

2015

# Inefficient Evidence

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## Recommended Citation

66 Ala. L. Rev. 423 (2014-2015)

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## INEFFICIENT EVIDENCE

Alex Stein \*

*Why set up evidentiary rules rather than allow fact finders to make decisions by considering all relevant evidence? This fundamental question has been the subject of unresolved controversy among scholars and policymakers since it was raised by Bentham at the beginning of the nineteenth century. This Article offers a surprisingly straightforward answer: An economically minded legal system must suppress all evidence that brings along a negative productivity-expense balance and is therefore inefficient. Failure to suppress inefficient evidence will result in serious diseconomies of scale.*

*To operationalize this idea, I introduce a “signal-to-noise” method borrowed from statistics, science, and engineering. This method focuses on the range of probabilities to which evidence falling into a specified category gives rise. Specifically, it compares the average probability associated with the given evidence (the “signal”) with the margins on both sides (the “noise”). This comparison allows policymakers to determine the signal-to-noise ratio (SNR) for different categories of evidence. When the evidence’s signal overpowers the noise, the legal system should admit the evidence. Conversely, when the noise emanating from the evidence drowns the signal, the evidence is inefficient and should therefore be excluded. I call this set of rules “the SNR principle.” Descriptively, I demonstrate that this principle best explains the rules of admissibility and corroboration by which our system selects evidence for trials. Prescriptively, I argue that the SNR principle should guide the rules of evidence selection and determine the scope of criminal defendants’ constitutional right to compulsory process.*

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\* Professor of Law, Cardozo Law School. I thank Ronen Avraham, Mitch Berman, Rick Bierschbach, David Carlson, John Deigh, Aaron Edlin, Lee Anne Fennell, Lisa Kern Griffin, Louis Kaplow, Vik Khanna, Alexi Lahav, Larry Laudan, Maggie Lemos, Jonathan Nash, Gideon Parchomovsky, Mike Pardo, Ariel Porat, Alex Reinert, Jessica Roth, Kate Shaw, Peter Siegelman, Ed Stein, Stewart Sterk, Guy Wellborn, and participants in workshops and presentations at Cardozo Law School, Texas Law School, and the Twenty-Third Annual Meeting of the American Law & Economics Association for helpful comments and suggestions. I also thank Jessica Marshall for excellent research assistance. Copyright © 2014 Alex Stein. All Rights Reserved. Please do not distribute, cite or quote without author’s permission.

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## INTRODUCTION

“Evidence,” wrote Bentham, “is the basis of justice.”<sup>1</sup> This observation aptly describes our legal system, where the outcome of trials critically depends on the parties’ ability to produce information that substantiates their claims. Yet, not every piece of information counts as “evidence” in legal procedures. Evidence rules exclude certain types of information—even relevant ones—from bearing on the outcome of cases.<sup>2</sup> This, of course, raises the question: Why?

Suppression of relevant information as legally “inadmissible” or “insufficient” presents a serious puzzle. In this Article, I set out to resolve this puzzle and provide a comprehensive justification for the extant design of evidence law. I contend that our evidence-sorting rules share one important commonality: they are designed to ensure that only information that satisfies an adequate “signal-to-noise ratio” will be considered by fact finders and decide the outcome of cases.

All information that parties submit to fact finders is comprised of a kernel of “signal” surrounded by “noise.” Under this taxonomy, “signal” refers to information reliable enough to allow the fact finders to determine the probability of the underlying allegation, and “noise” represents the exact opposite. Information not allowing the fact finders to make a reliable

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1. 5 JEREMY BENTHAM, RATIONALE OF JUDICIAL EVIDENCE 1 (Fred B. Rothman & Co., 1995) (1827).

2. See GEORGE FISHER, EVIDENCE 1 (3d ed. 2013) (“Evidence law is about the limits we place on the information juries hear.”).

determination of the relevant probability is “noise.” When the noise mutes the signal, the information becomes inefficient and the court should not admit it into evidence. In what follows, I call this information-sorting principle the “signal-to-noise ratio” or, in short, SNR. I posit that this principle underlies the design of our evidence law. More precisely, I argue that our evidence law works to prevent fact finders from relying on unacceptably noisy evidence—namely, evidence with a low SNR.

The SNR principle is widely used in statistics, science, and engineering.<sup>3</sup> As a broad concept, it represents an efficiency-driven approach to information management.<sup>4</sup> However, scant attention has been paid to its implications for the law. In this Article, I hope to redress this omission by shedding light on the profound effect of the SNR principle on our law of evidence.

The SNR principle focuses on the probabilities to which a given piece of information gives rise.<sup>5</sup> These probabilities may fall within the same range, or cluster, on a 0–1 scale. Alternatively, they may be dispersed across the scale and far removed from each other. Any set of probabilities, clustered and dispersed alike, has an average value representing the most dependable probability that fact finders can elicit from the given information. For example, evaluate a set of clustered probabilities of 0.4, 0.5, and 0.6 compared to a set of dispersed probabilities of 0.1, 0.5, and 0.9. Both of these sets have an average value of 0.5. This average probability is the “signal” coming from the information.

Any such signal stands between the outliers (the deviations from the mean) on the upper and the lower bounds of the probability scale. The difference between the signal and each outlier determines the “noise” level for the given set of probabilities.<sup>6</sup> Unsurprisingly, a set of dispersed (wide-ranging) probabilities is always much noisier than a set of clustered (short-ranging) probabilities. This pivotal point is illustrated by my numerical

3. See, e.g., STEPHEN T. ZILIAK & DEIRDRE N. MCCLOSKEY, THE CULT OF STATISTICAL SIGNIFICANCE: HOW THE STANDARD ERROR COSTS US JOBS, JUSTICE, AND LIVES 23–25 (2007) (unfolding a straightforward explanation and statistical application of SNR); Johannes F. de Boer et al., *Improved Signal-To-Noise Ratio in Spectral-Domain Compared with Time-Domain Optical Coherence Tomography*, 28 OPTICS LETTERS 2067 (2003) (exemplifying SNR’s centrality for optics); M.J. Firbank et al., *A Comparison of Two Methods for Measuring the Signal to Noise Ratio on MR Images*, 44 PHYSICS IN MED. & BIOLOGY N261 (1999) (using SNR to determine the efficacy of magnetic resonance imaging systems); Paul Glasziou et al., *When Are Randomised Trials Unnecessary? Picking Signal from Noise*, 334 BRIT. MED. J. 349, 351 (2007) (using SNR to determine validity of clinical medical research); Christopher S. Yoo, *Beyond Coase: Emerging Technologies and Property Theory*, 160 U. PA. L. REV. 2189, 2194–95 (2012) (attesting that SNR determines the efficacy of wave-based communications and citing communication engineering literature).

4. See generally JOHN R. PIERCE, AN INTRODUCTION TO INFORMATION THEORY: SYMBOLS, SIGNALS AND NOISE (2d ed. 1980).

5. See ZILIAK & MCCLOSKEY, *supra* note 3, at 23–27.

6. See *id.* at 24.

example where the two probability sets—as I already mentioned—yield the same signal (0.5), but the noise of the dispersed set (0.4) is four times stronger than the noise of the clustered set (0.1). The two sets of probabilities and their underlying information thus markedly differ from each other. Information giving rise to the dispersed probabilities has a low SNR:  $0.5/0.4=1.25$ . This SNR indicates that the noise embedded in the information is nearly as strong as its signal. Trying to elicit the truth from this information will consequently be more expensive than productive. On the other hand, information giving rise to the clustered probabilities has a very high SNR:  $0.5/0.1=5$ . This SNR indicates that the information's signal is five times stronger than the noise. Fact finders consequently will have no difficulty evaluating the information.

To illustrate, consider an official weather report stating the depth of snow in New York City on February 27, 2007. Probabilities associated with this information are high and clustered. Without knowing their numerical values, one can easily see that the report's SNR is high. After introducing those values—for example, 0.7, 0.8, and 0.9—one will see it more vividly. The signal embedded in the report equals 0.8, while the noise volume amounts to only 0.1. The report's SNR thus equals 8 ( $0.8/0.1$ ), with the signal being eight times stronger than the noise. This factor guarantees that fact finders' evaluations of this and similar reports will align with the truth in nearly every case.

Consider now an alibi witness with three perjury convictions who testifies at his brother's robbery trial. This information gives rise to low probabilities, ones that are much closer to 0 than to 1. Remarkably, because these probabilities form a uniform cluster, the witness's testimony has a high SNR as well, although, of course, not as high as in the weather report example. Here, too, one can see that this SNR is high even without assigning numerical values to the probabilities. Based on the experience we have with similar witnesses, assume that these values are 0.1, 0.2, and 0.3. Under this realistic assumption, the testimony's SNR will equal 2 ( $0.2/0.1$ ). The testimony's signal—0.2—is much weaker than the signal embedded in the weather report. The testimony's noisiness, however, is two times lower than the signal, which guarantees that fact finders' evaluations of this and similar testimonies will virtually never fall far off from the truth.

These examples show that whenever the range of the relevant probabilities is short, their signal will be much greater than the noise. Information that gives rise to a clustered probability—high, low, or in-between—therefore always qualifies as good evidence. This information will help fact finders reach the right decision and will virtually never mislead them. Hence, it is efficient and courts should always admit it into evidence.

Finally, consider a witness testifying in a murder trial that she heard from her friend—out of court—that the defendant killed the victim. This testimony is a classic example of “hearsay”—information that our law generally excludes from the category of admissible evidence.<sup>7</sup> This exclusion is fully justified. A statement made by an out-of-court declarant is either true or false, but whether it is true or false is unknowable. Fact finders consequently need to evaluate the statement’s probability of being true rather than false. In the case at bar, fact finders need to know the declarant’s motives for making the statement and whether he properly perceived and remembered the alleged murder incident. Alas, these credibility cues are not available. Absent credibility cues—positive, negative, or mixed—the declarant’s statement gives rise to a wide range of probabilities that cover all possible hypotheses about the statement’s trustworthiness. These probabilities form three clusters. One of those clusters occupies the upper side of the probability scale (close to 1); another cluster occupies the scale’s lower side (close to 0); and yet another cluster occupies the center (0.5). This dispersion—or variance—of probabilities indicates that the statement has a low SNR, as does all hearsay evidence unaccompanied with credibility cues. The noise coming from the statement mutes its signal, which makes the statement unworthy of fact finders’ consideration. This statement—and, indeed, all uncorroborated hearsay evidence—is too costly to evaluate relative to its informational benefit. Bringing it into the fact-finding process would increase the marginal cost of errors and error avoidance as a total sum.<sup>8</sup> Hence, it is inefficient and courts should not admit it into evidence.

In the pages ahead, I use the SNR principle to explain our system of evidence that operates with the help of admissibility and sufficiency rules. Admissibility rules are the central core of our law of evidence. They include the hearsay doctrine,<sup>9</sup> the rule against character evidence,<sup>10</sup> the conditions for admitting expert testimony,<sup>11</sup> and a number of other rules. Sufficiency rules encompass the corroboration requirements for accomplice testimony and some other categories of evidence. I demonstrate that our evidence law works to make sure that fact finders base their decisions only on information that gives rise to clustered probabilities and, consequently, has a high SNR. The law achieves this effect by disqualifying information associated with dispersed probabilities and therefore a correspondingly low

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7. See FED. R. EVID. 802.

8. See RICHARD A. POSNER, *ECONOMIC ANALYSIS OF LAW* 757–58 (8th ed. 2011) (observing that minimization of the aggregate cost of errors and error avoidance is a fundamental economic goal of procedural law).

9. See FED. R. EVID. 801–807.

10. See *id.* 404.

11. See *id.* 702.

SNR. Importantly, the law makes these pre-rulings in relation to categories of evidence instead of asking judges to carry out a cost-benefit analysis of individual items of evidence.<sup>12</sup> The resulting saving of adjudicative expenses makes these pre-rulings efficient from an economic standpoint.<sup>13</sup>

My account of evidence law is not merely descriptive. I accompany it with two significant normative contributions to legal theory. First and most important, I show that the SNR principle decisively resolves the debate about the purpose of evidence law.<sup>14</sup> Many scholars, beginning with Bentham,<sup>15</sup> call for the abolition of all admissibility and corroboration rules.<sup>16</sup> They argue that fact finders should evaluate all relevant evidence on a case-by-case basis without prior selection, as they do in most countries in the world.<sup>17</sup> This argument portrays our evidence law as yet another problematic example of American exceptionalism.<sup>18</sup>

Bringing the SNR principle into this debate underscores our system's need to macromanage evidence. American courts process millions of cases every year.<sup>19</sup> This unparalleled volume of litigation makes it imperative for our system to minimize the total cost of errors and error-avoidance in fact-finding.<sup>20</sup> To achieve this socially beneficial result, the system must get rid of inefficient evidence: one that increases the cost of fact-finding without

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12. Under Federal Rule of Evidence 403 and its state equivalents, judges retain their power to suppress any individual item of evidence if its prejudicial or wasteful effect on fact-finding substantially outweighs its probative value. This residual rule supplements the category-based method of selecting evidence chosen by our legal system. *See also infra* note 37.

13. *See infra* Part II.

14. *See* ALEX STEIN, FOUNDATIONS OF EVIDENCE LAW 107–40 (2005) (arguing that evidence law should be geared toward socially desirable allocation of the risk of error); WILLIAM TWINING, RETHINKING EVIDENCE: EXPLORATORY ESSAYS 192–226 (2d ed. 2006) (outlining and analyzing the debate about the nature and purposes of evidence law).

15. *See* BENTHAM, *supra* note 1, at 477–94; WILLIAM TWINING, THEORIES OF EVIDENCE: BENTHAM & WIGMORE 66–88 (1985).

16. *See, e.g.*, David P. Bryden & Roger C. Park, "Other Crimes" Evidence in Sex Offense Cases, 78 MINN. L. REV. 529, 561 (1994) ("For centuries, the movement has been toward abolition of those exclusionary rules that have as their basis the danger of misleading the fact-finder. Jurists and scholars alike increasingly have agreed with Bentham that technical rules of evidence designed to prevent fact-finders from making mistakes are, at best, more trouble than they are worth."). *See also infra* notes 58, 62–63 and accompanying text.

17. *See* MIRJAN R. DAMAŠKA, EVIDENCE LAW ADRIFT 1–25, 94–101 (1997); *see also* Kenneth Culp Davis, *An Approach to Rules of Evidence for Nonjury Cases*, 50 A.B.A. J. 723, 726 (1964) ("Our sick body of evidence law will get well sooner if our American evidence doctors will consult with some European evidence doctors."); *infra* notes 62–63 and accompanying text. Notably, the greatest British evidence scholar, Rupert Cross, made a striking statement: "I am working for the day when my subject is abolished." TWINING, *supra* note 14, at 1.

18. *See infra* Section I.C.

19. *See* Judith S. Kaye, *State Constitutional Law and the State High Courts in the 21st Century*, 70 ALB. L. REV. 825, 827 (2007) (attesting that "tens of millions of cases—ninety-eight percent of our nation's litigation— . . . annually come before the state courts"); Chief Justice Margaret H. Marshall of Massachusetts, *Remarks to Symposium: Great Women, Great Chiefs*, 74 ALB. L. REV. 1595, 1601 (2011) ("Every year millions of cases are filed in state courts . . .").

20. *See* STEIN, *supra* note 14, at 141.

significantly improving the accuracy of court decisions.<sup>21</sup> The system therefore will do well to suppress all evidence that has a low SNR.

My additional normative contribution concerns the Compulsory Process Clause of the Sixth Amendment.<sup>22</sup> The extent to which this Clause prohibits courts and lawmakers from suppressing criminal defendants' evidence is presently unclear.<sup>23</sup> Adoption of the SNR principle will remove this constitutional ambiguity. Evidence with a low SNR might raise a reasonable doubt as to whether the defendant committed the alleged crime. This factor favors the admission of such evidence. Defendants, however, should not be absolutely free to rely on such evidence, but they should be entitled to adduce it when better evidence is not within their reach. The defendant's showing of necessity should thus make him entitled to present any exculpatory evidence, including one with a low SNR. Suppressing such evidence would violate the Compulsory Process Clause.

Structurally, the Article unfolds as follows. In Part I, I explain how the SNR principle works and demonstrate its normative superiority over unregulated fact-finding. In Parts II and III, respectively, I use this principle to explain our system of evidence selection and to determine the scope of criminal defendants' entitlement to compulsory process. A short conclusion follows.

## I. MACROMANAGING EVIDENCE

### A. *A Tale of Two Systems*

Consider two legal systems: one large (*System L*) and another small (*System S*). *System L* processes 1,000,000 cases a year. *System S* has a much smaller inflow of cases: just 100,000. *System L*'s workload is thus ten times that of *System S*'s. The two systems are identical in every other respect: their laws are the same and their courts are equally competent and speedy. My final assumption is scarcity of resources: neither of the two systems can expend an unlimited amount of resources on its operation. Both systems must limit their expenditures to allow citizens to enjoy other amenities as well.

How would you design evidence laws for these two systems? Importantly, would you design one evidence law, or two?

These questions call for a cost-benefit analysis. Adjudicative fact-finding generates an indispensable benefit for society: it enables courts to

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21. See *id.* at 141–43.

22. U.S. CONST. amend. VI (“In all criminal prosecutions, the accused shall enjoy the right . . . to have compulsory process for obtaining witnesses in his favor . . .”).

23. See *infra* Part III.



properly assign entitlements and liabilities to parties. This benefit, however, is not cost free. Adjudicative fact-finding implicates two social costs: the cost of accuracy and the cost of errors.<sup>24</sup> The cost of accuracy encompasses the legal system's expenditures on fact-finding procedures that reduce the incidence of error. The cost of errors originates from incorrect factual findings produced by the system. These findings distort courts' assignments of entitlements and liabilities, thereby causing harm to parties.

The overarching goal of the law of evidence is to achieve a socially optimal tradeoff between these two costs.<sup>25</sup> Evidentiary rules ought to improve the accuracy of court decisions as cheaply as possible. To this end, they ought to minimize the cost of errors and error avoidance as an aggregate sum. This task is easy to formulate, but difficult to accomplish.

To make the task manageable, policymakers must split it up into three distinct subtasks. As an initial matter, policymakers need to formulate the standards of proof for civil and criminal trials. These standards are necessary because fact finders will have to make decisions under conditions of uncertainty and consequently need to have probability thresholds for making those decisions. Those thresholds should reflect society's preferences in the allocation of the risk of error. Policymakers consequently must determine, for every area of the law, whether society favors false positives (mistaken impositions of liability) over false negatives (mistaken exonerations), or vice versa, and how intense this preference is.<sup>26</sup> This factor is crucial because any proof standard that reduces the incidence of false positives increases the number of false negatives, and vice versa.<sup>27</sup> To convict a greater number of guilty defendants, policymakers must lower the probability threshold for convictions. Under a low threshold, however, courts will convict a greater number of innocents. To protect the innocent from erroneous conviction, policymakers would have to move the probability threshold upwards, but then a greater number of guilty criminals would go scot-free.

Policymakers consequently must decide how many guilty criminals they are willing to free from punishment in order to protect one innocent defendant against erroneous conviction. If this number is very high, policymakers should adopt the "beyond a reasonable doubt" standard for criminal trials. Under this standard, the prosecution will have to prove each and every element of the alleged crime beyond a reasonable doubt. Any

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24. See POSNER, *supra* note 8, at 757–58.

25. See *id.* at 819–24.

26. See *id.* at 827.

27. See *id.* at 827 n.2 ("Trading off Type I and Type II errors is a pervasive feature of evidence law.").

reasonable doubt as to whether the defendant committed the crime will consequently require fact finders to acquit him.

For civil litigation, policymakers should endorse a different allocation of the risk of error. In civil cases, there is no reason to favor false positives over false negatives, or vice versa. Hence both types of error should be given equal weight, and policymakers should favor a proof standard that maximizes the number of correct court decisions, namely, the “preponderance of the evidence” standard. This standard should apply both to elements of the suit and to affirmative defenses.<sup>28</sup> Under this standard, when fact finders are undecided about an element of the suit, they should dismiss the suit. Correspondingly, when fact finders are undecided about an affirmative defense, they should deny the defendant that defense.

Policymakers’ next mission is to formulate the basic gatekeeping criteria for evidence selection. The criteria must separate evidence that can satisfy the chosen proof standards from evidence that cannot. The gatekeeping criteria must therefore consist of evidence-sorting rules that will give courts the power to admit evidence that has the best probative potential, while excluding all inferior evidence from fact finders’ consideration.<sup>29</sup>

Formulating these criteria and rules is not difficult. Evidence that lends prima facie support to a party’s claim or defense is potentially capable of satisfying any proof standard. As a general matter, fact finders can find “preponderance” or “proof beyond a reasonable doubt” in any evidence that tends to prove the relevant claim or defense. Therefore, policymakers will do well to set up a broad admissibility provision authorizing courts to admit any evidence that is of consequence to the underlying claim or defense.<sup>30</sup> Policymakers must supplement this provision with rules that will motivate parties to adduce the best available evidence. These rules will require parties to call witnesses with direct knowledge of the relevant facts,<sup>31</sup> to rely on the most qualified expert witnesses in matters calling for scientific or professional expertise,<sup>32</sup> to adduce original documents

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28. See STEIN, *supra* note 14, at 143–48; cf. Eric L. Talley, *Law, Economics, and the Burden(s) of Proof*, in RESEARCH HANDBOOK ON THE ECONOMICS OF TORTS 305 (Jennifer Arlen ed., 2013) (examining cost-minimization and other core economic goals of proof burdens).

29. See generally Dale A. Nance, *The Best Evidence Principle*, 73 IOWA L. REV. 227 (1988) (developing a comprehensive “best evidence” principle and unfolding its normative virtues and explanatory power).

30. Cf. FED. R. EVID. 401 (categorizing as generally admissible evidence that “has any tendency to make a fact more or less probable than it would be without the evidence” when “the fact is of consequence in determining the action”).

31. Cf. *id.* 602.

32. Cf. *id.* 702.

whenever these are available;<sup>33</sup> to avoid delays;<sup>34</sup> and to minimize undue prejudice to opponents.<sup>35</sup>

The third, final, and most difficult matter that policymakers must consider is noisy evidence. Evidence falling into the “noisy” category is *probabilistically ambiguous*. This characteristic attaches to three categories of evidence: self-asserting, self-serving, and speculative.

Evidence is self-asserting when it contains an unexaminable statement of facts, which fact finders are asked to accept on faith. Consider a witness, Alice, who testifies in a criminal trial that her coworker, Harold, told her that he saw the defendant robbing the victim at gunpoint. The prosecutor uses Alice’s testimony to prove the robbery accusation, while Harold does not appear as a witness in the proceeding. Here, Harold’s statement is self-asserting because its credibility is unverifiable. Based on this statement alone, fact finders can ascribe any probability to the robbery accusation. The probability can be high, low, or in-between—a characteristic that makes Harold’s statement probabilistically ambiguous.

Evidence is self-serving when its producer has a motive and opportunity to fabricate it. Consider a suit against a dead person’s estate. The plaintiff testifies that the dead person loaned from him \$50,000 and did not repay the loan. This testimony is self-serving because the plaintiff knows that his attribution of a \$50,000 debt to the dead person cannot be controverted. The dead person cannot stand up and deny the plaintiff’s allegations. The plaintiff consequently can say in court anything he wants without facing rebuttal and penalties for perjury.

Evidence is speculative when it pools together cases with some shared similarities while suppressing their differences, thereby driving fact finders to treat the cases as identical. Consider a person accused of burning four of his houses over a nine-year period in order to recover insurance money. To prove the alleged fraud, the prosecution calls an actuary from the insurance industry to testify that a person’s chances of having four of her houses accidentally destroyed by fire over a nine-year period are one in 1.773 trillion.<sup>36</sup> This testimony properly rules out the accidental fire scenario. Yet, it is still speculative because it pools together cases in which a person burns his own houses to recover money from the insurer with cases in which a person has an enemy—an underworld enemy, perhaps—who sets fire to the person’s houses. Defendants falling into the first category of cases are perpetrators of insurance fraud. Defendants belonging to the second category are victims of arson.

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33. *Cf. id.* 1002.

34. *Cf. id.* 403.

35. *Cf. id.*

36. This example is drawn from *United States v. Veysay*, 334 F.3d 600, 603–04 (7th Cir. 2003).

What makes the actuary's testimony speculative and hence noisy is its insensitivity to transitions between these two very different categories of cases. Changing the defendant's identity from a fraudster to the victim of arson brings about no changes in the testimony. The testimony stays invariant across two completely different populations: fraudsters and arson victims. As a result, it does not help fact finders determine whether the defendant is a fraudster, as opposed to arson victim, or vice versa. This testimony only establishes that fraudsters outnumber arson victims, but this numerical prevalence says nothing about the individual defendant. Once fact finders try to connect the actuary's testimony to the specifics of the case, it becomes probabilistically ambiguous. Based on this testimony, fact finders can ascribe virtually any probability to the defendant's guilt: high, low, or intermediate.

What should policymakers do with noisy evidence? This question is not easy to answer.<sup>37</sup> Policymakers working for *Systems L* and *S* are unlikely to resolve it in the same way. Recall that the two legal systems are identical in all respects except caseload. *System L*'s caseload is much heavier than that of *System S*. This difference will not affect the design of the systems' proof burdens and basic evidence-selection rules. Because the two systems have similar substantive preferences, their tradeoffs between false positives and false negatives will be similar as well. The two systems also would not differ in their basic evidence-selection rules. These rules are fairly standard and uncontroversial.

The caseload difference, however, should affect the ways in which the two systems treat the noisy evidence. Because *System S*'s caseload is relatively light, it can afford expending some of its resources on the integration of noisy evidence in adjudicative fact-finding. For example, *System S* may authorize fact finders to dedicate more time to cases that involve noisy evidence. The number of such cases would be small. Cases in which noisy evidence would engender an erroneous assignment of liability or entitlement would be rare as well. Moreover, noisy evidence would occasionally help fact finders get to the truth. This beneficial effect would be relatively rare, but one cannot discount it completely.

*System L*'s heavy caseload exponentially increases the costs that this system would incur if it were to allow courts to consider noisy evidence. These costs would include the system's expenditures on fact-finding—which are ten times higher than those of *System S*—as well as the

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37. Richard Posner favors an item-specific, evidence-screening model that uses Federal Rule of Evidence 403. This model authorizes trial judges to select evidence for fact-finding by carrying out a cost-benefit tradeoff in relation to *every specific item of evidence*. See Richard A. Posner, *An Economic Approach to the Law of Evidence*, 51 STAN. L. REV. 1477, 1522–30 (1999). This model will work well with *System S*. For *System L*, however, implementing it would be too costly. For that reason, I support category-based screening of evidence. See *infra*, Part II.

distortions in the courts' assignments of entitlements and liabilities that would occur in cases in which noisy evidence will take fact finders astray. For every error engendered by noisy evidence under *System S*, courts operating under *System L* would make ten decisions that assign the relevant entitlement or liability to the wrong party. Benefits that *System L* would derive from noisy evidence would fall way below these costs. As the number of cases implicating noisy evidence gets higher, this negative balance would increase. Also, authorizing courts to put more time into processing noisy evidence would not improve this balance.

Worse yet, every item of noisy evidence exponentially increases the cost of trial and pretrial proceedings. In a proceeding with just one item of noisy evidence, parties and fact finders must expend their efforts and other resources on dealing with one noisy issue. When the court admits two items of noisy evidence, *A* and *B*, this expenditure triples as parties and fact finders have to deal with three noisy issues: Item *A*, Item *B*, and the relationship between the two items. This simple point resonates with a recent finding that, for every 1000 pages exchanged in discovery, only one page goes into evidence.<sup>38</sup> This ratio indicates how incredibly wasteful our current fact-finding procedures are. For obvious reasons, a legal regime that allows parties to adduce noisy evidence will make this waste ratio even higher than 1000/1.

Admission of noisy evidence, therefore, widens the gap between the cost of processing the evidence and the benefits of its information. This dynamic would drive *System L* into serious diseconomies of scale. To avoid these diseconomies, *System L* would do well to keep noisy evidence away from courts.<sup>39</sup>

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38. See LAWYERS FOR CIVIL JUSTICE, CIVIL JUSTICE REFORM GRP. & U.S. CHAMBER INST. FOR LEGAL REFORM, LITIGATION COST SURVEY OF MAJOR COMPANIES 3 (2010), available at <http://www.uscourts.gov/uscourts/RulesAndPolicies/rules/Duke%20Materials/Library/Litigation%20Cost%20Survey%20of%20Major%20Companies.pdf>.

39. One can draw a useful parallel between this exclusionary policy and the precedent doctrine. The precedent doctrine generates economies of scale by applying a discrete court ruling on a question of law—the precedent—in multiple cases. See POSNER, *supra* note 8, at 743–44 (analogizing precedent to “a stock of knowledge that yields services over many years to potential disputants in the form of information about legal obligations”). These multiple applications allow the legal system to make substantial investments in the production of precedents. As part of those investments, the system gives the power to make precedential rulings to its most senior courts, with several judges—as opposed to just one—sitting on the panel. The system also allows parties to engage in extensive argumentation about the desired precedent. Moreover, the system permits, and even affirmatively encourages, the submission of amicus briefs and social-science evidence to courts. See generally Ruben J. Garcia, *A Democratic Theory of Amicus Advocacy*, 35 FLA. ST. U. L. REV. 315 (2008). The system spreads the cost of its massive investment in precedents' production across many cases. As the number of cases in which courts rely on a precedent goes up, the system's prorated per-case investment in the precedent decreases. Correspondingly, the system's net benefit from developing and applying precedents steadily increases over time. *System S* need not have a binding precedent doctrine because it has a relatively light caseload. Correspondingly, the number of court decisions that could benefit from a precedent under that system would be small as well. *System S* consequently has no reason to invest substantial

To have a simple numerical example, assume that the overall net cost of evaluating noisy evidence (after offsetting its occasional informational benefit) is \$1,010 per case; that the legal system's cost of devising the appropriate evidence-selection rules and procedures is \$1,000,000; and that ancillary litigation over those rules will cost society \$1,000 per case. Under these assumptions, by making a one-time investment of \$1,000,000, the system will reduce its adjudicative expenses by \$10 per case; and so it will recoup its initial investment in devising the rules after 100,000 cases. Hence, a system with more than 100,000 cases ought to set up evidence-selection rules and procedures.

For *System L*, the annual caseload of 1,000,000 cases makes the investment into evidence-selection rules absolutely mandatory: the system will recoup the investment and start making substantial savings after a short period of six weeks. Failure to adopt the evidence-selection rules and procedures would thus be highly inefficient and wasteful of societal resources. *System S*, on the other hand, processes only 100,000 cases every year, and so it would take a whole year to recoup a \$1,000,000 investment in evidence-selection rules.<sup>40</sup>

### B. The SNR Principle

To address the challenge of noisy evidence in a cost-effective way, any legal system with a heavy caseload must set up a screen that would allow it to separate efficient from inefficient evidence. In the proceeding discussion, I demonstrate that in order to perform this task the system ought to adopt a "signal-to-noise ratio" (SNR). I also argue that this ratio lies at the heart of our evidence system (and fully substantiate this argument in Part II). The function of the SNR method is to set the acceptable level of signal to noise that the legal system can afford and then screen out evidence that falls below that level.

It is important to clarify as an initial matter that finding evidence that is completely noise-free and that gives fact finders a fixed probability for deciding the case is practically impossible. Any evidence relied upon by a self-interested party in a court proceeding exhibits some probabilistic

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resources into the production of good precedents. This system should authorize courts to revise their legal rulings, which would happen only occasionally, given the system's light caseload. This noncommittal approach would save the system's resources. By the same token, *System S* would also stay unbroken if it decides to allow fact finders to evaluate noisy evidence case by case. *System L*, on the other hand, must macromanage its courts' decisions in matters of both fact and law. Being a system with a heavy caseload, it cannot forego economies of scale. For *System L*, therefore, having a binding precedent doctrine is a clear economic necessity. For the same reason, *System L* ought to eliminate diseconomies of scale by setting up rules that suppress noisy evidence.

40. *System S* may still find it economically necessary to set up those rules. My primary concern here, however, is *System L*.

indeterminacy. Fact finders therefore cannot be completely insulated from noise. Indeed, our system relies on fact finders' ability to elicit dependable probability (a "signal") from evidence. Fact finders can perform this task cost-effectively when the evidence upon which they base their decision is informative. As I already explained, however, fact finders are unable to perform this task cost effectively when the noise coming from the evidence mutes the signal. To be informative, a piece of evidence must contain a dependable probabilistic signal that overpowers the noise.

The extent to which this signal should be stronger than the noise is a separate question, and an important one as well. There is no doubt that the ratio of signal to noise should be greater than 1. When that ratio equals 1, the noise coming from the evidence is as strong as its signal, which makes the evidence probabilistically ambiguous and hence too noisy. The evidence thus becomes inefficient. *A fortiori*, evidence whose signal-to-noise ratio falls below 1 is inefficient as well: noise coming from that evidence mutes its signal. To ensure that fact finders always receive a clear signal from evidence, the legal system should set the minimal signal-to-noise threshold at 2. The signal coming from evidence that goes to fact finders should be at least twice as strong as the noise. I call this requirement "the SNR principle."

Given the available knowledge about the world, calculating the SNR for any category of evidence is not difficult.<sup>41</sup> Statisticians have developed a formula for making the required calculus.<sup>42</sup> Computer engineers programmed this formula into automated calculators, some of which are available online.<sup>43</sup> Policymakers, however, can make adequate SNR assessments without this formula. All they need is to specify the range of probabilities that their experience associates with the relevant category of evidence and estimate how wide it is. Consider a category of, say, self-asserting evidence that gives rise to the following probabilities: 0.1, 0.2, 0.5, 0.5, 0.8, and 0.9. This range of probabilities—"variance," in the technical parlance—is very broad. As such, it indicates that the evidence's SNR falls below 2, which makes it impermissibly low. Policymakers consequently should suppress the entire category of evidence without needing to make any additional calculations. Alternatively, policymakers should arrange the relevant probabilities into three equal clusters—{0.1, 0.2}, {0.5, 0.5}, {0.8, 0.9}—and find the average probability for each

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41. When policymakers cannot determine the relevant probabilities even roughly, they should assume that these probabilities can be any. Evidence that gives rise to these indeterminable probabilities will consequently be identified as extremely noisy.

42. See ALLEN RUBIN, STATISTICS FOR EVIDENCE-BASED PRACTICE AND EVALUATION 70–71 (3d ed. 2012).

43. See, e.g., *Standard Deviation - Calculator*, EASYCALCULATION.COM, <http://www.easycalculation.com/statistics/standard-deviation.php> (last visited Oct. 17, 2014).

cluster. Average probabilities representing each cluster—0.15, 0.5, and 0.85—would then allow policymakers to determine the signal and the noise that come from the evidence. The evidence's signal would equal 0.5  $((0.15+0.5+0.85)/3)$  and the noise would amount to 0.35  $(0.5-0.15 \text{ and } 0.85-0.5)$ . The resulting SNR, 1.43, would indicate that the evidence is impermissibly noisy and hence inefficient.

While the formula for calculating SNR would give policymakers a more precise figure—1.58<sup>44</sup>—evidence law would not benefit from this precision. Both figures—1.43 and 1.58—are far removed from the minimal SNR threshold of 2. Therefore, the difference between these two figures is inconsequential. Both figures indicate that the evidence in question is too noisy and hence inefficient; and if so, policymakers should bar it from being admitted. Furthermore, in cases in which policymakers cannot properly identify the probabilities associated with the given category of evidence, they will do well to divide the unknown probabilities into three clusters—upper, lower, and average—that occupy roughly the same space on the probability scale between 0 and 1. Each cluster will then have an average probability (*UA*, *AA* and *LA*) that will allow policymakers to calculate the SNR. This calculation will be straightforward. The level of noise coming from the evidence will equal  $UA-AA=AA-LA$ ; and so the SNR will amount to *AA* divided by the level of noise ( $UA-AA$  or  $AA-LA$ ).

To illustrate how the SNR principle works, consider a rule that requires a plaintiff seeking to recover compensation for emotional distress as a stand-alone damage to adduce evidence demonstrating her direct involvement in the incident brought about by the defendant's wrongdoing.<sup>45</sup> Failure to adduce direct-involvement evidence dooms the suit.<sup>46</sup> The purpose of this rule is "to be able to distinguish legitimate claims of emotional trauma from the mere spurious"<sup>47</sup> by securing that fact finders have "clear and unambiguous evidence that the plaintiff was so directly involved in the incident giving rise to the emotional trauma that it is unlikely that the claim is merely spurious."<sup>48</sup> Under my terminology, this rule aims to secure a dependable SNR for self-serving evidence upon which courts award compensation for emotional harm.

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44. The requisite calculation appears in the Appendix.

45. See DAN B. DOBBS, *THE LAW OF TORTS* § 308 at 836–39 (2000) (attesting that most courts condition plaintiffs' ability to recover compensation for emotional distress upon presence of direct impact or other objective proof).

46. *Id.*; see also *Atl. Coast Airlines v. Cook*, 857 N.E.2d 989, 998–1000 (Ind. 2006) (reversing trial court's denial of the defendant's summary judgment motion on the plaintiffs' claim for emotional distress damages after finding that the plaintiffs' evidence did not show direct impact).

47. *Groves v. Taylor*, 729 N.E.2d 569, 572 (Ind. 2000).

48. *Id.*; see also *Spangler v. Bechtel*, 958 N.E.2d 458, 466 (Ind. 2011) (reaffirming the "direct impact" evidence requirement and its sorting rationale).



Consider a suit for emotional damages unaccompanied by “direct involvement” evidence or other verifiable proof of the plaintiff’s anguish. The only evidence that supports the suit is the plaintiff’s self-serving testimony. Because this testimony is uncorroborated and hence unverifiable, fact finders cannot separate it from similar testimonies of other plaintiffs. Some of those testimonies are truthful, while others are false. Yet another group of the plaintiffs’ self-serving testimonies are partly true and partly false. Every plaintiff, of course, knows well whether his testimony is truthful. The plaintiffs, however, are unwilling or, alternatively, unable to credibly communicate this information to fact finders. Plaintiffs with fake or inflated claims are unwilling to reveal the truth. Honest plaintiffs, on the other hand, are unable to convince the fact finders that their claims are genuine rather than fake.<sup>49</sup> Fact finders consequently face a pool of indistinguishable self-serving testimonies that can have virtually any probability on a scale between 0 and 1.

The only dependable signal that fact finders can elicit from this array of probabilities is 0.5. This average probability falls below the preponderance threshold ( $>0.5$ ), which makes it difficult for the plaintiff to satisfy the requisite standard of proof. The plaintiff’s testimony, however, still satisfies the “prima facie proof” requirement.<sup>50</sup> Therefore, under regular circumstances, the plaintiff’s case must go to trial, and that would give him an opportunity to convince the fact finders that his testimony is more credible than the average. Under general law, this testimony consequently would defeat the defendant’s motion for a direct dismissal of the suit. The reason for excluding the plaintiff’s testimony—and, indeed, for effectively denying him the opportunity of a trial—is the noise surrounding the testimony’s signal. This noise comes from the probabilities other than 0.5 that could also attach to the plaintiff’s testimony and that spread across the full range between 0 and 1. This spread of probabilities is fatal to the plaintiff’s case because it is too wide. As such, it increases the noise level to an inefficient and hence impermissible degree.

Assume for simplicity that probabilities attaching to this category of evidence range between 0.9 and 0.1. Under this assumption, the difference between the dependable signal (0.5) and the noisy extreme on each side (0.1 and 0.9) yields the noise level of 0.4. The signal-to-noise ratio consequently equals 1.25 ( $0.5/0.4$ ), which indicates that the noise coming from the evidence is nearly as strong as the signal. Because of this low

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49. Cf. Daniel J. Seidmann & Alex Stein, *The Right to Silence Helps the Innocent: A Game-Theoretic Analysis of the Fifth Amendment Privilege*, 114 HARV. L. REV. 430, 433 (2000) (explaining the right to silence as a mechanism that increases the credibility of innocent defendants’ testimonies by reducing criminals’ incentive to pool with innocents by fabricating self-exonerating stories).

50. Spangler, 958 N.E.2d at 465.

SNR, the fact finders' inquiry into the nature and causes of the plaintiff's emotional damages is bound to be more costly than productive. This factor marks the plaintiff's testimony, along with all other uncorroborated self-serving evidence, as inefficient.

Furthermore, admission of this testimony into evidence will trigger a response from the defendant. The defendant will cross-examine the plaintiff and will attempt to rebut his testimony. Adding the plaintiff's testimony and the defendant's rebuttal to a trial involving a judge, eight jurors, and two attorneys will create 78 channels for noisy, and hence unproductive, communications.<sup>51</sup> Consequently, a legal system that manages multiple trials and cares about efficiency has no choice but to suppress the plaintiff's testimony.

### C. *American Exceptionalism in the Law of Evidence*

Our system of evidence employs many evidence-sorting rules. These rules determine which evidence is admissible and, conversely, inadmissible as proof of the underlying facts. Admissible evidence goes to fact finders, who then evaluate its probative value and impact on the case at hand.<sup>52</sup> The court must preclude all inadmissible evidence.<sup>53</sup> Fact finders are not authorized to base their decision on such evidence.<sup>54</sup> In addition, evidence-sorting rules determine which evidence is self-sufficient, and thus requires no corroboration.<sup>55</sup> Conversely, these rules also determine which evidence can never satisfy the requisite proof standard without corroboration, even when fact finders find it credible.<sup>56</sup> Fact finders are not authorized to base their decisions on such uncorroborated evidence.

Evidence-sorting rules that apply in American courts thus disqualify a substantial amount of evidence that other countries allow fact finders to consider.<sup>57</sup> These countries form a majority of jurisdictions that adopted the regime of free proof.<sup>58</sup> This regime functions with two, rather than three,

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51. The number of communication channels equals  $[n(n-1)]/2$ , with  $n$  denoting the communicators' number. See generally Edward W. Cleary, *Evidence as a Problem in Communicating*, 5 VAND. L. REV. 277 (1952) (pioneering association of trial evidence with communicative processes).

52. See FED. R. EVID. 401.

53. See *id.* 103(d).

54. See *id.* 105.

55. See FISHER, *supra* note 2, at 1–3.

56. See, e.g., FED. R. EVID. 803(b)(3)(B), 801(d)(2).

57. See, e.g., FISHER, *supra* note 2, at 1–4 (outlining the American system of evidence selection).

58. For comparison between the American and the continental European systems of evidence, see DAMAŠKA, *supra* note 17, at 1–25. See also H. Richard Uviller, *Evidence of Character to Prove Conduct: Illusion, Illogic, and Injustice in the Courtroom*, 130 U. PA. L. REV. 845, 845 n.2 (1982) (“It comes as a surprise to American lawyers and law students to discover that a substantial number of highly developed legal systems—notably European—carry on litigation quite comfortably without any discernible ‘law of evidence.’”).

sets of evidentiary rules. One of these sets contains the proof burdens and another the basic evidence-selection rules.<sup>59</sup> These two sets of rules are supplemented with a few privileges that protect the confidentiality of certain information and thus guard against revelational harm.<sup>60</sup> Many scholars, beginning with Bentham,<sup>61</sup> have endorsed this regime.<sup>62</sup> They argue that sorting evidence into “reliable” and “unreliable” categories is futile, as evidence ought to be evaluated on a case-by-case basis rather than categorically.<sup>63</sup> Their opposition to evidence-sorting rules sparked an ongoing heated debate about the nature and purpose of the law of evidence.<sup>64</sup>

As part of this debate, the American system of evidence was criticized for its exceptionalism.<sup>65</sup> The system’s critics argue that its evidence-sorting rules make fact-finding too formal, unduly complicated, and unnecessarily expensive.<sup>66</sup> Given that free proof works reasonably well for many European countries, so goes the argument, why not have the same regime in American courts? This shift is not unprecedented. England—the

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59. See Alex Stein, *The Refoundation of Evidence Law*, 9 CAN. J.L. & JURIS. 279, 280–81 (1996).

60. See *id.*

61. See BENTHAM, *supra* note 1, at 477–94.

62. See LARRY LAUDAN, TRUTH, ERROR, AND CRIMINAL LAW: AN ESSAY IN LEGAL EPISTEMOLOGY 2 (2006) (arguing that relevancy alone should make evidence admissible).

63. See L. Jonathan Cohen, *Freedom of Proof*, in FACTS IN LAW, 16 ARCHIVE FÜR RECHTS- UND SOZIALPHILOSOPHIE 1 (William Twining ed., 1983) (commending a regime in which fact finders evaluate evidence on a case-by-case basis without any predetermined rules of proof).

64. See STEIN, *supra* note 14, at 107–40 (arguing that evidence rules are needed for allocating the risk of error); TWINING, *supra* note 14, at 192–236 (discussing virtues and vices of regulated and unregulated fact-finding); Stein, *supra* note 59, at 296–323 (arguing that free proof rests upon weak epistemic and moral foundations); see also Robert P. Burns, *The Withering Away of Evidence Law: Notes on Theory and Practice*, 47 GA. L. REV. 691, 706–11 (2013) (favoring abolition of admissibility rules); John Leubsdorf, *Evidence Law as a System of Incentives*, 95 IOWA L. REV. 1621 (2010) (interpreting evidentiary rules as inducing socially desirable litigation behavior); Michael S. Pardo, *The Nature and Purpose of Evidence Theory*, 66 VAND. L. REV. 547, 559–69 (2013) (favoring regulation of fact-finding by evidentiary rules).

65. See DAMAŠKA, *supra* note 17, at 101 (criticizing the American system of evidence for “deviat[ing] from ordinary decision-making” and for “strik[ing] discordant notes with arrangements recommended by a model of inquiry aimed at obtaining only accurate, trustworthy knowledge”). For cultural, institutional, and legal analyses of American exceptionalism in procedure and evidence, see AMALIA D. KESSLER, *INVENTING AMERICAN EXCEPTIONALISM: THE ORIGINS OF AMERICAN ADVERSARIAL LEGAL CULTURE, 1800–77* (forthcoming) (unfolding a powerful cultural and historical account of American exceptionalism in court procedures); Oscar G. Chase, *American “Exceptionalism” and Comparative Procedure*, 50 AM. J. COMP. L. 277, 296–301 (2002) (outlining the unique characteristics of the American trial and comparing them with the European trial); Richard L. Marcus, *Putting American Procedural Exceptionalism Into a Globalized Context*, 53 AM. J. COMP. L. 709, 715–22 (2005) (comparing the unique characteristics of the American civil trial with the core features of the British, German, and Japanese trial systems).

66. See *supra* notes 58, 62–63 and accompanying text.

birthland of evidence-sorting rules—did away with most of them and effectively allows fact finders to engage in a free evaluation of evidence.<sup>67</sup>

Traditional evidence scholars have joined the fray by voicing their support of the extant admissibility and corroboration rules.<sup>68</sup> They argue that evidence law should continue to perform its time-honored sorting role in order to prevent fact finders from considering evidence that might cause them to err.<sup>69</sup> Traditional scholars are also unwilling to give judges the decisive power to select evidence for trials.<sup>70</sup> They estimate that this power will lend itself to abuse and create distortions in court decisions.<sup>71</sup> Recently, this view has received an endorsement from a renowned legal philosopher, Frederick Schauer, who developed a sophisticated rule-driven theory of fact-finding.<sup>72</sup> This theory draws upon experimental studies that point to errors that people systematically make in conditions of uncertainty.<sup>73</sup>

The third view in this important debate belongs to me. My book, *Foundations of Evidence Law*,<sup>74</sup> demonstrated that evidence-sorting rules play a pivotal role in adjudication. These rules allocate the risk of error accompanying fact finders' decisions in a way that enhances the protection of people's substantive entitlements at a socially affordable cost.<sup>75</sup> Based on this insight, I argued that our evidence law should not only retain its rules of admissibility and corroboration, but should also expand their applicability.<sup>76</sup> This rationalization of evidence law has provoked an extensive discussion.<sup>77</sup> A number of scholars<sup>78</sup> and one court<sup>79</sup> have agreed with my core idea. Other scholars have criticized it.<sup>80</sup>

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67. See STEIN, *supra* note 14, at 209–13, 243–44 (documenting and discussing the abolition of hearsay, character, and corroboration rules in England).

68. See Lisa Dufrainmont, *Evidence Law and the Jury: A Reassessment*, 53 MCGILL L.J. 199, 220–31 (2008) (analyzing the traditional jury-control justifications of evidentiary rules); Richard D. Friedman, *Minimizing the Jury Over-Valuation Concern*, 2003 MICH. ST. L. REV. 967, 974–75 (2003) (arguing that evidence rules counter jurors' cognitive biases).

69. See Dufrainmont, *supra* note 68.

70. See THOMAS A. MAUET & WARREN D. WOLFSON, TRIAL EVIDENCE 292 (3d ed. 2005).

71. See, e.g., *id.* (mentioning mistrust of trial judges as states' reason for not setting up a discretionary framework for admitting expert evidence).

72. See Frederick Schauer, *On the Supposed Jury-Dependence of Evidence Law*, 155 U. PA. L. REV. 165, 199–202 (2006); see also Charles L. Barzun, *Rules of Weight*, 83 NOTRE DAME L. REV. 1957, 1988–96 (2008) (arguing that corroboration and admissibility rules can control fact finders' cognitive biases).

73. See generally DANIEL KAHNEMAN, THINKING, FAST AND SLOW (2011) (presenting and discussing psychological studies showing people's failures in cognition and reasoning). For critique of those studies, see Alex Stein, *Are People Probabilistically Challenged?*, 111 MICH. L. REV. 855 (2013) (book review).

74. See STEIN, *supra* note 14.

75. *Id.* at 133–40.

76. *Id.*

77. See Ronald J. Allen, *Laudan, Stein, and the Limits of Theorizing About Juridical Proof*, 29 LAW & PHIL. 195, 217–30 (2010) (book review); David Hamer, *The Truth Will Out? Incoherence and*

The SNR principle and its economic motivation reshape the parameters of the debate. Thus far, the debate focused on whether evidence-sorting rules can reduce the incidence of errors in court decisions and secure the desired allocation of residual errors. The SNR principle prompts policymakers to focus on a different, yet profoundly important, question: whether the legal system's caseload makes it economically prudent for courts to consider noisy evidence. The more cases there are to process, the greater the system's need to macromanage evidence in order to avoid diseconomies of scale. For a system that manages multiple trials, screening out inefficient evidence by applying the SNR principle is simply a plain economic necessity.

The SNR principle also puts the American evidence system in a different light. Not only does it offer a new theoretical grounding for our system's evidential *modus operandi* by revealing its efficient design, but it also shows that the "exceptionalism" label that the system's critics attached to it is misplaced. Evidence-sorting rules that our system employs indeed stand out as exceptional against the "norm" formed by a numerical majority of the world's countries that adopted a free proof regime.<sup>81</sup> This exceptionalism, however, has a straightforward explanation. For good or bad reasons, our state and federal courts manage an exceptionally large number of cases.<sup>82</sup> Because our legal system promotes not only fairness, but efficiency as well, we expect courts to adjudicate cases economically.<sup>83</sup>

*Scepticism in Foundations of Evidence Law*, 70 MOD. L. REV. 318, 323–27 (2007) (book review); Dale A. Nance, *Allocating the Risk of Error: Its Role in the Theory of Evidence Law*, 13 LEGAL THEORY 129 (2007); Michael S. Pardo, *The Political Morality of Evidence Law*, 5 INT'L COMMENT. ON EVID., no. 2, 2007, at 1, 11–16; Roger C. Park & Michael J. Saks, *Evidence Scholarship Reconsidered: Results of the Interdisciplinary Turn*, 47 B.C. L. REV. 949, 1018–24 (2006); Mike Redmayne, *The Structure of Evidence Law*, 26 OXFORD J. LEGAL STUD. 805 (2006).

78. Five critics of my book (Allen, *supra* note 77, at 228; Nance, *supra* note 77, at 161–64; Pardo, *supra* note 77, at 17; and Park & Saks, *supra* note 77, at 1023) acknowledge the core virtue of my rule-based risk-allocation theory while criticizing its conceptual apparatus and implications.

79. See *Hill v. Humphrey*, 662 F.3d 1335, 1355 (11th Cir. 2011) ("All kinds of rules serve to allocate the risk of an erroneous decision—procedural rules that determine who can participate in the presentation of evidence and argument, evidentiary rules that determine what evidence the trier of fact can consider, and decisional rules like the standard of proof at issue here."); (citing Alex Stein, *Constitutional Evidence Law*, 61 VAND. L. REV. 65, 67–68 (2008)).

80. See Hamer, *supra* note 77, at 326 (denying the centrality of risk-allocation to evidence law); Redmayne, *supra* note 77, at 820 (rejecting the risk-allocation theory of evidence law).

81. See Bryden & Park, *supra* note 16, at 561.

82. See Kaye, *supra* note 19, at 827; Marshall, *supra* note 19, at 1601; see also F. Andrew Hessick, *Standing, Injury in Fact, and Private Rights*, 93 CORNELL L. REV. 275, 323 (2008) ("Litigation is expensive both for the litigants and for the judiciary, and the volume of civil litigation is ever increasing."); Allegra M. McLeod, *Decarceration Courts: Possibilities and Perils of a Shifting Criminal Law*, 100 GEO. L.J. 1587, 1669 (2012) (attesting that our criminal courts manage high case volumes and consequently work to substitute trial with guilty pleas).

83. See Arthur R. Miller, *The Adversary System: Dinosaur or Phoenix*, 69 MINN. L. REV. 1, 1 (1984) (arguing that "[t]he inability of the American judicial system to adjudicate civil disputes economically and efficiently is one of the most pressing issues facing the courts today").

These two factors call for a complete ban on all inefficient evidence. Tolerating such evidence would make our fact-finding system slow and ineffectual.

Hence, evidence-sorting rules mandated by the SNR principle are unassailable. I now turn to identifying those rules and explaining how they work.

## II. THE SNR PRINCIPLE AND THE LAW OF EVIDENCE

In this Part, I demonstrate that the SNR principle explains and justifies our system's evidence-sorting rules. Evidence admissible under this system uniformly exhibits a strong signal and a low noise level—a combination that guarantees a high SNR. Conversely, inadmissible evidence embodies a weak signal, a high noise level, and correspondingly a low SNR. Corroboration requirements that attach to certain categories of evidence<sup>84</sup> follow the same logic. Evidence falling into those categories has an invariably low SNR and thus cannot, on its own, form a basis for factual findings. Conversely, evidence recognized by our system as capable of satisfying the requisite burden of proof always passes the minimal SNR threshold.

Based on the categorization established in Part I, I show that extant admissibility and corroboration rules disqualify three categories of evidence—self-asserting, self-serving, and speculative—all of which have an impermissibly low SNR. Evidence not falling into any of these categories may have a low SNR as well, but such evidence is not readily identifiable in advance and can only be dealt with case by case. In dealing with such evidence, courts should use their general power to exclude any

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84. Our legal system includes three additional corroboration requirements that perform no sorting role. One of those requirements bars conviction for perjury on the testimony of a single witness. Any such witness must be corroborated by additional testimony or other evidence. *See Weiler v. United States*, 323 U.S. 606, 609–10 (1945); *United States v. Chaplin*, 25 F.3d 1373, 1378 (7th Cir. 1994) (holding that “although criticized by some, the two-witness rule remains viable in perjury prosecutions”). Another requirement appears in Article III, Section 3 of the United States Constitution, which provides, “No Person shall be convicted of Treason unless on the Testimony of two Witnesses to the same overt Act, or on Confession in open Court.” U.S. CONST. art. III, § 3, cl. 1. These requirements curtail the government's power to prosecute individuals for perjury and treason—two overbroad and otherwise problematic offenses. *See* Richard A. Bierschbach & Alex Stein, *Overenforcement*, 93 GEO. L.J. 1743, 1765–71, 1771 n.128 (2005). Under our system, a criminal defendant's confession needs to be corroborated as well. *See Wong Sun v. United States*, 371 U.S. 471, 488–90 (1963). This requirement aims at securing the confession's voluntariness, but its constitutional status is unclear. *See United States v. Bukowski*, 435 F.2d 1094, 1106 n.7 (7th Cir. 1970) (“[I]t is not clear whether [the corroboration requirement for confessions] need be treated as a feature of ‘Due Process.’”). For discussion of this requirement, see Alex Stein, *Constitutional Evidence Law*, 61 VAND. L. REV. 65, 118–19 (2008).

individual piece of evidence when its prejudicial potential outweighs its probative value.<sup>85</sup>

### A. *Self-Asserting Evidence*

#### 1. *Hearsay*

The rule against hearsay is a pillar of the American system of fact-finding.<sup>86</sup> The rule provides that an assertion that a person makes out of court (expressly or implicitly) is generally not admissible as evidence purporting to establish the assertion's truth.<sup>87</sup> To become admissible, any such assertion must satisfy special conditions set by one of the exceptions to the hearsay rule.<sup>88</sup> Those exceptions are numerous and diverse.<sup>89</sup> Their combined effect is to make many hearsay statements admissible—a consequence that prompted some evidence scholars to question the desirability of the entire hearsay rule.<sup>90</sup> These scholars argue that the rule has effectively been rendered meaningless by its exceptions and conclude that the legal system should abolish it completely.<sup>91</sup>

This argument makes a valid conceptual point: the “hearsay” category indeed has lost much of its significance. However, the fact that much hearsay evidence has become admissible does not weaken the economic reasons for excluding *self-asserting* hearsay statements.<sup>92</sup> Such statements have an impermissibly low SNR; hence, admitting them into evidence

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85. See FED. R. EVID. 403.

86. Wigmore's monumental treatise famously described the hearsay rule as the “most characteristic rule of the Anglo-American law of evidence.” 5 JOHN HENRY WIGMORE, EVIDENCE IN TRIALS AT COMMON LAW § 1364, at 28 (James H. Chadbourne ed., rev. ed. 1974). Equally famously, Wigmore considered in-court cross-examination of witnesses as “beyond any doubt the greatest legal engine ever invented for the discovery of truth.” *Id.* § 1367, at 32.

87. See FED. R. EVID. 801(c).

88. See *id.* 802 (providing that hearsay evidence is not admissible subject to exceptions).

89. See *id.* 801(d), 803, 804, 807 (codifying thirty-seven exceptions to the hearsay rule).

90. See, e.g., Ronald J. Allen, Commentary, *The Evolution of the Hearsay Rule to a Rule of Admission*, 76 MINN. L. REV. 797, 798–99 (1992); Michael L. Seigel, *Rationalizing Hearsay: A Proposal for a Best Evidence Hearsay Rule*, 72 B.U. L. REV. 893, 894 (1992); David Alan Sklansky, *Hearsay's Last Hurrah*, 2009 SUP. CT. REV. 1, 82 (2009).

91. See Allen, *supra* note 90, at 800; Seigel, *supra* note 90, at 928–44 (calling for admission of best available hearsay evidence); see also Jack B. Weinstein, *Probative Force of Hearsay*, 46 IOWA L. REV. 331, 344–46, 353–55 (1961) (listing distinguished jurists who would abolish the hearsay rule and arguing that courts should have a broad discretion to admit hearsay into evidence).

92. Nor does it weaken the moral reasons for excluding such evidence. See STEIN, *supra* note 14, at 189–96, 228–34 (arguing that unchecked admission of hearsay statements allocates the risk of error in a morally objectionable way); cf. Seigel, *supra* note 90, at 895 (attesting that “despite the irrational nature of hearsay law, most judges use the current rule of exclusion and its myriad exceptions to admit reliable evidence, to exclude unreliable evidence, and to achieve ‘rough justice’ in the majority of cases”); Sklansky, *supra* note 90, at 1, 6 (attesting that “the dysfunctionality of the hearsay rule in its traditional form” is obvious and well understood, as are “the dangers of secondhand testimony”).

would be a serious economic mistake. The conceptual problem spotted by evidence scholars calls for a conceptual fix, not for the wholesale abolition of the entire hearsay rule. The required fix should separate self-asserting hearsay evidence—that ought to remain inadmissible—from hearsay statements that are not self-asserting and should therefore be considered admissible.

To illustrate, consider a witness who testifies in court and is cross-examined by the party adversary about the specifics of his testimony and other relevant circumstances. The cross-examination may unfold in three different directions: it may uncover weaknesses in the witness's testimony; it may accentuate the testimony's strength; and it also may reveal that the testimony has both strengths and weaknesses. In the first scenario, probabilities ascribable to the testimony being true will cluster around 0. Conversely, in the second scenario, these probabilities will cluster near 1. Finally, in the third scenario, the probabilities will cluster around 0.5. Each of those scenarios features low probabilistic variance and a correspondingly strong signal and low level of noise. Hence, testimony of a witness available for cross-examination normally has a high SNR. Any such in-court testimony is not self-asserting and is consequently more informative than noisy—and hence efficient—even when it fails to show credibility.

Consider now an uncorroborated hearsay statement made by a person who does not come to court to testify about the facts to which the statement attests. On a scale between 0 and 1, this and similar statements can have any probability of being true. This variance amplifies the noise and muffles the signal. As a result, this, and all other naked hearsay statements, have an impermissibly low SNR and therefore should not be admitted into evidence. Any such statement is self-asserting and, hence, inefficient.

With this in mind, I now move to examine the existing exceptions to the hearsay rule. Conventional wisdom, originating from John Henry Wigmore,<sup>93</sup> holds that those exceptions stem from pragmatic tradeoffs that combine experience with social policy.<sup>94</sup> Experience shows that certain hearsay statements—for example, bank records and other business documents—are trustworthy.<sup>95</sup> Trustworthiness of business records provides a compelling reason for admitting them into evidence. Social policy, for its part, calls for admission of hearsay statements necessary for

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93. See WIGMORE, *supra* note 86, §§ 1420–23, at 251–55.

94. See, e.g., Tom Lininger, *Prosecuting Batters After Crawford*, 91 VA. L. REV. 747, 755 (2005) (“hearsay exceptions should be set with reference to traditional policy concerns such as necessity and reliability” (citing WIGMORE, *supra* note 86, §§ 1421–22, and Myrna S. Raeder, *The Admissibility of Prior Acts of Domestic Violence: Simpson and Beyond*, 69 S. CAL. L. REV. 1463, 1512 (1996))).

95. See FED. R. EVID. 803(6) (broadly admitting business records).



implementing criminal law.<sup>96</sup> Those statements include dying declarations<sup>97</sup> and accounts coming from crime victims and intimidated witnesses.<sup>98</sup> The above-mentioned exceptions are mere illustrations of our system's *modus operandi*. The mix of experience and social policy accounts for the whole variety of hearsay exceptions that evolved under this system.

The exceptions' multiplicity and variety has driven scholars to portray them as a patchwork.<sup>99</sup> This patchwork, so goes the argument, is a product of uncoordinated efforts to align the hearsay doctrine with common sense and the common good.<sup>100</sup> Unsurprisingly, contemporary evidence literature features only one attempt at developing an organizing principle for hearsay exceptions. Four decades ago, Professor Laurence Tribe published an influential article that set up a triangle framework to map the inferences connecting a person's statement to the event to which that statement attests.<sup>101</sup> The triangle framework showed that those inferences may directly link the statement to the event without implicating the person's belief in the event.<sup>102</sup> Alternatively, those inferences may link the statement to the event by relying on the belief that the person formed from witnessing the event.<sup>103</sup> Critically, Tribe's triangle also demonstrated that the four hearsay dangers<sup>104</sup>—misperception, faulty memory, ambiguity, and insincerity—are present only in the inferences that link the statement to the person's belief.<sup>105</sup> Tribe's statement-belief-event triangle identifies any such statement as hearsay.<sup>106</sup> On the other hand, statements that go directly to the event and thus require no triangular inference are not hearsay.<sup>107</sup>

Equally important, Tribe's triangle allowed him to connect discrete hearsay dangers to inferences drawn from a person's statement.<sup>108</sup>

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96. See, e.g., Lininger, *supra* note 94, at 768–82 (arguing that uncompromising application of the hearsay rule silences victims of domestic violence). In the civil context, hearsay statements are often needed and are consequently admissible to interpret and ascertain the validity of the declarant's will. See FED. R. EVID. 803(3).

97. See FED. R. EVID. 804(b)(2).

98. See *id.* 804(b)(6) (rendering admissible a hearsay statement “offered against a party that wrongfully caused—or acquiesced in wrongfully causing—the declarant's unavailability as a witness, and did so intending that result”).

99. See James Joseph Duane, *The Trouble with United States v. Tellier: The Dangers of Hunting for Bootstrappers and Other Mythical Monsters*, 24 AM. J. CRIM. L. 215, 268 (1997) (describing hearsay exceptions as “patchwork”); Seigel, *supra* note 90, at 893.

100. See Seigel, *supra* note 90, at 895; Sklansky, *supra* note 90, at 1, 6.

101. See Laurence H. Tribe, *Triangulating Hearsay*, 87 HARV. L. REV. 957, 959 (1974).

102. *Id.* at 958–61.

103. *Id.*

104. See Edmund M. Morgan, *Hearsay Dangers and the Application of the Hearsay Concept*, 62 HARV. L. REV. 177, 189 (1948).

105. See Tribe, *supra* note 101, at 958.

106. *Id.* at 959.

107. *Id.*

108. *Id.* at 959–61.

Misperception and faulty memory create misalignments between the person's belief in the event's occurrence and the event itself.<sup>109</sup> Ambiguity and insincerity, on the other hand, undo the match between the person's statement and his underlying belief. When the person testifies in court, fact finders are often able to assess the effects of those dangers on the statement's credibility. This ability explains the hearsay exceptions that come into play when the person who made the statement testifies in court.<sup>110</sup> When the person does not testify in court, however, the hearsay dangers are beyond the fact finders' control. In any such case, courts should only be able to admit the statement under exceptional circumstances. According to Tribe, such circumstances are present when the conditions under which the person made the statement rule out *one pair* of dangers: misperception and faulty memory or, alternatively, ambiguity and insincerity.<sup>111</sup> That is, "one good leg" of the testimonial triangle makes out the case for an exception to the hearsay rule.<sup>112</sup> Based on this insight, Tribe uncovered a substantial alignment between his "one good leg" standard and the hearsay exceptions recognized by our law.<sup>113</sup>

This insight is undeniably important. From an economic standpoint, however, Tribe's "one good leg" criterion for admitting hearsay statements into evidence is deficient. This criterion suffers from instability that precludes efficient fact-finding. The removal of misperception and faulty-memory dangers or, alternatively, the elimination of ambiguity and insincerity risks does not make the underlying hearsay statements trustworthy. All it does is increase the probability of those statements' trustworthiness. Even so, this probability increase will be moderate because the remaining hearsay dangers still impair the statements' credibility. Importantly, the range of relevant probabilities does not get significantly narrower as a consequence of this increase. Satisfaction of the "one good leg" requirement therefore does not significantly improve the statement's SNR.

The SNR principle offers a superior framework for explaining hearsay exceptions and guiding their development. This principle calls for a re-categorization of different hearsay statements based on the features that determine the statements' signal and level of noise. With this in mind, I divide the existing hearsay exceptions into three distinct groups: testifying

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109. *Id.* at 958.

110. *See* FED. R. EVID. 801(d), 803(5) (rendering admissible different statements of testifying declarants); *id.* 804(b)(1) (rendering admissible a person's former testimony that allowed the opponent to adequately cross-examine the person when the testimony was delivered); Tribe, *supra* note 101, at 961–63.

111. *See* Tribe, *supra* note 101, at 964–69.

112. *Id.*

113. *Id.*

declarant, event statements, and documents. Exceptions falling into the first group require that the person who made the statement—the declarant—testify as a witness in the court proceeding. Under this condition, the statement's opponent can cross-examine the declarant about the statement and its surrounding circumstances. As in the case of in-court testimony, the declarant's cross-examination will narrow the range of probabilities that attach to the statement. The statement's opponent, of course, does not have to cross-examine the declarant: her entitlement to do so is not an obligation. However, if the opponent decides to forego the cross-examination opportunity, the statement's probabilities of being true would normally cluster around 1. This effect will not be present in rare cases in which the declarant's statement is manifestly untrustworthy, but then the statement's probability of being true will cluster around 0. Under either scenario, the statement will have a sufficiently high SNR, which means that fact finders would be able to process it cost-effectively with a relatively small margin of error. For that reason, statements made by testifying declarants are virtually always admissible.<sup>114</sup>

The second group of exceptions incorporates statements integrated in some specific event relevant to the fact finders' decision. Event statements qualitatively differ from descriptive statements that people make after witnessing an event. From the credibility standpoint, event and descriptive statements are indistinguishable: their probabilities of being true are bound to vary from one case to another. What makes those statements qualitatively different from each other is the range of probabilities attaching thereto. While a descriptive statement can have any probability of being true, the range of probabilities attaching to an event statement will normally be narrow.

To see why, compare the following statements: (1) complaints about pain that a victim of a workplace accident made to his co-workers immediately after the accident; and (2) the victim's description of the accident given two days later to an inspector from the Occupational Safety and Health Administration. Each of those statements may be true or false. However, the distribution of these "true" and "false" scenarios will not be the same as we move from one statement to another. Begin with the second, descriptive, category of statements. Statements falling into this category are probabilistically open-ended. We know from experience that accident reports coming from self-interested individuals can be motivated

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114. Functional equivalents of such statements are admissible as well. They include admissions that a party to the proceeding made personally or through an agent. *See* FED. R. EVID. 801(d)(2)(A), (C), (D). Any such admission can be adduced into evidence because the party can controvert it by utilizing her superior access to information pertaining to her or her agent's statement. Probabilities attaching to party admissions thus always form a narrow range—a feature that guarantees a sufficiently high SNR.

by a variety of reasons that do not always elicit a true statement. When the person who made the report does not come to testify in court, the mix of reasons that prompted him to give the report remains hidden. Under such circumstances, the report's probability of being true, rather than false, can be any. Statements affiliating to the event category do not exhibit such open-endedness. Instead, they give rise to a narrow range of probabilities that may occupy the high end, the low end, or, alternatively, the middle of the scale between 0 and 1. Fact finders will normally be able to identify the relevant cluster of probabilities by combining their general knowledge of the world with the declarant's statement and its surrounding circumstances. This general knowledge will allow fact finders to understand the event that the declarant lived through and the statement he made during that event. Importantly, this event will include the declarant's physical and emotional condition, about which fact finders will hear from testifying witnesses (the declarant's co-workers, in my example).<sup>115</sup>

Cases involving an event statement will virtually always present fact finders with a narrow range of probabilities.<sup>116</sup> These cases include present sense impressions,<sup>117</sup> utterances reacting to a startling event<sup>118</sup> and other spontaneous statements,<sup>119</sup> dying declarations,<sup>120</sup> statements promoting a conspiracy to commit a crime,<sup>121</sup> and patients' communications with doctors.<sup>122</sup> Remarkably, these cases also include statements expressing the declarant's intent to take a particular action.<sup>123</sup> For example, a declarant's

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115. Cf. Eleanor Swift, *A Foundation Fact Approach to Hearsay*, 75 CALIF. L. REV. 1339, 1367 (1987). This important article develops a normative theory for admitting hearsay into evidence. Under this theory, courts ought to admit a hearsay statement when its proponent produces "foundation facts" about the statement's surrounding circumstances, thereby enabling fact finders to evaluate the statement's reliability. Statements satisfying Professor Swift's foundation-fact criterion will usually have a high SNR. Unsurprisingly, the foundation-fact criterion can explain a number of exceptions to the hearsay rule. See *id.* at 1390–1427 (justifying hearsay exceptions that align with the foundation-fact criterion and criticizing those that do not).

116. Statements against the declarant's pecuniary, proprietary, or criminal interest, admissible under Federal Rule of Evidence 804(b)(3), form a separate category. Under Federal Rule of Evidence 804(b)(3)(A), any such statement must be so contrary to the declarant's interest that a reasonable person in his position would not have made it unless he believed it to be true. This condition removes the statement from the self-asserting category, as the statement must be verifiable in order to be admitted into evidence. Moreover, Federal Rule of Evidence 804(b)(3)(B) prohibits the admission of an uncorroborated statement "that tends to expose the declarant to criminal liability." This rule bolsters the separation between self-asserting and verifiable hearsay statements.

117. See FED. R. EVID. 803(1).

118. See *id.* 803(2).

119. See *id.* 803(3).

120. See *id.* 804(b)(2).

121. See *id.* 801(1)(2)(E).

122. See *id.* 803(4).

123. These statements are admissible under the *Hillmon-Pheaster* doctrine, presently codified into Federal Rule of Evidence 803(3). See *Mut. Life Ins. v. Hillmon*, 145 U.S. 285, 295 (1892); *United States v. Pheaster*, 544 F.2d 353, 379–80 (9th Cir. 1976), *cert. denied*, 429 U.S. 1099 (1977).

statement to friends: "Here is Pheaster. I am going to buy drugs from him" is admissible as evidence indicating that the declarant might have acted upon his stated intent. Because the declarant was killed shortly thereafter, his meeting with Pheaster singles Pheaster out as a possible murderer.<sup>124</sup> Here, too, probabilities that attach to the declarant's statement are clustered rather than dispersed. Fact finders' general knowledge of the world consequently would enable them to identify the narrow space that these probabilities occupy on the 0 to 1 scale. For instance, evidence showing that the declarant had left his friends immediately after telling them that he is going to meet Pheaster would prompt fact finders to assign the declarant's statement a high probability of being true. Conversely, evidence showing that the declarant spent the entire evening with his friends would take this probability down. Under both scenarios, the statement's SNR will be high. Fact finders would thus be able to evaluate the statement accurately and efficiently.

Documents belonging to the third group of hearsay exceptions have a high SNR as well. These documents include records compiled in the regular course of business or governmental activity.<sup>125</sup> Importantly, under the exceptions' conditions, firms and public agencies that generate these internal documents must also rely on them in carrying out their business.<sup>126</sup> As a result, the documents' probabilities of being accurate about the reported facts fall into a narrow range. Furthermore, these probabilities tend to be fairly high. This feature guarantees a high SNR. Indeed, it turns documentary hearsay into a paradigmatic example of efficient evidence.

## 2. Other Evidence

Hearsay is a prime example of self-asserting evidence, but by no means the only example. Consider a witness who just finished giving his direct testimony in a legal proceeding and who for some reason refuses to answer questions at his cross-examination. Under regular circumstances this refusal would make the witness's direct testimony inadmissible and the fact

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124. *Pheaster*, 544 F.2d at 374–80. The declarant's demise was proved by his disappearance. *Id.* at 358. Notably, some courts require additional corroborative evidence connecting the declarant's statement with the non-declarant's conduct, while others impose no such requirement. *See United States v. Houlihan*, 871 F.Supp. 1495, 1499–1501 (D. Mass. 1994) (describing the split among circuits and deciding not to require corroboration). The corroboration requirement here obviously improves the statement's SNR.

125. *See* FED. R. EVID. 803(6)–(15), (17), (22), (23).

126. This internal reliance separates admissible business and governmental records from self-serving documents that individuals, firms, and agencies prepare in anticipation of litigation. *See generally* Gideon Parchomovsky & Alex Stein, *The Distortionary Effect of Evidence on Primary Behavior*, 124 HARV. L. REV. 518 (2010).

finders would have to ignore it.<sup>127</sup> As another illustration, consider an expert witness who testifies about her findings without explaining the methodology she used to arrive at those findings. Under extant law, this testimony will be inadmissible as well.<sup>128</sup>

Our law of evidence does not explicitly connect those rules to each other. Evidence scholars also do not make this connection. Instead, they explain and justify those rules on separate unrelated grounds.<sup>129</sup> The SNR principle establishes an important connection between the two rules. Both rules render inadmissible self-asserting evidence that gives rise to probabilities occupying the entire scale from 0 to 1. As I already have shown, such evidence has an impermissibly low SNR: its noise mutes the signal. Having fact finders consider it would consequently be inefficient.

### B. Self-Serving Evidence

Evidence is self-serving when it supports its proponent's case while giving the opponent no opportunity to examine its veracity. If courts were to admit such evidence without restrictions, it would give the submitting party an unfair advantage. Worse yet, it is not the only problem that self-serving evidence engenders. Another, and more critical, problem is the range of probabilities that attach to self-serving evidence. As I explained in Part I, this range is extremely wide. When a party adduces evidence that does not open itself to scrutiny, the evidence's probability of being true can be any. This wide range of probabilities makes the evidence overwhelmingly noisy and takes its SNR below the minimal threshold. The evidence, consequently, becomes inefficient.

The law treats self-serving evidence in a uniform fashion. Fact finders can make no findings based on self-serving evidence when the party

127. See, e.g., *Denham v. Deeds*, 954 F.2d 1501, 1504 (9th Cir. 1992) (citing *United States v. Esparsen*, 930 F.2d 1461, 1469–70 (10th Cir. 1991)); *United States v. Doddington*, 822 F.2d 818, 822 (8th Cir. 1987); *United States v. Frank*, 520 F.2d 1287, 1292 (2d Cir. 1975)) (“Where a defense witness’s invocation of Fifth Amendment protection against self-incrimination amounts to a refusal to be cross-examined, the testimony cannot be considered reliable. We therefore join with those circuits that have permitted the exclusion of a defense witness’s testimony when the witness has refused on cross-examination to respond to questions on non-collateral matters.”); *United States v. Cardillo*, 316 F.2d 606, 611 (2d Cir. 1963), *cert. denied*, 375 U.S. 822 (1963) (holding that when a prosecution “witness . . . precludes inquiry into the details of his direct testimony, there may be a substantial danger of prejudice because the defense is deprived of the right to test the truth of his direct testimony and, therefore, that witness’s testimony should be stricken in whole or in part”).

128. See, e.g., *Minix v. Canarecci*, 597 F.3d 824, 835 (7th Cir. 2010) (holding that expert testimony must be suppressed when the expert does not “explain the methodologies and principles supporting the opinion”); *Koken v. Black & Veatch Constr., Inc.*, 426 F.3d 39, 47 (1st Cir. 2005) (holding that an expert’s failure to explain his methodology dooms his testimony under *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993)).

129. See, e.g., FISHER, *supra* note 2, at 2 (attesting that “themes that unify the rules of evidence” are “[h]ard . . . to identify”).

relying on it offers no additional proof—corroboration—that confirms its veracity.<sup>130</sup> My preceding discussion provided two important examples of this requirement. One of these examples features a party to a civil proceeding whose testimony attributes a debt or transaction to a dead person. For such setups, many states require courts to ignore the party's testimony when it is not accompanied with corroborative evidence.<sup>131</sup> Importantly, courts explicitly limit this requirement to a self-serving testimony coming from an interested witness.<sup>132</sup> When a disinterested witness testifies against a dead person, her testimony does not require corroboration.<sup>133</sup>

Another example involves a plaintiff who testifies that he sustained emotional distress as a result of the defendant's negligent action. For this setup, state and federal courts require corroborative evidence.<sup>134</sup> By and large, they require the victim to provide independent evidence showing that he was impacted by, or directly involved in, the accident that allegedly caused him emotional distress.<sup>135</sup>

As I previously explained, these are clear examples of self-serving testimony: one that comes from an interested party not facing a meaningful prospect of rebuttal. Any such witness can say anything to promote her interest. For that reason, her testimony, without more, can have any

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130. See *Latif v. Obama*, 666 F.3d 746, 759 (D.C. Cir. 2011) (finding that the defendant lacked credibility because he had no evidence other than his own self-serving statement).

131. See, e.g., TEX. R. EVID. 601(b) ("In civil actions by or against executors, administrators, or guardians, in which judgment may be rendered for or against them as such, neither party shall be allowed to testify against the others as to any oral statement by the testator, intestate or ward, unless that testimony to the oral statement is corroborated or unless the witness is called at the trial to testify thereto by the opposite party . . ."); VA. CODE ANN. § 8.01-397 (2014) ("In an action by or against a person who, from any cause, is incapable of testifying, or by or against the committee, trustee, executor, administrator, heir, or other representative of the person so incapable of testifying, no judgment or decree shall be rendered in favor of an adverse or interested party founded on his uncorroborated testimony."); see also *Keith v. Lulofs*, 724 S.E.2d 695, 775–76 (Va. 2012) (finding uncorroborated testimony about a testator's will insufficient as a matter of law); *Williams v. Condit*, 574 S.E.2d 241, 243 (Va. 2003) (citing *Diehl v. Butts*, 499 S.E.2d 833, 837 (Va. 1998)) (explaining that the corroboration requirement under Va. Code Ann. § 8.01-397 was "designed to prevent a litigant from having the benefit of his own testimony when, because of death or incapacity, the personal representative of another litigant has been deprived of the testimony of the decedent or incapacitated person").

132. See, e.g., *Condit*, 574 S.E.2d at 243 (Va. 2003).

133. See *Jones v. Williams*, 701 S.E.2d 405, 407 (Va. 2010). This case featured a nurse who testified for the plaintiffs in a medical malpractice suit filed posthumously against an obstetrician to whom she assisted in the disputed delivery procedure. The Virginia Supreme Court held that the nurse was not an "interested party" for purposes of Va. Code Ann. § 8.01-397 (2014) and that her testimony consequently did not require corroboration.

134. See, e.g., *Hitt v. Connell*, 301 F.3d 240, 250–51 (5th Cir. 2002); *Sullivan v. Bos. Gas Co.*, 605 N.E.2d 805, 810 (Mass. 1993).

135. See *supra* notes 45–48 and accompanying text; see also *Metro-North Commuter R.R. Co. v. Buckley*, 521 U.S. 424, 432–38 (1997) (requiring evidence of "physical impact" or injury for suits brought under the Federal Employers' Liability Act that demand compensation for fear and emotional distress originating from the plaintiff's long-term exposure to asbestos).

probability between 0 and 1. Consequently, this testimony is too noisy, and hence, inefficient. The corroboration requirement for any such testimony brings about two effects. First, it narrows the range of probabilities to which the testimony gives rise, thereby increasing the testimony's SNR. Second, and equally important, it opens the testimony to scrutiny, thereby curbing the witness's self-serving temptations.

This logic is followed by an important rule of criminal procedure: the corroboration requirement for the defendant's accomplice who testifies against the defendant.<sup>136</sup> Most states (but not the federal system<sup>137</sup>) have this requirement.<sup>138</sup> The reason for having this requirement must be clear by now. An accomplice to the alleged crime is a well-informed insider who knows most of the crime's details, if not all of them. This knowledge enables the accomplice to develop a false, but entirely believable, self-serving account of the relevant events, which the defendant will find difficult to refute. For that reason, uncorroborated testimony of the defendant's accomplice can have any probability between 0 and 1. As in my other examples, any such testimony has an impermissibly low SNR, which makes it inefficient. This inefficiency can only be remedied by corroborative evidence, which the law generally requires.

My last illustration comes from divorce law. Most, but not all, jurisdictions across the United States have switched from a fault-based to a no-fault divorce system.<sup>139</sup> Jurisdictions that still consider spousal fault as relevant to divorce, child custody, and the allocation of spousal assets<sup>140</sup> encounter a serious evidentiary problem. Oftentimes, a spouse comes to court with a fabricated, yet facially credible, story that portrays himself (or herself) as a victim of the other spouse's adultery or degrading behavior. For obvious reasons, such stories are easy to make up but difficult to disprove. They address events that took place under the cloak of intimacy. Moreover, people who know the truth—the rival spouses and the alleged paramour—have an interest in the outcome of the case and are

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136. See Richard A. Bierschbach & Alex Stein, *Mediating Rules in Criminal Law*, 93 VA. L. REV. 1197, 1222 (2007) (discussing the corroboration requirement for accomplice testimony that exists in many states); Robert J. Norris et al., "Than that One Innocent Suffer": *Evaluating State Safeguards Against Wrongful Convictions*, 74 ALB. L. REV. 1301, 1349 n.330 (2011) (listing states that have formal corroboration requirements for accomplice testimony).

137. See, e.g., *Watson v. Howard*, 123 F. App'x 910, 917 (10th Cir. 2005) ("Federal law does not require independent corroboration of accomplice testimony . . ."); *United States v. Necoechea*, 986 F.2d 1273, 1282 (9th Cir. 1993) ("The uncorroborated testimony of an accomplice is sufficient to sustain a conviction unless it is incredible or insubstantial on its face." (citing *United States v. Lai*, 944 F.2d 1434, 1440 (9th Cir. 1991), *cert. denied*, 502 U.S. 1062 (1992))).

138. See Bierschbach & Stein, *supra* note 136, at 1222.

139. See Joel A. Nichols, Comment, *Louisiana's Covenant Marriage Law: A First Step Toward a More Robust Pluralism in Marriage and Divorce Law?*, 47 EMORY L.J. 929, 937–40 (1998) (describing the ascendance of no-fault divorce across the United States).

140. *Id.* at 935–36.



consequently not believable as witnesses. As a result, a spouse's testimony that attributes matrimonial misconduct to his or her adversary can have virtually any probability. To counter this noise and secure the minimal SNR, the law instructs courts not to rely on such testimony when it is not supported by evidence coming from a disinterested witness.<sup>141</sup>

The SNR principle offers the best explanation to these corroboration requirements. An alternative explanation, endorsed by the conventional wisdom, holds that these requirements are set to enhance the accuracy of fact finders' decisions.<sup>142</sup> This explanation has a certain appeal, but ultimately fails to convince. The reason is quite straightforward: our evidence law allows fact finders to convict a person of murder and many other serious crimes on the testimony of a single witness.<sup>143</sup> All the fact finders need to do is believe that witness "beyond a reasonable doubt."<sup>144</sup> The "one witness" rule is the norm,<sup>145</sup> while the corroboration requirements are properly viewed as exceptions to the norm. If those requirements were to enhance the accuracy of fact finders' decisions, they would not be exceptional but would rather apply across the board. Courts would then require corroboration to accompany any prosecution witness who testifies against the defendant in a murder trial.

The corroboration requirements, however, do not enhance the accuracy of fact finders' decisions. Instead, they work to eliminate inefficient evidence—one that brings to courts high probabilistic variance and a correspondingly high level of noise. For that reason, the requirements only apply to self-interested witnesses whose informational advantage allows them to tell lies that avoid detection. Those witnesses would not mislead fact finders on many occasions, as fact finders would tend not to believe them. Those witnesses, however, would nearly always waste the fact

141. See, e.g., OHIO REV. CODE ANN. RCP, Rule 75(M) (West 2004) ("Judgment for divorce, annulment, or legal separation shall not be granted upon the testimony or admission of a party not supported by other credible evidence."); *Allen v. Allen*, 53 So. 3d 960, 964 (Ala. 2010) ("The wife's testimony of the husband's alleged confession of adultery, alone, is not sufficient evidence upon which to base a divorce on the ground of adultery." (citing *Yates v. Yates*, 676 So. 2d 365, 366 (Ala. Civ. App. 1996))); *Coker v. Coker*, 423 S.W.3d 599, 603 (Ark. 2012) (attesting that Arkansas law requires corroboration for a spouse's evidence of cruelty and indignities as a ground for divorce); *Chapel v. Chapel*, 700 So. 2d 593, 597 (Miss. 1997) (reaffirming the rule requiring a party to a divorce proceeding to corroborate his or her complaint about habitual cruel and inhuman treatment by the other spouse).

142. See *Idaho v. Wright*, 497 U.S. 805, 824 (1990) (associating corroboration requirement with removal of "a threat to the accuracy of the verdict"); see also, e.g., Samuel W. Buell, *Response, Purposes and Effects in Criminal Law*, 93 VA. L. REV. BRIEF 215, 218–19 (2007) (attesting that corroboration requirements "are justified by goals of reliability and accuracy").

143. 7 WIGMORE, *supra* note 86, § 2034(2), at 343.

144. See *United States v. Levi*, 405 F.2d 380, 383 (4th Cir. 1968); see also *United States v. Ingram*, 600 F.2d 260, 263 (10th Cir. 1979) (stating courts' general adherence to the "one witness" rule); WIGMORE, *supra* note 86, § 2034(2), at 343 (stating the general rule authorizing jurors to decide a case on the uncorroborated testimony of a single witness).

145. *Ingram*, 600 F.2d at 263.

finders' time and efforts when the party who calls them does not offer corroborative evidence.

### C. *Speculative Evidence*

Evidence is speculative when it prompts fact finders to use rough statistical generalizations.<sup>146</sup> Consider the following claim made by the prosecutor in a criminal case: Being a person with a criminal record, the defendant is prone to committing crimes—a disposition that increases the probability that he perpetrated the crime in question. Our system bans such claims and their supporting evidence, e.g., the defendant's past crimes.<sup>147</sup> By doing so, it tells fact finders: Judge the act, not the actor; base your verdict on what the defendant did on the occasion in question, not on who he is.<sup>148</sup> The conventional wisdom holds that this ban<sup>149</sup> is justified. The reason is straightforward: suppression of past crimes and bad-character evidence, in general, fends off prejudice against defendants.<sup>150</sup> Allowing fact finders to consider this evidence would increase the prospect of erroneous conviction for innocent defendants.<sup>151</sup>

This principle came under attack. A number of leading scholars have criticized the suppression of past-crime and bad-character evidence.<sup>152</sup> They argue that this evidence gives fact finders relevant information that should normally increase the probability of criminal accusations.<sup>153</sup> These

146. *United States v. Veysey*, 334 F.3d 600, 603 (7th Cir. 2003).

147. *See Michelson v. United States*, 335 U.S. 469, 475–76 (1948).

148. *Id.* (explaining that evidence of a criminal defendant's bad character "is not rejected because character is irrelevant; on the contrary, it is said to weigh too much with the jury and to so overpersuade them as to prejudge one with a bad general record and deny him a fair opportunity to defend against a particular charge"); *see also* TWINING, *supra* note 14, at 231, 243–45, 259 (explaining the "judge the act, not the actor" principle); Miguel Angel Mendez, *California's New Law on Character Evidence: Evidence Code Section 352 and the Impact of Recent Psychological Studies*, 31 UCLA L. REV. 1003, 1044–59 (1984) (arguing that character evidence can rationally prove very little and is highly prejudicial to criminal defendants). The Supreme Court has yet to decide, however, whether this principle is part of the defendant's constitutional due process protection. *See Estelle v. McGuire*, 502 U.S. 62, 75 n.5 (1991) ("Because we need not reach the issue, we express no opinion on whether a state law would violate the Due Process Clause if it permitted the use of 'prior crimes' evidence to show propensity to commit a charged crime.").

149. *See* FED. R. EVID. 404(a)(1), 404(b)(1).

150. *Id.* 404 advisory committee's note.

151. *Michelson*, 335 U.S. at 475–76.

152. *See, e.g.,* Park & Saks, *supra* note 77, at 972 (arguing that a defendant's past violent behavior should be admitted into evidence "if [it] has been recurrent, if the situation settings for the behavior at issue were similar, and if fact finders can be given realistic, informative, data-based cautions about the predictive power of the evidence"); Mike Redmayne, *The Relevance of Bad Character*, 61 CAMBRIDGE L.J. 684, 698–700, 713–14 (2002) (arguing that the "presumption that previous convictions are more prejudicial than probative is based on a lack of understanding of offending patterns" and that reasons underlying the suppression of bad-character evidence are overstated).

153. *See* Park & Saks, *supra* note 77, at 972; Redmayne, *supra* note 152, at 713–14.

scholars estimate that complaints about prejudice associated with this evidence are overblown because the prejudice can be contained.<sup>154</sup> For example, judges can instruct jurors to consider past-crime and bad-character evidence with caution.<sup>155</sup> Moreover—so goes the argument—even though this evidence will prejudice jurors, judges in bench trials could still use it because they are not likely to be taken astray by prejudice.<sup>156</sup>

The SNR principle adds an important new dimension to this debate while providing decisive support to the extant law. Defendants with criminal records are not equals. Some defendants are career criminals, whereas others have learned that crime does not pay. Defendants situated between these two extremes have a variety of conflicting motivations that favor and disfavor engagement in illicit activities in the future. Evidence of past crimes, however, does not distinguish between these markedly different groups of defendants. Moving from one group of defendants to another changes things dramatically, but does not change the evidence. This invariance marks past-crime evidence as rough or insensitive to the actual facts of the case.<sup>157</sup> Facts underlying such evidence can be any. Consequently, the probability of the defendant's guilt extractable from his criminal record can be any as well. Hence, past-crime and bad-character evidence have an impermissibly low SNR. This evidence is inefficient, and our system does well to exclude it.<sup>158</sup>

Things become different when a defendant's prior misdeeds are relevant to the specifics of the case and can be integrated into the event's narrative. For example, a defendant's prior burglary conviction can show his ability to burglarize houses, as well as reveal his *modus operandi*. This use of the defendant's criminal past does not allude to rough generalizations and speculative projections about human behavior. Rather, it makes a narrow claim about the defendant's capabilities and specific

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154. See Redmayne, *supra* note 152, at 714.

155. See Park & Saks, *supra* note 77, at 972–74; see also Roger C. Park, *Character at the Crossroads*, 49 HASTINGS L.J. 717, 775–79 (1998) (favoring admission of bad-character evidence when it is more probative than prejudicial).

156. See, e.g., Peter Tillers, *What Is Wrong with Character Evidence?*, 49 HASTINGS L.J. 781, 789 (1998) (arguing that the ban on character evidence should be and, in fact, is relaxed in bench trials).

157. For a foundational account of the “sensitivity” criterion, see TIMOTHY WILLIAMSON, KNOWLEDGE AND ITS LIMITS 147–63 (2000). See also STEIN, *supra* note 14, at 91–106 (introducing the “Principle of Maximal Individualization”—a variant of “sensitivity”—and uncovering its implications for the law of evidence); David Enoch et al., *Statistical Evidence, Sensitivity, and the Legal Value of Knowledge*, 40 PHIL. & PUB. AFF. 197, 202–10 (2012) (unfolding an interesting application of “sensitivity” to evidence law).

158. Our system, however, admits past sexual misconduct as evidence against the defendant facing new sexual offense accusations. See FED. R. EVID. 413–414. See generally Katharine K. Baker, *Once a Rapist? Motivational Evidence and Relevancy in Rape Law*, 110 HARV. L. REV. 563 (1997) (criticizing Federal Rule of Evidence 413 for creating a dangerous sex-offender stereotype that increases the risk of wrongful conviction for certain underprivileged defendants, while allowing “normative” rapists to escape conviction).

behavioral pattern. Unsurprisingly, this evidence is admissible.<sup>159</sup> Any such evidence has a relatively low level of noise and a strong signal. The evidence's high SNR makes it efficient and worthy of consideration by fact finders.<sup>160</sup>

On similar grounds, our law suppresses sexual history of an alleged victim of rape or sexual assault—the so-called “promiscuity” evidence—while allowing courts to admit into evidence discrete sexual encounters that are part of the specifics of the case.<sup>161</sup> For example, evidence that the alleged rape victim and the defendant had consensual sex in the past may be admitted to prove consent and to negate the defendant's mens rea.<sup>162</sup> Courts also admit evidence showing that the alleged victim brought false rape accusations against people with whom she had consensual sex.<sup>163</sup> This evidence-sorting policy can be easily explained by the SNR principle. The so-called “promiscuity” evidence is too noisy. An attempt at associating a woman's “promiscuity” with different entrapment and retaliation scenarios, in which she agrees to have sex with the defendant and subsequently accuses him of rape, is speculative at best. Such scenarios can have any probability between 0 and 1, which indicates that “promiscuity” evidence has a very low SNR. By contrast, discrete sexual encounters that establish a case-specific defense or allegation give rise to a narrow range of probabilities. Such evidence satisfies the minimal SNR threshold and is consequently admissible.

As yet another illustration, consider a rule that suppresses evidence showing “that a person was or was not insured against liability” in order to prove that “the person acted negligently or otherwise wrongfully.”<sup>164</sup> The suppressed evidence associates a person's disposition for careless or, conversely, careful behavior with her having or, alternatively, not having

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159. See FED. R. EVID. 404(b).

160. Under specified conditions, our evidence law allows bad-character and prior-crime evidence to impeach a testifying witness. This permission is premised on the witness's implicit, and sometimes express, self-description as a truth teller. This description communicates to fact finders the witness's good moral standing, which the opponent of his or her testimony becomes entitled to attack. The impeachment doctrine thus allows one type of speculative evidence (bad character) to battle another (good character). Unsurprisingly, this doctrine is widely regarded as problematic, especially when it allows past-crime evidence to impeach a testifying criminal defendant. For my attempt at vindicating this doctrine, see STEIN, *supra* note 14, at 165 (demonstrating that a testifying defendant who risks impeachment by prior convictions signals truthfulness, which increases his chances of acquittal when the prosecution does not rebut his testimony). For its recent critique by two prominent scholars, see Larry Laudan & Ronald J. Allen, *The Devastating Impact of Prior Crimes Evidence and Other Myths of the Criminal Justice Process*, 101 J. CRIM. L. & CRIMINOLOGY 493, 509 n.57 (2011) (underscoring empirical data that exhibit a higher rate of conviction among defendants with criminal records who choose to testify).

161. See FED. R. EVID. 412(a), (b)(1).

162. See *id.* 412(b)(1)(B).

163. See, e.g., *State v. Smith*, 743 So. 2d 199 (La. 1999).

164. See FED. R. EVID. 411.

liability insurance. This association relies on a speculative generalization about human behavior. Arguably, holders of liability insurance tend to reduce their precautions against harm to another person, while uninsured individuals, who must use their own money to pay for damages they cause, tend to be more careful. This generalization is speculative because it cuts across too many people and circumstances. Under certain conditions it holds true, while under different circumstances it misses the target completely. Many insured individuals have reasons to behave carefully. Conversely, uninsured individuals may have an incentive for careless behavior. A person's holding of liability insurance, when used as evidence, consequently gives rise to a wide variety of probabilities. This variance makes the evidence noisy and inefficient.<sup>165</sup>

Consider now the suppression of "subsequent remedial measures" evidence<sup>166</sup> that often has a decisive effect on tort litigation.<sup>167</sup> Our law provides that "[w]hen measures are taken that would have made an earlier injury or harm less likely to occur, evidence of the subsequent measures is not admissible to prove: negligence; culpable conduct; a defect in a product or its design; or a need for a warning or instruction."<sup>168</sup> The suppression of potentially probative evidence serves to motivate firms and individuals to improve safety without fear that the introduced improvement will be used in court as an implicit admission of fault or responsibility for the accident.<sup>169</sup> Another reason for suppressing the evidence is its vagueness.<sup>170</sup> Oftentimes, firms and individuals introduce new safety measures based upon newly acquired knowledge that was not available beforehand. What they do, consequently, does not acknowledge prior fault.<sup>171</sup>

This two-fold explanation is incomplete because it does not negate the case-by-case approach to subsequent remedial measures. Arguably, courts should suppress such evidence only when it is overwhelmingly prejudicial to a tort defendant. In all other cases, fact finders ought to determine the most probable implication flowing from the defendant's introduction of subsequent remedial measures. If the evidence properly signals prior

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165. But the court may admit this evidence for another purpose, such as proving a witness's bias or prejudice or proving agency, ownership, or control. *See id.* 411.

166. *See id.* 407.

167. *See, e.g.,* *Flaminio v. Honda Motor Co.*, 733 F.2d 463, 468–70 (7th Cir. 1984) (applying Federal Rule of Evidence 407 to suppress evidence of safer motorcycle design in a products liability suit); *Tuer v. McDonald*, 701 A.2d 1101 (Md. 1997) (applying Maryland Rule of Evidence 407 to suppress evidence of the change in the physicians' protocol for administering an anticoagulant drug).

168. FED. R. EVID. 407.

169. *See Flaminio*, 733 F.2d at 470–72. For excellent discussion and critique of this rationale, see Dan M. Kahan, *The Economics—Conventional, Behavioral, and Political—of "Subsequent Remedial Measures" Evidence*, 110 COLUM. L. REV. 1616 (2010).

170. *See Flaminio*, 733 F.2d at 471.

171. *Id.*

negligence, they should find the defendant liable. In all other scenarios, fact finders should ignore the evidence in deciding about the defendant's fault. When a defendant's subsequent remedial measures properly indicate prior fault, suppressing this evidence may not be the most optimal way to induce safety improvement. Why give product manufacturers and other tort defendants a "carrot" when a "stick" may achieve the same effect at a cheaper price and without sacrificing the aggrieved plaintiff's interest in a compensatory remedy? Specifically, why not abolish the defendant's evidentiary privilege and legislate a rule that increases a defendant's penalty upon finding that it failed to introduce an available safety enhancement?

The SNR principle removes these doubts by giving a straightforward justification to the law's suppression of subsequent remedial measures. Conflicting inferences flowing from this evidence do not merely indicate vagueness to which courts are accustomed. They also associate subsequent remedial measures with a wide array of probabilities that vary from one case to another. As we already know, this variance creates noise that drowns the signal that fact finders need to elicit from the evidence, and cutting through this noise is unaffordably expensive. A legal system that processes one hundred tort cases a year could afford this expenditure. A system that handles hundreds of thousands of such cases annually, however, cannot afford it. For that simple reason, courts should suppress subsequent remedial measures as evidence of fault.<sup>172</sup>

My final example features speculative expert evidence, sometimes labeled as "junk science."<sup>173</sup> Under the extant doctrine governing the admission of expert testimony, an expert witness cannot base her opinion upon naked statistical correlations.<sup>174</sup> Rather, she must base her opinion on data or replicable experiments that have a scientifically recognized low margin of error.<sup>175</sup> Absent such foundation, the expert's testimony would not be admissible.<sup>176</sup> The Supreme Court's landmark decision, *General Electric Co. v. Joiner*,<sup>177</sup> vividly illustrates this important rule. In that case, the plaintiff's experts associated his lung cancer with his exposure, as the defendant's employee, to dioxins and furans, byproducts of polychlorinated

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172. As prescribed by Federal Rule of Evidence 407, however, "the court may admit [such] evidence for another purpose, such as impeachment or—if disputed—proving ownership, control, or the feasibility of precautionary measures."

173. See PETER W. HUBER, *GALILEO'S REVENGE: JUNK SCIENCE IN THE COURTROOM* (1991).

174. See *id.* at 163–66.

175. See FED. R. EVID. 702; *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579 (1993).

176. See *Daubert*, 509 U.S. at 594; *United States v. Avitia-Guillen*, 680 F.3d 1253, 1260 (10th Cir. 2012) (holding that a low error rate strongly favors admission of expert evidence under *Daubert's* multifactor test).

177. 522 U.S. 136, 139–40 (1997).

biphenyls (PCBs).<sup>178</sup> The experts based this association upon studies that showed an increased rate of cancer among individuals exposed to PCBs, without ruling out other potential causes that included cigarette smoking and genetics.<sup>179</sup> The Supreme Court reinstated the trial court's assessment of this evidence as not rising above "unsupported speculation"<sup>180</sup> and held that this testimony is inadmissible.<sup>181</sup>

The SNR principle straightforwardly explains this rule. Statistical correlations stay invariant across different factual setups and their causal explanations. For reasons I already provided, this invariance is fatal to correlation evidence that favors one causal explanation over others. The evidence's failure to discredit the alternative explanations widens the range of probabilities that attach to the favored scenario. This wide range of probabilities amplifies noise and results in a low SNR. Think again of the *Joiner* case: there, the plaintiff's causal allegation did not fail because its probability of being true was too low. Rather, this allegation failed because its probability of being true could be any.

### III. COMPULSORY PROCESS

The Compulsory Process Clause of the Sixth Amendment gives a defendant in a criminal trial the right "to have compulsory process for obtaining witnesses in his favor."<sup>182</sup> The right's categorical language, its incorporation into a broader constitutional entitlement to present a defense,<sup>183</sup> and its status as "a fundamental element of due process of law"<sup>184</sup> that applies across the United States<sup>185</sup> seem to mandate courts to admit all exculpatory evidence.<sup>186</sup>

178. *Id.* at 143–45.

179. *Id.* at 144–46. The plaintiff's experts also based their opinion on animal experiments in which infant mice had developed cancer after being exposed to massive doses of PCBs. *Id.* at 144–45. The Supreme Court rejected this part of the experts' testimony for showing "too great an analytical gap between the data and the opinion proffered." *Id.* at 146.

180. 864 F. Supp. 1310, 1326 (N.D. Ga. 1994).

181. *Joiner*, 522 U.S. at 146.

182. U.S. CONST. amend. VI.

183. *See* *Washington v. Texas*, 388 U.S. 14, 19 (1967) (interpreting the Compulsory Process Clause as a defendant's "right to present a defense"); *see generally* Robert N. Clinton, *The Right to Present a Defense: An Emergent Constitutional Guarantee in Criminal Trials*, 9 IND. L. REV. 711 (1976).

184. *Washington v. Texas*, 388 U.S. at 19.

185. *Id.* at 17–18.

186. Courts need not accept irrelevant evidence, as it is not exculpatory. *See* *Crane v. Kentucky*, 476 U.S. 683, 689–90 (1986) (finding the Compulsory Process Clause does not mandate admission of evidence that is irrelevant). However, the defendant's constitutional entitlement to potentially exonerating information may set aside an established privilege. *See, e.g.,* *Matter of Farber*, 394 A.2d 330 (N.J. 1978) (holding statutory privilege protecting confidentiality of media informants' identity

This appearance, however, is seriously misleading. The Supreme Court ruled that the Clause does not abridge the “power of States to exclude evidence through the application of evidentiary rules that themselves serve the interests of fairness and reliability—even if the defendant would prefer to see that evidence admitted.”<sup>187</sup> More broadly, the Court decided that the defendant’s right to adduce exculpatory evidence can be trumped by “countervailing public interests” that include “[t]he integrity of the adversary process, which depends both on the presentation of reliable evidence and the rejection of unreliable evidence, the interest in the fair and efficient administration of justice, and the [prevention of] potential prejudice to the truth-determining function of the trial process.”<sup>188</sup> This interpretation raises an important question about the limits of the government’s power to block away exculpatory evidence. From a criminal defendant’s perspective, this question presents itself as a quest for a principle by which to identify evidence deserving the compulsory process protection.

The Supreme Court’s decisions about the meaning of compulsory process reveal no such principle. Worse yet, some of these decisions contradict others. The Court’s decision in *Washington v. Texas*<sup>189</sup> struck down a statute that disqualified criminal accomplices as defense witnesses.<sup>190</sup> The Court held that Texas had no legitimate interest in deeming a broad category of defense witnesses “unworthy of belief”<sup>191</sup> instead of allowing fact finders to determine the credibility of those witnesses case by case.<sup>192</sup> The Court decided that the statute in question was arbitrary, illogical, and hence unconstitutional.<sup>193</sup>

In *Rock v. Arkansas*,<sup>194</sup> the Supreme Court followed the *Washington* principles. Based on these principles, it vacated the Arkansas Supreme Court decision that upheld the suppression of the defendant’s hypnotically-enhanced testimony.<sup>195</sup> The Court held that the testimony’s suppression

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unconstitutional to the extent it limited criminal defendants’ access to potentially exonerating information).

187. *Crane*, 476 U.S. at 690.

188. *Taylor v. Illinois*, 484 U.S. 400, 414–15 (1988).

189. 388 U.S. 14 (1967).

190. *Id.* at 18–22.

191. *Id.* at 22.

192. *Id.* (quoting *Rosen v. United States*, 245 U.S. 467, 471 (1918)).

193. Under that statute, a defendant’s accomplice could be called to testify as a prosecution witness and, upon acquittal, as a defense witness as well. *See id.* at 22–23. These conditions did not remove the reliability concerns from the accomplice’s testimony. When a defendant’s accomplice is called to testify by the prosecution, he has a motive to lie in order to curry favor with the government. But as a previously acquitted defense witness who enjoys the constitutional protection against re-prosecution, he is free to say anything he pleases. *Id.*

194. 483 U.S. 44 (1987).

195. *Id.* at 61–62.



was “arbitrary”<sup>196</sup> and “disproportionate to the purposes [it is] designed to serve.”<sup>197</sup> The Court explained that suppression of defense evidence is warranted only when the evidence is fundamentally “untrustworthy and . . . immune to the traditional means of evaluating credibility.”<sup>198</sup> According to the Supreme Court, hypnotically enhanced testimony does not automatically fall into this category—self-asserting, self-serving, and speculative under my taxonomy. The defendant therefore was entitled to give that testimony at her trial.<sup>199</sup>

Between *Washington* and *Rock*, the Supreme Court decided another important case, *Chambers v. Mississippi*.<sup>200</sup> It involved a defendant accused of murdering a police officer. To prove his innocence, the defendant subpoenaed a witness who confessed on several occasions to being the murderer and who subsequently repudiated the confessions.<sup>201</sup> Expectedly, the witness insisted on his innocence.<sup>202</sup> The trial court did not allow the defendant to cross-examine the witness about his admissions of guilt, nor did it permit the defendant to introduce those admissions into evidence.<sup>203</sup> The first decision relied on the outdated principle that required a party who called a witness to vouch for the witness’s credibility.<sup>204</sup> The second decision was based on the rule against hearsay.<sup>205</sup> The Supreme Court held that both decisions violated due process.<sup>206</sup> Specifically, it decided that the “voucher” principle and the hearsay rule should not have blocked evidence that was critical to the defense and “bore persuasive assurances of trustworthiness.”<sup>207</sup> This decision cited *Washington*, but did not explicitly rely on the Compulsory Process Clause.<sup>208</sup>

Although favorable to the defendant, this decision implicitly reversed the burden of proof. Before this decision, vindicating a rule or a ruling that suppresses exculpatory evidence required the government to show a

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196. *Id.* at 61.

197. *Id.* at 56.

198. *Id.* at 61.

199. *Id.* at 62.

200. 410 U.S. 284 (1973).

201. *Id.* at 287–88.

202. *Id.* at 288.

203. *Id.* at 291.

204. *Id.* at 295.

205. *Id.* at 292–94.

206. *Id.* at 297–98, 302.

207. *Id.* at 302.

208. *Id.* (citing *Washington v. Texas*, 388 U.S. 14, 19 (1967)).

compelling interest.<sup>209</sup> After this decision, it is the defendant who needs to demonstrate that his evidence is potentially decisive and reliable.<sup>210</sup>

The Court's shift to reliability and necessity played a crucial role in its decision in *United States v. Scheffer*<sup>211</sup>—a case that involved an airman accused of using drugs.<sup>212</sup> At his trial before court-martial, the defendant offered into evidence the results of his polygraph examination administered by the Air Force Office of Special Investigations.<sup>213</sup> This examination focused on the defendant's claim that he had not knowingly used drugs while working for the Office<sup>214</sup> and indicated "no deception."<sup>215</sup> The military judge ruled this evidence inadmissible pursuant to a military rule of evidence that expressly suppresses "the result of a polygraph examination [and] the polygraph examiner's opinion."<sup>216</sup> The defendant challenged the rule on constitutional grounds, but the judge decided that the rule was not unconstitutional.<sup>217</sup> The court-martial subsequently found the defendant guilty,<sup>218</sup> and the Air Force Court of Criminal Appeals affirmed his conviction.<sup>219</sup> However, the United States Court of Appeals for the Armed Forces reversed the guilty verdict for violating the defendant's "Sixth Amendment right to present a defense."<sup>220</sup>

On appeal by the United States, the Supreme Court rejected the defendant's constitutional claim and reinstated the guilty verdict.<sup>221</sup> The Court held that "there is simply no way to know in a particular case whether a polygraph examiner's conclusion is accurate, because . . . doubts and uncertainties plague even the best polygraph exams."<sup>222</sup> The Court also underscored the government's legitimate interest in suppressing evidence that diminishes the jurors' "core function of making credibility

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209. See Janet C. Hoefel, *The Sixth Amendment's Lost Clause: Unearthing Compulsory Process*, 2002 Wis. L. REV. 1275, 1293 n.77 (2002).

210. *Cf. id.* at 1301–02 (describing the *Chambers* decision as a shift to reliability).

211. 523 U.S. 303 (1998).

212. *Id.* at 305–06.

213. *Id.* at 306.

214. *Id.*

215. *Id.*

216. See MIL. R. EVID. 707(a). This rule was promulgated by the United States President pursuant to Article 36 of the Uniform Code of Military Justice that authorizes the President, as Commander in Chief of the Armed Forces under Article II, Section 2 of the United States Constitution, to prescribe for military courts "modes of proof . . . by regulations which shall, so far as he considers practicable, apply the principles of law and the rules of evidence generally recognized in the trial of criminal cases in the United States district courts." 10 U.S.C. § 836(a) (2012).

217. *Scheffer*, 523 U.S. at 307.

218. *Id.*

219. *Id.*

220. *United States v. Scheffer*, 44 M.J. 442, 445 (C.A.A.F. 1996).

221. *Scheffer*, 523 U.S. at 317.

222. *Id.* at 312.

determinations in criminal trials.”<sup>223</sup> Based on these observations, and on society’s need to avoid collateral litigation in criminal trials,<sup>224</sup> the Court ruled that suppression of exculpatory polygraph evidence does not violate compulsory process.<sup>225</sup> By my lights, exculpatory polygraph evidence was denied constitutional protection because it is speculative, self-asserting, and potentially self-serving as well.

This decision contradicts *Rock*: A case in which the Court granted protection to hypnotically-enhanced testimony that also appears to be speculative and self-asserting.<sup>226</sup> Aware of that difficulty, the Court made a sustained effort at reconciling its decision in *Scheffer* with *Rock*, *Chambers*, and *Washington*.<sup>227</sup> Specifically, it reasoned that suppression of exculpatory evidence in each of those three cases “undermined fundamental elements of the defendant’s defense,”<sup>228</sup> whereas in *Scheffer* it caused no such harm.<sup>229</sup> The Court explained that *Rock*, *Chambers*, and *Washington* remedied suppressions of factual evidence with strong exculpatory potential.<sup>230</sup> Factual exculpatory evidence, it elaborated, is vital for the defense, whereas evaluative evidence that merely bolsters the credibility of the defendant’s testimony is not vital.<sup>231</sup> The Court estimated that suppression of evaluative evidence does not seriously weaken the defendant’s ability to fend off criminal accusations.<sup>232</sup>

This reasoning does not properly reconcile *Scheffer* with *Rock*. The defendant in *Scheffer* did not try to exonerate himself simply by adducing the “no deception” opinion of the polygraph expert. Instead, he tried to exonerate himself by combining his testimony with that opinion.<sup>233</sup> By the same token, the defendant in *Rock* did not try to exonerate herself by her testimony alone. Rather, she tried to exonerate herself by her testimony and by the hypnotic intervention that helped her testify as she did.<sup>234</sup> Therefore, the Court ought to have carried out a comparison between these two pairs of evidence. More to the point, the Court ought to have compared

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223. *Id.* at 312–13.

224. *Id.* at 314.

225. *Id.* at 317.

226. See Hoefel, *supra* note 209, at 1304 (attesting that *Scheffer* contradicts *Rock*, “where the uncertain state of the art of hypnosis resulted in the accused being able to present it for the jury’s consideration”).

227. *Scheffer*, 523 U.S. at 315 (“The three of our precedents . . . *Rock v. Arkansas*, *Washington v. Texas*, and *Chambers v. Mississippi*, do not support a right to introduce polygraph evidence, even in very narrow circumstances.”).

228. *Id.*

229. *Id.* at 315.

230. *Id.* at 316–17.

231. *Id.*

232. *Id.* at 317.

233. *Id.* at 306.

234. *Rock v. Arkansas*, 483 U.S. 44, at 62 (1987).

*Scheffer*'s polygraph evidence with the potentially suggestive intervention of the hypnotic expert that took place in *Rock*. This comparison would have revealed speculative, self-asserting, and self-serving evidence on both sides. *Scheffer* and *Rock* are indistinguishable.

The upshot of these decisions is clear. Exculpatory evidence that shows reliability will always receive constitutional protection under the Compulsory Process Clause.<sup>235</sup> To show reliability, evidence must not be self-asserting, self-serving, or speculative. The Court came close to denying constitutional protection to evidence falling into these categories, but it has not yet done so expressly. This analysis suggests that criminal defendants would not be able to overturn evidentiary rules that suppress exculpatory evidence for having a low SNR.<sup>236</sup>

This proposition, however, has become uncertain after the Supreme Court's decision in *Holmes v. South Carolina*.<sup>237</sup> In that case, the defendant confronted murder, rape, and other serious accusations by offering into evidence another person's out-of-court admissions of guilt.<sup>238</sup> He called four witnesses to testify about those admissions.<sup>239</sup> The person alleged to have made the admissions testified at the pretrial hearing and denied making them.<sup>240</sup> The trial court suppressed the admissions by applying the South Carolina rules<sup>241</sup> that allow such evidence to be presented to fact finders only when it raises "a reasonable inference . . . as to [the defendant's] own innocence" rather than "a conjectural inference as to the commission of the crime by another [person]"<sup>242</sup> and when it does not contradict "significant forensic evidence" that implicates the defendant.<sup>243</sup> Evidence suppressed by these rules thus falls into the self-asserting category that exhibits a uniformly low SNR.

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235. For a recent application of this principle, see *Harris v. Thompson*, 698 F.3d 609, 623–39 (7th Cir. 2012) (holding that the trial court's disqualification of defendant's five-year-old son as an incompetent witness under Illinois law violated compulsory process).

236. The scant academic writings about compulsory process have not addressed this question. See, e.g., Akhil Reed Amar, *Sixth Amendment First Principles*, 84 GEO. L.J. 641, 699–700 (1996) (favoring an equality-driven interpretation of compulsory process that voids any one-sided rule that restricts the defendant's ability to adduce certain evidence while allowing the prosecution to adduce it); Hoeffel, *supra* note 209, at 1278 (arguing that the Compulsory Process Clause entitles defendants to adduce any exculpatory evidence that the prosecution can test "with the tools of the adversary process"); Peter Westen, *Confrontation and Compulsory Process: A Unified Theory of Evidence for Criminal Cases*, 91 HARV. L. REV. 567, 590–96 (1978) (arguing that the Compulsory Process Clause entitles defendants to adduce any exculpatory evidence subject to availability of witnesses and compelling governmental interests).

237. 547 U.S. 319 (2006).

238. *Id.* at 322–23.

239. *Id.* at 323.

240. *Id.*

241. *Id.* at 323–24.

242. *State v. Gregory*, 16 S.E.2d 532, 534 (S.C. 1941).

243. *State v. Gay*, 541 S.E.2d 541, 543 (S.C. 2001).

Surprisingly, the Supreme Court decided that the Compulsory Process Clause did entitle the defendant to adduce the third-party admissions into evidence.<sup>244</sup> The Court ruled that the Clause entitles defendants to present virtually any proof of innocence and that exculpatory evidence can only be suppressed when it “has only a very weak logical connection to the central issues.”<sup>245</sup> Based on this new standard, the Court found the defendant’s constitutional complaint justified and vacated his conviction.<sup>246</sup> The Court explained that “because the prosecution’s evidence, *if credited*, would provide strong support for a guilty verdict, it does not follow that evidence of third-party guilt has only a weak logical connection to the central issues in the case.”<sup>247</sup>

This decision could constitute a historic expansion of compulsory process if, indeed, it intended to lay down a new standard that entitles defendants to rely on any exculpatory evidence except that which has “a weak logical connection to the central issues in the case.”<sup>248</sup> Two reasons run against this understanding of the Court’s decision. The first reason has to do with the decision itself. This decision gave defendants a broad formulation of constitutionally protected evidence, but it also expressly approved *Scheffer*—a decision that favors a much narrower formulation.<sup>249</sup> The second reason is more fundamental. Pursuant to its authority under the Rules Enabling Act of 1934,<sup>250</sup> the Court promulgated Federal Rule of Evidence 804(b)(3)(B) that requires corroboration for any third-party admission of guilt by which the defendant attempts to exonerate himself.<sup>251</sup> By promulgating this rule, the Court indicated that the corroboration requirement—not very different from South Carolina’s rule that it voided in *Holmes*—is not unconstitutional.<sup>252</sup> Indeed, the Federal Rule of Evidence that the Court promulgates functions as a safe harbor for states that adopt those rules. Adoption of a federal rule gives the state a virtual guarantee that the rule will pass constitutional muster.<sup>253</sup>

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244. *Holmes*, 547 U.S. at 330–31.

245. *Id.* at 330.

246. *Id.* at 331.

247. *Id.* at 330.

248. *Id.*

249. *Id.* at 324–26.

250. See 28 U.S.C. § 2072(a) (2012) (conferring on the Supreme Court “the power to prescribe general rules of . . . evidence for cases in the United States district courts . . . and courts of appeals”).

251. See FED. R. EVID. 804(b)(3)(B) (providing that a statement against the declarant’s penal interest can only be admitted into evidence when it is “supported by corroborating circumstances that clearly indicate its trustworthiness”).

252. See Stein, *supra* note 84, at 156–60 (explaining and illustrating the “safe harbor” dynamic).

253. *Id.*

The meaning of compulsory process has been further complicated by the Supreme Court's most recent decision, *Nevada v. Jackson*.<sup>254</sup> This decision featured a defendant who attempted to rebut charges of rape by showing that the alleged victim had accused him of sexually assaulting her on several prior occasions as well, but the police were unable to verify those accusations and reported skepticism about their truthfulness.<sup>255</sup> The trial judge allowed the defendant to cross-examine the victim about those prior incidents, but refused to admit the police reports into evidence and to subpoena the officers involved.<sup>256</sup> The judge relied on the Nevada evidence rule that prohibits impeachment of a witness by specific instances of her misconduct.<sup>257</sup> The judge also determined that "the proffered evidence had little impeachment value because at most it showed simply that the victim's reports could not be corroborated."<sup>258</sup> Against this decision, the defendant argued that his constitutional right to present a defense entitled him to adduce the police reports and subpoena the officers to testify as defense witnesses.

The Supreme Court disagreed.<sup>259</sup> As a basis for its decision to deny the defendant habeas relief, the Court stated the rule that authorizes a federal court to "overturn a state court's application of federal law only if it is so erroneous that 'there is no possibility fair-minded jurists could disagree that the state court's decision conflicts with this Court's precedents.'"<sup>260</sup> Based on this rule, the Court held that the defendant was not entitled to habeas corpus relief because none of its precedents "*clearly establishes* that the exclusion of such evidence for such reasons in a particular case violates the Constitution."<sup>261</sup> The Court justified this decision by identifying the difference between cross-examination of the alleged victim, to which the defendant was unquestionably entitled, and adducing evidence that "may confuse the jury, unfairly embarrass the victim, surprise the prosecution, and unduly prolong the trial."<sup>262</sup> Under my taxonomy, police reports that evaluated the victim's credibility were speculative and for that reason undeserving of constitutional protection.

This level of uncertainty about the meaning of a core constitutional doctrine is undesirable. Defendants, prosecutors, courts, and lawmakers should be able to find out when a suppression of exculpatory evidence is

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254. 133 S. Ct. 1990 (2013).

255. *Id.* at 1991.

256. *Id.*

257. See NEV. REV. STAT. § 50.085(3) (2013).

258. *Jackson*, 133 S. Ct. at 1993.

259. *Id.* at 1992–94.

260. *Id.* at 1992 (quoting *Harrington v. Richter*, 562 U.S. 86 (2011)).

261. *Id.* at 1994 (emphasis added).

262. *Id.* at 1993–94.

constitutional. The Supreme Court can easily create order in the compulsory process doctrine, since all of its problematic decisions dealt with exculpatory evidence that was self-asserting, self-serving or speculative. The SNR principle therefore can help the Court to delineate the scope of defendants' compulsory process entitlement with greater precision.

The first step in this process is to acknowledge that the compulsory process protection extends to all exculpatory evidence that does *not* fall into the self-asserting, self-serving or speculative category.<sup>263</sup> Such evidence is efficient and should be admitted. For example, testimony of an accomplice relied upon by the defendant in *Washington* was unquestionably efficient evidence that properly received full protection under the Compulsory Process Clause.<sup>264</sup> On the other hand, self-asserting, self-serving, and speculative evidence is inefficient. Because such evidence has a low SNR, defendants should not be automatically entitled to adduce it. Yet, as I explain below, defendants should still be able to rely on such evidence in exceptional cases that show necessity.

Efficiency of court proceedings is an important societal goal, and defendants should not be allowed to frustrate it at will. This goal, however, is not overarching.<sup>265</sup> Erroneous conviction and punishment of an innocent person cause enormous harm to that person and to society at large.<sup>266</sup> For that reason, our legal system is willing to let many guilty criminals go unpunished in order to protect a single innocent person against erroneous conviction.<sup>267</sup> Consistent with this principle, defendants should be allowed to adduce inefficient exculpatory evidence upon a showing of necessity. Any defendant relying on self-asserting, self-serving, or speculative evidence would thus have to convince the court that this is the best evidence available to him under the circumstances of the case. As part of this burden, the defendant would normally have to give up his Fifth Amendment privilege and testify as a witness.

*Chambers*, *Rock*, and *Holmes* are excellent examples of defendants who met this burden. Each of those defendants brought before the court the best available evidence and testified in his or her defense.<sup>268</sup> The defendant in *Scheffer* also met this burden: he testified in his defense and adduced polygraph evidence generated by the same office that accused him of using

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263. See *United States v. Scheffer*, 523 U.S. 303, 309 (1998).

264. *Washington v. Texas*, 388 U.S. 14 (1967).

265. See RONALD DWORKIN, A MATTER OF PRINCIPLE 79–88 (1985) (explaining why an innocent defendant's right to be acquitted should trump adjudicative efficiency).

266. See STEIN, *supra* note 14, at 172–74 and sources cited therein.

267. *Id.*

268. See *Chambers v. Mississippi*, 410 U.S. 284, 296–98 (1973); see also *Holmes v. South Carolina*, 547 U.S. 319, 330 (2006); *Rock v. Arkansas*, 483 U.S. 44, 57 (1987).

drugs.<sup>269</sup> These factors separate *Scheffer* from a case featuring a non-testifying defendant who adduces a privately commissioned polygraph examination. To make his polygraph evidence admissible, this defendant would have to testify and allow the prosecution's polygraph expert to examine him as well. By the same token, defendants generally cannot rely on their self-exonerating out-of-court statements as a substitute for their testimony. Our law of evidence properly categorizes such statements as self-serving and inadmissible.<sup>270</sup>

Finally, the defendant in *Jackson* chose not to testify.<sup>271</sup> That choice was within the defendant's rights, but it denied the prosecution an opportunity to question the defendant about the prior occasions on which he claimed to have been falsely accused by the victim of sexually assaulting her. The trial judge, therefore, was right to suppress the evidence, speculating that the alleged victim attempted to frame the defendant. The defendant ought to have proffered, instead, the non-speculative evidence: his own testimony. My proposed principle is simple: defendants must provide the best available evidence—one that exhibits the highest SNR relative to its alternatives.<sup>272</sup>

#### CONCLUSION

Bentham famously wrote that “[e]vidence is the basis of justice” and that when you “exclude evidence, you exclude justice.”<sup>273</sup> Bentham's followers—the modern-day abolitionists of evidentiary rules—have adopted this slogan.<sup>274</sup> This slogan, however, is only half-true. Evidence is the basis of justice, yet its exclusion does not necessarily exclude justice. Contrariwise, admission of potentially probative, but noisy, evidence might distort justice by leading fact finders astray. At a minimum, such evidence will require costly processing and consideration, causing waste and delays in the administration of justice. At worse, it will lead to erroneous

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269. *United States v. Scheffer*, 523 U.S. 303, 306 (1998).

270. *People v. Russell*, 242 P.3d 68, 91–92 (Cal. 2010) (affirming suppression of defendant's self-serving and uncorroborated statements aligning with the hearsay rule and constitutional principles); *State v. Stano*, 159 P.3d 931, 939–41 (Kan. 2007) (attesting that “a defendant's ‘unverified, uncross-examined, self-serving statements to the police’ are inadmissible” and holding that suppression of such statements aligns with due process (quoting *State v. Barnwell*, 675 N.E.2d 148, 154 (Ill. App. Ct. 1996))).

271. *Jackson v. Nevada*, 133 S. Ct. 1990, 1991 (2013).

272. For that reason, Federal Rule of Evidence 804(b)(3)(B) is constitutionally problematic in that it indiscriminately suppresses uncorroborated admissions of guilt by third parties. To avoid the constitutional problem, courts should allow defendants to satisfy the corroboration requirement by testifying in their defense. This solution will align with my proposed principle.

273. BENTHAM, *supra* note 1, at 1.

274. *See supra* notes 17, 58–67 and accompanying text; *see also* Redmayne, *supra* note 77, at 814.



decisions. As I have shown in this Article, a legal system that manages multiple trials cannot afford either cost.

#### APPENDIX

##### *Calculation of SNR for Footnote 44 and Accompanying Text*

This calculation uses the average probability for signal (here, 0.5) and the

standard deviation formula for noise:  $\sqrt{\frac{\sum(x-a)^2}{n-1}}$ .<sup>275</sup>

In this formula,  $x$  represents each applicable probability;  $a$  represents the average probability;  $n$  represents the total number of applicable probabilities; and  $\sum$  is an aggregation of all  $(x-a)^2$ .

The requisite calculation proceeds as follows:

##### Step 1:

| $x$ | $a$ | $x-a$ | $(x-a)^2$ |
|-----|-----|-------|-----------|
| 0.1 | 0.5 | -0.4  | 0.16      |
| 0.2 | 0.5 | -0.3  | 0.09      |
| 0.5 | 0.5 | 0     | 0         |
| 0.5 | 0.5 | 0     | 0         |
| 0.8 | 0.5 | 0.3   | 0.09      |
| 0.9 | 0.5 | 0.4   | 0.16      |

Step 2:  $\sum=0.5(0.16+0.09+0+0+0.09+0.16)$ .

Step 3:  $n-1=5$ .

Step 4:  $\frac{\sqrt{0.5}}{\sqrt{5}} = \frac{0.707}{2.236} = 0.316$  (NOISE LEVEL).

Step 5:  $0.5/0.316=1.58$  (SNR).

275. See RUBIN, *supra* note 42, at 61.