise letter of the criminal law dates back to the Enlightenment and is intended to impose limits on the arbitrary application of the law by judges.[30]

Looking at the details, the key elements of comparisons based on similarity are as much in need of clarification as are the structural elements of decisions made by balancing: the logic involved in decisions made by weighing and by analogy remains obscure.[31] One might even start with the assumption that the relevant factors influencing decisions vary from person to person. Thus, the psychology of decision making by weighing of interests or by analogy represents a promising future research question. A rationalization effect probably does occur, however; due to similar patterns of socialization, one would expect similar decisions based on the use of weighing and analogy. In addition, the key elements of legal decision making based on either method must be made explicit and thus become reviewable. In this way, the goal of subjecting legal decision making to rational criticism and control can be achieved.

6. Outlook

What is remarkable about legal logic is its close connection to the kinds of reasoning used in everyday life. One could regard legal logic as an abstracted structuring, in the form of legal rules, of real-life conflict-resolution strategies. Without this strong link, the law and its champions (i.e., lawyers) would not be accepted by society. The special character of legal logic is thus determined by its function. Nevertheless, legal logic does not seem arbitrary, nor is it merely an expression of specific cultures. Its basic elements—the syllogism by which the law is applied to the facts and the requirement that the facts be correctly established—seem to be valid in all cultures, even if there are enormous differences in the ways by which fact is ascertained. These structural similarities suggest that the different types of legal logic have a common root but that its further exploration falls within the domain, not of formal logic, but rather of empirical anthropology and psychology.

Notes

1. For a long time, research into everyday as well as scientific reasoning fell within the domain of rhetoric. In the 1970s and 1980s, a (general) theory of reasoning established itself on this basis, from which specifically legal theories of reasoning soon developed (cf. Bongiovanni et al., 2018; Feteris, 1999/2017; van Eemeren et al., 2014). What is common to almost all of these different notions is that deductive logic is considered to play a very small role in factual reasoning.

2. An excellent overview is found in Prakken and Sartor (2015; cf. also Hage, 2005). For a historical overview, see Krimphove (2017).

3. For more details, see chapter 11.1 by Horty and Roy (this handbook).

4. Preliminary work on this took place in the early years of legal informatics (e.g., Rödig, 1980). An excellent example for recent work is Prakken (2017).

5. On the meaning of "legal logic" as part of the doctrine of legal argumentation, see Perelman (1979), Feteris (1999/2017), and Bongiovanni et al. (2018).

6. This is, so to speak, the "standard" for the drafting of legal rules (cf. Larenz, 1991, pp. 250ff.; Zippelius, 2012, § 5).

7. The legal concept of "laws of sound thinking" seems extremely naive, considering the now very sophisticated literature on "thinking and reasoning." For a good introduction, see Evans (2017).

8. For a critical evaluation of the "consensus theory of truth," see Rescher (1995, pp. 44ff.).

9. For more detail, see chapter 6.1 by Starr (this handbook).

10. Strictly speaking, the flowcharts for the analysis of cases so popular in legal education and legal science could also be called "heuristic methods." For more details on heuristics and the law, see Gigerenzer and Engel (2006).

11. Compare also with section 7 in this handbook.

12. Compare also with chapter 2.4 by Fiedler, Prager, and McCaughey (this handbook).

13. It should be noted that precedent plays an important role both in common and civil law systems (cf. Glendon, Carozza, & Picker, 2015, chapter 11/2; Harris, 2016, pp. 190ff., 202ff.).

14. Compare with details in chapter 11.4 by Prakken, chapter 5.5 by Hahn and Collins, and chapter 5.6 by Woods (all in this handbook).

15. For a good summary, see Evans (2017); for legal perspectives, see Spellman and Schauer (2012) and Warner (2005).

16. See citations in Hilgendorf (1991, pp. 26ff.).

17. For a more modern and detailed analysis, see chapter 11.4 by Prakken (this handbook).

18. For the English translation, see Albert (2014, chapter 28).

19. Such forms of judicial decision making are often referred to as "qadi jurisprudence." (A "qadi" [or "kadi"] is a judge of a traditional sharia court.)

20. For a detailed analysis of "weighing," see Möllers (2017/2019, pp. 331–364). For an Anglo-Saxon perspective, see Broome (2006) and Lord and Maguire (2016).

21. Compare with chapter 8.2 by Peterson (this handbook).

22. R. v. Dudley and Stevens (1884) 14 QBD 273 DC.

23. See Hilgendorf (2018) for more details and references.

24. *Entscheidungen des Bundesverfassungsgerichts*, vol. 115, pp. 118–166 (judgment of 15.2.2006, Az. 1 BvR 357/05).

25. In countries belonging to the common-law legal tradition, the distinction between "justification defenses" and "excuse defenses" has still not been fully accepted in criminal legal theory, although it has been dealt with in more sophisticated treatments for decades (cf. Robinson, 1997, pp. 379ff., 477ff.).

26. Compare also with Ladeur (2004). For the Anglo-Saxon perspective on weighing, see Broome (2006) and Lord and Maguire (2016).

27. Klug (1982, pp. 137ff.).

28. Under the doctrine of binding judicial precedent, a decision by a superior court will bind lower courts in the same jurisdiction in later cases where the material facts are exactly the same. Sometimes, however, the material facts are slightly different. Then the superior court's decision is said to be a *persuasive* precedent

rather than a binding precedent, meaning that the lower court should consider it but is under no obligation to follow it.

29. For a thorough analysis, see Goldstone and Son (2012).

30. It is significant that one of the first legislative measures undertaken by the National Socialists after their seizure of power in Germany was the lifting of the ban on the use of analogy in criminal law. The rule "No punishment without law" was replaced with "No offense without punishment."

31. For an ambitious attempt to rationalize the concepts of "weighing" and "reasoning by analogy" from a logical perspective, see Hage (1997).

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