This paper is intended for scholars interested in method, philosophy, law, and legal theory.

Science–Law Analogies: Method in Science *versus* Method in Law

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Abstract. Legal scholars have made much out of connections between law and science. This paper begins by surveying such analogies. Next, we make the argument that scientific methods and the practical commonsense problem-solving methods of lawyers and judges are distinct specialized methods both of which are differentiations of a more general method. We end by drawing attention to the need for legal theorists to have a language that refers to mental acts in order to understand and evaluate method in law.

Science–Law Analogies

The legal historian David Sugarman explains that the first professional law teachers who took up university positions from 1850 to 1907 in England faced skeptical university colleagues and the hostility of the legal profession. In response law teachers claimed they had a special expertise—teasing out and systematizing the general principles underlying what appears on the surface to be a chaotic and disorderly array of laws and legal decisions. For them

> the law was ultimately governed by principles akin to the laws of natural science… In short, exposition, conceptualization, systematization and the analysis of existing doctrine became equated with the dominant tasks of legal education and scholarship (Sugarman 1991, 38).

Sugarman (1991, 39) writes that '[c]lassical law dons asserted that law was a science. This, however, seems to have meant little more than the law was clear, rational, internally coherent, and systematized.'

In 1961 Richard Wasserstrom drew an analogy between science and law to help explain and support his portrait of justification as the key element in judicial decision making. This was part of his effort to reconcile a debate between formalists and legal realists over the decision process. Wasserstrom illustrated and supported a rigid distinction between discovery and justification in law by equating a scientist's discovery of a vaccine by random selection with the legal realists' description of having hunches and intuitions. Just as the scientist can test a vaccine to judge if it works, lawyers' hunches and intuitions which are part of a discovery process are subject to a distinct and independent rational and logical process of legal justification. The key question is not where the hunch came from. Rather, the important question is whether the vaccine works and whether the judicial decision is legally justified. A decision is justified when there is a logically valid relationship between the major premise, minor premise, and decision, and there are good reasons for selecting the premises.

Neil MacCormick drew an analogy between Popper's version of scientific justification and second-order legal justification in order to explain and support his analysis of testing in second-order legal justification. MacCormick argued that

just as scientific justification involves testing one hypothesis against another and rejecting that which fails relevant tests, second-order justification in law involves testing rival possible rulings against each other and rejecting those which do not satisfy relevant tests (MacCormick 1978, 103).

The tests are whether or not the hypothesis or the legal decision (1) makes sense in the world and (2) makes sense in the context of the system. Whether a scientific hypothesis makes sense in the real world depends on whether the experimental evidence supports it. By analogy, whether a legal decision makes sense in the world depends on whether an evaluation of its likely consequences supports it. Whether a scientific hypothesis makes sense in the system depends on whether it is compatible with other relevant theories. By analogy, whether a legal decision makes sense in the system depends on whether it is consistent and coherent with the existing legal system. As McCormick (1978, 107) puts it, legal justification 'involves two elements, consequentialist argument and arguments testing proposed rulings for consistency and coherence with the existing legal system.' Thus, behind both scientific and judicial reasoning is an assumption that logical consistency provides the controlling element in the process of justification.

Bruce Anderson (1996, 37–52) noted that the analogy of testing in science is used as a way of understanding and legitimating a rigid distinction between discovery and justification in legal reasoning. By identifying science with law, the prestige of science in the academic community helps bolster and enhance the attractiveness of MacCormick's account of discovery and justification and helps fix justification as the crucial process in legal reasoning. The analogy between science and law also helps quell doubts about the absence of limitations and constraints on judicial decision making. Judicial decision making is not out of control, but is 'scientifically' managed.

When Anderson examined this analogy between Popperian science and legal justification he noted that the analogy has a floating quality that casts 'doubt on the appropriateness of using testing in science as a way of understanding and legitimating the process of legal justification.' In fact, he concluded that

the plausibility of the analogy seems to depend on not taking the analogy too seriously. Although analogies are drawn between hypotheses and rulings, between the derivation of predictions and consequences, between the idea of empirically testing predictions and consequences, and between the body of scientific knowledge and the body of rules that constitute a legal system, the analogy breaks down at almost every point of comparison when subjected to a detailed analysis. The asymmetry between predictions and consequences and between empirical testing and evaluations of justice, and common sense challenges the plausibility of comparing science and law (Anderson 1996, 52).

Further, he claimed that MacCormick's

science–law analogy masks important aspects of legal reasoning. It suppresses the extent to which judges are personally responsible for legal decisions. The analogy obscures the fact that judges are ultimately responsible for evaluating the pros and cons of the consequences of a ruling; they are responsible for judging which set of consequences is more appropriate than another set; and they are also responsible for evaluating and judging whether or not a ruling is consistent and coherent with other valid rules and legal principles. Further, the focus of the science-law analogy on testing and justification hides the problem-solving tradition that has always been crucial to legal decision

making, especially evident in sentencing and the consideration of mitigating circumstances. The preoccupation with the 'objective' logical aspects of legal reasoning obscures the important contribution that the experiences, knowledge, values, and methods shared by members of the legal profession play in understanding problematic situations and in discovering and inventing appropriate solutions to problems (Anderson 1996, 52).

Zenon Bankowski used an analogy between science and law to challenge the idea that there is a clear distinction between discovery and justification in judicial decision making. Bankowski's position is that something is a 'discovery' only if it has passed the relevant tests. Hence an untested drug does not count as a discovery until it has been proven to actually work. Bankowski (1988, 13) stresses that 'discovery includes justificatory activity. Discovery and justification are inter-related in that what counts as a discovery is partly determined by the discovery process which, in turn, depends on the procedures of justification. The implications are that empirical testing guides the process of forming hypotheses and that legal justification guides the process of judicial decision making. In other words, the procedures of discovery and justification affect what you discover. His point is that 'the way we set about finding the truth will also determine in part the truth we get' (Bankowski 1988, 13). For instance, the conclusion of a police investigation that 'X did it' is the endpoint of a method of discovering what happened. And the verdict of a jury that 'X is guilty' is the endpoint of a method for discovering what happened.

Today many European legal theorists proudly identify themselves as *legal scientists*, and characterize their work as *legal science*. Mark van Hoecke, for instance, refers to doctrinal legal scholarship as legal science. In fact, he claims that 'legal doctrine is a scientific discipline in its own right with a methodology that, in its core characteristics, is quite comparable to the methodology used in other disciplines' (Van Hoecke 2011, 17). He describes this method:

Legal scholars collect empirical data (statutes, cases, etc.), create hypotheses on their meaning and scope, which they test using classic canons of interpretation. In the next stage, they build theories (e.g. the direct binding force of European Union law), which they test and from which they derive new hypotheses (e.g. on the validity, meaning or scope of a domestic rule which conflicts with European Union law). Described in this way, doctrinal legal scholarship fits perfectly with the methodology of other disciplines: Scientific inquiry, seen in a very broad perspective, may be said to present two main aspects. One is the ascertaining and discovery of facts, the other the construction of hypotheses and theories (Van Hoecke 2011, 11).

Jaap Hage (2011, 20) asserts that 'the method for a normative science is essentially the same as that of a science that deals with "facts."' In both types of disciplines the criterion for accepting a position is whether the position fits in a coherent position set held by that person. For Hage both "sciences" (1) pursue and accumulate knowledge, (2) aim to organize and systematize this knowledge, and (3) are cooperative enterprises in that agreement on what counts as good reasons for adopting or rejecting knowledge is necessary.' (4) Further, '[i]n abstract the method of all sciences, including legal science, is to create a coherent set of positions that encompass everything, and therefore also beliefs about the law' (Hage 2011, 19).

In a further effort examining method in comparative law Hage invokes a science–law analogy using Stephen Toulmin's work. Hage draws on Toulmin's version of scientific method to help answer two questions about method and comparative law: 'Is comparative law a method of legal research?' (Hage 2015, 37) and 'Does comparative law have a method of its own?' (Hage 2015, 52). He begins by presenting Toulmin's portrait of scientific method stressing the roles of warrants and data. Warrants are inference rules comparable to major premises in syllogisms. They indicate which data are relevant to supporting a conclusion. Data are the actual factual information collected by scientists required to support a conclusion stipulated by the warrant.

For Hage method takes two forms. 'Scientific method consists first and foremost of one or more standards for evaluating the relevance of information supporting a conclusion' (Hage 2015, 39). Presumably, if the data or the type of data collected does not match the data stipulated by the warrant the data is not relevant and does not satisfy the conditions of the warrant. Hence the importance of warrants. Method, then, in this account is understood in terms of a basic set of standards for evaluating the relevance of arguments (Hage 2015, 38).

He refers to the second form of method as "derived." Here 'a method is a set of guidelines on how research is to be conducted to obtain the relevant information' to support a conclusion (Hage 2015, 39). It includes guidelines on which data to collect and how to collect them, for example guidelines on interviewing, statistical techniques, and testing (Hage 2015, 39). Here warrants help make it possible to formulate guidelines for collecting data that support a conclusion (Hage 2015, 40).

Consistent with his focus on warrants, Hage declares it is better to reinterpret the rigid distinction between discovery and justification by sharply distinguishing between the process of hypothesis formulation and the 'logic' of justification because justification is not a process but an argument (Hage 2015, 45).

When the time comes to answer his first question, 'Is comparative law a method of research?' his answer is 'Yes.' The context he has in mind is, for instance, a judge showing the effects of laws in a foreign jurisdiction in order to evaluate potential or actual laws in the judge's jurisdiction. In this example, comparative law based arguments can be used to justify conclusions about the suitability of a law.

Regarding Hage's second question 'Does comparative law have a proper method of its own?' the type of situation he is thinking about is legal scholars comparing laws in one country with the laws in another country, but doing it without having any immediate practical purpose. His answer to the question is that 'there is no single proper way of conducting comparative law research' (Hage 2015, 52) because the method depends on the purpose of the research, the research question posed, and the extent that the comparison goes beyond textual analysis to theoretical and cultural issues, and general principles of criminal law, for instance. Nevertheless he takes it for granted that regardless of the way a comparison is made, comparative data are used as reasons to support a conclusion and that method belongs to the field of justification (Hage 2015, 44).

In their Introduction to a collection of essays examining what they consider to be two equally valid types of legal theory—jurisprudence and legal science—Sean Coyle and George Pavlakos define legal science as a view that sees legal theory and legal practice as distinct enterprises where 'legal science aims to give a 'neutral' account of the very general, or 'basic' or 'foundational' properties of law' (Coyle and Pavlakos 2005, 4). In this context

legal norms are considered ‘mind-independent entities which form part of the furniture of the external world: they are objects open to scientific description, analysis, and study’ (Coyle and Pavlakos 2005, 6). Neutrality, objectivity, and scientific detachment, then, are guiding principles.

Let’s take our bearings. The science–law analogy is used in various ways by legal theorists. One, claiming law is like science is used to help bolster the credibility and respectability of the work of law teachers and legal theorists. Two, the scientific method, as appropriated by legal theorists and textbook writers is used to help them understand and decide what their proper aims, objectives, and methods are, and should be. To be more specific, the analogy is used to support a rigid distinction between discovery and justification, to present justification as the significant aspect of legal reasoning, and to portray justification as a rational, logical, and objective exercise.

These efforts to draw analogies between science and law make sense insofar as the activities of both groups are performative. Scientists are actively engaged in understanding more about the world and in doing so conduct research and test their hypotheses, and judges are actively engaged in testing competing interpretations and evaluating alternative courses of action. And legal scholars, like scientists, research and formulate and test their interpretations of the law.

However, we claim that the science–law analogies above are weak. These science–law analogies all rest on the assumption that legal scholars’ explanations of science and scientific method are accurate and that the core elements of scientific method can be applied to law without needing to be fundamentally modified. But I expect that most scientists and most lawyers and legal theorists believe that their core methods are quite different from each other. Are they? The following sections are concerned with identifying important differences between the methods used in science and law.

Method in Science

It is safe to say that scientists and non scientists believe there is something very special about science and that scientists have a distinctive and successful method. In fact, the work devoted to understanding and explaining scientific method is extensive and comprehensive. Method is a key topic in science. Every scientist has to understand how to apply the exigencies of scientific method in their particular field of inquiry, whether in the natural sciences such as physics, chemistry or biology or human sciences such as psychology and anthropology. As an undergraduate major in experimental psychology I was required to take two full-year courses in method. Every psychology major was trained in experimental design, formulating hypotheses, how to properly collect data, how to test and verify hypotheses, and how to communicate the results. Of course, the proper use of statistics was a crucial tool. Masters and Ph.D. students took additional courses in experimental design. Although each scientific specialty has its own accepted way of doing things adapted to the materials they research, they take it for granted that if they do not follow the accepted practices of their specialty their results are not valid.

Scientific method is also an important topic in the History of Science and in Philosophy of Science. The work of Thomas Kuhn on paradigm shifts immediately comes to mind. An outstanding example of a study of methodology is Bernard Lonergan’s

explanation of classical, statistical, and genetic methods in *Insight* (Lonergan 1992, 57–162).

Let's consider the ways science is a specialized type of inquiry. Scientists using classical method seek universal formulations in the sense that they pertain to the data whether the data are in Italy or Iceland. While scientists unavoidably investigate specific instances and occurrences in their research, the goal of classical method is not to understand a particular occurrence but to provide a general explanation. For instance, a zoologist in devising an experiment to understand the flight of pigeons (*Columbidae*) will use the data of particular pigeons. But the object of the study is the species not an individual pigeon. The explanations and formulations they arrive at are abstract in that they move beyond concrete data to capture the general relations among the data. To be valid the results should apply to all pigeons and it is not necessary to study every pigeon in existence to reach valid results. Likewise, Galileo's law of falling bodies is relevant to *all* falling bodies and any systematic deviations from the law will require further laws to account for deviations from the ideal state such as friction related to the shape of the object falling or the effects of wind.

The goal of scientists in classical method *per se* is simply to understand and explain the relations among data. Understanding and explaining are not immediately practical. It is clear, nonetheless, that there are practical applications that might follow. The flight of the Kitty Hawk depended upon the Wright Brothers' understanding of, among other things, the laws of falling bodies, Newton's laws of motion, and the science of aerodynamics.

The formulations of scientists are precise. The terms are defined by how the terms are related. And the relations fix the terms. Galileo's law and Einstein's mass-energy equivalence have been expressed in a precise mathematical language where each term and each relation has an exact meaning, not open to interpretation. The sign "=" in $e=mc^2$ does not mean approximately the same or close enough; and "c" means the speed of light or 299,792,458 meters per second.

For scientists, 'objects are apprehended in their verifiable relations to one another. They are known by their internal relations, their consequences and differences, and the function they fulfill in their interaction… Questions are scientific if, and only if, they can be settled by appealing to sensible data' (Lonergan, 1971, 82). Scientists are 'confined to insights into the data of sense experience' (Lonergan, 1992, 93). This means that

> if a correlation or hypothesis or law or probability expectation or theory or system pertains to empirical science, then (1) it involves sensible consequences, and (2) such consequences can be produced or at least observed (Lonergan 1992, p. 94).

The language used is technical and objective in reference. The language is not about how the objects are related to us, not how something looks or feels for instance.

In their contemporary meaning *science* and the *scientific method* typically mean the natural sciences. The implication is that other fields and disciplines have a more tentative grasp on the claim to be truly scientific. We are, however, unclear about the meaning of scientific method proposed by legal theorists. If they mean the method of the natural sciences with its restriction to empirical data, then the data of consciousness and the human meaning it produces, so relevant in legal argument and deliberation, become problematic because in any exact sense you cannot *see* understanding, intention, or meaning.

Pushing beyond these general remarks about the nature of scientific method, there are specific methodological canons relevant to any activity that would be named 'scientific' according to the accepted meaning of modern empirical science. Six methodical canons relevant to the natural or non-human sciences can be identified (Lonergan 1992, 93–121). One, there is the canon of *selection*. It states that relevant data must be empirical, that is, the data must involve sensible consequences that can be produced or observed. Two, there is a canon of *operations*. The empirical data of a scientific inquiry is the source of hypotheses and laws that cumulatively and progressively approximate reality in a systematic fashion. Three, there is the canon of *relevance*. This canon restricts the intelligibility proper to empirical science to immanent intelligibility. Put plainly, the aim of a science is not primarily application or prediction; it is systematic understanding or explanation. It specifies the precise relationships among relevant terms of the hypothesis. Galileo's law of falling bodies, $d=1/2gt^2$, or Einstein's mass-energy equivalence, $e=mc^2$, are well known formulations of such an immanent intelligibility. The law of falling bodies states precisely what the relationship is between the distance and time when a body falls in a vacuum. The mass-energy equivalence states the precise relationship that pertains to the relationship of energy and mass. In accordance with this canon a consistent logical formulation in and of itself would not satisfy the exigence of the canon. Four, the canon of *parsimony* states that everything that is not verified or cannot be verified in the sensible data must be excluded. Five, the canon of *complete explanation* makes the demand that all relevant data need to be *explained.* It is not enough to simply describe or sort the data into categories. Six, there is the canon of *statistical residues*. This canon states that in addition to the classical method discussed above, which explains the immanent intelligibility of data, there are also statistical procedures which explore the instances of events. Classical method provides the universal terms and relations applicable in all situations which provide the context for the application of statistical methods. Thus, Galileo's law of falling bodies provides the basic terms while the comparison of the rates of actual events in space and time would be an application of statistical procedures. Plotting the actual rates of falling bodies does not by itself provide an explanation of the fundamental relationship between distance and time when bodies fall. The statistical variations which occur in the actual rates of falling bodies would only be explained through some combination of classical laws. By way of example, Einstein's theory of relativity is an achievement of classical method, while quantum mechanics with its focus on events employs statistical procedures. For a complete explanation of the world, then, we would need both classical and statistical procedures. For this reason, a potential unification of classical theories such as the theory of relativity and statistical theories such as found in quantum field theory informs the search for a unified field theory and grand unified theories in physics.

If the requirements of these six canons are not met, then the activity or procedure could not be properly called scientific, at least as it pertains to the natural or non-human sciences. For example, the practice of alchemy may at first glance appear to be scientific; accurate measurements are taken and hypotheses about the nature of chemical interactions are proposed. However, when we compare the methods of alchemy with modern chemistry, it is no surprise that alchemy is not included in the list of modern empirical sciences while chemistry is. Alchemists have failed to verify their central hypothesis that base metals can be transmuted into noble metals, while the inquiries in modern chemistry, structured in

terms of the periodic table of elements regularly produces verifiable results, which are subsequently applied in industrial processes, medicine, pharmacy and so forth.

While no one seriously disputes that the methods of natural sciences such as physics and chemistry as properly empirical and scientific, the issue is more complex when we extend the scientific method to human data, and especially human meaning, which are dealt with in the human sciences. This issue is relevant to our topic as the central claim of legal theorists is that there is a proper analogy that pertains to science and law that would confirm the claims above regarding the methods of legal scholars and legal theorists. This is a large issue pertaining to the status of all human sciences and studies. It is worth taking note that a discussion of methodical canons, even one confined to the natural sciences, has no option but to consider the process and acts of the conscious subject. In each of the six canons we can specify relevant mental operations. The selection and operation of a method involves 'internal' human acts of specific human beings whether it be a judge or a scientist or a student of the legal processes.

Robert Henman makes this point in the context of neuroscientists' efforts to achieve a theory of cognition or thinking. An important part of the work of neuroscientists is to collect data—brain scans and images—in their search for correlations between neural activities at particular locations in the brain and the occurrence of mental acts such as problem-solving. He notes that neuroscientists take it for granted that they know what they are talking about when they refer to problem-solving, understanding, knowing, judging, paying attention, thinking, or decision-making. But Henman asks what exactly do they mean? What empirical data are they referring to?

Henman's answer is that neuroscientists use these terms in an everyday commonsense fashion. His point is that they do not have specific empirical data, no data referent, in mind when they talk about sensing, attention, thinking, decision-making, and problem-solving. In other words, neuroscience lacks accurate descriptions and any grasp of functional relations among conscious cognitive activities. The crux of his argument is that neuroscientists can and should include the data of consciousness in their research. He stresses that images from brain scans are one type of data and that the data of mental acts are another type of data. Mental operations are data, but not data in the sense that they have to be measured. Rather, conscious operations and experience such as asking questions, understanding, and judging are data in the sense of being something that can be attended to, described, understood and identified. To state it simply, a theory of thinking cannot be achieved solely through imaging and scanning technologies. It must include and account for both the data of sense—the data produced by imaging and scanning—and the data of consciousness—the data produced by the researcher's and the subject's performance (Henman 2013,49–56).

In the natural sciences it may seem, at first glance, to be the case that we can minimize the contribution of the human subject to considering the extent that researchers follow the canon of methods proper to an empirical science. However, if the human sciences and studies of human beings and their meaning are the central object of research it is impossible to bypass considering the human contribution to human meaning. When a judge deliberates, he is primarily considering human meaning, whether that be the evidence presented in the trial, the written words that constitute the record of legal history relevant to the case, or any self-examination of his own preconceptions. What then does it mean to be properly scientific when the data includes not only the data of sense, but also the data

of consciousness and the expressions of meaning that have their source in acts of human consciousness? To what extent can we say that legal scholars and legal theorists have considered systematically this data in their estimation of what constitutes a science? We will return to this question in our concluding remarks on the need for a language of mental acts to ground a science of law.

Method in Law

Like scientists, the legal profession believes it has a specialized method. Lawyers, judges, law teachers, and legal theorists would draw attention to skills such as fact-finding, identifying legal issues, interpreting legal texts, analyzing cases, framing and presenting arguments, and making decisions on the merits of arguments. However, compared to the sciences relatively little has been written about method in law. Only recently has method been brought to the attention of legal theorists with essays collected by Sean Coyle and George Pavlakos (2005), Michael Giudice, Wil Waluchow, and Maksymilian Del Mar (2010), and by Mark von Hoecke (2011). Further, guidebooks or catalogues for Ph.D. students that describe various methods from which people studying law can choose—doctrinal, socio-legal, comparative, critical legal studies, positivism, and so on—have been published (McConville and Chui 2010; Watkins and Burton 2013).

Let's begin with what lawyers and judges actually do? If we want to get to grips with legal methods legal philosophers have to turn their attention to the actual methods of lawyers and judges when they perform their practical activities. Legal theorists and legal scholars are missing important aspects of law when they ignore the operations and performance of the practitioners of law.

Consider the commonsense practical problem solving method of lawyers and judges. Perhaps because it is a spontaneous activity, so obvious to all involved, seemingly trivial, or perhaps because we are distracted by rules, principles, and rights, and obsessed with legal texts it goes unnoticed that lawyers and judges are trouble-shooters. They are engaged in practical problem-solving. The job of lawyers is to advise and help their clients find a way out of an array of practical problems or to help them avoid them. And the job of judges is to decide on a course of action. The legal profession is primarily engaged in a practical activity, not a theoretical inquiry.

What stands out is how different it is from the scientific method. Lawyers and judges are concerned with particular concrete events, situations, and circumstances. Their aim is to grasp what happened, how it happened, why something happened, when it happened, where it happened, and who was involved. But this type of understanding is not performed primarily for the sake of understanding, but for the sake of doing something, transforming some situation, solving a problem. As noted above scientists are primarily directed towards the goal of empirically verifiable explanations, not practical applications.

This practical problem solving method is a development of spontaneous features of human thought. It is the method of common sense problem-solving we use in our daily lives applied to specific problems in the legal context. Questions are asked. Insight is achieved. Judgments are made. And further questions are posed and answered until the lawyer or judge grasps that there are no more relevant questions to be asked and answered. Scientists are also involved in practical problem solving activity. They design experiments, develop techniques, and so forth, but their practical activity is for the sake of an explanation

that satisfies the canons of scientific method. Lawyers and judges, however, are primarily directed towards solving practical problems that arise in their professional life. How do I defend *this* client, what evidence is admissible, what sentence is appropriate? Their aim is not complete explanation.

The method of lawyers and judges is a method specializing in dealing with particular and concrete events, situations, circumstances, and problems that call for immediate and practical results and solutions. The aim of this method is to master each situation as it arises. This is accomplished by asking and answering two overarching questions: What is the situation? and What needs to be done? We know what to do in new situations by adding insights to what we already know. Here, the questions asked and knowledge gained is for the sake of doing something.

The method is the same method used to solve problems in ordinary living. Questions are asked and insights are spontaneously added to what is already known. Analogy and generalization come in handy. But the analogies are not strictly logical and we cannot help but come up with general solutions and general rules. And an expert is recognized as someone who knows when something does not make sense, or is novel or strange, and knows exactly what to do. The type of knowledge attained is not something you can systematically organize or put your finger on. An experienced lawyer or judge cannot tell you everything they know. Law libraries and data bases consist in hundreds of books, legal decisions, and texts. Legal decisions are organized by jurisdiction, court level, and date, but they are not systematically organized. Textbooks are grouped by topic. But there is no precise inventory of knowledge. The legal profession does not possess anything like chemistry's periodic table.

The language of law is a specialized case of ordinary language. It is loose and lacks precision. The words do not name the intrinsic properties of things. Rather, they focus our attention and guide our actions.[1] For instance, there is no precise definition of contract. To understand what a contract is students have to read judicial decisions on the topic, legislation, and textbooks. And even after doing that, no neat and precise definition or explanation of contract law can be formulated. All professions and tasks have a specialized commonsense language that informs their communications. Artists talk about the problems in the application of colour and texture; chess players talk about the queen's gambit and the French defense, and so on.

A strong argument can be made that the specialized practical problem solving method of lawyers and judges is distinct from the specialized methods of scientists. Scientists aim to understand for the sake of understanding, but lawyers and judges seek understanding for the sake of doing something. Scientists have developed highly specialized methods for collecting data and testing and verifying hypotheses, but lawyers and judges use the spontaneous methods of everyday practical common sense to solve legal problems. A scientist's objective is to achieve abstract and universal formulations and explanations, but the aim of lawyers and judges is to solve particular concrete practical problems here and now. The overarching focus of scientists is on matters of explanation and fact, namely discovering and verifying whether the relations in the selected data are, in fact, supported by the experimental results. But lawyers and judges have three foci: one, judging what is, in fact, the concrete situation; two, deliberating about what should be done and then judging what is the best course of action to take in a particular concrete situation;

[1] See Lonergan 1971, 82.

and three, deciding to execute that course of action. These differences in method are due to different needs giving rise to different modes of operation.

While both the method of science and the methods of the legal profession are in the most general sense a result of common human cognitive activity, each have their own specialized aims, specialized types of understanding and knowledge, special types of expression, specialized procedures, and specialized professional groups. However, while legal method is a specialization of commonsense practicality, science properly speaking is a distinct specialization. Even though it requires its own variety of common sense to get results its primary aim is a systematic understanding or explanation applicable to all instances. The law, however, determines the outcome of specific cases.

The differences in scientific methods and legal methods highlighted above reveal, at the very least, that the performance of scientists significantly differs from the performance of lawyers, judges, and legal theorists. Hence legal theorists must be very careful not to mimic or indiscriminately use, and borrow from, the methods of scientists. The danger is that contemporary legal theorists will neglect important aspects of law such as the particular and concrete aspect of cases and the immediate and practical nature of law and legal analysis. By far, the biggest problem is neglecting the fact that deliberation is a key activity in legal method. Broadly speaking, scientific method does not offer many clues or insights into understanding legal methods.

Acknowledging the breakdown of science–law analogies and the operation of commonsense problem solving can also help us better understand the methods of legal theorists. For instance, doctrinal legal scholars, such as Anne Ruth Mackor (2011) and Pauline Westerman (2011), who see themselves as legal scientists organizing the law and fitting new judicial decisions into the corpus of law, are actually performing a practical activity, namely showing how, and making, things fit together. The questions ‘Does this particular decision conflict with that decision or that series of cases? and Is this case sufficiently similar to that case?’ are part of a spontaneous practical commonsense inquiry set in a legal context. General statements can be made about the cases—the principle these cases stand for is X or Y, but such statements are neither abstract nor universal. They are general statements about particular concrete cases and they are not considered invalid and rejected if the outcomes of similar situations in other jurisdictions are different or if exceptions are made. The methods of doctrinal legal scientists are a specialized type of commonsense practical problem solving, not theoretical inquiry.

Take Mark Van Hoecke’s analysis of method in legal doctrine. He claims that the interpretation of texts and legal documents ‘is at the core of the whole activity of legal scholarship’ (Van Hoecke 2011, 14). Interpretation is required when there are ‘diverging readings of the same text’ (Van Hoecke 2011, 13) or where ‘the researcher has to determine the exact meaning and scope of a newly enacted statute or a recent court decision’ (Van Hoecke 2011, 14). The applied aspect of interpretation is acknowledged when he writes that ‘research questions in legal doctrine are indeed very often linked to ‘the precise meaning and scope of legal concepts, legal rules, legal principles and/or legal constructions.’ (Van Hoecke 2011, 14). The primarily practical orientation of interpretation becomes explicit when he writes that ‘interpretation questions arise when texts are unclear,’ and ‘when the result of a literal interpretation leads to unreasonable, inequitable, or even absurd results.’ (Van Hoecke 2011, 14).

As Van Hoecke points out legal doctrine is concerned with legal texts—statutes, case law, treaties, general principles of law, customary law, binding precedents, and scholarly writings. This is its data. However, these types of expression correspond to constellations of judgments of value and decisions, data that are very different from the empirical data of scientists.

Van Hoecke lists the rules governing the selection of texts and the relative 'weight' to give texts when evaluating their relevance. For instance, 'a statutory text that is unconstitutional will be irrelevant; a binding precedent is more relevant than a non-binding one; a publication by a law professor who is an expert will have more weight than one by a young academic; a well-argued position will be more relevant than one without an argument; valid rules are relevant and non-valid rules are not; and the relevance of valid rules and principles may require weighing and be a matter of degree. These are all general guidelines, pointers to bear in mind, generally accepted practices that have worked in the past. They are unlike the specialized and precise criteria used by scientists to select their empirical data. Further, these guidelines are general and incomplete insofar as their application to particular texts depends on the experience of each doctrinal legal scholar. This is consistent with the operation of the method of commonsense whereby an incomplete accumulation of related insights and judgments requires additional insights into particular situations and circumstances in order to understand the situation and know what to do.

Van Hoecke notes that theories such as the direct effect of European Law are based on generally accepted assumptions about what 'law' is and its role in society, a theory of valid legal sources (e.g. the acceptance of unwritten general principles) and their hierarchy (e.g. the priority of European Law over domestic law), a methodology of law (e.g. the acceptance of a more active role of judges in legal interpretation), an argumentation theory (to support interpretations), a legitimation theory (e.g. interpretive theories are not true or false, but are more of less convincing), and a shared world view comprised of common basic values and norms (concerning, for instance, marriage, family, homosexuality, abortion, and euthanasia).

Even though the term 'theory' is used to mark shared assumptions, knowledge, procedures, and values they are nothing like the verified definitions and theoretical explanations natural scientists aspire to reach. Rather, what Van Hoecke describes is more akin to the practical working knowledge common to members of the same occupation. It is worth highlighting that political issues and family values have no role in scientific method *per se*.

Van Hoecke draws attention to various limitations of legal doctrine. He notes that there is no agreement among legal theorists on the nature of legal doctrine as a discipline independent of national traditions of legal scholarship. And he doubts if a consensus on the nature of methodology of legal doctrine can be reached among the international legal community or even in a single legal system. But these limitations are not surprising when you take account of the fact that the focus and scope of legal doctrine is limited by its concern with legal texts and documents of a particular tradition, in a particular jurisdiction, at a particular time. Legal doctrine is not differentiated like the sciences are in terms of theoretical concerns, issues and objectives.

Finally, Van Hoecke's observation that it is difficult to draw the line between practice and legal doctrine fits descriptions of the specialized method of common sense

where knowledge for the sake of understanding and knowledge for the sake of doing something are blurred.

Jaap Hage claims that '[l]egal science deals by and large with the question which rules we should have, or should enforce by collective means' (Hage 2011, 29). Although he states his intention is 'to outline a method for legal science as a description of existing law' (Hage 2011, 28), the practical nature of legal science dominates his account. For instance, he writes that 'Legal science would then be… aiming at the collective pursuit and systematization of normative knowledge, in particular knowledge which rules should (here and now) be enforced collectively' (Hage 2011, 28). He repeats this claim when he asserts that 'The law itself is normative. It is the answer to a normative question and, in particular, the question "Which norms should be enforced collectively?" (Hage 2011, 41). These are practical concerns. 'Here and now' captures the concrete and particular character of the issues.

He goes on to say that the process of determining which norms to enforce requires that the relevance of facts is to be determined by the standards, and that values are to be balanced in concrete cases by standards. He presumes that the standard used for adopting rules and evaluating action 'aims at the promotion of long-term happiness of sentient beings. Let us call it the H-standard' (Hage 2011, 41). In this way, the H-standard is used to 'determine what count as relevant facts and to determine the contents of the law' (Hage 2011, 42). He believes that '[t]he H-standard provides the proper standard to determine what ought to be done' (Hage 2011, 43). 'Legal method consists therefore essentially of the methods to determine the consequences of collective behavior for the long-term happiness of sentient beings' (Hage 2011, 42). That method also includes the methods used in psychology, sociology, evolutionary biology, economics plus reading and interpreting legislation, treaties, and case law. What emerges from these texts is that the overarching goal of legal science is practical understanding, understanding for the sake of achieving happiness.

Hage claims that a position concerning the contents of the law is acceptable if it is justified. 'A person is absolutely justified in accepting such a position if this position fits in a coherent position set held by this person' (Hage 2011, 38–39), and 'that this person is not aware of required changes in his or her position that would make him or her reject this position' (Hage 2011, 39). This notion of coherence is consistent with an explanation of the development of commonsense intelligence as a spontaneous collaboration in testing and improving insights, and that the criterion of commonsense judgment is whether all the relevant questions have been satisfactorily answered.

Hage also captures aspects of the commonsense method of "legal science" when he characterizes the process of developing a coherent set of propositions as a 'spontaneous' activity where 'the spontaneous positions reflect "the world outside"' (Hage 2011, 37) and the world influences our spontaneous positions. At the heart of the commonsense method are collaborative efforts of spontaneously asking questions, achieving insights, and asking further questions that reveal deficiencies in understanding, that, in turn, lead to modifying and complementing previous insights, and further questions. As we learn, our understanding of the world grows and develops, and we also change the world with our actions.

His description of the development of a coherent position fits the explanation of commonsense method comprised of incomplete sets of insights and judgments to be

completed by adding insights into each new situation, a method that is not subject to systematic formulation. Hage writes: 'One does not come up with a coherent set of propositions from scratch. Normally one starts from an already existing set' (Hage 2011, 35--36). 'New ones are added or existing ones removed due to the demands of rationality... A particular position is justified relative to a position set if it is an element of this set, and if this set is coherent' (Hage 2011, 37). Here, the description of a position set is an example of the development of commonsense understanding.

Further, legal theorists should be wary of using inaccurate or mistaken portraits of science restricted to logic, argumentation and justification. Science is not about conceptualizing what is essential and permanent, but testing and verifying hypotheses and theories. Hypotheses and theories are judged to be correct insofar as they are supported by evidence and they are open to revision and development in that further understanding is possible. Scientists do not consider their explanations of the relations among data to be permanent, essential, necessary. Rather, they are contingent in the sense that things, in fact, happen to be this way. There is no reason to think that law is any different. Indeed, since law and legal systems are the result of deliberation and choice you would think that law would not have features that are essential, permanent, and necessary.

However, many legal scholars are engaged in seeking the essence of law, the essential and necessary features of law. They are trying to get hold of the permanent and enduring properties of law—rules, principles, rights, duties, institutions, or whatever—what every legal system must have if it is to be considered a legal system. While many legal scientists are hunting for the essential and permanent properties of law, natural scientists are seeking verified possibilities, and philosophers of science have moved on to study method.

Why do we have these types of weak and misplaced analogies between science and law? Although this specialized method of common sense excels at practical problem solving and trouble-shooting it has its limitations. Because of its single-minded focus on the concrete and particular, the immediate and practical, this method is unable to analyze and evaluate itself. Its method does not, and cannot, lead to understanding its own method and identifying its strengths and its limitations. The limitations of practical problem solving are evident in the legal profession's and many legal scholars' lack of interest in, and/or inability to adequately handle theoretical matters, their dismissal of other forms of knowledge as dubious, their indiscriminate use of the findings of other disciplines for their own purposes, their focus on solving problems immediately and their lack of concern for the long term, and their confidence that they can handle and pronounce on any type of issue or problem. The science–law analogy drawn by contemporary legal theorists is one instance.

The breakdown of the science–law analogies cannot be solely attributed to misunderstanding scientific method. The scientific method is a specialized method, specializing in achieving abstract and universal formulations and explanations. And in that pursuit, it reveres and respects six specialized methodological canons. The scientific method, or parts of it, cannot be adopted uncritically by legal theorists who have different types of questions and different types of data. The specialized concerns of legal theorists also call for their own specialized methods, and efforts to understand and identify them.

The Need for Language that Refers to Mental Operations

Scientists and members of the legal profession are curious. They ask questions. They have insights. And they make judgments. Scientists ask questions about how their data are related. How, precisely, is breast cancer related to genetics? Scientists are trying to grasp the abstract relations among their data. They have insights that are formulated as hypotheses, definitions, or explanations. For scientists the achievement is moving beyond the sense data they have collected to formulating the abstract relations among the data. Their definitions, explanations, and theories are abstract and universal. Is-questions are posed: Is there a correlation between breast cancer and particular genes? These are tested by some sort of experiment. The results are recorded, tabulated, graphed, and statistically analyzed. The sufficiency of the evidence for a proposed judgment is grasped. Judgments of fact are posited: "Yes the test results support the hypothesis," or "No they don't," or "The results conflict with previous studies." Lawyers and judges also ask questions: "What precisely is the situation? What happened? Who did that? How did it happen?" And so on. Lawyers and judges are trying to grasp how particular concrete events fit together. Their insights capture how particular concrete events are related and they formulate them as possible interpretations of the situation, narratives of what occurred. They then go on to assess whether or not their interpretations are correct. They grasp the sufficiency of the evidence for their proposed judgment of fact: "Yes, my interpretation is correct" or "No, the evidence does not support how I understand the situation," or "I need more information in order to make a judgment on the truth or falsity of my interpretation of events." Both science and law are specializations of the operations of attending, understanding, and judging.

The point is that despite the specialized nature and goal of each type of inquiry both scientists and legal practitioners perform the same basic operations. They wonder about what they see, hear, touch, taste, smell, remember, or imagine. They ask questions that begin with What? How? When? Why? Where? Who? They achieve insights. They formulate their insights as explanations or narratives. They test them to assess whether or not there is sufficient evidence for their prospective judgments. And they reach judgments of fact. What the methods of science and commonsense practical problem solving have in common are those basic mental operations. To state it simply, the cognitional elements that comprise the methods of both scientists and lawyers are What-questions, direct insights, formulations expressed as definitions and narratives, Is-questions, reflective insights, and judgments of fact.

So far, our analysis of science and law has focused on facticity—how, in fact, scientific data are related, and how, in fact, particular concrete events are related. Both scientists and lawyers test their formulations and make judgments of fact. For scientists, an explanation is correct if it is, in fact, verified in other situations and under different conditions. A lawyer's narrative or story is factually correct if all the relevant questions have been asked and answered satisfactorily, and the sufficiency of the evidence has to be grasped.

However, deliberating and deciding are very important operations for lawyers and judges. But deliberating about what to do is not a key element of scientific method. Empirical science is primarily concerned with understanding for the sake of understanding. This is a key difference between the performance of scientists and lawyers that cannot be overlooked. That key difference is that scientists' attention is restricted to understanding

data and reaching judgments of fact. Lawyers and judges, however, want to understand events, situations, and circumstances, but they also want to know what to do, and then do it. Their inquiry does not end with judgments of fact. They have to do something, give advice, reach a verdict or pronounce a sentence, which has practical consequences. I cannot over emphasize the fact that deliberating about what to do, making value judgments, and deciding are key operations for lawyers and judges. The mental activities that comprise this phase of their method are: What-to-do-questions, practical insights, options and plans, Should-I-do-this-or-do-that-questions, practical reflective insights, judgments of value, and decision. A superficial comparison between science and law misses these important, dare I say, essential, elements of the method of lawyers, judges, and legal theorists.

While all the same basic elements—questioning, achieving insights, and judging are called into play in both science and law, the focus of questions in science is the three lowest levels of conscious operation constituting the reach for fact: experiencing, understanding, and judgment. The focus of attention in law is on the higher levels: the reach for deliberation, evaluation, choice, decision. However, the actual performance of lawyers and judges helps us point of a deeper criticism of the science–law analogy. Legal scholars' accounts of science are massively truncated; the cognitive operations of questioning, insight, and judgment find no thematic place. Likewise, their portraits of law and legal reasoning need to be corrected and developed by the full thematic of questioning, discovery, formulation, judgment of value, and expression in the general field of deliberation.

Conclusion

Our paper began by illustrating how legal theorists have drawn on science to help them fix justification as the key process in legal reasoning, portray judicial decision making as subject to constraints, understand and guide their analyses, and bolster the prestige of their work. However, our examination of method in science revealed that what legal theorists mean by science is vague and inaccurate, that law–science analogies are very weak, and that such analogies neglect important data, namely the process of questioning, evaluating, deliberating, making choices, and deciding performed by lawyers, judges, and legal theorists. The subsequent analysis of method in law highlighted the specialized commonsense method concerned with solving practical problems in particular concrete cases and the practical orientation of legal scholars tackling the question 'What is the law?' The point is that the specialized method employed by lawyers, judges, and the legal scholars noted in this paper is distinct from the specialized methods of scientists in terms of aims, types of understanding and knowledge, types of expression, procedures, and professional groups. Further, our analysis casts doubt on the accuracy of the beliefs of legal scholars who might agree with us that the law–science analogies are weak and assert that, of course, scientists and legal scholars do different things, but still think of their analytical methods, at least to some degree, as scientific.

It is evident that the indiscriminate use of scientific method will neither help legal 'scientists' determine what the law is, nor will it help them reflect on the nature of law, nor will it help them understand and evaluate their own methods. What will be useful to legal theorists is understanding accurately and precisely how, and to what extent, scientific methods and legal methods are similar and different. It will help legal theorists from

neglecting deliberation, from making inaccurate portraits of legal reasoning in terms of a rigid distinction between discovery and justification, from restricting legal reasoning to logic, from conflating justification with expression, from not grasping the complexity of interpretation,[2] from searching for the essential and necessary features of law, from making superficial claims regarding objectivity,[3] from talking about mind-independent values, and from using inappropriate methods.

Finally, what we have been doing in this paper is methodology, the study of methods. We have been using language that refers to mental acts. The basic terms are: sense experience, what-questions, direct insights, narratives or explanations, is-questions, reflective insights, judgments of fact, what-to-do-questions, practical insights, options & planning, is-it-to-be-done questions, practical reflective insights, judgments of value, and decisions. These mental operations are the core of legal reasoning in law schools, law offices, courtrooms, judges' chambers, and legal theory conferences. It is remarkable they are not yet part of the vocabulary of legal theorists. Perhaps someday they will take their proper place in an adequate, dare we say, "science" of law.

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[2] See Brown 2011 for an insightful examination of this issue.
[3] See Anderson and Shute, 2016 for the grounds of a more adequate analysis of objectivity.

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