

# Introduction: Non-Demonstrative Proofs in Early Modern Europe

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According to Aristotle, *ἐπιστήμη* – that is, *scientia* or certain knowledge – must be based upon demonstrative arguments or syllogisms about things that cannot be otherwise, thus affording necessary conclusions. One may not disagree with such arguments: as long as scientific demonstrations are rightly understood, they force assent. Yet, Aristotle recognizes that the realm of things that can be known (and demonstrated) with absolute certainty or necessity is relatively limited – so limited that he will concede that one can have scientific knowledge of things that happen for the most part (*ὡς ἐπὶ τὸ πολὺ*), being thus, strictly speaking, not logically necessary.

These assumptions constitute perhaps one of the most consequential ideas in the history of Western thought. Especially influential was also a corollary to the definition of scientific demonstration, namely the notion that outside the realm of logical necessity and *ἐπιστήμη*, the argumentative reasons one may use will never be able to demonstrate, being limited to persuading. Persuasive arguments are further distinguished by Aristotle into the rhetorical, which may sway, and the dialectical, which have such an inherent argumentative rigour that they ought to persuade. An essential difference thus sets demonstrative arguments apart from the rhetorical and dialectical since only the former enjoy logical necessity. Even the relatively powerful dialectical arguments, which obey a rigorous logical structure, cannot but fall short of certainty since their premises do not fulfill the requirement of syllogistic argumentation, being merely generally admitted or probable (*ἔνδοχος*). This is also true for rhetorical arguments, which Aristotle sees in connection to dialectic, as a weaker form of persuasive argumentation that does not obey a logical structure.

The uneven territory of argumentative persuasiveness is the subject matter of this focus. All of the cases here analyzed spring from the recognition of the impossibility to produce logically necessary demonstrations. In most cases, this awareness emerged from two very different attitudes. On the one hand, though agreeing with Aristotle's theory of demonstration, many scholars found them-

selves working in fields that could not afford them with the kind of premises required by Aristotelian ἐπιστήμη – for instance the fields of law, history, and philology. On the other hand, from the sixteenth and seventeenth centuries onwards, a growing number of philosophers rejected the Aristotelian demonstrative framework altogether, being convinced that the causal understanding that according to Aristotle underlays scientific knowledge is essentially a chimera.

Most of the great paradigm shifts that characterize European culture from the early fifteenth century correlate highly with a gradual but steady decline in the general confidence about the possibility of demonstrating with logical necessity. Along with growing skeptical attitudes came, for instance, the gradual fall from favor of a philosophical genre such as the traditionally demonstrative *disputatio*, which was at least in part supplanted by other genres, persuasive dialogues first of all. Most importantly, the decline of demonstrative argumentations rekindled the interest in non-demonstrative strategies of proof that were originally treated by Aristotle under the heading of rhetoric and dialectic.

From the early fifteenth century, these disciplines became the stronghold of humanist education, often misrepresented as a pedantic enterprise into grammatical quibbles and stylistic fastidiousness. Yet, as Coluccio Salutati argued in a 1405 letter to Giovanni Dominici, the humanist preoccupation with rhetoric and dialectic was far from trifling. Along with grammar, rhetoric and dialectic were required by one's search for truth, being conceived as the disciplines that taught respectively to discern truth from falsehood and to persuade of the truth.<sup>1</sup> Only in this light, can one understand the humanist urge to found or renovate a dialectical organon that could serve as a foundation for all disciplines, as was the objective of Lorenzo Valla, Rudolf Agricola, and Petrus Ramus only to mention the best-known exponents of the humanist “dialectical revolution”.

Yet, the question remained, more pressing the ever: were rhetorical and dialectical proofs necessarily inferior to logical demonstrations? Where there circumstances under which persuasive arguments could be at least functionally as

<sup>1</sup> “Quis negare potest, cum dialectica sit inquisitiva veritatis, que sola finis est omnium liberalium artium et quaruncunque scientiarum, quod hanc necesse sit discere Christianos? [...] Nescio qualiter hoc commodius expedire velem quam cum divo Aurelio Augustino. Dicit enim in quarto *De doctrina christiana* questionem hanc absolvens in hac forma, videlicet: nam cum per artem rethoricam [*sic*] et vera suadentur et falsa, quis audeat dicere adversus mendacium in defensoribus suis inermem debere consistere veritatem [...]?” (Salutati 1891-1911: 4.1: 222, 224). Cf. also Vergerio (2002: 50) about the purpose of the trivium: “Ante omnia igitur, si quid proficere de doctrinis volumus, congrui sermonis habenda est ratio et curandum ne, dum maiora prosequimur, turpiter in minoribus labi videamur. Proxime huic disputandi ratio adhibenda est, per quam in unaquaque re quid verum falsumve sit, facile argumentando quaerimus. Ea, cum sit discendi scientia sciendique disciplina, ad omne doctrinarum genus viam facile aperit. Rhetorica vero tertia est inter rationales disciplinas, per quam artificiosa quaeritur eloquentia, quam et tertiam posuimus inter præcipuas civilitatis partes”.

probative as syllogistic conclusions? And how could one work towards increasing the persuasiveness of one's arguments?

All of these questions, which lie at the very heart of the issues discussed in this focus, entail the rhetorical and dialectical notion of *probabilitas*. Latin authors generally translated with *probabilitas* the Greek τὸ εἰκός, defined in Aristotle's *Rhetoric* as what happens for the most part and concerns things that may be other than they are, being so related to that in regard to which they are probable as the universal to the particular (cf. Arist. *Rb.*, 1357a). In Cicero's simpler, judicially imbued explanation, *probabilitas* (also termed *veri similitudo*) is the quality of those "things that usually accompany truth" – it is the quality of the usual and the expected and thus has probative force when it is employed to assess the credibility of accounts about events that may or may not have happened (cf. Cic. *Inv. rhet.*, 1.21.29).

So conceived, classical *probabilitas* conjoined two concepts that are today perceived as separate, probability and 'probativity'. This conception paved the way for scholastic treatments of the theory of probability, which became especially developed in fields including jurisprudence, moral philosophy, economics and political theory. Not surprisingly, the medieval discussion of *probabilitas* provided early modern authors with a wealth of theoretical instruments and argumentative strategies that were incorporated in the great Renaissance effort to develop a probative organon that did not rely on logically necessary demonstrations, but rather on persuasive reasons belonging to the fields of rhetoric and dialectic.

The first three articles of this focus offers a bird's-eye view of the notions of proof and evidence that emerged from this epistemic background.

In his article, James Franklin traces a history of probable argumentation as it was deployed in law, moral theology, and finance especially. Provided that the essence of judicial procedures was to evaluate the evidence for and against a claim, allowing the judge to reach virtual certainty about alleged crimes, medieval jurisprudence constituted a somewhat obvious seedbed for the discussion of *probabilitas* and probable arguments. As remarked by Franklin, "the conceptual developments of legal *probabilitas* overflowed into Catholic moral theory, where the confessional was regarded as a miniature court of canon law and hence manuals for confessors advised on theory applicable to deciding 'cases of conscience'". Lastly, new impetus was given to the theory of *probabilitas* by the late medieval and early Renaissance diffusion of aleatory contracts such as maritime insurances, annuities, and games of chance, which required a statistical understanding of the nature of risk.

Although he admits that humanists too adopted some of the tools derived from the theory of *probabilitas* in order to develop philological and critical

methods for assessing the plausibility of historical accounts and philological readings, Franklin stresses the role played in the development of probable arguments by late scholastic authors such as Medina, Soto, Cano, Lessius and Caramuel, who applied strategies of probable argumentation to the most diverse fields of knowledge in order to reach conclusions that, though falling short of the certainty afforded by scientific demonstrations, could nonetheless be very probable – so probable, in fact, that under certain circumstances they could be considered as good as certain.

Franklin's article offers us valuable insights that concern in particular the continuity between the medieval and the early modern development of the concepts of *probabilitas*, proof, and evidence. Moreover, Franklin opens up discussion of some crucial and debated aspects in the history of *probabilitas* and argumentation, first among which is the relationship between epistemic probability and aleatory or stochastic probability. As shown by Franklin, both kinds of probability existed and were conceptualized well before the time of Pascal and Port-Royal. Most notably, however, Franklin argues that they were also perceived by scholastic authors as two different albeit connected concepts, the former being dealt with the continuation of legal and moral debates, while the latter provided a background for the Renaissance risk culture of business.

Franklin's article concludes with an analysis of Galileo's use of probable arguments in the field of natural sciences. In his *Dialogue Concerning the Two Chief World Systems* Galileo intermingled rhetorical and dialectical arguments; yet, in order to enhance the probative strength of the latter, he adopted a two-fold strategy. First, he eschewed dialectical arguments grounded in extrinsic probability (i.e., arguments supported by probable authority). Secondly, he rejuvenated arguments based upon intrinsic probability (i.e., arguments whose conclusion is supported by the evidence) by clothing them in mathematics more than was ever done before. Thus purged of extrinsic probability and refashioned in mathematical terms, Galileo's persuasive arguments offer us, according to Franklin, an example of "the successful movement of probabilistic argument into the domain of quantitative sciences, the area in which the Scientific Revolution was to transform the world of ideas".

Other examples of this movement of probabilistic argument into early modern culture are provided by Barbara Shapiro, whose article paints a veritable 'atlas' of probabilistic, rhetorical proofs so as they were understood and used across the whole spectrum of early modern culture.

Shapiro shows how probabilistic strategies of proof emerging from the epistemic background described by Franklin were adapted and applied to a variety of different disciplines that – for one reason or the other – could not afford scientific demonstrations. Most importantly, however, Shapiro argues that while

appreciating the different shapes probable arguments took in different disciplines, we must not fail to observe these disciplines in relation to one another, lest we fail to see two crucial aspects of the history of probable arguments. One is the role played by textbooks, encyclopedias and dictionaries in familiarizing a non-intellectual audience with the idea of probabilistic knowledge; the other is the cross-disciplinary nature of some instruments of probable inference – for instance, credible witness testimony – which were not exclusive to one area of early modern culture, belonging instead to a common intellectual background.

Shapiro's analysis of the commonalities that characterize early modern notions of probable argumentation concentrates on four disciplinary areas: history, religion, law, and natural science. The orchestration of demonstrative and probable arguments posed different challenges to the scholars in these fields, who were led to find unique solutions to satisfy a common yearning for certainty. Historians, on the one hand, were appealed by the ideal of a rhetorically persuasive narrative but also laid claims to a kind of certainty appropriate for matters of fact. Theologians, on the other hand, embraced the medieval tradition of probability upon developing the complex organon of early modern casuistry but also used probable and circumstantial evidence in order to provide rational proofs for belief in Scripture. A similar probabilistic approach to evidence was one of the core concerns of early modern jurisprudence, whose attempt to reach conclusions as close as possible to certain knowledge are analyzed by Shapiro both with regard to the continental and the English legal tradition. Finally, Shapiro focuses on what she considers "the most challenging intellectual area to be examined", that is the natural sciences, where the effort to find a valuable 'dialectical alternative' to the canons of demonstrations and mathematical certainty led to the adoption of hypotheses, seen "as a means of linking 'matters of fact' with generalizations, principles and theory".

While Franklin's and Shapiro's observation shed light on the early modern development of dialectical arguments, the third article of this focus concerns the other branch of persuasive argumentation, namely rhetoric. Francis Goyet invites us to reflect on the emergence of rhetorical means of persuasion as they were used in the seventeenth century in order to fulfill a purpose that dialectical arguments could not achieve. Thanks to a careful lexicographical analysis that charts the history of the terms *convincere* (Lat.) and *convaincre* (Fr.), Goyet enlightens us on the early modern tension between the dialectical desire to prove in a way that defeats our adversary and the rhetorical urge to persuade an audience who is entirely free to agree or disagree with us.

The key figure in Goyet's reconstruction is Pascal, whose works are described as a watershed in the history of rhetorical arguments. Before Pascal, Goyet argues referring in particular to the prominent example of Descartes, the

main philosophical objective was always the victory over hypothetical adversaries who needed to be defeated by one's reasons. Pascal too, according to Goyet, has in mind this to kind of philosophical victory in *The Art of Persuasion* (c. 1655) and – perhaps even more so – when he argues against actual adversaries in the *Provincial Letters* (1656-57), whose aim is to defeat the Jesuits completely. Yet a new kind of argument emerges in the *Pensées*. Alongside the desire to force the audience to admit the truth of the Christian religion, Pascal discovers the crucial importance of a kind of arguments that persuades while respecting the freedom of the audience. This kind of (rhetorical) persuasive arguments is the same that was chosen by Jesus, who “could have appeared in a manner ‘absolutely capable of ‘convincing’ all men’ but refused to do so, not wishing to force anybody”. Instructed by the example of Christ, who sought to persuade the heart (*le cœur*) rather than convincing the intellect (*l'esprit*), in the *Pensées* Pascal brings to the fore the importance of rhetorical arguments that – unlike dialectical ones – draw their use precisely from the fact that they do not force the audience, respecting its freedom.

Goyet closes the first part of this focus, shedding light – along with Franklin and Shapiro – on the theoretical underpinning of the Renaissance and early modern development of persuasive argumentation of both the dialectical and the rhetorical kind. The second part of this focus contributes to the analysis by discussing some case studies that concern the application and use of probable arguments and proofs in specific fields or situations. Doing so, this volume tries to avoid disciplinary compartmentalization, which could appear partially anachronistic, obscuring the commonalities that – as reminded by Shapiro – characterize early modern notions of probable argumentation. Instead, the second part of this focus concerns the two main functions of probable or persuasive argumentation: the critical search for probable evidence persuading us to believe claims that we are presented with, on the one hand, and the quest for persuasive proofs that may convince others to believe our own claims on the other.

The second part of this focus opens with an article that address the question of historical truth in the Renaissance, dealing in particular with the concept of historical evidence, understood as the requirement for one's belief in the veracity of historical accounts. Giuliano Mori's article focuses on the sixteenth century and, more specifically, on the critical historical method illustrated by the late scholastic philosopher Melchor Cano. Cano's interest in the quest for historical evidence belongs to his apologetic project to devise repositories of arguments (*loci theologici*) that theologians could use in order to defend the Catholic doctrine. Cano innovatively includes among these argumentative *loci* that of human history. Yet, before human history can be used to persuade others, it is

the theologians' task to become persuaded of the veracity of the accounts drawn from human history. Theologians must thus put on their critical hat, making an effort to evaluate precisely the intrinsic probability of historical evidence.

Cano's intellectual project and cultural background – Mori insists – were very different from famous coeval examples of the critical historical method that arose from the application of humanist philology to the field of legal history. Cano drew his method from the scholastic and judicial tradition of assessment, comparison, and grading of probability. Therefore, it is not surprising that Cano's critical historiographical tools should have close parallels in the inquisitorial tradition – for instance, the notion of reputation (*fama*), the principle of multiple witness corroboration, and the technique of computing and combining probabilities. As Mori shows analyzing the denunciation of the forgeries by Annius of Viterbo in the *Loci theologici*, Cano was not deaf to the innovations of humanist philology, of which he made use in order to update the judicial and scholastic method for assessing probabilities. Yet, at variance with authors such as François Baudouin and Jean Bodin, he did not consider philology as a method per se but rather as an auxiliary tool.

These observations are employed by Mori in order to stress the importance of the tradition of probable reasoning for modern critical scholarship. The comparison of Cano's critical method with that of Baudouin and Bodin invites a revision of widespread assumptions about the rise of modern historical scholarship as the result of the humanist battle against the allegedly uncritical and authoritarian forces of scholasticism and Bartolism. Mori concludes that “there were many possible roads to modern historical criticism. All of them, however, required two distinct factors” – on the one hand, a comparative methodology for the assessment and grading of probability whose precedents could be found in scholastic and judicial tradition; on the other, the philological awareness required to assess the intrinsic textual or linguistic probability (or improbability) of written sources.

The issue of how to evaluate the probability of received accounts is also at the heart of Stefania Tutino's article, which shifts the focus from the field of history to that of religious faith and doctrine. Medieval theologians – along with jurists and canonists – recognized the importance of credibility for religious beliefs though subordinating it sharply to the kind of truth received by divine revelation. It was in the early modern period that confessional, philosophical, and apologetic challenges brought the question of the credibility or plausibility of the truth of Catholic doctrines to the fore. The newly acquired centrality of this aspect produced a growing interest in the kinds of theological evidence that, differing from the invincible proof of divine revelation, could nonetheless make beliefs credible (or incredible). In a way that parallels closely the rekindled in-

terest in probable argumentation illustrated in this volume, Tutino shows how dialectical and rhetorical arguments entered the field of post-Reformation Catholicism in an unprecedented way.

In order to explore the relationship between truth, credibility, and evidence Tutino scrutinizes the case study offered by an alleged miracle that took place in the Italian town of Bolsena. In the spring of 1693, Agostino Berton visited the site of a well-known medieval miracle: a church whose altar had been stained during a celebration by the blood of Christ miraculously dripping from a holy wafer. Initially skeptical, Agostino was convinced of the veracity of the original miracle when he received a vision of a tiny naked baby moving towards him from the stains of blood on the altar.

Agostino's vision was immediately subjected to close investigation. The local clergy acknowledged that Agostino's testimony lacked some credibility, yet they also realized that Agostino's vision did not promote a new cult but merely corroborated a precedent miracle that was instead well-established and fully verified. Therefore, they believed that Agostino's account was a perfect example of when reason should make room for faith. A similar tension between the need for credibility and the appeal to faith is also illustrated by the subsequent interrogation of Agostino in Rome, where the Holy Office inquired about the doubts that he had initially harbored. Agostino satisfied the inquisitors that he had absolute faith in the Eucharistic dogma and had been merely dubious of the fact that the stains on the altar were those of the real blood of Christ dripping from the wafer, since he had had no proof of the miracle before he received his vision. The Inquisitors found no fault in Agostino's perspective on truth and credibility: the dogmas of the Catholic religion had to be embraced by faith, and no proof was required of their truth; miracles, instead, needed to be credible in order to be believed. As Tutino concludes, "from the perspective of the seventeenth-century ecclesiastical authority, good faith did not necessarily produce 'right' faith. In other words, even though the censors knew that faith cannot be reduced to a matter of reasonable evidence and demonstrable proofs, it must include a measure of credibility".

Following Mori's and Tutino's analyses of the ways in which probable reasoning was used by early modern authors as a critical tool, that is in order to assess the intrinsic probability of received accounts, the final part of this focus looks at rhetorical and dialectical arguments from a different perspective. Rather than analyzing on how early modern authors sought probable evidence to justify their own belief (or disbelief) in something, the last two articles of this focus explore the ways in which rhetorical and dialectical 'proofs' were used in order to convince others. This 'probative use' of rhetorical and dialectical arguments is analyzed in particular in relation to the fields of theology and philosophy.

In his article, Rudolf Schuessler explores the role played by scholastic probabilism in regulating the acceptance of philosophical doctrines. The case study chosen by Schuessler is especially instructive, not least because it concerns a philosophical school that was traditionally considered controversial by Catholic authors. Analyzing the different attitudes towards Epicureanism that developed within the Catholic milieu in seventeenth-century Italy and France, Schuessler makes two important points. First, he shows that – contrary to widespread assumptions – the Catholic attitude towards Epicureanism was not as unfavorable as is often thought, especially in the first half of the seventeenth century, in milieus such as those of pope Urban VIII in Italy and Cardinal Richelieu in France. Secondly – and even more significantly for the purpose of this special issue – Schuessler explains the favorable reception of Epicureanism by relating it to the history of probabilism.

In the first half of the seventeenth century, the prevalent Catholic approach to morality was grounded in probabilism, defined as the doctrine according to which one could rationally embrace ‘probable opinions’ considered true by competent evaluators, even in contrast to other competent evaluators. These assumptions – Schuessler demonstrates – were applied not only to moral theory but also to philosophy, allowing early modern authors to regard specific, Christianized Epicurean claims as tenable irrespective of the greater consent commonly given to Aristotelianism. The rise of probabilism thus coincided with the heyday of neo-Epicureanism as reflected in the works of Pierre Gassendi and François La Mothe Le Vayer in France, Francis Bacon and Thomas Hobbes in England, Giovanni Nardi and Francesco Sforza Pallavicino in Italy.

In the second half of the seventeenth century, opposition mounted against the doctrine of probabilism, especially after the publication of Pascal’s *Provincial Letters*. As demonstrated by Schuessler, in this case too, the decline of probabilism and the weakening of Epicurean positions were synchronous. Yet, while in France the “rise of a new scientific worldview may have compensated neo-Epicureans for the decreased protection offered by probabilism”, in Italy “probabilism proved more resilient than in France, but Epicurean thought diminished further”. This decline is amply illustrated by Schuessler, whose analysis of Sforza Pallavicino’s *Del bene* (1644) – a work imbued with Epicurean and hedonistic themes, authored by a foremost Jesuit, Cardinal, probabilist and follower of Galilei – contrasts sharply with the ineffective attempts by Alessandro Marchetti to obtain permission to publish his translation of Lucretius’ *De rerum natura* in 1667.

Schuessler’s analysis of Pallavicino’s work provides us with a case study of how, in the field of theological discussion, probable reasoning and dialectical arguments could be applied to specifically philosophical issues such as the ac-

ceptability of Epicureanism. The reverse case is analyzed by Alberto Artosi and Giovanni Sartor, whose article focuses on Pascal and Leibniz, showing how they resorted to probable arguments upon facing the quintessential theological question of the existence of God.

On the shared premise that none of the available “proofs” could demonstrate God’s existence in a necessary way, both Pascal and Leibniz held that one should nonetheless assume the existence of God. Yet, in spite of superficial similarities, the ways they did so – Artosi and Sartor demonstrate – were greatly different. Pascal’s wager is essentially game-theoretic in nature: it appeals to considerations of probability and utility and its purpose is to determine one’s optimal decision under uncertainty. This is why, according to Leibniz, Pascal paid attention only to moral arguments. On the contrary, Leibniz sought to prove the existence of God by means of ontological arguments that could ultimately satisfy the canons of demonstrative validity. To do so, he devised a probabilistic argument grounded on the legal procedure of accepting something as true as long as there is no proof to the contrary. At variance with Pascal’s, Leibniz’s argument did not concern – at least not primarily – the field we know as decision theory, but rather that of presumptive reasoning. “Faced with the troubling question of God’s existence, Pascal and Leibniz adopted two quite different attitudes: Pascal framed his argument in terms of *acting as if* God existed; Leibniz sought to substantiate the *belief that* God exists”.

Having thus analyzed Pascal’s and Leibniz’s probable arguments for the existence of God, in the second part of their article, Artosi and Sartor ask whether those arguments were really persuasive. Objections are raised against both arguments: while Pascal’s wager only works on the assumption that there is a nonzero probability of winning the bet, Leibniz’s argument is valid as long as there is a way of “prioritizing” the presumption of the possibility of God over its contradictory (otherwise, by Leibniz’s own standards, one should presume that God does not exist as long as the contrary is not proved). While the objection to Pascal’s argument may be solved only if one posits that the wager is addressed to those alone who are willing to bet on God’s existence, Artosi and Sartor argue that Leibniz had an answer to the aforementioned objection. In his *Elements of Natural Law*, he strove to prove that presumption always lies on the side that has fewer logical and ontological requirements or conditions, this being always the side of possibility. When applied to Leibniz’s probable argument for the existence of God, this principle stipulated that God’s possibility ought to be inferred unless its impossibility could be established.

Artosi and Sartor’s conclusions are illuminating not only for what they show about Pascal and Leibniz but also because they raise some crucial points that

concern both the entire history of probable arguments and the history of scholarship on probability.

First, they demonstrate that classical, medieval, and Renaissance traditions informed ‘modern’ concepts of probability such as Pascal’s and Leibniz’s. More specifically, along with Franklin, Shapiro, Mori, and Tutino, Artosi and Sartor remind us of the enormous influence that Renaissance legal culture had on the development of modern probable arguments as they were used in non-legal areas including those of science, philosophy, and theology. By the same token – the articles in this focus demonstrate – other classical and medieval traditions such as forensic rhetoric (see Goyet) and scholastic theology (see Schuessler) also played a crucial role in the process that led to the formation of the modern notion of probability.

Artosi and Sartor also address another central issue in the early modern history of probable reasoning, namely the relationship between presumptive reasoning – as exemplified by the legal tradition and Leibniz’s argument – and probability calculus – as developed by Pascal’s and Bernoulli’s mathematics of probability. This question often presents itself in this volume, most explicitly in Franklin’s article, which suggests that both stochastic or aleatory probability (i.e., probability calculus) and epistemic probability existed well before the time of Pascal and were perceived as two different notions that had different applications. Artosi and Sartor similarly suggest that Leibniz ultimately viewed presumptive reasoning and probability calculus as two distinct notions, but they argue that he ultimately came to think of them as two related branches of the same logic.

These conclusions touch upon two debated issues that have shaped the discussion on the history of probability for the past fifty years, since the publication of Hacking’s groundbreaking *The Emergence of Probability*. One is the question of the relationship between post-Pascalian probability and previous notions of probable argumentation and probable proof. The other concerns instead the relationship between two notions of probability that we have come to perceive as greatly different: stochastic, aleatory, or objective probability on the one hand and epistemic or subjective probability on the other.

Thanks in particular to important critiques of Hacking’s theses including Garber and Zabell’s “On the Emergence of Probability” (1979) and Franklin’s *The Art of Conjecture* (2001), I think we can say that most scholars – with partial but notable exceptions<sup>2</sup> – have come to agree that there was no real ‘emergence’

<sup>2</sup> See for instance Daston (1988; 2000). In her sympathetic review of the second edition of Hacking’s work, Daston argued that Hacking’s critics too “have largely adopted his terms of framing of the problem, ‘the emergence of probability’, even if they have not embraced the surprising specifics of his solution or the bold generalities of his approach” (2007: 805). While this is certainly a proof of

of post-Pascalian probability understood as something that was entirely inconceivable in earlier times. Crucial scholarship in the past decades, including the works of many of the contributors to this volume,<sup>3</sup> demonstrated that there were longstanding medieval and Renaissance traditions of probable reasoning (rhetorical, legal, dialectical, economical, etc.) that cannot be considered as mere ‘preconditions’ for seventeenth-century probability, understood – in Hacking’s terms – as “something which is not probability but which was, through something like a mutation, transformed into probability” (2006: 9). Rather, these traditions informed the modern, seventeenth- and eighteenth-century notion of probability which, although differing in many ways from earlier versions of the same concept, should not be seen as something completely new but rather as the relatively seamless evolution of a tradition that had existed for centuries if not millennia. The many allusions in this special issue to the post-Pascalian heritage of the early modern notions of probability here discussed provide – I believe – a strong argument in support of this moderately continuist perspective.

Connected to the debate on the emergence of probability is the question of the relationship between aleatory and epistemic probability. This question too was in some way inaugurated by Hacking, who proposed that “the probability that emerged so suddenly is Janus-faced”, being on the one side aleatory and on the other epistemic (2006: 12).<sup>4</sup> According to Hacking, these two ‘sides’ of probability were not distinguished sharply, at least not initially – Daston (1994), for instance, suggests that they came to be viewed as clearly separate notions in the mid-nineteenth-century. Franklin, Artosi and Sartor argue, instead, in this volume, that epistemic and aleatory probability – i.e., probability<sub>1</sub> and probability<sub>2</sub> in Carnap’s terms – were clearly distinguished in the time of Pascal and even before, characterizing different traditions that may or may not have been integrated.

Personally, I am inclined to take a somewhat conciliatory position, suggesting that the distinction between aleatory and epistemic probability was, pragmatically, a difference that made no difference: one that was perceived and recognized even before the time of Pascal and Leibniz without ipso facto preventing scholars from combining the two notions within the same epistemological and argumentative systems. This assumption offers – I believe – a few ad-

Hacking’s lasting influence, I do not believe that it is a reason to disregard the main criticism directed against Hacking’s thesis, namely that we should not see the pre-seventeenth-century history of probability as something completely distinct from seventeenth- and eighteenth-century probability.

<sup>3</sup> See Franklin (2001); Schuessler (2019); Shapiro (1983; 1991); and Tutino (2014; 2018). See also Ginzburg (2000); Hald (1990); Lancaster and Raiswell (2018); MacLean (1992; 2000; 2002); Rabinovitch (1973); Schneider (1980); Serjeantson (1999; 2006).

<sup>4</sup> Cf. also Hacking (2006: 11-17, 122-133).

vantages. Firstly, it agrees with the moderately continuist perspective sketched above since it allows us to appreciate the commonalities that unite not only the pre-Pascalian and post-Pascalian probability, but also the different notions of probability that were used simultaneously in different disciplinary contexts, as shown for instance by Shapiro. Moreover, a pragmatic approach to the distinction between aleatory and epistemic probability may also allow us to consider in a new light recent developments in the area of probability, which in some way suggest that even for us – or at least for the great majority of the world’s population, which is not trained in analytic philosophy – the distinction between probability<sub>1</sub> and probability<sub>2</sub> may still be one that pragmatically makes little difference. A ‘persuasive argument’ in favour of this claim is provided for instance by the extraordinary importance assumed in the last decades by applications of Bayesian inference in the fields of philosophy, psychology, economics, and law.

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