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The Embedded Epistemologist: Dispatches from the Legal Front*

SUSAN HAACK

Abstract. In ordinary circumstances, we can assess the worth of evidence well enough without benefit of any theory; but when evidence is especially complex, ambiguous, or emotionally disturbing—as it often is in legal contexts—epistemological theory may be helpful. A legal fact-finder is asked to determine whether the proposition that the defendant is guilty, or is liable, is established to the required degree of proof by the [admissible] evidence presented; i.e., to make an epistemological appraisal. The foundherentist theory developed in *Evidence and Inquiry* can help us understand what this means; and reveals that degrees of proof cannot be construed as mathematical probabilities: a point illustrated by comparing the advantages of a foundherentist analysis with the disadvantages of probabilistic analyses of the evidence in the Sacco and Vanzetti case (1921), and of the role of the statistical evidence in *Collins* (1968).

1. Judging of Evidence: Theory & Practice

Everyone has daily, hourly, and momentary need of ascertaining facts which he has not directly observed; not from any general purpose of adding to his stock of knowledge, but because the facts themselves are of importance to his interests or his occupation. *The business of the magistrate, of the military commander, of the navigator, of the physician, of the agriculturalist, is merely to judge of evidence, and to act accordingly.* [. . .] [T]his is the only occupation in which the mind never ceases to be engaged. (John Stuart Mill, 1843)¹

We are doubtless, in the main, logical animals, but we are not perfectly so. [. . .] [Knowledge of the guiding principles of reasoning] would probably be [. . .] of no service to a person [. . .] whose activity moves along thoroughly-beaten paths. [. . .] *But let a man venture into an unfamiliar field, or where his results are not continually*

* Plenary Invited Lecture, Chambers Conference on “The Point and Purpose of Epistemic Evaluation,” University of Nebraska, Lincoln, September 2010.

¹ Mill 1843, 5 (my italics). In another context I would take issue with Mill’s assumption that there is a clean distinction between facts which are directly observed and facts which are inferred; but in the present context the points on which we agree are far more important than those on which we disagree.

checked by experience, and all history shows that even the most masculine intellect will sometimes lose his orientation [. . .]. He is like a ship in the open sea, with no one on board who understands the rules of navigation. (C. S. Peirce, 1877)²

Mill is right: all of us, all the time—in deciding what to eat, how to get to our destination, whom to trust, whether to buy insurance, etc., etc.—constantly “judge of evidence, and act accordingly.” We need to know what actions on our part are likely to achieve desired results, and what to frustrate them; and if we are to find this out, we have no option but to follow such indications of truth as are available to us, i.e., to go with such evidence as we have, or can obtain. Moreover, as Mill’s list—the magistrate, the military commander, the navigator, the physician, the agriculturalist—reminds us, a correct assessment of where evidence points can be of crucial, even of life-and-death, importance.

Mill’s *System of Logic*, from which my first quotation comes, was first published in 1843. But, as the reference in Mill’s subtitle to “*Principles of Evidence*” reveals, the word “logic” was then understood much more broadly than is now usual,³ and included much of what would now be called “epistemology” (a word that seems to have gained currency only later).⁴ Indeed, by my lights, evidence, quality of evidence, and weight of evidence—“degree of proof,” as Mill would say—are absolutely *core* epistemological concepts, at the very heart of the enterprise.⁵ The subject-matter of epistemology—at any rate, of epistemology as I conceive it—is a ubiquitous human practice of great importance in our lives.

But this, while reason enough to motivate those of us with a taste for it to engage in epistemological theorizing, by no means shows that epistemological theory has real-world, practical relevance. In ordinary circumstances people manage to “judge of evidence” more or less adequately without having, or needing, any kind of *theory* of what makes evidence better or worse. Indeed, people can manage to assess the worth of evidence

² Peirce 1877, 5.366 and 368 (my italics). References to the *Collected Papers* are by volume and paragraph number. (Yes, of course I noticed Peirce’s phrase “masculine intellect”; but my reaction is wry amusement, not the righteous indignation we have come to expect from self-styled “feminist epistemologists”—some of whom, I note, themselves revive old stereotypes, now in the form of supposed “women’s ways of knowing.”)

³ See Haack 2005a, 223–4.

⁴ Around 1906, I note, Peirce described the word “epistemology” as “an atrocious translation of *Erkenntnislehre*.” Hartshorne et al. 1931–58, 5.496.

⁵ In Haack 1993, I offer an analysis of epistemic justification in which quality of evidence is key (and in the introduction to the 1st edition, and again in “‘Know’ is Just a Four-letter Word,” included in the 2nd, I argue that the concept of knowledge is of relatively minor importance). In Haack 2003, I develop an account of the warrant of scientific claims and theories in which evidence and the sharing of evidence are central, and an account of the methods of science in which social “helps” to inquiry—including the mechanisms encouraging honest reporting of evidence—play an important role. And in Haack 2005b, I argue in part that such epistemic virtues as intellectual honesty and intellectual courage must be understood in terms of an inquirer’s relation to evidence.

more or less adequately even without benefit of a *word* for it. The English word “evidence” may be qualified by “sketchy” as well as “complete,” by “flimsy” as well as “overwhelming,” by “strong” as well as “weak”; but the French word “évidence” (like the English word “evident”) conveys certitude, and “preuve”—though a somewhat less misleading translation of “evidence” than “évidence”—also means “proof, demonstration.”⁶ Yet French-speaking magistrates, military commanders, physicians, etc., assess evidence much as we native English speakers do.⁷

But the main point here is that the real-world importance of the *practice* of appraising the strength of evidence doesn’t by itself show the real-world relevance of epistemological *theory*. “Mankind judged of evidence, and often correctly,” as Mill puts it, “before [epistemology] was a science, or they never could have made it one.”⁸ As this suggests, and as I argued in *Evidence and Inquiry*,⁹ our untutored judgments that this evidence is strong but that weak, this evidence relevant to whether *p* but that irrelevant, etc., constitute something like the raw data of epistemological theorizing. You might say, paralleling the medieval distinction between *logica utens* and *logica docens*,¹⁰ that these untutored judgments are the *epistemologica utens* on which the construction of an *epistemologica docens*—epistemological theory—depends.

Does this mean that epistemological theory *has no* the real-world relevance? Not at all. This is the point of the second of my opening quotations. Peirce uses the word “logic” in a sense, if anything, even more

⁶ I first learned this from difficulties I encountered when epistemological papers of mine were translated into French. See e.g., Haack 2001a, Haack 2002. A few years later, there was a lengthy interchange on the “evidence-bouncer” list (<Evidence@casa.ucl.ac.uk>) about how to translate “evidence” into French and other Romance languages. The same problem, I understand, arises in Italian with “evidenza”; but friends in Spanish-speaking philosophy tell me the problem with the Spanish “evidencia” is less acute, because of the popularity of dubbed American legal dramas. All these words have the same etymology, deriving from the Latin, “video, videre,” to see; and even the English word can still, in some contexts, convey certainty.

⁷ Ancient historian Jason Davies observes that French writers in his field circumvent the problem by writing along the lines of “The text of Livy. . . . tell us that Rome was founded by Romulus. This leads to the conclusion that . . . without doubt, we can say that. . . .” Posting of Jason Davies, p.j.davies@ucl.ac.uk, to the “evidence bouncer” list (note 6 above), February 28, 2007 (on file with author).

⁸ Mill 1843, 6. At the time Mill wrote, “science” (like “logic”) had a broad meaning, referring to any systematic body of knowledge, and not only to what we would nowadays call sciences; so what he means is, roughly, that epistemology could not have become a discipline if not for the pre-existing practice of judging evidence. On the history of the concept of science, see Hayek 1952, chap. 1.

⁹ Haack 1993, 49–50.

¹⁰ I learned this distinction from Peirce, who writes that “a classification of arguments, antecedent to any systematic study of the subject, is called the reasoner’s *logica utens*, in contradistinction to the results of the scientific study, which is called *logica docens*.” Hartshorne et al. 1931–58, 2.204 (1902).

expansive than Mill's:¹¹ So, roughly paraphrased in early-21st-century philosophical terminology, the thought is that in ordinary circumstances we can assess the worth of evidence well enough without benefit of any theory; but that when the evidence is especially complex, ambiguous, or difficult, or the subject-matter so emotionally colored that we are in danger of losing our cool, epistemological theory "would be sure to be found useful."

In legal contexts, the evidence that must be assessed is sometimes extremely complicated, ambiguous, difficult, and emotionally disturbing; so this is one area of real life where epistemological theory may prove helpful. "May" prove helpful, not "will": I have quite deliberately been less categorical than Peirce, because an epistemological theory isn't likely to be much use here unless, first, it has something to say about what makes evidence relevant or irrelevant, better or worse, stronger or weaker, truth-indicative or misleading;¹² unless, second, it is spelled out in enough detail to get a grip on evidence of the complexity encountered in legal cases; and unless, third, it is, at least approximately and in broad outlines, well, *right*—by which I mean that, ideally, it should both correspond at least approximately to the contours of our untutored judgments of evidence, and support the appropriate relation between quality of evidence, and hence degree of warrant, and likely truth.¹³ By no means *all* the work of professional specialists in epistemology, in other words, is likely to be of any use in legal contexts. Few, if any, of all those efforts to "refute the skeptic," or all those forays into Gettier-ology,¹⁴ are likely to be helpful here; nor epistemological theories such as reliabilism,¹⁵ veritism,¹⁶ or "virtue epistemology"¹⁷ that eschew or play down the concepts of evidence and quality of evidence; nor even theories that acknowledge the central

¹¹ And to a modern ear, the title of the essay from which my quotation is taken, "The Fixation of Belief," sounds distinctly epistemological.

¹² Though, to be sure, it needn't use the word "evidence," but might speak of data, reasons, testimony, etc.

¹³ See Haack 1993, chap. 10; Clendinnen 2007; Haack 2007a.

¹⁴ A wild-goose chase, in my opinion. As I argued in Haack 2009a, the underlying problem is a mismatch between the concept of knowledge, which is categorical, and the concept of epistemic justification, which comes in degrees; and there is no way to set the standard of justification required for knowledge high enough to avoid Gettier paradoxes without falling into skepticism. (Unlike attempted solutions to the Gettier paradoxes, however, this deflationary paper of mine *does* have some potential relevance in legal contexts, since it includes an analysis of the contextual character of what makes evidence misleading.)

¹⁵ True, one finds occasional allusions to evidence in Goldman 1986; but, as I argued in Haack 1993, chapter 7, Goldman sneaks in the concept of evidence only where he is trying to plug some hole in his official, reliabilist theory—in which this concept plays no role.

¹⁶ Again, one finds entries under "evidence" in the index of Goldman 1999; but these allusions to evidence, like those in Goldman 1986, are adventitious: almost all the entries take readers to the chapter on law.

¹⁷ See my "Foreword" to Haack 1993, 2nd ed. (2009), 25–6, where I distinguish the two quite different enterprises advanced under this rubric.

role of evidence but assume a categorical conception of warrant; nor much, if any, of what the still-thriving “feminist-epistemology” industry churns out;¹⁸ nor, etc.

And neither, of course, should we expect *only* professional specialists to shed light on legally relevant issues; there are important insights, as we have already seen, in older writers working in logic, broadly conceived—as there are in the work of thoughtful scientists and historians, and of the many legal thinkers who have pondered over the rationale for the intricacies of evidence law¹⁹ (and, etc.). Nor should we forget that epistemological insights can be found in works of fiction: Scott Turow’s *Reversible Errors*,²⁰ for example, or Michael Frayn’s *Headlong*²¹—two novels of very different *genres* that both convey how misleading incomplete evidence can be. And neither, I should add, is the usefulness of epistemological theory to the law a one-way street: In many legal cases the evidence is far more tangled and baffling than even the most elaborate of philosophers’ cartoon examples, so that an epistemologist who ventures into the bramble-bush²² is likely to learn as much as he teaches—and may be sobered to discover how severely legal issues about evidence and proof can test his theory. In what follows, as I put my own foundherentist theory to work on a battery of issues in current U.S. evidence law, we shall see something both of the challenges, and of the rewards.

2. Epistemology Legalized: Philosophical Theory & Legal Rules

It is worth pausing to note that the current U.S. law of evidence is a highly evolved and very singular system for determining matters of fact; and that different legal systems have (or have had) very different ways of doing this. Once upon a time, English courts relied on trial by ordeal, in which the defendant might, for example, be asked to grasp a red-hot iron bar, so that his wound could later be checked to see whether it had festered—which was taken to be an indication of guilt; or trial by oath, in which the defendant would swear before God that he was not guilty, and “oath-helpers,” also known as “con-jurors,” would swear that *his* oath was not

¹⁸ Another wild-goose chase, in my opinion. As I argued in Haack 1996a, there is simply no such connection between feminism and epistemology as the rubric “feminist epistemology” requires.

¹⁹ See e.g. Gilbert 1754; Bentham 1827; Thayer 1898; Wigmore 1904–5.

²⁰ Turow 2002 (a criminal-defense attorney investigating in the course of a last-minute death-penalty appeal uncovers evidence that seems to make it more and more likely that his client is guilty—until it reveals that he isn’t).

²¹ Frayn 1999 (a philosophy lecturer is desperately trying to discover whether the painting he is scheming to buy cheap from his hard-up, clueless aristocratic neighbor is a priceless missing Bruegel; and uncovers evidence that seems to show that yes, it is—no, that it isn’t—yes, that it is, . . . and so on).

²² Llewellyn’s marvelous metaphor for the common law. Llewellyn 1951.

foresworn.²³ In early Anglo-Saxon times, whether a defendant was required to swear an oath at all, and if so, whether his oath required oath-helpers, and if so, how many, depended on his rank.²⁴ Even today, in countries which enforce traditional Sharia (Islamic) law, the testimony of a male witness is given twice the weight of a woman's;²⁵ and until very recently Pakistani law required four male, Muslim eye-witnesses to substantiate a charge of rape.²⁶ Moreover, different legal systems allocate the task of making factual determinations differently: in the civil-law systems of Europe, Latin America, etc., the task of making factual determinations falls to the judge; in Anglo-American common-law systems, it (normally)²⁷ falls to the jury.

The need to determine facts naturally leads to rules about *burdens of proof* and *standards of proof*. In U.S. law, "burden of proof" covers two things: principles about which party is obliged to produce evidence—sometimes known as the "burden of production";²⁸ and principles about which party has the burden of establishing the elements of the case—sometimes known as the "burden of persuasion,"²⁹ but perhaps better described as the burden of proof proper. Standard of proof is a matter of the degree of proof required, i.e., how strong the evidence must be for the burden to be satisfied. In a criminal case, the burden of proof (persuasion) falls on the prosecution, and the charge must be proved "beyond a reasonable doubt." In a civil case, the burden of proof (persuasion) falls on the plaintiff, and the complaint must be proved "by a preponderance of the evidence" or, as it is sometimes put, must be shown to be "more probable than not." There are also intermediate standards of proof, notably the "clear and convincing" evidence required in special circumstances such as the termination of

²³ Maitland 1909, Lecture II; Bartlett 1986; Kadri 2005, chap. 1.

²⁴ Oliver 2002, 174ff. (Under the law of Withred [c.695 A.D.] the word of the king or a bishop doesn't need the support of an oath; priests and deacons must swear oaths, but don't need the support of oath-helpers; the oath of a freeman requires the support of three oath-helpers of the same rank.)

²⁵ See Janin and Kahlmeyer 2007, 32 (on traditional Islamic law, in which this principle holds) and 130 (traditional Islamic law is still in force in some countries, e.g., Saudi Arabia).

²⁶ Anonymous 2006, A6. Pakistan was formed on partition from India in 1947; and separated from Bangladesh (formerly East Pakistan) in 1971. Malik 2008, 123, 129–141, 171. Both the Indian and the Pakistani legal system grew out of the English law; however, Indian law has gradually become more codified, becoming more like a civil-law system, while the underlying common-law structure of Pakistani law has been overlaid by Islamic principles. See Sial and Iqbal 2005.

²⁷ "Normally" because a judge may (i) direct a verdict if the evidence presented doesn't reach even the minimal standard at which a reasonable person might find for the prosecution, or for the plaintiff; and (ii) may override a jury verdict when he believes that no reasonable person could have reached that result on the evidence presented (known as a "judgment n.o.v."—*nil obstante verdictum*, notwithstanding the verdict). Moreover, (iii) "bench trials" are heard by a judge, or panel of judges, without a jury. See Greenberg 1986, 421.

²⁸ Graham 2007, 577–9.

²⁹ *Ibid.*, 579–81.

parental rights, issues of citizenship, the contents of a lost deed, etc.;³⁰ and standards lower than “preponderance of the evidence,” such as the “reasonable suspicion” required for a search.³¹ And sometimes the law relies on iterated epistemological operators: e.g., the Texas death-penalty statute requires prosecutors seeking the death penalty in a capital case to prove *beyond a reasonable doubt* that *there is a probability* that the defendant will be dangerous in future³² (“definitely maybe,” as my students say).

Some assignment of burdens and standards of proof is needed to ensure that a result is reached: if the party that has the burden of proof doesn’t meet the standard of proof, the other side wins. And the reasons for the *particular* burdens and standards of proof required, likewise, have little to do with epistemic factors, being grounded in considerations of quite other kinds: Most obviously, the requirement that a criminal charge be proven *by the prosecution* and *beyond a reasonable doubt* rests on the idea that it is morally much worse to convict someone of a crime he didn’t commit than to fail to convict someone of a crime he did commit.

In addition to rules about burdens and standards of proof, common-law systems—by contrast with the so-called “free evaluation of proof” characteristic of civil-law systems—impose rules of *admissibility*, governing what evidence may legally be presented to, or taken into account by, the finder of fact. The structure of these rules, like the common law itself, is thoroughly adversarial; in particular, except in cases of egregious legal error, only if the opposing party challenged the admissibility of evidence at trial can its having been admitted be appealed (the “plain error rule”).³³ In U.S. law, some of these restrictions are constitutional: the most familiar—the one everyone knows who watches American legal dramas on TV—being that evidence obtained by means of an unconstitutional search is inadmissible, as is any further evidence obtained as a result of such evidence (“fruit of the poisonous tree”).³⁴

In 1975 the Federal Rules of Evidence (FRE) clarified and simplified a mass of confusing, and sometimes conflicting, principles of admissibility that had gradually evolved over various areas of law.³⁵ A few examples:

³⁰ Broun et al. 2006, 488.

³¹ The terminology (“reasonable suspicion”) derives from courts’ interpretation of the Fourth Amendment to the U.S. Constitution. In simple terms, there is probable cause “where the known facts and circumstances are sufficient to warrant a man of reasonable prudence in the belief that contraband or evidence of a crime will be found.” *Illinois v. Gates*, 462 U.S. 213 (1983), 238; *Ornelas v. United States*, 517 U.S. 690 (1996), 696. See also Congressional Research Service Jan. 30, 2006, 1.

³² Tex. Code Crim. Proc. Ann. art.37.071 (West Supp. 2009).

³³ Federal Rule of Evidence 103(d). LexisNexis 2009 Federal Rules of Evidence. See also Wright and Graham 2005, vol. 21, 973–86.

³⁴ The doctrine was first hinted at in *Silverthorne Lumber Co. v. United States*, 251 U.S. 385, S.Ct. 182, 64 L. Ed. 319 (1920); the phrase, “fruit of the poisonous tree,” was first used in *Nardone v. U.S.*, 308 U.S. 338, 60 S.Ct. 266, 84 L. Ed. 307 (1939). See generally Anonymous 1998.

³⁵ See Camson 2010.

FRE 106 provides that if one party introduces some written or recorded statement, the other party may require that the remainder of that statement (if it is introduced only in part), or related relevant statements, also be introduced. Rule 401 provides that relevant evidence is admissible unless otherwise excluded. Rule 403b excludes relevant evidence if it would waste time, or is likely to confuse or mislead the jury. Rule 407 excludes “evidence of subsequent repair.” Rule 501 protects evidentiary “privileges” (e.g., between husband and wife,³⁶ psycho-therapist and patient, etc.).³⁷ Rule 702 provides that the testimony of a qualified expert is admissible provided it is relevant, helpful to the trier of fact, and based on “sufficient” data arrived at by “reliable” methods and “reliably” applied to the facts of the case. Rule 802 excludes hearsay evidence—except, that is, for dying declarations, “excited utterances,” regular business records, and (I shan’t list the umpteen other exceptions to this rule), etc. Rule 1002, the “Original Writing” rule, provides that original documents, recordings, etc. are to be preferred, but allows that copies may be admitted unless a genuine question is raised about the authenticity of the original, or it would be unfair to admit the duplicate in place of the original. And so on.³⁸

“The purpose of the ordinary rules of [admissibility of] evidence,” Michael Graham writes, “is to promote the ascertainment of the truth.” By contrast, he continues, the rule acknowledging evidentiary privileges “is designed to permit the exclusion of evidence for reasons wholly unconnected with the quality of the evidence or the credibility of the witness.”³⁹ Actually, this seems to be true of some other rules as well. Why is it felt to be undesirable to allow a plaintiff to establish that his landlord acknowledges responsibility for maintaining the property in safe condition by producing evidence that, after he fell down the rotten steps and broke his leg, his landlord fixed them?—Presumably, because we don’t want to discourage landlords from fixing wonky steps (or failing wiring, leaky roofs, etc.). But, as Graham says, unlike the rules about burdens and standards of proof, most of the rules governing admissibility are quasi-epistemological, having to do with the supposed likelihood that evidence of a certain kind is truth-indicative: With hearsay evidence, for example—testimony about what someone not available at trial has said—the original witness can’t be cross-examined; but dying declarations are excepted on the grounds that a person who knows he is about to die wouldn’t lie (and, etc., for the other exceptions). Rule 702 clearly aims to ensure that only

³⁶ *Trammel v. U.S.*, 445 U.S. 40 (1980).

³⁷ *Jaffee v. Redmond*, 518 U.S. 1 (1996).

³⁸ Federal Rules of Evidence. No, there aren’t more than a thousand of these rules: they are divided into sections, and the numbering system indicates which section of the Rules a specific Rule falls—all the rules with a 400 number, for example, are in section IV (“Relevancy and Its Limits”).

³⁹ Graham 2007, 539.

reliable expert testimony is heard; Rule 106 to ensure that incomplete documentary evidence doesn't mislead the fact-finder; and Rule 1002 to ensure that documentary evidence has not be altered or doctored. And, again, so on.

Undeniably, substantive justice requires factual truth; and in some trials (though by no means all), the key issue is a factual one: Did Mrs. Coppolino die of natural causes, or was she poisoned?⁴⁰ Was it the defendant, Mr. Downing, or someone else, who posed as the Reverend Claymore to obtain goods by fraud?⁴¹ Was the substance discovered in one of Mr. Pavia's shoes cocaine, or something else?⁴² Did Ethel Brownstone really sign the document ostensibly giving these valuables to her niece Roberta Starzecpyzel, or is the signature a forgery?⁴³ Was it the MMR vaccine that caused Yates Hazelhurst's autism, or was the fact that his disorder came on shortly after his MMR shot a coincidence?⁴⁴ But what the finder of fact is asked to determine is *not* whether the defendant did it, but *whether the proposition that the defendant did it is established, to the required degree of proof, by the admissible evidence presented*;⁴⁵ in other words—subject to the legal constraints signaled by the phrases “to the required degree of proof” and “admissible evidence”—*to make an epistemological appraisal*.

As this reveals, and as I wrote in “Epistemology Legalized” (2004), “the law is up to its neck in epistemology.”⁴⁶ So if Richard Rorty were right, if epistemological theory is misconceived and epistemological evaluation simply and solely a matter of social convention, what we deludedly call a “justice system” would really be a ghastly farce. (You might wonder why someone who believed, as Rorty professed to, that there is no such thing as objectively better and worse evidence would waste his time mocking epistemologists, rather than campaigning to dismantle the legal system. But of course Rorty, who in the ordinary affairs of life doubtless “judged of evidence” just like the rest of us, surely *didn't* really believe what he professed.)

Evidence scholarship of one kind and another—some historical, some interpretive, some quasi-epistemological—has been around for a long time; but in the 1970s practitioners of the so-called “New Evidence Scholarship”

⁴⁰ *Coppolino v. State*, 233 So.2d 68 (Fla.2d DCA 1968).

⁴¹ *U.S. v. Downing*, 753 F.2d 1224 (3rd Cir. 1985).

⁴² *U.S. v. Pavia*, 892 F.2 148 (1st Cir. 1989).

⁴³ *U.S. v. Starzecpyzel*, 880 F.Supp. 1027 (S.D.N.Y. 1995).

⁴⁴ *Hazelhurst v. Secretary of the Department of Health and Human Services*, U.S. Ct. of Federal Claims, Office of Special Masters, No. 03-654V (Feb. 12, 2009)—one of a series of recent test cases in the vaccine court, all of which concluded that no causal connection had been established. (“MMR” stands for “Mumps, Measles, and Rubella [German measles].”)

⁴⁵ There is an issue worth exploring here about the role of the background beliefs a fact-finder will also bring to a case; but I don't at present know exactly what to say about it, and so will set it aside for now.

⁴⁶ Haack 2004, 44.

took a self-consciously epistemological turn. My first foray into legal epistemology, in fact, was to look at the dispute between those New Evidence Scholars who favored a “fact-based” and those who favored a “story-based” account of the structure of evidence—a dispute that turned out to be, in effect, a reprise of the old dispute among epistemologists between foundationalism and coherentism.⁴⁷ But this controversy soon came to feel too familiar, and the solution, after *Evidence and Inquiry*,⁴⁸ too obvious, to be truly engaging. Instead, in “Epistemology Legalized” I tackled two important critiques of the way common-law systems handle evidence: Peirce’s argument that the adversarial process is singularly ill-designed to discover the truth,⁴⁹ and Jeremy Bentham’s argument that exclusionary rules of evidence, likewise, are epistemologically inefficient.⁵⁰ And because, in the course of writing *Defending Science*,⁵¹ I had been drawn into issues about science and the law, I soon found myself writing a series of papers focused on the epistemological weaknesses of the law on expert, especially scientific, testimony.⁵² Now it is time to take on some core questions about “degree of proof” directly.

*

Though I will borrow from others where needed, I shall rely primarily on the foundationalist epistemological theory developed and defended in *E&I*⁵³ and refined and amplified in the third chapter of *Defending Science—Within Reason*.⁵⁴ The concepts of evidence, quality of evidence, and degree of warrant play central roles in this theory; though not fully spelled out in every respect, it is detailed enough to suggest answers to some legally-significant questions; and, though still imperfect, it is approximately correct—in my view, anyway, or else I would have dumped it and started over.

In this account, the evidence with respect to any claim or theory includes both experiential evidence and reasons, working together like the clues and already-completed intersecting entries in a crossword puzzle. In the present context, questions about experiential evidence are only marginally relevant; but issues about the structure of evidence and the determinants of evidential quality, and hence of degrees of warrant, will be directly

⁴⁷ The “New Evidence Scholarship”—essentially, epistemology for legal scholars—is so-called by contrast with traditional evidence scholarship, which is concerned with the interpretation, rationale, and application of legal rules of evidence. See Lempert 1988.

⁴⁸ Haack 1993.

⁴⁹ Peirce, in Hartshorne et al. 1931–58, 2.635 (1878).

⁵⁰ Bentham 1827; or, for an abridged treatment, Bentham 1825.

⁵¹ Haack 2003.

⁵² See e.g., Haack 2001b; 2005c; 2007b; 2008b; 2009b; 2010.

⁵³ Haack 1993; see especially Chapter 4.

⁵⁴ Haack 2003; see especially Chapter 3.

apropos. In brief: evidence can be stronger or weaker, better or worse; and a belief, claim, or theory, if it is warranted at all, may be warranted to a greater or lesser degree. The structure of evidence isn't linear, like a mathematical proof, but ramifying, like a crossword puzzle; and what makes the evidence with respect to a claim better or worse is analogous to what makes a crossword entry more or less reasonable: how *supportive* it is (analogue: how well a crossword entry fits with the clue and already-completed entries); how *secure* it is, independent of the claim in question (analogue: how reasonable the solutions to intersecting crossword entries are, independent of the one in question); and how *comprehensive* it is, i.e., how much of the relevant evidence it includes (analogue: how much of the crossword has been completed).

This theory is *worldly*, in the sense that the determinants of evidential quality are not formal, but material. Supportiveness of evidence is (roughly speaking) a matter of the contribution it makes to the explanatory integration of evidence-plus-conclusion; and genuine explanation requires a vocabulary that corresponds to real kinds of thing or stuff. So—as we should have learned, long ago, from the “grue” paradox⁵⁵—evidential support depends not on form but on content. Comprehensiveness depends on how much of the evidence relevant to the claim in question the evidence includes; and whether and to what degree evidence is relevant to a claim is, again, not a matter of form, but depends on facts about the world. Whether the way a person writes his “g”s is relevant to his trustworthiness depends on whether it is true, as graphologists claim, that a person's character can be discerned from his handwriting; whether the fact that the defendant's wound heals cleanly is relevant to his guilt or innocence, as the practice of trial by ordeal presupposed, depends on whether it is true that God will protect the falsely accused; whether a study of the effects of this drug on infant mice is relevant to its likely effect on humans, as some of the plaintiffs who introduce animal studies in toxic-tort cases suppose,⁵⁶ depends on whether it is true that baby mice are like humans in the relevant physiological respects. And so on.

Mill observes that epistemology “does not give [...] proofs, but teaches what makes them proofs, and how [...] to judge of them.”⁵⁷ Again, he's right; and the material character of the determinants of evidential quality explains why. While articulating what determines whether or to what degree a claim is warranted is the job of an epistemological theory, telling us whether or to what degree specific claims are warranted—which can require specific background knowledge—is not. This suggests the solution to a quasi-legal puzzle raised in George Eliot's *Middlemarch*: Dr. Lydgate, a

⁵⁵ Goodman 1953; see also Haack 2003, 84–6, 131–5.

⁵⁶ See, e.g., *Gen. Elec. Co. v. Joiner*, 522 U.S. 136 (1997).

⁵⁷ Mill 1843, 5.

local physician, and Mr. Chichely, the town attorney, disagree about who should be the new Middlemarch coroner. He should be a physician, Dr. Lydgate maintains; only physicians know “the action of poisons.” No, he should be an attorney, Mr. Chichely insists; only attorneys are trained in weighing evidence. Ridiculous, Dr. Lydgate retorts; there is no generic skill of weighing evidence, independent of a particular field of knowledge: “[You] might as well say that scanning verse will teach you to scan the potato crop.”⁵⁸ Dr. Lydgate has it right: An attorney (or an epistemologist) ought to know that how good evidence is depends in part on how supportive and independently secure it is, and in part on how much of the relevant evidence it includes; but this doesn’t tell him what evidence is relevant to, or to *what degree* it supports, e.g., the conclusion that Mrs Coppelino died, not of natural causes, but from succinylcholine chloride poisoning. *That* requires knowledge of how poisons work.

Quality of evidence and, in consequence, warrant, are not categorical but come in degrees; and we often speak of how probable it is, given such-and-such evidence, that p , or of how probable this evidence makes it that p . However, these “probabilities” or, as I prefer to say, these epistemic likelihoods, *cannot be identified with the probabilities of the standard mathematical calculus*. This thought is not new. We find it, for example, in *Human Knowledge, Its Scope and Limits* (1948), where Bertrand Russell argued—citing John Maynard Keynes⁵⁹—that the notion of probability at work in epistemological contexts is not the familiar statistical one, and does not conform to the Kolmogorov axioms.⁶⁰ In Russell’s terms, the key epistemological concept is “degree of credibility,” the degree of credence a rational man would give, which rises “with increase of evidence.”⁶¹ This precisely parallels my notion of warrant.

In *E&I* I expressed skepticism about the possibility of assigning numerical degrees of warrant;⁶² and by the time of *Defending Science* I was able to articulate some of the crucial differences between degrees of warrant and mathematical probabilities. First of all, I pointed out, the concept of warrant is too subtle, and too worldly, to allow a viable epistemological theory of a purely formal kind. Moreover, degrees of warrant don’t satisfy the axioms of the standard probability calculus. The probability of p and the probability of not- p must add up to 1; so when p has a low degree of probability, not- p must have a high degree. But when there is insufficient evidence either way, *neither p nor not- p* may be warranted to any appreciable degree. On top of which, because there

⁵⁸ Eliot 1871–2, 155.

⁵⁹ Keynes 1921.

⁶⁰ Russell 1948; Part 5, especially Chapter 1.

⁶¹ *Ibid.*, 343.

⁶² Haack 1993, 15, 20 (in the Foreword to the 2nd edition of 2009), 272 (in the original text).

are multiple determinants of evidential quality, there may be no linear ordering of degrees of warrant.⁶³

And in a recent legal paper in which I figured out how, and when, a combination of multiple pieces of evidence all pointing in the same direction can warrant a conclusion to a higher degree than any of them alone can do, I stumbled obliquely on yet another problem: evidence from different areas may, in combination, not only enhance the comprehensiveness and the supportiveness of the evidence as a whole, but also increase the independent security of component bits of evidence. In a toxic-tort case, for example, the addition of the results of animal studies may increase the security (warrant) of the results of an epidemiological study of the effects of the same drug; in a murder trial, evidence that the defendant was elsewhere at the time of the crime may increase the security (warrant) of another witness's testimony that the person he saw at the crime scene was taller than the defendant.⁶⁴ But (for independent p and q) the mathematical probability of p & q is the *product* of the probability of p and the probability of q —which is always less than the probability of either.

These arguments persuade me that “epistemic probabilism,” as I shall call the equation of epistemic likelihoods and mathematical probabilities, is false. Probabilists, however, seem unfazed—perhaps assuming that Bayes's theorem will enable them to avoid the problem about conjunction by providing a way to “update” epistemological probabilities by adjusting “prior” probabilities in light of additional evidence and “conditional” probabilities.⁶⁵ So in the next section, as I turn to issues about legal degrees of proof, my strategy will be to contrast the advantages of my worldly, foundherentist approach with the shortcomings of Bayesian-probabilistic approaches.

3. Degrees of Proof: Problems with Probability & Worries about Weight

“Reasonable suspicion”—“a preponderance of the evidence”—“clear and convincing evidence”—“proven beyond a reasonable doubt.” Like the common law generally, these standards have evolved gradually over time; according to one commentator, the highest and most familiar of these standards, “beyond a reasonable doubt,” “has existed in Anglo-American law for at least seven hundred years, and perhaps for well over a thousand years.”⁶⁶ Not surprisingly, precise definitions of these standards have never been formulated; nor is it clear that precise definitions would be desirable even if they were feasible.

⁶³ Haack 2003 75–7.

⁶⁴ Haack 2008c: 253–89.

⁶⁵ A diagnosis suggested in Jaffee 1984–5, 950.

⁶⁶ DeLoggio 1986, 25. But compare Chadbourn 1989, 405 (dating the “precise distinction” requiring proof beyond a reasonable doubt in criminal cases to the early 1700s.)

I was startled to read, in the 6th edition of a well-known textbook, *McCormick on Evidence*, that the “reasonable doubt” formula “points to what we are really concerned with, *the state of the jury’s mind*,” whereas “preponderance of the evidence” and “clear and convincing evidence” “*divert attention to the evidence*.”⁶⁷ This has things exactly backwards: As the “reasonable” in “beyond a reasonable doubt” signals, the evidence, and whether it is strong enough, is *precisely* what the fact-finder should be attending to (and a juror who is absolutely certain the defendant is guilty—but not because of the admissible evidence presented at trial but because of something he learned outside the courtroom, or because of evidence that was presented at trial but that the court instructed the jury to disregard—has an obligation to vote to acquit nonetheless). Legal degrees of proof are not degrees of credence; they are degrees of *rational credibility* or *warrant*.

The word “preponderance” in “preponderance of the evidence” may suggest that what is required is simply *a greater mass* of evidence this way than that; but legal writers have noted, correctly, that this can’t possibly be sufficient. In one venerable textbook we are asked to imagine that twenty witnesses testify that A signed the document, and nineteen that he did not. There is more evidence that A did sign the document than that he didn’t, but on the basis of such evidence no reasonable person would form an opinion as to whether he did or not; “[t]he prudent and careful man would remain in a state of doubt.”⁶⁸ A century later, my colleague Professor Graham writes in the textbook I cited earlier that, while the two formulae “more probable than not” and “by a preponderance of the evidence” are often used interchangeably, they are not equivalent. “More probable than not,” he argues, is the better formulation, because evidence that preponderates over an opponent’s may nonetheless be insufficient to establish that the claim in question is more probably true than not.⁶⁹ In other words, the evidence presented in favor of *p* may be stronger than the evidence presented against it (so that *p* is better warranted by the evidence presented than not-*p* is); and yet may be so weak that *neither p nor not-p* is more warranted than not. It is implicit in this argument, though Graham doesn’t make it explicit, that the legal notion of probability cannot be understood in terms of the usual mathematical calculus.

Indeed, “legal probabilism” (as I shall call the idea that it can) is as indefensible as the epistemological probabilism of which it is a special case. Nevertheless, it has long proven very seductive. George Boole was an early enthusiast for this idea,⁷⁰ and it was for a long time a popular, not say

⁶⁷ Broun et al. 2006, 483 (italics mine).

⁶⁸ Chadbourn 1989, vol. 9, 420–1, quoting Trickett 1906.

⁶⁹ Graham 2007, 580.

⁷⁰ Boole 1854, chapter XXI.

dominant, strain in the New Evidence Scholarship.⁷¹ To be sure, a number of writers have tried to resist its blandishments. Many of these, however, have stopped short of denying it outright, stressing only that it is unrealistic to imagine that evidentiary probabilities could be precisely measured, not arguing that they aren't mathematical probabilities at all;⁷² or, like Lawrence Tribe in his critique of "Trial by Mathematics,"⁷³ arguing that precise calculation of probabilities, even if it were feasible, is usually not desirable. And even those who deny legal probabilism outright don't always seem able to resist the seduction altogether. Bentham, for example, denied that the degrees of proof with which the law is concerned could, even in principle, be mathematical probabilities; and yet his idea that we can measure a witness's confidence in a proposition by the odds at which he would bet on it seems to pull strongly in a probabilistic direction.⁷⁴ William Wills averred that the "moral" (i.e., legal) sense of probability is essentially different from its mathematical sense, and that legal probabilities cannot be expressed numerically; and yet wrote that the probability of evidence increases geometrically rather than arithmetically.⁷⁵ And so on.

In *The Provable and the Probable* (1977)⁷⁶ Jonathan Cohen—on whose historical survey my previous paragraph partly relied—made a very searching and thorough case against what he called "Pascalian probabilism" as a theory of legal proof; but went on to suggest a different, but still formal, "Baconian" conception of legal probabilities. A few years later Leonard Jaffee made a no less effective case against the Bayesian probabilism then gaining ground among evidence scholars.⁷⁷ A detailed discussion of the points of agreement and disagreement would take me too far from the present line of argument; but I'm sure both Cohen and Jaffee would agree that, as I believe, Bayesian probabilism gives us no real understanding of degrees of legal proof. And for myself, I will admit that the Bayesians put me irresistibly in mind of a really, really old joke: a passing policeman asks a drunk frantically searching for his car keys in the pool of light under a lamp-post, "Are you sure this is where you dropped them, Sir?" "Nah," the drunk replies; "I dropped them on the *other* side of the street—but I can't see a thing over there!" I will illustrate the point by

⁷¹ See, e.g., Ellman and Kaye 1979, or the essays in Tillers and Green 1988.

⁷² See e.g., Starkie 1842, vol. I, 570: "The notions of those who have supposed that mere moral probabilities or relations could ever be represented by numbers [. . .], and thus be subject to numerical analysis, cannot but be regarded as visionary and chimerical."

⁷³ Tribe 1971.

⁷⁴ Bentham 1827, Volume I, Book I, Chapter vi; 1925, 41. Mill is more consistently skeptical of legal probabilism; see 1843, 353ff.

⁷⁵ Willis 1872, 000.

⁷⁶ Cohen 1977. It is possible, indeed, that Cohen influenced my thinking on these matters; I have a vague memory of hearing him present part of this book at the University of Warwick some time in the mid-1970s, and of having been much impressed by the cogency of his talk.

⁷⁷ Jaffee 1984–5.

means of examples: two well-known cases where the evidence has been subjected to Bayesian analysis, but where, I shall argue, my account offers a much better understanding—first, the case of Sacco and Vanzetti, and then the *Collins* case.

In 1921 two Italian anarchists, Nicola Sacco and Bartolomeo Vanzetti, were charged with a murder committed in the course of a payroll robbery in South Braintree, Massachusetts. At trial, the prosecution argued that Sacco fired the fatal shot, and Vanzetti was in the getaway car as one of the collaborators in a conspiracy to murder. The central issue was whether these really were the perpetrators. Fifty-nine witnesses testified for the prosecution, ninety-nine for the defense; and their testimony—about Sacco and Vanzetti's presence at the scene of the crime; about the bullets fired; about a cap found at the scene, allegedly belonging to Sacco; about the defendants' alibis; about subsequent actions of theirs supposedly revealing "consciousness of guilt"—was confusing to say the least. Moreover, strong emotions were involved: Sacco and Vanzetti were radicals, and the country was in the grip of a "Red Scare." The jury found them guilty, and they were sentenced to death.⁷⁸ While they were awaiting execution, another inmate of the same prison, Celestino Madeiros—a member of the notorious "Morelli gang" who was awaiting his appeal against a conviction for another murder—confessed that it was he and his gang, not Sacco and Vanzetti, who had committed the Braintree robbery and murder. But like all the other motions and appeals, an appeal based on this confession failed;⁷⁹ and in August 1927 Sacco and Vanzetti were executed.

Enormously controversial at the time, the subject of numerous books,⁸⁰ articles,⁸¹ websites,⁸² plays,⁸³ movies,⁸⁴ novels,⁸⁵ and even poems,⁸⁶ the case continues to attract the attention of evidence scholars to this day, as debate continues: Does the evidence warrant the conclusion that, as the jury

⁷⁸ Topp 2005, "Introduction," 1–51, and "Chronology of Events Related to the Sacco and Vanzetti Case" (1888–1977), 185–8. The primary sources (transcripts of the trial and appeals) can be found in Anonymous 1969.

⁷⁹ Topp 2005, 33–6.

⁸⁰ *Ibid.*, 190–4, provides summary descriptions of fifteen books on the case, the earliest published in 1927, and the most recent in 1991. I shall concentrate on one of these: Frankfurter 1927, and another book not on Topp's list: Kadane and Schum 1996.

⁸¹ See e.g., Pernicone 1979; Starrs 1986.

⁸² The Sacco and Vanzetti Commemoration Society has a specialized website. <http://www.saccoandvanzetti.org/>. Doug Linder's "Famous Trials" website is also very helpful. <http://law2.umkc.edu/faculty/projects/ftrials/saccov/saccov.htm>.

⁸³ Yrouty 1929; Anderson 1935; Lippa 1998. There have also been two operatic treatments: one, *Sacco and Vanzetti*, begun by Marc Blitzstein and finished, after Blitzstein's death, by Leonard Lehrman; and another by Anton Coppola entitled *Sacco & Vanzetti*. Both were first performed in 2001.

⁸⁴ Rose 1960; Montaldo 1971; A&E Television 1998; Miller 2006.

⁸⁵ Sinclair 1928 (according to Topp 2005, 195, Sinclair began writing this novel on the day of Sacco and Vanzetti's execution); Fast 1953.

⁸⁶ Cullen 1927; Millay 1928.

found, both Sacco and Vanzetti were involved⁸⁷ or, as later scholars have suggested, Sacco but not Vanzetti⁸⁸ or, as Felix Frankfurter argued in a book published the year the two were executed, and many others since then, neither of them?⁸⁹

Almost seventy years after Sacco and Vanzetti went to the electric chair, Jay Kadane and David Schum offered a probabilistic analysis of the evidence through which Frankfurter and many others had sifted.⁹⁰ The analysis given in their book—366 closely-printed pages crammed with diagrams and mathematical formulae—relies in part on “Wigmore diagrams,”⁹¹ and in part on Bayesian probabilism.⁹² The Wigmore diagrams, Kadane and Schum tell us, enable them to “decompose” the evidence into its components and identify its presuppositions, and the Bayesian analysis to calculate degrees of proof. In fact, however, Wigmore diagrams aren’t a way of *determining* the presuppositions and implications of evidence, only a way of *representing* them.⁹³ But here it is the problems with the Bayesian analysis—the mathematical streetlight under which Kadane and Schum believe they have found the epistemological keys to the Sacco and Vanzetti case—on which we need to focus.

Kadane and Schum note that the Federal Rules of Evidence explain “relevant” evidence as evidence that either raises or lowers the probability of some fact at issue.⁹⁴ Though they are aware that Cohen had argued that degrees of legal proof don’t satisfy the Kolmogorov axioms,⁹⁵ they offer no reply, but simply proceed as if it were clear that they do. (They may be assuming that Bayes’s Theorem will enable them to finesse the problem about conjunction; but so far as I am aware they don’t say so explicitly.) Kadane and Schum acknowledge, however, that legal probabilities cannot be understood in terms either of the doctrine of chances, or of statistical frequencies; rather, they are *epistemic* probabilities—or, as they say more

⁸⁷ Montgomery 1960; Felix 1965.

⁸⁸ Russell 1962; Young and Kaiser 1985.

⁸⁹ Frankfurter 1927; Lyons 1927; Fraenkel 1931; Erhmann 1933.

⁹⁰ Kadane and Schum 1996. Unlike Frankfurter, however, they also had available the results of the special commission which in 1983 re-examined the ballistic evidence in the case. *Ibid.*, 216.

⁹¹ Wigmore 1913, §§29ff. A brief summary can be found in Godwin 2000.

⁹² At one point they also introduce a third piece of machinery: fuzzy logic—leaving me wondering wryly whether they ever met a squiggle they didn’t like! Kadane and Schum 1996, 54–5. This is not the place to comment on this particular lapse of judgment; but interested readers are referred to Haack 1979.

⁹³ I don’t mean to deny that Kadane and Schum sometimes manage, e.g., to identify possible sources of reasonable doubt between the evidence presented and the conclusions drawn; only that the Wigmore diagrams are what enable them to do so. In this context they allude briefly to abduction, or as they also say, “imaginative reasoning.” Kadane and Schum 1996, 35, 39, 74. However, they have nothing to say about what makes such reasoning better or worse.

⁹⁴ Kadane and Schum 1996, 50. (They are aware that these rules were not in force at the time of the Sacco and Vanzetti trial.)

⁹⁵ *Ibid.*, 152.

than once, “personal, subjective, or epistemic probabilities.”⁹⁶ The “or” here clearly means “i.e.,” not “or, in the alternative”; so what is on offer is (ostensibly, at least) a subjective Bayesianism that identifies probabilities with degrees of belief. Of course, “personal” doesn’t mean the same as “subjective,”⁹⁷ and “epistemic” doesn’t mean the same as either; but I shan’t linger over these difficulties.

According to Kadane and Schum, the probabilities in which they traffic are degrees of belief. The idea is to calculate a degree of belief that p based on *prior* degrees of belief that q , r , etc., and *conditional* degrees of belief that p -given- q , etc.; in this case, to calculate a degree of belief that Sacco was involved or a degree of belief that Vanzetti was, given some prior and conditional degrees of belief. This will yield *reasonable* degrees of belief in the ultimate probanda only if the prior and conditional degrees of belief are reasonable. Perhaps Kadane and Schum are assuming that the minimal probabilistic-coherence constraints imposed by the probability calculus qualify this as an account of *rational* belief;⁹⁸ but if so, they are mistaken: probabilistic coherence, even if necessary,⁹⁹ falls far short of sufficient for reasonableness or warrant. In any case, we need to know where Kadane and Schum’s assignments of prior and conditional degrees of belief come from. These are, they tell us, simply their own, and other scholars’, degrees of belief.¹⁰⁰ So they offer no categorical conclusion, but only calculate the various degrees of belief that Sacco was involved, and the various degrees of belief that Vanzetti was that, subject to those minimal coherence constraints, various prior and conditional degrees of belief would yield.

In their one concession to Cohen’s critique, Kadane and Schum allude in the title of the concluding section of Chapter 6 of their book to the “completeness” of the evidence in the case.¹⁰¹ Reading this, I thought for a moment that some real epistemology was about to happen. But no: in this very short section Kadane and Schum simply note, first, that Bayes’s rule *has nothing to say* about the completeness (or in my terminology, the comprehensiveness) of the evidence considered; and, second, that they didn’t consider what basis there might be for the “probabilistic links” that

⁹⁶ *Ibid.*, 24, 120, 159.

⁹⁷ See Haack 1993, 148.

⁹⁸ Kadane and Schum 1996, 160.

⁹⁹ Given the point about the probability of p and the probability of not- p adding to 1, I am not certain it *is* necessary; but I won’t pursue that issue here.

¹⁰⁰ Kadane and Schum 1996, 25: “Our initial intent was to obtain various probability judgments [...] from the experts involved in the ongoing dispute,” as well as their own (but some of those experts died, and Prof. Starrs was able to provide estimates only on some of the evidence).

¹⁰¹ *Ibid.*, 239–40. The notion of “prior” probabilities might be seen as (very rough) analogues of independent security, and “conditional” probabilities as (very rough) analogues of supportiveness; but there is nothing in the Bayesian scheme even roughly analogous to comprehensiveness.

they assumed, which is why they arrive only at probability assignments that “might” be made.¹⁰² This confirms, as I said earlier, that the Bayesian apparatus tells us nothing about what determines which (if any) of these degrees of belief in the ultimate probanda are reasonable; *that* depends on . . . , well, on epistemological considerations far beyond its scope.

To see why Kadane and Schum’s Bayesian apparatus fails even as a calculus of degrees of warrant, however, we need to go deeper, and to look more closely at the ostensible assimilation of probabilities and degrees of belief, previously taken for granted for the sake of argument. It soon becomes apparent that something isn’t right. One sign of trouble is that Kadane and Schum think it relevant to look in some detail at psychological studies of people’s skill, or lack of it, in assessing probabilities.¹⁰³ But if someone’s probability that *p* simply *is* the degree to which they happen to believe it, this would be entirely *irrelevant*. Another sign is Kadane and Schum’s curious equation of *e*₁’s *being* independent of *e*₂ with *e*₁’s *seeming* (to someone) to be independent of *e*₂.¹⁰⁴ And when you look more closely, you see that this is the usual pattern: Kadane and Schum *aren’t* really identifying probabilities and degrees of belief; their talk of “subjective degrees of belief” is shorthand for *the degree of [presumably, objective] probability that someone believes a proposition to have*.¹⁰⁵ But what are these probabilities? Kadane and Schum have conceded that they are not statistical or aleatory, and can’t sustain the idea that they are degrees of belief; so we are left entirely in the dark about *what* they are.

But enough already: Let me turn now to the much slimmer volume in which, fifty years before, Felix Frankfurter had sifted through much the same evidence, and concluded that “[e]very reasonable probability points away from Sacco and Vanzetti; every reasonable probability points toward the Morelli gang.”¹⁰⁶ This was one of the very few uses of “probable” I noticed in the entire book; and it’s abundantly clear that what Frankfurter means is that the evidence *quite strongly warrants the conclusion* that it was the Morelli gang, and not Sacco and Vanzetti, who committed the crime. There is no hint that he thinks of these “reasonable probabilities” (epistemic likelihoods, degrees of rational credibility or warrant) as mathematically calculable; instead, his assessments of the evidence are

¹⁰² *Ibid.*, 240 (italics mine).

¹⁰³ *Ibid.*, 166–9.

¹⁰⁴ “What [nonindependence] means is that knowledge of one item of evidence *may influence our judgment of the probative force of another*.” *Ibid.*, 129 (italics mine).

¹⁰⁵ “[T]he probabilities of concern to us are subjective in nature; they are epistemic judgments made by persons who have studied this case rather carefully.” *Ibid.*, 35. “[S]ome of our analyses concern specific probability judgments from persons who have become very familiar with the [. . .] evidence.” *Ibid.*, 122–3.

¹⁰⁶ Frankfurter 1927, 101. In 1927, Frankfurter was a professor at Harvard Law School. In 1939 he was sworn in as Associate Justice of the U.S. Supreme Court, from which, after suffering a stroke, he retired in 1962. Baker 1969, 88, 103, 213, 329.

expressed in language that would be entirely congenial to Russell—or to me. Here are just a few examples, from the scores I might have chosen:

- At trial, a year after the robbery, Mary Splaine testified with great confidence that she saw Sacco—whom she described in remarkable (though not perfectly accurate) detail—in the getaway car. However, interviewed by the police immediately after the crime, Splaine had said she *couldn't* identify the person she saw; and earlier she had even identified a different man. She picked out Sacco—whom by then she had seen several times at the police station and in court—only after she discovered that the first man she fingered couldn't have been the shooter, because he was in jail at the time of the crime.¹⁰⁷
- Expert witness Proctor testified at trial that “bullet 3” was “consistent with its having been fired from Sacco’s pistol,” and Judge Thayer interpreted this to mean that “it was [Sacco’s] pistol that fired the shot.” However, not all of Proctor’s evidence was given at trial; in his affidavit he had said that “[a]t no time was [he] able to find any evidence whatever which tended to convince [him] that [this bullet] [. . .] came from Sacco’s pistol.”¹⁰⁸
- The lies Sacco and Vanzetti told at the police station were presented by the prosecution as evidence of “consciousness of guilt”; but—this being a period of wholesale arrests and deportation of aliens under suspicion of Communist sympathies—Sacco and Vanzetti may have lied, not because they knew they were guilty of the Braintree robbery, but because they feared their political radicalism had got them into trouble.¹⁰⁹

This really *does* shed epistemological light; and I don’t believe it’s wishful thinking to note how closely it follows the contours of my account of the determinants of evidential quality. In my terminology: while Splaine’s testimony was pretty strongly supportive of the conclusion that Sacco was involved in the Braintree crime, its independent security was very low; while Proctor’s testimony at trial was somewhat supportive of the conclusion that Sacco fired the fatal shot, his affidavit reveals that this testimony was incomplete, and the more complete evidence in the affidavit would have been significantly less supportive of that conclusion; while their

¹⁰⁷ Ibid., 11ff. According to Prof. Linder’s summary of the evidence with respect to Sacco, Mary Splaine was one of seven eyewitnesses who placed Sacco in or near Braintree around the time of the crime (a few others testified that Sacco resembled one of the bandits). See the “Famous Trials” website (note 80 above).

¹⁰⁸ Ibid., 76ff. According to Prof. Linder’s summary, two defense experts testified that this bullet couldn’t have come from Sacco’s gun. Again, see the “Famous Trials” website (note 80 above).

¹⁰⁹ Ibid., 35ff.

having lied to the police was quite supportive of the conclusion that Sacco and Vanzetti knew they were guilty of *something*, that they knew they were guilty of the kind of political radicalism that could get them deported would be no less good an explanation than that they knew they were guilty of the robbery and murder in Braintree. And so on.

4. Statistical Evidence: Its Scope and Limits

To point out the shortcomings of legal probabilism is not, of course, to suggest that statistical data of one kind or another may not be part of the evidence of which legal fact-finders need to assess the worth. It would be absurd to deny that statistical evidence of almost every conceivable kind, from DNA analyses and epistemological studies to actuarial calculations, can be very important to legal fact-finding. So the next task is to see whether my account can explain the contribution such evidence makes to the overall weight of the evidence in a case. Again, I will illustrate by means of an example.

Janet and Malcolm Collins have become, as George Fisher puts it, “a classroom hypothetical—an evidence-law cliché.”¹¹⁰ The elderly robbery victim described the person who pushed her over and stole her purse as a young woman, about 145 pounds, with light blond hair worn in a ponytail; another eyewitness saw a blond woman run out of the alley where the robbery took place and get into a yellow car driven by a Negro man with a mustache and a beard. At trial—apparently because the victim was unable to identify Janet, and the other eyewitness’s identification of Malcolm was weak—the prosecution introduced a mathematics instructor as expert witness to testify, on the basis solely of a statistical argument, that the probability was overwhelming that these were the perpetrators: essentially, that given the “product rule,” the odds against there being another such couple around—the woman with blond hair in a ponytail and the man a Negro with a mustache and a beard, driving a yellow car—were an astronomical 1 in 12 million. However, the expert witness failed to note that the elements for which he gave numerical odds weren’t independent (e.g., the categories “man with mustache” and “Negro man with beard” are not exclusive); and he freely acknowledged that he had simply *made up* those numbers “for illustrative purposes”—after which the prosecutor made matters worse by telling the jury that these invented figures were “conservative” estimates, and that he had “mathematical proof” of the Collinses’ guilt.¹¹¹ The Collinses were convicted. Malcolm appealed, and in 1968 was granted a new trial. Later that year, when the prosecutor was unable to get

¹¹⁰ Fisher 2006, 8.

¹¹¹ *People v. Collins*, 438 P.2d 33 (1968), 37 (“conservative estimates”), 41 (“mathematical proof”).

the witnesses together for a new trial, the case against Malcolm Collins was dismissed; what happened to Janet Collins after 1968 remains unclear.¹¹²

In his ruling granting Malcolm Collins a new trial Justice Sullivan argued, first, that the statistician's calculations had no basis in fact; and moreover, that even if they *had* had some basis, such evidence couldn't possibly be sufficient: "no mathematical formula could ever establish [. . .] that the prosecution's eyewitnesses correctly observed and accurately described the distinctive features [. . .] [linking] defendants to the crime."¹¹³ Fair enough. But suppose the statistics *hadn't* been made up, but had been a well-founded estimate. Then they couldn't, surely, have been disregarded entirely; though insufficient, they would have been relevant.

Not long after the case against Malcolm Collins was dismissed, Michael Finkelstein and William Farley offered "a Bayesian approach to identification evidence"—opening with a commentary on the *Collins* case.¹¹⁴ Statistical identification evidence, they argue, "should not normally be sufficient to support an identification unless accompanied by other evidence that would form the basis for a 'prior' estimate of identity"; and Bayes's theorem, they continue, can justify this intuitive idea, by translating a one-in-*n* statistic into "a probability statement that describes the probative force of that statistic."¹¹⁵ We should already be suspicious: How could a simple theorem of the probability calculus possibly perform such a feat of translation? As we shall soon see, it can't.

Unlike Kadane and Schum, Finkelstein and Farley realize that the familiar subjective-Bayesian strategy of identifying probabilities with degrees of belief won't work, at least in its usual form. So what do *they* think these subjective probabilities are? In Finkelstein and Farley's own words: "one can [. . .] interpret subjective probability of [. . .] guilt as the relative frequency of guilt over cases judged to be similar in the degree of belief they engender."¹¹⁶ Insofar as I can make sense of this, it seems to say that the "subjective probability" that the defendant is guilty (presumably, the subjective probability for some person *x*) is the proportion of (presumably, possible-but-not-necessarily-actual) cases in which the facts are different from this one but in which *x* judges that his subjective degree of belief that the defendant is guilty would be the same, in which the defendants *would* be guilty. Like Kadane and Schum, it seems, what Finkelstein and Farley mean by "subjective probability" is the probability assigned to a proposition by some subject. But *this* probability can't be subjective, or we would be in an infinite regress; it must be an *objective* probability that the subject assigns to the proposition in question. Unlike

¹¹² Fisher 2006, 21–2.

¹¹³ *Ibid.*, 40.

¹¹⁴ Finkelstein and Farley 1969–70.

¹¹⁵ *Ibid.*, 498.

¹¹⁶ *Ibid.*, 504.

Kadane and Schum, however, who give us no further account of what that objective probability might be, Finkelstein and Farley try to shoehorn it into a quasi-frequentist mold.

But *what* class of possible-but-not-necessarily-actual cases is a juror supposed to be imagining? How are they to be individuated? How could a juror possibly estimate the proportion of those possible-but-not-necessarily-actual cases in which the defendant would in fact be guilty? Finkelstein and Farley's "explanation" is baffling; and things only get worse when you try to extrapolate it from *x*'s judgment of the probability of the ultimate probandum to his prior assignments of probabilities, or to his assignments of conditional probabilities. Finkelstein and Farley concede that their gloss is "artificial"; but this is a gross understatement. In the end (like Kadane and Schum), they leave us still in need of an intelligible explanation of what "probable" could mean here.

While *Collins* might strike you as a case of life imitating art—or, rather, of life imitating epistemologists' cooked-up examples—the issues it raises about statistical evidence come up over and over:¹¹⁷ with respect to every kind of statistical identification evidence, whether it be the probability that this letter was typed on the plaintiff's typewriter, or that the DNA found at the crime scene came from the defendant, or . . . , etc.; with respect to epidemiological evidence in toxic-tort cases; and so forth. The necessity of thinking about the role of statistical evidence in DNA cases has forced lawyers to clarify one significant issue: the argument from "the [statistical] probability of a random match between the DNA found at the crime scene and the defendant is $1/n$ " to "the [epistemic] probability that the defendant did it is $1/n$ " has come to be acknowledged as invalid (and branded "the prosecutor's fallacy").¹¹⁸ But we still stand in need of a more general understanding of the interplay between statistical probabilities and epistemic likelihoods.

As Justice Sullivan observed, statistical evidence is about a population, and in consequence never sufficient by itself conclusively to identify one individual; and this prompts the thought that such evidence can lose its force in the context of other evidence that this *can't* be the individual concerned. Very occasionally, despite very strong DNA evidence, we get the wrong man. One example has become famous, or perhaps notorious: in 1999, on the basis of a DNA "cold hit," British police arrested Raymond Easton for a robbery committed 200km from where he lived; but Mr.

¹¹⁷ As, I should add, Finkelstein and Farley are well aware; like me, they simply pick *Collins* as an eye-catching example. (They do not, however, have DNA evidence in mind; the first time such evidence was presented in court in the U.S. was in 1987, in the Florida case of Tommy Lee Andrews. See *Andrews v. State*, 533 So. 2d 841 (Fla. App. 1988).)

¹¹⁸ The earliest published reference I have found is in Thompson and Schumann 1987, 170. The phrase soon begins to turn up in rulings: see, e.g., *People v. Pizarro*, 10 Cal. App. 4th 57, 12 Cal Rptr. 2d 436 (1992); *State v. Spann*, 617 A.2d 247 (NJ, 1993).

Easton, who had Parkinson's disease, was so weak that he couldn't dress himself, drive, or even walk more than 10m without help, and so couldn't possibly have committed the crime.¹¹⁹

This sad story suggests that the account we are looking for might go something like this. Statistical evidence tells us that the frequency of occurrence of property *F* in population *P* is n/m —or as we might say more idiomatically, “very common,” “common,” “uncommon,” “rare,” “very rare,” “extremely rare.” Now imagine two possible congeries of evidence-plus-conclusion, in one of which the statistical evidence and the rest interlock tightly together, and in the other of which they do not:

- E1: the perpetrator is in *P* and has *F*
- E2: the occurrence of *F* in *P* is rare, very rare, or extremely rare; so there are few, very few, or very, very few people in *P* who might have committed the crime
- E3: the defendant, *d*, is in *P* and has *F*
- E4 (a): *d* was seen at the scene of the crime, has motive, & owns a gun of the right caliber, etc.
- C: *d* did it
- E1: the perpetrator is in *P* and has *F*
- E2: the occurrence of *F* in *P* is rare, very rare, or extremely rare; so there are few, very few, or very, very few people in *P* who might have committed the crime
- E3: *d* is in *P* and has *F*
- E4 (b): *d* couldn't have been at the scene of the crime, doesn't have motive, had no access to a gun, & is too shaky to aim a gun anyway, etc.
- C: *d* did it¹²⁰

It is clear that the first of these is quite tightly integrated, while the second is woefully *unintegrated*. Suppose that *F* is (as in the case of Mr. Easton) the DNA “fingerprint” of the perpetrator: in the first example, we have an explanation of the evidence that the perpetrator has *F* (*viz.*, that *d* did it, and *d* has *F*); in the second example, we have none (except “it's a weird coincidence,” which is no explanation at all). And from this it follows, on my account, that the claim that the defendant did it is well-supported by the evidence in the first case, and poorly supported by the evidence in the second.

In real life, things are usually messier. *Collins* certainly was: For example, Malcolm, who had a record, had run away when the police came, and was discovered hiding in a neighbor's closet;¹²¹ and Janet had asked the police

¹¹⁹ Genewatch UK January 2005, 23.

¹²⁰ “E1,” “E2,” etc., stand for “evidence”; “C” for “conclusion.”

¹²¹ *People v. Collins* (note 111), 35.

whether, if she owned up to the crime but said Malcolm wasn't involved, he would be let off.¹²² But I think it's clear that this case falls somewhere in between my two schematic examples; which is why I am inclined to say that more likely than not the Collinses *were* guilty—but that, even if the statistical calculations had been well-founded, this would *not* have been proven beyond a reasonable doubt by the evidence presented.

Of course, however supportive it may be, statistical evidence will contribute little to the warrant of a conclusion unless it is also reasonably independently secure. This was the problem with the (invented) statistical testimony in *Collins*; and the same problems arise in DNA cases where there is reason to think that the laboratory concerned makes a lot of mistakes,¹²³ or in toxic-tort cases where there is reason to think that the epidemiological studies relied on are poorly designed or sloppily conducted.¹²⁴ Moreover (as Justice Sullivan saw) even very solid statistical evidence that very few people in *P* have *F* won't have much probative force if the evidence that the perpetrator is a member of *P*, or that he has *F*, is weak. And (as the incomplete testimony of Mr. Proctor in the Sacco and Vanzetti case illustrates) if key evidence to the contrary is missing, even if a claim is very well-supported by very secure evidence, it won't necessarily be well-warranted.

Just to be clear: I haven't said, and of course I don't believe, that there's anything inherently wrong with the standard mathematical calculus of probabilities, or with Bayes's theorem; my point is only that these mathematical devices are not the Universal Epistemological Wrenches some people think they are.

*

Nor have I said that the *only* point and purpose of epistemic appraisals, or of epistemological theory, is to be found in their role in legal contexts, and I don't believe that, either; my point is only that this is *one* real-world context where they are relevant. (To suppose that epistemological ideas are useful only in legal concepts would be almost as wrong-headed as supposing that Bayes's Theorem can do all the work of epistemology.)

A century ago, John Dewey wrote in *How We Think* that it is the business of education "to cultivate deep-seated and effective habits of discriminating tested beliefs from mere assertions, guesses, and opinions," and "to develop a lively, sincere, and open-minded preference for conclusions that are properly grounded, and to ingrain into the individual's working habits

¹²² *Ibid.*, 35–6.

¹²³ See e.g. *U.S. v. Bonds et al.*, 12 F.3d 540 (6th Cir. 1993).

¹²⁴ See, e.g., *Blum ex. Rel. Blum v. Merrell Dow Pharmaceuticals, Inc.*, 33 Phila. Co. Rptr.193, 243 (Ct. Comm. Pleas Pa. 1996), *rev'd*, 705 A2d 1314 (Pa. Super. Ct. 1997), *aff'd*, 764 A2d 1 (Pa. 2000). There is a detailed discussion of this case in Haack 2008b.

methods of inquiry and reasoning appropriate to the various problems that present themselves.¹²⁵ Indeed. This brings out the relevance of epistemology *across the board*: The habits and preferences Dewey describes are invaluable not only to the juror, not only to “the magistrate, the military commander, the navigator, the physician, and the agriculturalist” but also to the teacher, the parent—to all of us.¹²⁶

But while Dewey had a very acute sense of the importance of key epistemological notions—well-grounded opinion *versus* mere assertion, well-motivated and appropriately-conducted inquiry *versus* the partisan, the stilted, the sloppy. . . ., etc.—he had a very low opinion of the “epistemological industry” of his day, which in an inspired moment he described as afflicted with “intellectual lockjaw.”¹²⁷ And in the same chapter of *How We Think* from which I quoted earlier, Dewey quotes from John Locke’s *Conduct of the Understanding*: “those who readily and sincerely follow reason, but [. . .] have not a full view [. . .] have a pretty traffic with known correspondents in some little creek [. . .] but will not venture into the great ocean of knowledge.”¹²⁸ Locke’s shrewd comment prompts me to observe, by way of conclusion, that by contrast with the burgeoning “niche” epistemology fashionable today, which confines itself almost exclusively to a “pretty traffic with known correspondents,” epistemology in the tradition of Locke, Mill, Peirce, and Dewey—the tradition to which my own epistemological work belongs—offers the prospect of intellectually exciting and practically useful ventures into “the great ocean of knowledge.” This paper has, I hope, provided at least a glimpse of how the two-way traffic between legal practice and epistemological theory proposed here could benefit them both.¹²⁹

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¹²⁵ Dewey 1910, 27–8.

¹²⁶ Sadly, so far as I can judge, education seems to fail lamentably, at every level, in this crucial task; but why this is so and how we might do better are obviously topics for another occasion. But see Haack 1996b, for some thoughts on this matter with respect to higher education specifically.

¹²⁷ Dewey 1946, 344 (“the epistemological industry”); 1931, 51 (“intellectual lockjaw”).

¹²⁸ Locke 1706, 9–10. In between the two parts of this splendid passage that Dewey quotes, Locke writes that “[i]n this we may see the reason why some men of study and thought, that do reason right, and are lovers of truth, do make no great advances in their discoveries of it. Error and truth are uncertainly blended in their minds; their decisions are lame and defective, and they are very often mistaken in their judgements.” *Ibid.*, 9.

¹²⁹ My thanks to Mark Migotti for his comments—helpful as always—on more than one draft; to Andrew Jurs for helpful correspondence; and to Pamela Lucken for her help in finding materials.

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