The Science of Conjecture

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Evidence and Probability before Pascal

With a New Preface

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Preface to the 2015 Edition

The first edition of *The Science of Conjecture* reconfigured the field of the history of probability in two ways. The first concerned a wider than usual conception of the nature of probability. The second involved a Renaissance-free view of the history of Western ideas. In the decade since the book's publication, the first of these has gained traction, the second has not.

The book's conception of the subject matter stemmed from an *objective Bayesian* (or logical probabilist) theory of probability. According to that theory, as developed by Keynes in his *Treatise on Probability* and by later authors,[1] the main notion of probability is of an objective logical relation holding between a body of evidence and a conclusion. The body of evidence available in court does or does not make the defendant's guilt highly probable; the known facts do or do not support the theory of global warming, irrespective of any contingent facts about the world or what anyone's opinion is. Logical probability may or may not be numerical; even if it is, qualitative or approximate judgments are often of most importance.

That perspective opened up all kinds of evaluation of uncertain evidence as the natural subject matter of a history of probability. Thus, *The Science of Conjecture* focused on the law of evidence, which, over many centuries of thought, especially in medieval Roman law, had developed evidential concepts like the modern proof beyond reasonable doubt. Moral theory and business were also familiar with concepts of probabilities and risks, mostly quantified only loosely.

During the late twentieth century, debate on "interpretations of probability" largely took the form of pitched battles between frequentists and related schools (who held that probability dealt with relative frequencies or objective propensities) and subjective Bayesians (who took probability to be about degrees of belief, subject to some con-

1. The classic works are J. M. Keynes, *A Treatise on Probability* (London, 1921) and E. T. Jaynes, *Probability Theory: The Logic of Science* (Cambridge, 2003).

straints). But in recent years, a more objective and logical Bayesian interpretation has gradually come to the fore. Statisticians felt the need for some objectivity in prior probabilities, which permitted solid results in a great range of applied areas such as image processing.[2] Legal theorists similarly felt the need for an objective understanding of uncertainty in legal decision making,[3] and there has been extended debate about the use of Bayesian methods in legal cases involving DNA and other identification evidence.[4] Bayesian networks have become a popular method of representing knowledge and making causal inferences in artificial intelligence.[5] Philosophers added objective logical theories to the range of options they considered.[6] It was particularly noticed that probabilistic reasoning works with the confirmation of conjectures in pure mathematics, where there are only logical relations, implying that there must be a purely logical interpretation of probability applicable in those cases.[7] Objective Bayesian approaches to the philosophy of science would seem to be warranted, but have been less popular.[8]

Public understanding of the Bayesian perspective was advanced by Sharon Bertsch McGrayne's semipopular 2011 history, *The Theory That Would Not Die*.[9] It took a triumphalist view of the victory of Bayesian-

2. J. O. Berger, "The case for objective Bayesian analysis (with discussion)," *Bayesian Analysis* 1 (2006): 385–402 and 457–64; J. O. Berger, J. M. Bernardo, and D. Sun, "Objective priors for discrete parameter spaces," *Journal of the American Statistical Association* 107 (2012): 636–48.

3. J. Franklin, "The objective Bayesian conceptualisation of proof and reference class problems," *Sydney Law Review* 33 (2011): 545–61.

4. E.g., P. Roberts and A. Zuckerman, *Criminal Evidence*, 2nd ed. (Oxford, 2010), ch. 4; *Law, Probability and Risk* 11 (4) (Dec 2012), special issue on the *R v T* debate.

5. K. B. Korb and A. E. Nicholson, *Bayesian Artificial Intelligence*, 2nd ed. (London, 2010); L. Bovens and S. Hartmann, *Bayesian Epistemology* (Oxford, 2004).

6. A. Hájek, "Interpretations of probability," *Stanford Encyclopedia of Philosophy* (2002, revised 2009), http://plato.stanford.edu/entries/probability-interpret/; D. H. Mellor, *Probability: A Philosophical Introduction* (London, 2005); J. Franklin, "Resurrecting logical probability," *Erkenntnis* 55 (2001): 277–305; J. Williamson, *In Defence of Objective Bayesianism* (Oxford, 2010).

7. J. Franklin, "Non-deductive logic in mathematics," *British Journal for the Philosophy of Science* 38 (1987): 1–18; later works listed in J. Franklin, "Non-deductive logic in mathematics: the probability of conjectures," in A. Aberdein and I. Dove, eds., *The Argument of Mathematics* (New York, 2013), 11–29.

8. J. Franklin, *What Science Knows: And How It Knows It* (New York, 2009).

9. S. B. McGrayne, *The Theory That Would Not Die: How Bayes' Rule Cracked*

ism, in a more or less objectivist form, over frequentism. The revival of Bayesianism, it argued, was driven by practice more than theory, beginning with Alan Turing's use of Bayes' Theorem in World War II cryptography and given momentum by the availability of sufficient computing power to calculate results of the formula on large databases. That view of the story sees Bayesianism as essentially about a numerical formula, thus neglecting the wider sphere of evidence evaluation, such as in law and scientific hypothesizing. It thus confines the story to recent times and to more mathematically technical fields.

The global financial crisis of 2008 also brought to the fore the problems of the relation between numerical formulas for probabilities and the true chance of events happening. Nassim Nicholas Taleb's *The Black Swan* was the most successful of several works that explained an inherent difficulty in predicting rare events. Because they are rare, there is little relevant evidence, so purely inductive methods are unreliable and must be supplemented with expert opinion to situate the event in a context; unfortunately, expert opinion is chronically unreliable, especially with very small probabilities.[10]

The recognition of imprecise or fuzzy probabilities within Bayesianism has advanced, but it is still a minority interest.[11] Nevertheless, it is recognized as important that statistical methods should be robust, that is, only slightly sensitive to errors in the data. Thus, imprecision is allowed for in such statistical methods. Imprecision is important in applications like safety science, where there may be insufficient evidence to ground precise probabilities.[12]

Perhaps the most surprising recent development has been the grow-

the Enigma Code, Hunted Down Russian Submarines, and Emerged Triumphant from Two Centuries of Controversy (New Haven, 2011).

10. N. N. Taleb, *The Black Swan: The Impact of the Highly Improbable* (New York, 2007, 2nd ed., 2010); J. Franklin, "Operational risk under Basel II: A model for extreme risk evaluation," *Banking and Financial Services Policy Report* 27 (10) (Oct 2008): 10–16; the unreliability of expert opinion shown in, e.g., P. E. Tetlock, *Expert Political Judgment: How Good Is It? How Can We Know?* (Princeton, 2005).

11. P. Coolen-Schrijner, F. P. A. Coolen, M. C. M. Troffaes, and T. Augustin, "Imprecision in statistical theory and practice," *Journal of Statistical Theory and Practice* 3 (2009): 1-9; Society for Imprecise Probability: Theory and Practice (http://www.sipta.org).

12. T. Augustin and R. Hable, "On the impact of robust statistics on imprecise probability models: A review," *Structural Safety* 32 (2012): 358–65; D. R. Insua and F. Ruggeri, eds., *Robust Bayesian Analysis* (New York, 2000).

ing realization among developmental psychologists that babies are powerful Bayesian reasoners. Six-month-old infants show surprise if a box which they know contains mostly pink and a few yellow balls reveals a sample that is mostly yellow, whereas they are not surprised when the sample is mostly pink. That is, they know implicitly that the composition of a sample is likely to approximately match the composition of the population.[13] Twelve-month-olds have much more sophisticated abilities to integrate such frequency perceptions with other knowledge, such as expectations about object motions.[14] Regarding infants as "Bayesian ideal observers" has proved to be predictive of baby behavior in such studies. Since these abilities are acquired even before infants have learned to speak, it is clear that humans have pre-linguistic abilities to respond to and reason about probabilities, confirming the view of *The Science of Conjecture* that the story of probability is one of bringing to consciousness existing but implicit probabilistic knowledge.

The second main idea behind *The Science of Conjecture* was to take a pro-medieval, anti-Renaissance approach to the early modern history of ideas. The scholastics and legal writers of the late middle ages developed the main concepts of the evaluation of uncertain evidence as well as of commercial risk. The development of those ideas slowed in the "Renaissance," to be revived and driven forward in the scientific revolution of the seventeenth century. That will appear as a strange tale, until it is recognized that much the same happened for nearly all areas of intellectual thought, especially the more abstract ones. A similar thesis was maintained for physics and related sciences by Pierre Duhem a century ago and has recently been revived convincingly in James Hannam's *God's Philosophers*.[15] The implication that the medieval contribution was con-

13. S. Denison, C. Reed, and F. Xu, "The emergence of probabilistic reasoning in very young infants: evidence from 4.5- and 6-month-olds," *Developmental Psychology* 49 (2013): 243–49; similar in F. Xu and V. Garcia,"Intuitive statistics by 8-month-old infants," *Proceedings of the National Academy of Science of the U.S.A.* 105 (2008): 5012–15; C. A. Lawson and D. H. Rakison, "Expectations about single event probabilities in the first year of life: the influence of perceptual and statistical information," *Infancy* (2013), doi: 10.1111/infa.12014.

14. E. Téglás, E. Vul, V. Girotto, M. Gonzalez, J. B. Tenenbaum, and L. L. Bonatti, "Pure reasoning in 12-month-old infants as probabilistic inference," *Science* 332 (2011): 1054–59.

15. J. Hannam, *God's Philosophers: How the Medieval World Laid the Foundations of Modern Science* (London, 2009), published in the United States as *The Genesis of Science: How the Christian Middle Ages Launched the Scientific Revolution* (Washington, DC, 2011).

fined to or especially prominent in (what we now call) science is incorrect. On the contrary, science strictly speaking was not the natural bent of the scholastics, who were much more at home in disciplines that rely on conceptual analysis, such as economic theory and law. That has not yet been generally accepted. While there are some older texts on particular topics, such as Marjorie Grice-Hutchinson's *The School of Salamanca* and James Gordley's *The Philosophical Origins of Modern Contract Doctrine*,[16] they have not been followed up and situated in an overall story. There remains a gap in the market. A substantial book needs to be written on the full extent of the scholastic contribution to modern thought.[17]

Updates

On the subject matter of *The Science of Conjecture* itself, the development of ideas about evidence and probability up to 1650, there have not been any major new works. The second edition of Hacking's *The Emergence of Probability* reprinted the first edition, prefaced with brief comments on more recent work.[18] It will suffice to review briefly some studies of particular topics.

Gabbay and Koppel review the Talmudic rules on "follow the majority" (for example, to declare a piece of meat of unknown origin to be kosher if a majority of nearby butchers are kosher). They conclude that the rules do not involve probabilistic thinking but are strictly rules of action to determine an outcome.[19]

16. M. Grice-Hutchinson, *The School of Salamanca: Readings in Spanish Monetary Theory, 1544–1605* (Oxford, 1952); J. Gordley, *The Philosophical Origins of Modern Contract Doctrine* (New York, 1993).

17. An initial attempt and an overview of what needs to be done is in J. Franklin, "Science by conceptual analysis: the genius of the late scholastics," *Studia Neoaristotelica* 9 (2012): 3–24.

18. I. Hacking, *The Emergence of Probability: A Philosophical Study of Early Ideas about Probability, Induction and Statistical Inference*, 2nd ed. (New York, 2006); his more positive review of *The Science of Conjecture* in *Isis* 95 (2004): 460–64. There was little attempt to cover the pre-Pascalian period in D. M. Gabbay, S. Hartmann, and J. Woods, eds., *Handbook of the History of Logic*, vol. 10, *Inductive Logic* (Oxford, 2011). Summaries of the story as it now are in R. Schüssler, "Probability in medieval and Renaissance philosophy," *Stanford Encyclopedia of Philosophy*, 2014, http://plato.stanford.edu/entries/probability-medieval-renaissance/, and J. Franklin, "Pre-history of probability," in *Oxford Handbook of Philosophy and Probability*, ed. C. Hitchcock and A. Hájek, forthcoming, 2015.

19. D. M. Gabbay and M. Koppel, "Uncertainty rules in Talmudic reasoning," *History and Philosophy of Logic* 32 (2011): 63–69.

Some studies of the moral doctrine of probabilism in the early modern period have clarified its nature and shown how widespread it was in education in Catholic countries.[20] Juan Caramuel Lobkowitz, the most extreme of the probabilist moral theologians—presented in *The Science of Conjecture* as something of a figure of fun—has been defended by Julia Fleming on the basis of his later works.[21]

One of the main findings of *The Science of Conjecture* was that late medieval canon lawyers, reflecting on business practice with contracts like insurance, annuities, and options that depend on chance outcomes, made great strides in understanding the pricing of risk. That has been confirmed by the detailed studies of Giovanni Ceccarelli on Olivi and other canonistic thinkers.[22] These studies show that late medieval thinkers had a deep understanding of the nature of risk, although the quantification involved is imprecise (as is indeed appropriate to the approximate frequencies and multiple sources of information involved in estimating risks such as in marine insurance).

20. R. A. Maryks, *Saint Cicero and the Jesuits: The Influence of the Liberal Arts on the Adoption of Moral Probabilism* (Aldershot, 2008); R. Schüssler, "On the anatomy of probabilism," in J. Kraye and R. Saarinen, eds., *Moral Philosophy on the Threshold of Modernity* (Dordrecht, 2005), 91–113. R. Schüssler, "Scholastic probability as rational assertability: the rise of theories of reasonable disagreement, *Archiv für Geschichte der Philosophie* 96 (2014): 151–284.

21. J. Fleming, *Defending Probabilism: The Moral Theology of Juan Caramuel* (Washington, DC, 2006); also A. Solana-Ortega and V. Solana, "Morality principles for risk modelling: needs and links with the origins of plausible inference," in *Bayesian Inference and Maximum Entropy Methods in Science and Engineering, 2009* (American Institute of Physics Conference Proceedings, vol. 1193), 161–69.

22. G. Ceccarelli, "Risky business: theological and canonical thought on insurance from the thirteenth to the seventeenth century," *Journal of Medieval and Early Modern Studies* 31 (2001): 607-58; G. Ceccarelli, "The price for risk-taking: marine insurance and probability calculus in the Late Middle Ages," *Journal Electronique d'Histoire des Probabilités et de Statistique* 3/1 (2007); G. Ceccarelli, "Stime senza probabilità: assicurazione e rischio nella Firenze rinascimentale," *Quaderni storici* 45 (2010): 651–702; also E. D. Sylla, "Business ethics, commercial mathematics, and the origins of mathematical probability," *History of Political Economy* 35 (2003), annual supplement: 309–37; S. Piron, "Le traitement de l'incertitude commerciale dans la scolastique médiévale," *Journal Electronique d'Histoire des Probabilités et de Statistique* 3/1 (2007). Some clarifications on the meaning of Oresme's contemporary work in N. Meusnier, "À propos d'une controverse au sujet de l'interprétation d'un théorème 'probabiliste' de Nicole Oresme," *Journal Electronique d'Histoire des Probabilités et de Statistique* 3/1 (2007).

On lotteries and games of chance, there have been a few studies but no new major findings.[23] There remains the possibility that intense research in obscure vernacular literatures may yet show that games of chance were much better understood in earlier times than is as now apparent.

The chapter on probability in religious argument showed the beginnings of a divergence between English and continental thought related to "reasonableness," with English works following Hooker's *Laws of Ecclesiastical Polity*, emphasizing the need for reasonableness and moderation in matters of religion and politics. Recent work has shown that England really has had a unique history related to probability and reasonableness. Although English thinkers were not prominent in the development of probabilistic thinking up to 1650, John Graunt's work of 1662 on inferences from mortality tables was a unique departure, representing a large first step in drawing conclusions from statistical data.[24] It was followed up in England especially. At a deeper cultural level, Anna Wierzbicka's *English: Meaning and Culture* describes how John Locke's writings on probability, reasonableness, and moderation became ingrained in the English language. The words "reasonable" and "probably" appear in modern English with a frequency and range of application very much higher than their cognates in other European languages, as do words indicating hedges relating to degrees of evidence such as "presumably," "apparently," "clearly." These phenomena indicate an Anglophone mindset that particularly values attention to the uncertainties of evidence.[25]

Our understanding of the history of probability has reached a stable state. It is time to use that history as a resource for deepening our insights into some of the most conceptually tangled but crucial concepts of modern life: risk, evidence, and uncertainty.

23. G. Ceccarelli, "Le jeu comme contrat et le risicum chez Olivi," in A. Boureau and S. Piron, eds., *Pierre de Jean Olivi (1248–1298): Pensée scolastique, dissidence spirituelle et société* (Paris, 1999), 239–50; N. Meusnier, "Le problème des partis peut-il être d'origine arabo-musulmane?" *Journal Electronique d'Histoire des Probabilités et de Statistique* 3/1 (2007); E. Welch, "Lotteries in early modern Italy," *Past and Present* 199 (2008): 71–111.

24. J. Franklin, "Probable opinion," in P. Anstey, ed., *Oxford Handbook of British Philosophy in the Seventeenth Century* (Oxford, 2013), ch. 15; further background in B. J. Shapiro, "Testimony in seventeenth-century English natural philosophy: legal origins and early development," *Studies in History and Philosophy of Science A* 33 (2002): 243–63.

25. A. Wierzbicka, *English: Meaning and Culture* (Oxford, 2006), esp. chs. 4 and 8.

Preface

"Probability is the very guide of life," in Bishop Butler's famous phrase.[1] He does not mean, of course, that calculations about dice are the guide of life but that real decision making involves an essential element of reasoning with uncertainty. Humans have coped with uncertainty without the benefit of advice from mathematicians, both before and after Pascal and Fermat's discovery of the mathematics of probability in 1654. And they have talked and written about how to do so. So there is a history of probability that concerns neither mathematics nor anticipations of mathematics.

This is a history of rational methods of dealing with uncertainty. It treats, therefore, methods devised in law, science, commerce, philosophy, and logic to get at the truth in all cases in which certainty is not attainable. It includes evaluation of evidence by judges and juries, legal presumptions, balancing of reasons for and against scientific theories, drug trials, and counting shipwrecks to determine insurance rates. It excludes methods like divination or the consulting of oracles, which are substitutes for reasoning about uncertainty.

Three levels of probabilistic reasoning are distinguishable:

1. Unconscious inference, the reactions to uncertain situations that the brain delivers automatically at a subsymbolic level. This system of actions—the cloud out of which, so to speak, talk about uncertainty condensed—can be studied by psychology, but it is not history. (A review of what is known about it, and its relation to conscious inference, is given in chapter 12.)

2. Ordinary language reasoning about probabilities. It is this middle level that is the main subject of this book. It may avoid numbers entirely, as in "proof beyond reasonable doubt" in law or the nonnumerical judgments of plausibility that scientists and detectives make in evaluating their hypotheses. Or it may involve rough numerical estimates of probabilities, as in racecourse odds and guesses about the risks of rare events.

3. Formal mathematical reasoning of the kind found in textbooks of probability and statistics.

The higher levels may be more noble and perfect, but they are so at a cost: they are less widely applicable.

The theme of this book, then, must be the *coming to consciousness* of uncertain inference. The topic may be compared to, say, the history of visual perspective. Everyone can see in perspective, but it has been a difficult and long-drawn-out effort of humankind to become aware of the principles of perspective in order to take advantage of them and imitate nature. So it is with probability. Everyone can act so as to take a rough account of risk, but understanding the principles of probability and using them to improve performance is an immense task.

There is one further essential distinction to be made. Probability is of two kinds.[2] There is *factual* or *stochastic* or *aleatory* probability, dealing with chance setups such as dice throwing and coin tossing, which produce characteristic random or patternless sequences. Almost always in a long sequence of coin tosses there are about half heads and half tails, but the order of heads and tails does not follow any pattern. On the other hand, there is *logical* or *epistemic* probability, or *nondeductive logic*, concerned with the relation of partial support or confirmation, short of strict entailment, between one proposition and another. A concept of logical probability is employed when one says that, on present evidence, the steady-state theory of the universe is less probable than the big bang theory or that an accused's guilt is proved beyond reasonable doubt though it is not absolutely certain. How probable a hypothesis is, on given evidence, determines the degree of belief it is rational to have in that hypothesis, if that is all the evidence one has that is relevant to it.

It is a matter of heated philosophical dispute whether one of these notions is reducible to the other.[3] In any case the surface distinction is clear and provides an orientation in the history of the subject. In the period covered by the present study, logical probability was the main focus of interest, and the word *probability* was reserved solely for this case. The little study of factual probability there was—concerned with dice and insurance—was not seen as connected with logical probability.

Consequently, the book opens with three chapters on the law of evidence, in which there has been the most consistent tradition of dealing explicitly with evidence that falls short of certainty. Conscience, conceived as a kind of internal court of law, could also be in doubt; the rule of probabilism concerning it is the subject of the fourth chapter. The fifth chapter describes the (not very successful) attempts by rhetoricians

and logicians to give some account of uncertain reasoning. Evidence for scientific theories (understanding *science* widely) is considered in the next two chapters, followed by two chapters on probability in philosophy and religion, dealing largely with inductive arguments and design arguments for the existence of God. The tenth chapter describes commercial and legal thought on the nature of aleatory contracts (agreements like insurance, annuities, and bets whose fulfillment depends on chance). One aleatory contract, gaming with dice, has outcomes that can be exactly evaluated mathematically: It is the subject of chapter 11.

The reader with an average familiarity with received ideas on intellectual history is asked to make a small number of reorientations, at least provisionally.

The first concerns probability specifically. Two points should be made, to avoid perceptions that early writers are indulging merely in confused "anticipations" of later mathematical discoveries. The first is that the process of discovering the principles of uncertain reasoning is far from over. It can sometimes appear that, beginning with Fermat and Pascal's success with dice in 1654, there has been a successful colonization of all areas of uncertain reasoning by the mathematical theory of probability. As in so many areas, the arrival of the computer has shown that previous knowledge about thinking processes was not nearly as precise as had been thought—not precise enough, in particular, to allow a complete mechanical imitation of them. More is said about this in the epilogue; suffice it to say here that there is no agreement on, for example, how to combine evidence for conclusions in computerized expert systems for medical diagnosis. The disagreements are fundamental and are about quite simple issues that have occupied thinkers about uncertain inference for two thousand years: how to decide the strength with which evidence supports a conclusion, how to combine pieces of evidence that support each other, and what to do when pieces of evidence conflict.

The second point is that while the probability of outcomes of dice throws is essentially numerical, and advances in understanding are measured by the ability to calculate the right answers, it is otherwise with logical probability. Even now, the degree to which evidence supports hypotheses in law or science is not usually quantified, and it is debatable whether it is quantifiable even in principle. Early writers on probability should therefore be regarded as having made advances if they distinguish between conclusive and inconclusive evidence and if they *grade* evidence by understanding that evidence can make a conclusion "almost certain," "more likely than not," and so on. Attempts to give numbers

to those grades are not necessarily to be praised. One should not give in to the easy assumption that numbers are good, words bad.

The other requested reorientations concern two features of the history of ideas generally. They will seem strange to anyone even slightly familiar with the usual portrayals of the rise of modern science. The template antiquity > medieval decline > renaissance > scientific revolution does not fit the history of probability; certainly not the history of logical probability. In particular, it is not possible to read the story with the medieval Scholastics as "them" and the men of the seventeenth century as "us." The Scholastics made many advances in the clarification and deepening of concepts necessary to understand probability. And contrary to the myths put about by their many enemies, they explained themselves perfectly clearly.

Finally, the reader is asked to regard it as normal to find many ideas developing in legal contexts. Like the Scholastics, lawyers are often thought of as pursuing esoteric interests of little consequence for the outside world and as, by and large, enemies of scientific progress. It is argued that the prominence of both Scholastics and lawyers is not unique to probability but that their contributions to the development of modern ideas generally have been substantially underrated. A brief overview of their wider importance in the history of ideas is given in chapter 12, in order to situate the development of probability in its appropriate context.

It is useful to keep a few questions in mind while reading the detailed history. Researchers in the field have wondered why the development of probability theory was so slow—especially why the apparently quite simple mathematical theory of dice throwing did not appear until the 1650s. The main part of the answer lies in appreciating just how difficult it is to make concepts precise, especially when mathematical precision is asked for in an area that seems at first glance to be imprecise by nature. Mathematical modeling is always difficult, as is evident in contemporary parallel cases such as the mathematization of continuity that led to the calculus of Newton and Leibniz. The very idea of a "geometry of chance," as Pascal put it, is revolutionary. An evaluation of this and alternative explanations of the slowness of the rise of probability is given in chapter 12. It is suggested that, nevertheless, some mystery remains.

The book has an unusually high proportion of quotation. It is in the nature of the material that, once a small amount of context has been supplied, the authors can be allowed to speak for themselves. Paraphrase is pointless. The book is to be read in only one place at a time: the notes contain references only, the purpose of which is solely to increase the

reader's degree of belief in the statements referenced. It is written in only one language, except for occasional words from the original language of texts, included to indicate that there is no overinterpretation through tendentious translation.

The purpose of history may not be to teach us lessons, but the story told here does have a certain contemporary relevance, even though it ends in 1660. The last century of the old millennium saw a gradual waning of faith in the objectivity of the relation of uncertain evidence to conclusion. In the philosophy of science, Popper, Kuhn, and their schools denied that observational evidence could make scientific theories more probable, and attention in the field moved to sociological and other nonevidential influences.[4] Postmodernism, presuming rather than arguing for the absence of objective methods of evaluating theories, offered a number of other reasons—or rather causes—of actual beliefs, such as the demands of "power."[5] The situation is not so bad in law, which has largely retained a commitment to the objectivity of evidence, but even there, theory is not as robust as practice.[6]

The past is a counterweight to these febrile inanities of pygmies who stand on the shoulders of giants only to mock their size. Just as one who feels battered by the relentless enfant terriblisme of "modern" art or music can revive his spirit by communion with Vermeer or Mozart, so the friend of reason can draw comfort from the achievements left by the like-minded of the past. The story of the discovery of rational methods of evaluating evidence can serve as a point of reference and can supply material for the defenses of rationality that will have to be undertaken.

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