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***61 HEURISTICS AND BIASES IN THE COURTS: IGNORANCE OR ADAPTATION?**

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The human brain is extremely efficient, but it is not a computer. The brain has a limited ability to process information but must manage a complex array of stimuli. In response to its natural constraints the brain uses shortcuts that allow it to perform well under most circumstances. [\[FN1\]](#) Reliance on these shortcuts, however, leaves people susceptible to all manner of illusions: visual, mnemonic, and judgmental. [\[FN2\]](#) For example, people process scenes in motion pictures as if the images actually move, [\[FN3\]](#) mis-remember the occurrence of events that never happened, [\[FN4\]](#) and treat outcomes as having been more predictable than they were. [\[FN5\]](#) People are generally aware of these limitations, and they adapt to them so as to avoid disastrous consequences. Social institutions further facilitate such adaptations. [\[FN6\]](#) An institution that plays as significant a role in society as the courts has ***62** surely adjusted to the brain's limitations and the illusions that these limitations produce. If so, an understanding of human cognitive processes can shed new light on how the law has developed and how it should develop. For example, central features of the legal system, such as the assignment of fact-finding and interpreting law to different entities (juries and judges), might persist in the American legal system partly because they ameliorate the influence of cognitive illusions.

Scholars who study the implications of psychological phenomena for law usually assume that the courts are ignorant of cognitive limitations and are therefore in need of reform. [\[FN7\]](#) An understanding of cognitive psychology, however, is not a prerequisite to accommodating the brain's limitations. [\[FN8\]](#) For example, in response to many of the deceptions that air travel perpetrates on the senses, airplane designers have created a set of instruments to guide pilots, who must then learn to distrust the sensations they experience during flight. [\[FN9\]](#) Airplane designers need not possess a detailed knowledge of human sensation and perception to realize that mechanical aids are necessary to pilot a plane successfully. An education in psychology would surely allow designers to refine these adaptations, but even without such knowledge people and institutions easily avoid many costly consequences of cognitive illusions.

In other contexts institutions adapt to illusions of judgment, which are probably the most relevant set of cognitive illusions to ***63** the courts. [\[FN10\]](#) For example, psychologists have uncovered a set of biases plaguing experts' judgments that make developing foolproof complex systems or structures, such as nuclear power plants and large buildings, difficult. [\[FN11\]](#) Experts who design such systems commonly fail to foresee ways in which complicated processes can go awry. [\[FN12\]](#) In spite of this cognitive limitation most complex systems hold together well because professions develop adaptations. As one example, civil engineers are trained that in the course of designing structural support for a building, they should estimate the support needed and then multiply their estimates by a safety factor of somewhere between three and eight. [\[FN13\]](#) Civil engineers cannot accurately estimate the amount of structural support a building requires, [\[FN14\]](#) but even the most inaccurate engineer would not underestimate the amount of needed support by more than the safety factor. Consequently, despite the cognitive limitations of civil engineers, buildings are safe.

Many professions develop procedures to compensate for the limitations of human judgment. Over the centuries of their existence, common-law courts might have done the same. Like engineering, the law is a learned profession with a long tradition that presumably has had the opportunity to learn from its mistakes. This observation implies that the law has adapted to cognitive illusions of judgment. Such illusions would not, therefore, provide a basis for advocating widespread reform efforts, although they would facilitate an understanding of how the law has developed.

Important differences between courts and other social institutions, however, might keep the courts from adapting as well to *64 cognitive illusions. First, courts might lack adequate pressure to improve the quality of their decision making. [FN15] Civil engineers who build faulty buildings will quickly find themselves without clients, but courts are public resources that do not face true competitive pressures. [FN16] Judges surely have some incentives to make good law and avoid illusions of judgment, but they lack the incentives that other institutions face. [FN17] Second, courts rarely encounter feedback. On issues of law, judges can usually count on a settlement, rather than an appeal, [FN18] and on issues of fact, judges rarely learn the true state of affairs. These impediments make it somewhat less likely that courts would adapt to illusions of judgment than other social institutions.

Unfortunately, courts do not follow a consistent pattern of either ignoring or adapting to illusions of judgment. [FN19] Courts both ignore and adapt to the same illusion in similar situations. As discussed in Part I of this Article, courts have developed numerous adaptations to an illusion of judgment known as the hindsight bias, but in cases involving the law governing trusts, courts seem to have fallen victim to it. Similarly, as described in Part II of this Article, in some contexts courts have recognized and *65 adapted to illusions of judgment that arise from a cognitive process known as the representativeness heuristic, while in other, similar contexts, the courts seem oblivious to it. Scholarship applying cognitive psychology to law also reflects this problem. Recent scholarship documenting new applications of cognitive psychology to law contains blends of both positive implications and normative prescriptions of cognitive illusions. [FN20] For example, some scholars argue that cognitive illusions that lead people to be too optimistic about their abilities to fulfill commitments can explain some legal doctrine, [FN21] others contend that similar illusions support new legal reforms. [FN22]

Closer inspection reveals a pattern of ignorance and adaptation in the courts. As discussed in Part III, courts are more likely to recognize the influence of cognitive biases in the types of cases that generally require trial by jury than in cases that typically require trial by judge. This distinction is consistent with an observation that cognitive psychologists have made between insider versus outsider perspectives on cognitive illusions. [FN23] Psychologists argue that people can more easily identify cognitive biases when they treat a decision-making problem as one of a class of similar problems that many other people face than when they treat it as a unique problem that they face alone. [FN24] As a consequence, cognitive biases are easier to spot in others than in *66 oneself. [FN25]

As applied to the legal process, judges are more likely to adopt an outsider perspective to decision making by juries than by themselves or other judges. When judges both determine the procedural rules that govern fact-finding and decide the facts themselves they are inside the decision-making task. This insider perspective makes it difficult to identify cognitive illusions that might affect judgment. By contrast, a jury trial necessarily separates the fact-finding process from the process of adopting procedural rules to govern fact-finding. This creates an outsider perspective on the decision-making process thereby making it easier for courts to identify cognitive illusions.

Rather than a troublesome anomaly for the psychological analysis of law, the identification of a split between adaptation to and ignorance of cognitive illusions illuminates a novel perspective on the legal system. In addition to the conventional arguments in defense of trial by jury, research in cognitive psychology suggests that the reliance on juries facilitates the identification of erroneous fact-finding processes.

I Hindsight Bias and Legal Judgments

People overestimate the predictability of past events: a phenomenon known as the hindsight bias. [FN26] Among the cognitive illusions of judgment that psychologists have studied, the hindsight bias is one of the most well-documented and well-understood. It is also quite intuitive, and its effects are relatively easy to identify. Hence, it is a good candidate for testing the theory that courts adapt to illusions of judgment. In many contexts, the courts have recognized and adapted to the influence that the bias has on judgment. [FN27] In at least one circumstance, however, in the *67 law governing liability of trustees, the courts have fallen prey to the bias.

A. The Hindsight Bias

The originator of the work on the hindsight bias, psychologist Baruch Fischhoff, described it as follows:

In hindsight, people consistently exaggerate what could have been anticipated in foresight. They not only tend to view what has happened as having been inevitable but also to view it as having appeared "relatively inevitable" before it happened. People believe that others should have been able to anticipate events much better than was actually the case. [FN28]

To demonstrate how the bias operates, Baruch Fischhoff presented undergraduate subjects with a brief account of the circumstances leading up to a war between the British and the Nepalese Gurkhas in the early nineteenth century. [FN29] The account stated that the war had four possible outcomes: British victory, Gurkha victory, stalemate with no peace treaty, or stalemate with a peace treaty. Four groups of subjects were told that one of the four outcomes had actually occurred. The subjects were then asked to estimate the probability that they would have assigned to each outcome had they not been told of the actual outcome. A fifth group of subjects was asked to estimate the probability of each of the four outcomes without having been provided with any outcome. The results showed clear evidence of a hindsight bias. Subjects who were provided with an outcome rated it as having been more probable than subjects who were not given an outcome and subjects who were given a different outcome. [FN30]

Psychologists have conducted nearly 130 experiments demonstrating the existence of the hindsight bias using a variety of different methods, materials, and subjects. [FN31] Every published empirical test of the hindsight bias replicates the phenomenon. [FN32] *68 Procedures that ask people explicitly to estimate the response of others who are not given an outcome and procedures in which people are asked to remember their own pre-event estimates for likelihood of various outcomes both replicate Fischhoff's original findings. [FN33] Furthermore, manipulations designed to reduce the size of the effect such as paying people for accurate answers, telling people about the existence of the hindsight bias, or having people construct elaborate analyses of the likelihoods of the various outcomes do not eliminate the bias' influence on judgment. [FN34] Even researchers who tend to be skeptical of the existence of illusions of judgment have concluded that the hindsight bias is a robust phenomenon. [FN35]

Psychologists have developed a widely accepted theory accounting for the hindsight bias. [FN36] The bias results primarily from the natural (and useful) tendency for the brain to incorporate known outcomes into existing knowledge automatically, and to make further inferences from that knowledge. [FN37] For example, subjects in the British-Gurkha study who were told that the British had won probably made inferences about colonial warfare. [FN38] They may have concluded, for example, that the advantages that the British had over the Gurkhas (better weapons and training) were more important in such conflicts than the Gurkha advantages (better knowledge of the terrain and greater motivation). Subjects informed of a Gurkha victory may have inferred the opposite. When asked to estimate the probability of a British victory, the subjects relied on their new belief that better weapons and training were more important than knowledge of the terrain and greater motivation. These inferences then induced the subjects *69 to make high estimates for the probability of the known outcome, relative to the estimates of people who were unaware of the outcome and hence had not developed such beliefs. [FN39] Even if people can suppress their knowledge of the outcome, they are not even aware that they have made these further inferences, and consequently cannot suppress them.

More generally, ignoring a known outcome is unnatural. [FN40] Normally, people should integrate new information into their existing store of knowledge and use it to make future predictions. Assessing the predictability of past events requires that both the outcome and the subsequent inferences that depend upon learning the outcome be ignored. Perhaps because such judgments are so uncommon and unnatural, people cannot make them accurately.

Few decisions in ordinary life require an assessment of the predictability of past outcomes, but such assessments are pervasive in legal contexts. Whenever a court must determine what a party "should have known," it is susceptible to the influence of the hindsight bias. [FN41] Several studies have demonstrated that the bias influences judgments of legal liability. For example, one study compared the decisions made by subjects randomly assigned either to decide in foresight whether a defendant should take a precaution against flooding, or to judge in hindsight whether a decision not to take the same precaution was negligent. [FN42] In foresight, the subjects listened to evidence on the costs and benefits of the precaution. They learned that the precaution had an annual cost of \$100,000, but would completely eliminate any likelihood of a flood that would cause \$1,000,000 in damage to a nearby bakery. Most of the evidence related to the probability that the flood would occur. Subjects had to estimate this probability in order to decide whether the precaution should be taken. Subjects judging liability in hindsight

were told that the precaution had not been taken and that the \$1,000,000 flood had occurred. They then reviewed the same evidence on the probability of the flood that the foresight subjects reviewed and decided whether the precaution should have been taken. In foresight, 76% of the subjects concluded that the flood was so *70 unlikely that the precaution was unnecessary. In hindsight, 57% of the subjects concluded that the flood was so likely that the failure to take the precaution was negligent. As a consequence of the hindsight bias, ex ante estimates of appropriate care to be taken against causing harm are apt to appear unreasonable when judged ex post. This result has been replicated in three other studies. [\[FN43\]](#)

B. Courts Adapting Well to the Hindsight Bias

The evidence that the hindsight bias influences judgments of liability might be taken as a suggestion that determinations of liability in the courts are in need of reform. Some scholars have, in fact, made this claim. [\[FN44\]](#) Because the bias is quite intuitive and easily observable, however, courts might have already recognized and adapted to its influence.

The key to understanding how the legal system might respond to the hindsight bias is recognizing that there is no effective strategy to induce a judge or jury to make an unbiased ex post assessment of the ex ante probability of an adverse outcome. No known decision-making strategy enables people to make decisions in hindsight that resemble decisions made in foresight. [\[FN45\]](#) Psychologists have tried informing people about the bias, increasing their motivation for accuracy, and having them conduct detailed analysis of alternative outcomes, all without much success. [\[FN46\]](#) The few researchers who have claimed to eliminate the bias have done so only by confusing research subjects about which outcome actually occurred [\[FN47\]](#) or by asking a question in hindsight that does not call for an ex ante estimate of the likelihood of the outcome. [\[FN48\]](#) Learning an outcome causes people to *71 update their beliefs without even realizing it, making it impossible to restore, or even remember, the beliefs that they held before they learned the outcome.

Even if psychologists discover some mechanism for ameliorating the influence of the hindsight bias, it is likely to be too intrusive to be suitable for a judicial proceeding. Those methods that have proven partially effective at debiasing require significant restructuring of the decision-making task. For example, several researchers have reduced the bias by having subjects provide detailed explanations for how alternative outcomes might have been obtained, or by drawing out fault trees to document the ways in which alternative outcomes might have occurred. [\[FN49\]](#) Others have achieved some reduction in the magnitude of the bias by having subjects make detailed assessments of the plausibility of the potential outcomes in foresight. [\[FN50\]](#) These techniques are so foreign to the kinds of procedures that judges and juries use to assess liability that they are not good candidates for ameliorating the influence of the hindsight bias in the courts.

The law does, of course, have a heavy-handed means of altering the outcome at trial, allocating the burden of production and setting the standard of proof. These safeguards commonly operate against the party most likely to benefit from the hindsight bias--the plaintiff. [\[FN51\]](#) This observation has led some to advocate raising the standard of proof to clear and convincing evidence in cases in which the plaintiff is likely to benefit from the hindsight bias. [\[FN52\]](#) The problem with such a blunt reform as adjusting the standard of proof is that it treats the symptom, not the disease. Such a reform might be inadequate, or might over-compensate for the bias' influence.

This is not to say that courts are powerless to adapt to the hindsight bias. Courts recognize that they will not be able to obtain accurate ex post assessments of the ex ante probabilities of adverse outcomes and adjust the decision-making process in one of two ways: they either suppress evidence that could not have been known beforehand or they attempt to enforce an ex ante *72 standard. [\[FN53\]](#)

The law includes several examples of efforts to suppress information that could not have been known beforehand. For example, courts suppress evidence of subsequent remedial measures in accident cases, so as not to exacerbate the influence of the hindsight bias. [\[FN54\]](#) Also, courts refuse to allow suits to proceed when the only evidence of negligence or fraud consists of a bad outcome. [\[FN55\]](#) As a final example, in cases challenging the validity of a patent on the grounds that the invention was "obvious," courts have recognized the potential influence of the hindsight bias (once the innovation is developed, the insights that led to its creation become obvious). Rather than

relying on an open-ended inquiry into whether an invention seemed obvious, the courts assess factors that are not susceptible to the bias' influence, such as whether the innovation satisfied a long-felt unresolved need and enjoyed immediate commercial success. [FN56]

Courts also attempt to avoid relying on hindsight by identifying an ex ante norm to apply. For example, in tort law, courts treat compliance with a custom or a safety regulation as evidence of non-negligence. [FN57] In medical malpractice cases, doctors cannot be held liable if the care they provided comported with prevailing medical custom. [FN58] Finally, in corporate law, officers and directors are not liable for negligent business decisions. [FN59] Courts support these doctrines, in part, because of their concern with the *73 accuracy of liability determinations conducted in hindsight. [FN60]

Adaptation to the hindsight bias will not necessarily lead to more accurate decisions in the courtroom. Courts overreact to the influence of the bias. For example, suppressing subsequent remedial measures in accident cases slightly reduces the pool of relevant evidence that the fact-finder has available to decide the case. If the effect of the hindsight bias is small, these adaptations might be overreactions to the problem of judging liability in hindsight. [FN61] Furthermore, the hindsight bias is only one of many cognitive limitations that affect the courtroom. Adjusting only for the hindsight bias can unduly tilt the playing field, particularly as the bias tends to benefit plaintiffs. Along similar lines, identification of the role of hindsight might simply create a handy excuse for courts to dismiss actions against disfavored plaintiffs, such as those bringing claims under the federal securities laws. [FN62]

Accurate assessments of the ex ante probabilities would clearly be superior to many of the remedies that courts have pursued as responses to the hindsight bias. Research on the bias, however, indicates that such assessments are not available. Remarkably, courts have avoided the temptations of simple responses (such as altering the standard of proof) that would not really solve the problem. Courts might be overreacting to the hindsight bias, but they at least recognize the nature of the problems they face. Without such recognition, courts would have no chance of responding to the underlying consequences of cognitive illusions.

C. Courts Falling Prey To the Hindsight Bias

Courts do not uniformly adapt to the hindsight bias, however. As discussed below, the law governing the liability of trustees for improperly investing trust assets is best described as an instance of courts falling prey to the hindsight bias.

The law governing investment of a trust's assets implicates the hindsight bias. If an investment turns out badly, and the beneficiary sues, the trustee's investment decisions will seem imprudent, maybe even negligent, in hindsight. [FN63] As a result, trustees *74 are at the same risk for being judged too harshly as ordinary tort defendants and corporate officers. As Professor Scott, the reporter for both the first and second Restatements of Trusts, described the problem: "It is difficult . . . for a judge . . . to disregard the lesson taught by subsequent events and to put himself in the position in which the trustee was when he acted." [FN64]

If courts have adapted to the hindsight bias in other contexts, then they should have adapted in trusts and estates law as well. The case law, however, suggests ignorance, not adaptation.

1. A Brief History of Trustee Liability for Imprudent Investments

Contemporary American law governing trustee liability developed first in England in the eighteenth century. At that time, English courts adopted the "legal-list" rule; no trustee could be liable for investing a trust's assets in a legally prescribed category of investments. [FN65] Purchasing investments not identified as legally safe would result in a surcharge against the trustee if the investment lost money. The list was quite short--it included only government-issued bonds. By the middle of the nineteenth century, courts added some select equities to the list (for example, stock in the East India Company), but the rule was always an exceptionally cautious one. [FN66] As a consequence, trustees tended to invest only in a limited set of low-risk, low-yield securities. [FN67]

Nineteenth-century American courts initially borrowed from England and followed the legal-list doctrine, but a new rule emerged in the United States. In 1830, in *Harvard College v. Amory*, [FN68] the Supreme Judicial Court of Massachusetts abandoned the wooden "legal-list" rule in favor of a more flexible, *75 "prudent-investor" standard. The court held that, in deciding how to invest the corpus of a trust, trustees were "to observe how men of prudence, discretion and intelligence manage their own affairs, not in regard to speculation but in regard to the permanent disposition of their funds, considering the probable income, as well as the probable safety of the capital to be invested." [FN69] According to the court, the law should not restrict a trustee to purchasing a limited range of legally prescribed investments for a trust. Trustees should be free to follow the best investment practices of the time and should be liable only for purchasing an investment that a "prudent" investor would have avoided. The prudent-investor rule adopted in the *Amory* case promised flexibility by encouraging trustees to treat the trust's assets the same way they would treat their own assets. Presumably, as prudent-investment strategies improved over time, so too would the investment strategies required by a court following the prudent-investor rule.

The prudent-investor rule had the potential to ameliorate two distinct disadvantages of the legal-list rule. First, the approved investments consisted largely of government bonds that provided no protection against the risk of inflation. [FN70] Second, the rate of return on these investments was historically much lower than that of a diverse array of securities. [FN71] The prudent-investor rule promised to encourage trustees to take advantage of developments in finance theory that produce improved investment strategies that avoided the defects in the investments identified by the legal-list rule.

Despite the apparent advantages of the prudent-investor rule, courts were slow to adopt it. [FN72] Most states retained some version of the legal-list rule until the Great Depression revealed that even government lands entailed some economic risks. [FN73] This revelation inspired most state legislatures to reform their trust law to adopt the prudent-investor rule.

The potential for flexibility that the prudent-investor rule *76 promised, however, was never quite realized. Courts applying the prudent-investor rule became more concerned with the "probable safety" than the "probable income" of investments. Consequently, courts repeatedly condemned trustees for purchasing "speculative" investments such as shares of stock bought on margin, "bonds selling at a large discount because of uncertainty as to whether they will be paid at maturity," junior mortgages, and real estate. [FN74] Despite the fact that many prudent investors include securities such as these in a well-diversified portfolio, courts repeatedly held trustees liable for losses that arose from investing in these forms of high-risk (but high-yield) investments.

Judicial concern with high-risk, high-yield investments would be appropriate if the trustee had also failed to diversify the risks of these investments. The case law, however, includes several instances in which courts held trustees accountable for the poor performance of specific investments in a diversified portfolio. [FN75] Citing cases like these, the Restatement (Second) of Trusts and influential treatises condemned these investments, holding them to be per se speculative. [FN76] The courts thus converted a potentially flexible "prudent-investor" rule into a "constrained-prudent-investor" rule. [FN77] The constrained rule that developed was essentially identical to the legal-list rule--trustees were immune from liability for a narrow class of investments and were essentially insurers of good performance for the rest.

A few jurisdictions, while embracing this constrained rule, also asserted that the prudent-investor rule was one of conduct, not outcome. [FN78] A trustee who appeared to be taking reasonable care by carefully monitoring investments and seeking out investment advice would not be liable if an investment performed poorly. Courts in these jurisdictions held that the prudent-investor rule was one of "conduct rather than performance." [FN79] Even in such jurisdictions, however, investing in the proscribed categories of *77 securities could result in liability, regardless of the level of care exercised by the trustee. [FN80]

Intense criticism accompanied the development of the constrained-prudent-investor rule. [FN81] Armed with the same understanding of modern portfolio theory that drove trustees to purchase some high-risk, high-yield investments, academics ridiculed the courts' applications of the prudent-investor rule. [FN82] In response to the undesirable consequences of the rule, the American Law Institute produced a new Restatement in 1992, [FN83] along with a Uniform Prudent Investor Act ("UPIA"). The new Restatement and UPIA incorporate modern notions

of investment, replacing admonitions against speculation with a requirement that the trustee invest for "risk and return objectives reasonably suited to the trust." [FN84] Combined with an affirmative duty to diversify, this new doctrine is designed to restrain courts from singling out individual investments in a portfolio that have performed poorly without assessing the role that these investments played in the portfolio's diversification scheme. Several states quickly adopted the UPIA. [FN85] How the judiciary ultimately responds to the new rule remains to be seen.

2. The History of Trustee Liability as an Adaption to the Hindsight Bias

Two major improvements in financial investment theory obviously explain much of the developments in trust law. The creation, in the nineteenth century, of relatively stable investment vehicles by governments and large corporations made the legal-list rule possible. The development, in the twentieth century, of modern portfolio theory, with its lessons for reducing the risk of high-yield investments through diversification, made long-term investment of larger trusts exclusively in government securities foolish. At two points in the history of trustee liability, courts clung to bright-line tests that impeded the use of these economic innovations. Although settlors and trustees could always contract out of the anachronistic rules, doing so would have been *78 costly. In both cases, legislative reforms were necessary to purge the courts of their reliance on outdated analysis.

The aversion to the flexible prudent-investor rule arguably reflects concern with relying on judgments in hindsight as a basis for liability. Because of the hindsight bias, an investment that seems prudent in foresight will often seem imprudent in hindsight, thereby resulting in liability under the prudent-investor rule. Consequently, like other negligence standards, the prudent-investor rule creates incentives for trustees to be too cautious with the trust's assets. [FN86] The logical adaptation to the influence of the hindsight bias is a bright-line rule. [FN87] A list of easily identifiable investments that are either per se legal or per se illegal would avoid the influence of the hindsight bias. Inducing trustees into investing in a limited portfolio of low-risk, low-yield investments is a costly solution to the problem of judging in hindsight. This solution, however, might be less expensive than holding trustees to a de facto strict liability standard. [FN88]

A process-oriented version of the prudent-investor rule, in which liability turns on whether the trustee was adequately informed before investing, could also reduce the influence of the hindsight bias. The declaration by the New York Courts, for example, that the prudent-investor rule is one of "conduct rather than performance" reflects some recognition of the problem of judging liability in hindsight. Such a rule could be similar to the business judgment rule in corporate law, where the duty of corporate fiduciaries is merely to make well-informed (and disinterested) decisions. Applying a process-oriented rule to trustees could mitigate the effect of the hindsight bias to some extent, although the outcome might influence courts' assessment of the adequacy of the process. [FN89] In fact, as applied, New York's version of the prudent-investor rule continued to create liability for trustees that might be attributable to the hindsight bias. This is unlike the business judgment rule, which operates as a blanket *79 protection against liability for negligence. Consequently, even the process-based rule constrained the investments that trustees were willing to undertake. [FN90]

In sum, the development of bright-line and process-based rules of liability for trustees could reflect a judicial attempt to cope with the problem of determining negligence in hindsight. These rules are costly adaptations. The bright-line rules make diversification more expensive, thereby reducing the returns on investments that trustees make. The process-based rules create an excess of incentives for trustees to create an elaborate paper trail to demonstrate that they have satisfied the procedural requirements of the rule and apparently do not eliminate the influence of the hindsight bias. [FN91] Nevertheless, these adaptations might be less troublesome than applying a straightforward negligence rule influenced by the hindsight bias. Although the courts might look foolish to commentators who are unaware of the influence of the hindsight bias, the courts might be doing the best that they can in a world where assessments of negligence are necessarily biased.

3. The Real Story: Courts Falling Prey to the Hindsight Bias

Closer scrutiny of the case law, however, suggests that courts judging the liability of trustees have not cleverly adapted to the hindsight bias, but have fallen prey to its influence. The legal-list rule of the nineteenth-century can

be described as an effort to draw a bright line in order to avoid relying on judgments in hindsight, but the constrained-prudent-investor rule cannot. The constraints developed as the courts assessed the prudence of trustees in cases in which investments produced worse than expected results. In these cases, courts consistently failed to appreciate the problems associated with judging in hindsight. They conducted post hoc searches for evidence that investments were too risky. For example, in *Chase v. Pevear*, the Supreme Judicial Court of Massachusetts upheld the lower court's surcharge of a trustee for two investments, constituting less than four percent of a large and diverse portfolio, because these two companies included some "disquieting information" in their prospectuses. [FN92] The courts also acted as if trustees were nearly omniscient. For *80 example, in *First Alabama Bank v. Martin*, the Alabama Supreme Court held that a group of five high-risk, high-yield equities were speculative, as evidenced by the fact that the trustee had lost money on them by selling "at the bottom of the market." [FN93] The court assumed that the trustee knew that the price of the equities was "recovering," and hence the trustee should not have sold them. Similarly, a California Appellate Court held a trustee liable for investing in a second mortgage on a property after the owner defaulted because the trustee had "left an inadequate margin of security." [FN94] The court failed to address the issue of how the trustee could have known whether the margin was inadequate. One court even held a trustee liable for failing to foresee the stock market crash of 1929. [FN95] The pattern in cases of trustee liability, even in contemporary cases, has been to use evidence of an adverse outcome as the basis for scrutinizing individual investments in a portfolio, and then labeling investments that performed poorly as speculative. [FN96]

As a consequence of their reliance on hindsight, courts continuously declared investments of certain types to be speculative. [FN97] Because of the hindsight bias, any investment with the potential to lose money could have given rise to liability; the riskier the investment, the more likely that it would result in liability. Consequently, the prudent-investor rule evolved from a flexible standard of liability into a source of constraints on trustees developed by adjudication in hindsight. [FN98]

Had the courts understood that they were unable to judge the liability of investors in hindsight properly, they would have understood the failings of the bright-line rule that they were developing *81 by accident. When portfolio management came into its own in the late 1960's, any court that recognized the problem of judging in hindsight would have realized that there were some tradeoffs to be made. A bright-line rule avoids the problem of judging in hindsight, but makes it difficult for trustees to follow a strategy of diversification. This recognition would have enabled the courts to take stock of this tradeoff and possibly adopt a procedural standard. As noted above, the procedural standard might reflect a good compromise. Indeed, a minority of states (although notably, New York was among them) attempted to develop a process-based liability rule. [FN99] For the most part, however, courts fell prey to the bias and developed doctrine that would delay the application of modern portfolio theory into the law of trusts by about three decades. [FN100]

Explanations other than judicial susceptibility to the hindsight bias could account for the results of these cases. The investment strategies of the trustees in these cases are somewhat unusual. In both *Chase v. Pevear* [FN101] and *First Alabama Bank v. Martin*, [FN102] the trustees had purchased a diverse, but somewhat idiosyncratic selection of securities. Likewise, in *In re Estate of Collins*, [FN103] it is unclear why the trustee would have chosen that particular second mortgage as an investment vehicle. It is unclear why the trustees in these cases purchased these idiosyncratic investments rather than a sensible combination of mutual funds. It might be that these courts suspected some sort of self-dealing that they could not identify, or simply felt that the investment strategies were too bizarre to support, wholly apart from their poor performance. Nevertheless, these courts easily lapsed into the language of judging in hindsight, thereby driving other trustees into overly cautious investment strategies.

II Representativeness and Legal Judgments

Another cognitive phenomenon known as the representativeness heuristic also has the potential to influence judgments made *82 in the courts. [FN104] The representativeness heuristic refers to the reliance on the degree of apparent similarity between the features of the events to the features of the category in judging whether an event is a member of a particular category. [FN105] Because judges and juries must determine whether a set of events fits into a particular category, they likely rely heavily on the representativeness heuristic. Like the hindsight bias, in some circumstances, courts have identified this phenomenon and made some corrections for it and, in other circumstances, courts have fallen prey to its undesirable consequences.

A. The Representativeness Heuristic

People frequently must determine whether an event is the product of a particular process or is a member of a certain category of events. For example, in determining whether to provide a student with a favorable letter of recommendation for a judicial clerkship, a law professor might have to judge whether a high-quality writing sample from the student indicates that she is capable of first-rate legal research and scholarship. Similarly, jurors must determine whether a defendant's nervous demeanor evinces a guilty conscience. Such judgments have been widely studied by psychologists. [FN106] These studies reveal that people make categorical judgments primarily by assessing the degree to which the event resembles the category. When the event is similar to the category, people judge the likelihood that the event is a member of that category as high; when the event is not similar to the category, people judge the likelihood that the event is a member of that category as low. Psychologists refer to this decision-making strategy as the representativeness heuristic. [FN107]

The representativeness heuristic can be a wonderfully accurate rule of thumb. Often, a high-quality writing sample provides *83 good evidence that a student would make a fine judicial clerk. Problems arise because people tend to rely on the representativeness heuristic to the exclusion of other information relevant to categorical judgments. [FN108] For example, reliance on the representativeness heuristic leads people to discount the importance of a category's prevalence (often referred to as the "base rate"). [FN109]

To demonstrate the tendency for people to ignore base rates, Tversky and Kahneman gave subjects a description of an individual and asked them to estimate the likelihood that the person identified by the description was either a lawyer or an engineer. [FN110] They also informed the subjects that the person was randomly selected from a group of one hundred individuals who were all either lawyers or engineers, and they provided the subjects with the proportion of lawyers and engineers in the sample. Although the subjects' estimates were quite sensitive to the description, they were relatively insensitive to the proportion of lawyers and engineers in the population. When informed, for example, that the target person was married with no children, was of high ability and motivation, promised to be successful in his field, and was well liked by his colleagues, subjects reported that the likelihood that this person was a lawyer was 50%, regardless of whether the stated proportion of lawyers in the population was 70% or 30%. The subjects paid close attention to this vague information about the target person and discounted the importance of highly relevant statistical information.

Even professional decision makers underrate the importance of background statistics. For example, one study showed that medical doctors chronically misinterpret the meaning of medical tests designed to detect rare diseases. [FN111] To see how this might occur, consider the following hypothetical. [FN112] Suppose that a patient manifests symptoms that lead a doctor to suspect that the patient might have a rare disease. One in one hundred patients with these symptoms actually has the disease. The doctor *84 administers a test that is 90% accurate (and the accuracy does not depend upon whether the patient actually has the disease or not). Doctors tend to believe that patients who test positive for the disease are highly likely to have the disease. [FN113] In fact, under these conditions, the patient is unlikely to have the disease, as described in the tables below.

Table 1: Rare Disease Problem

		Test Result		Total
		Positive	Negative	
Actual	Positive	0.9	0.1	1.0
Condition	Negative	9.9	89.1	99.0

Total 10.8 89.2 100.0

Because one percent of patients with the symptoms actually have the disease, and patients with the disease are 90% likely to test positive, the probability that any given patient tests positive and has the disease is 0.9%. (The probability that the patient has the disease and tests negative is 0.1%). Because 99% of patients with the symptoms do not have the disease, and patients without the disease are 10% likely to test positive, the probability that the patient does not have the disease and tests positive is 9.9%. (The probability that the patient does not have the disease and tests negative is 89.1%). As a result, the probability that a patient who tests positive actually has the disease is 0.9 divided by 10.8, or only 8.3%.

In the rare disease problem, the doctors discounted the importance of the base rate of the illness in the relevant patient population. [FN114] Instead of engaging in a normatively appropriate Bayesian process [FN115] of updating their pre-test beliefs about the patients in light of the new test results, they committed what can be called the "inverse fallacy." [FN116] That is, they confused the probability of the evidence given the hypothesis with the probability of the hypothesis given the evidence. The reliability *85 of the medical test (90%) is the probability of the evidence (a positive result) given the hypothesis (the patient has the illness). Although this error could be ascribed to confusion about what was meant by "90% accurate," or ignorance of probability theory, the inverse fallacy is precisely the kind of mistake that reliance on the representativeness heuristic would produce. [FN117] The heuristic leads people to believe that the positive outcome of the test is conclusive and the base rate statistics are not. [FN118]

Excessive reliance on the representativeness heuristic leads to an array of other similar problems in evaluating evidence. People make categorical predictions that are insensitive to the reliability of the evidence supporting their predictions, misunderstand what a random sequence of events looks like, and fail to appreciate common statistical phenomena like regression to the mean. [FN119] In short, people assume that if a bird looks like a duck, quacks like a duck, and walks like a duck, it's a duck. This is a good heuristic on the whole, but it leads people to ignore the proportion of geese in the population that the alleged duck has been drawn from, the reliability of the observations about the alleged duck, and how the alleged duck was selected from the group of wildfowl. Folk aphorisms have developed in some fields to remind people of the need to attend to base-rate statistics. For example, doctors are admonished, "when you hear hoof beats, don't think zebras." Such aphorisms confirm the need for some adaptation to counteract people's tendency to discount the importance of base rate statistics.

B. Adapting to the Representativeness Heuristic: Forensic Evidence

An excessive reliance on the representativeness heuristic can easily lead judges and juries to misinterpret the implications of forensic evidence. For example, finding carpet fibers at a crime scene that match fibers found in a criminal defendant's home can seem like damning evidence of guilt. To assess such evidence *86 properly, a fact-finder must also attend to the prevalence of the type of carpet fibers. If 90% percent of all carpet fibers would match each other in the test used by the forensic expert, then such evidence is of little value. Reliance on the representative-ness heuristic suggests that people will tend to downplay the importance of the probability of a random match. Furthermore, the heuristic can lead a fact-finder to disregard other characteristics of the evidence that undermine its probative value, such as the probability of laboratory error or other mismanagement of the evidence.

Forensic evidence that is explicitly probabilistic can easily lead decision makers to commit the inverse fallacy. [FN120] As an example, suppose forensic evidence in a criminal case reveals that the perpetrator had a relatively rare blood type that is found only in one in twenty adults. Suppose further that the defendant also has the same blood type as the perpetrator. Committing the inverse fallacy here would lead a decision maker to infer that there is a only one in twenty chance that the defendant is innocent. [FN121] Such an inference confuses the probability that the defendant is innocent given the matching blood type with the probability of the matching blood type given an innocent defendant (which is actually one in twenty). Determining the probability that the defendant is innocent given the matching blood type requires knowing the probability that the defendant is innocent in the absence of a blood test, which might be inferred from a base-rate statistic. [FN122]

1. Forensic Evidence: Adaptation

Several features of the trial process counteract the tendency to ***87** commit the inverse fallacy and induce decision makers to pay closer attention to background characteristics of forensic evidence. First, forensic evidence is subject to cross-examination and presentation of counter-arguments by a defense attorney. Unlike many cognitive biases, the inverse fallacy can be avoided by describing its operation to decision makers. [\[FN123\]](#) Thus, even though a prosecutor would want to induce a decision maker to commit the inverse fallacy, a reasoned cross-examination of the forensic expert presenting the evidence will bring out the true probative value of the testimony. To use the example of the match of a rare blood type, a defense attorney can easily point out that thousands of other people in the relevant population also share the rare blood type. In fact, some commentators have worried that defense attorneys can use the probabilistic nature of forensic testimony to induce juries to ignore forensic testimony altogether. [\[FN124\]](#)

Courts also require careful documentation of background factors such as the chain of custody of forensic evidence. [\[FN125\]](#) This focuses attention on those factors that the representativeness heuristic might otherwise lead people to disregard. These rules also enable defense attorneys to explore the possibility of laboratory error or other background factors that may affect the probative value of the evidence. Even if the decision maker is susceptible to the inverse fallacy, the adversarial process and the rules involving forensic evidence facilitate a countervailing influence on the decision maker.

The problem of the inverse fallacy is most acute in the context of DNA evidence. In principle, even though DNA evidence is sometimes referred to as "DNA fingerprinting," it does not differ from other probabilistic forensic evidence like blood type. [\[FN126\]](#) DNA matching consists of comparing small segments of a DNA sample from the perpetrator with the same segments of a DNA sample from the suspect. Many people share the same DNA ***88** profile at a particular segment, just as many people share the same blood type. Because a DNA lab can examine multiple segments, however, they can generate a much more precise match than would be the case for a blood type. Thus, whereas for blood type, the likelihood of a random match can range from one in four to one in one hundred, it is common for the likelihood of a random DNA match to range from one in one million to one in one billion. [\[FN127\]](#) As a consequence, a decision maker who commits the inverse fallacy in the case of a DNA match will be nearly confident of the defendant's guilt.

In evaluating the admissibility of DNA evidence, courts have expressed concern with the impact of DNA evidence on juries. Some courts have treated such evidence in the same way that they treat other forensic evidence, and allowed full introduction of such evidence and cross-examination, but others have worried that DNA evidence has too much potential for abuse, and excluded it. [\[FN128\]](#) Occasionally courts have allowed the fact of a DNA match to be admitted, but disallowed any reference to the likelihood of a random match. [\[FN129\]](#) In all cases, the courts have expressed the concern that the fact-finder will give too much weight to the fact of a DNA match. The current trend favors full admissibility of DNA evidence, but courts that have changed from excluding to allowing this testimony have done so only after deciding that the technique's reliability has improved so much that its probative value outweighs the potential for misinterpretation by the fact-finder. [\[FN130\]](#)

Judicial treatment of DNA evidence can be (and has been) criticized. Scholars have argued that those courts that have excluded DNA evidence have done so because of an unjustified (or empirically unsupported) assertion that juries will overreact to this evidence. [\[FN131\]](#) Even if this is true, courts are focused on the right issue: overweighing the value of a DNA match. The representativeness heuristic predicts that juries will attend too closely ***89** to the fact of a forensic match and pay comparatively less attention to base-rate statistics, which is precisely the concern that courts have expressed. The disparate judicial treatment of DNA evidence has resulted because the courts vary in the degree of concern that they express for the tendency of decision makers to overweigh the fact of a match. As with other forensic evidence, courts seem aware of the problem of the representativeness heuristic and have adopted procedures that respond to it.

Clearly, in some instances the courts have overreacted to the problem of representativeness in evaluating DNA evidence. Allowing the admission of the fact of a DNA match but not the probability of a random match is a foolish

adaptation. More generally, in the case of DNA evidence, courts failed to consider the possibility that juries simply distrust novel scientific evidence and actually under-weigh DNA evidence. [FN132] As with the hindsight bias, the adaptation might be worse than the problem. Nevertheless, without some recognition of the biases that might influence judgment in the courtroom, courts would be structuring rules under the naive hope that biases cancel each other out.

2. Forensic Evidence: Ignorance

Evidence of judicial ignorance of statistical principles and reliance on the representativeness heuristic can also be found. [FN133] In cases involving child sexual abuse, courts consider the presence of certain factors to constitute probative evidence that a child was sexually abused as long as a medical doctor indicates that these factors are "consistent with" child sexual abuse. [FN134] Doctors looking for a diagnosis search actively for factors that are "inconsistent with" disorders or conditions, as an accurate means of ruling such conditions out as a possible diagnosis. Assuming that "consistent with" means the same thing as "probative of," however, is essentially committing the inverse fallacy. In many cases, the presence of factors that are consistent with child sexual abuse are also common among children who are not victims of sexual abuse. [FN135] Rather than attending to base-rate and background statistics, courts are looking for characteristics in children that *90 match those characteristics of children who are sexually abused. In effect, courts rely on the representativeness heuristic to determine whether such evidence has probative value.

As is the case with all forensic evidence, effective cross-examination could highlight the statistical aspects of the evidence, thereby mitigating the effects of the representativeness heuristic. The error that judges make, however, is that they apply the wrong test for admissibility; they treat the term "consistent with" as being identical to "probative of." Consequently, the error that judges make is not in the weight that they give to the evidence, but that they give it any weight at all.

C. Falling Prey to the Representativeness Heuristic: Res Ipsa Loquitur

Similarly, the development of the doctrine of *res ipsa loquitur* suggests that courts fall prey to the inverse fallacy. As it is ordinarily stated, *res ipsa loquitur* represents a profound misunderstanding of the laws of probability in precisely the way that the representativeness heuristic predicts. Rather than recognizing and adapting to the bias, most courts have fallen victim to its influence.

In most of the usual forms in which it is presented, as Professor David Kaye has argued, the doctrine of *res ipsa loquitur* is badly flawed. [FN136] According to the Restatement (Second) of Torts, when judging liability for an event that resulted in injury to a plaintiff, a fact-finder may infer that the defendant was negligent if "the event is of a kind which ordinarily does not occur in the absence of negligence." [FN137] It is not entirely clear what the phrase "ordinarily does not occur in the absence of negligence" means precisely. It has commonly been restated as an assertion that the probability of injury, given the exercise of reasonable care, is small, or at least smaller than the probability of injury given negligence. [FN138] In most cases that embrace the doctrine, the facts can support either of these assertions. [FN139] Without information on the base rate of negligence, however, neither assertion supports the *91 conclusion that the defendant was more likely than not to be negligent.

To see why, consider an example, which replicates the rare disease problem described earlier. Suppose that a plaintiff is an innocent bystander who is injured when a barrel of flour falls on him. The defendant, a flour merchant, had employees lowering barrels of flour from his facility at the time of the accident, but there is no other proof of negligence on the defendant's part. [FN140] It is not difficult to believe that barrels normally do not fall on bystanders when people take reasonable care, or even that such accidents are far less likely to occur when the defendant is careful than when the defendant is negligent. Nevertheless, these observations cannot, by themselves, support the conclusion that the defendant failed to exercise reasonable care. Suppose that the probability of an injury given negligence is 10% and the probability of an injury given reasonable care is 1%. This would easily satisfy the traditional test for *res ipsa loquitur*, as described above. Further suppose that negligence is rare, and only occurs 1% of the time. Under these circumstances, the defendant is almost certainly not negligent.

Table 2, below, describes the conditional probabilities of the four possible outcomes, given the facts. Because the defendant is negligent 1% of the time and is 10% likely to cause an injury when negligent, the probability that on any given occasion a victim is injured by the defendant's negligence is 0.1% (and the probability that the defendant is negligent, but causes no injury is 0.9%). Because the defendant is not negligent 99% of the time and is 1% likely to cause an injury when not negligent, the probability that on any given occasion a victim is injured even though the defendant took reasonable care is 0.99% (and the probability that the defendant is not negligent and causes no injury is 98.01%). As a result, the conditional probability that the defendant is negligent, given that the plaintiff is injured, is 0.10 divided by 1.09, or 9.2%. [\[FN141\]](#)

Table 2: Res Ipsa Loquitur Problem

		Event		Total
		Injury	No Injury	
Actual	Negligent	0.10	0.90	1.0
Condition	Not Negligent	0.99	98.01	99.0
Total		1.09	98.91	100.0

Without incorporating the background rate of negligence into the calculation, the observation that barrels do not normally fall onto bystanders when reasonable care is exercised cannot ***92** constitute sufficient evidence of negligence by itself. The base rate of negligence is essential to evaluating the likelihood that the defendant was actually negligent.

The apparent inability of courts to formulate a proper interpretation of *res ipsa loquitur* can be attributed to a poor understanding of probability theory by the judiciary. Even so, ignorance of probability theory does not predict what kind of mistakes in probabilistic reasoning judges are apt to make. Relying on the representativeness heuristic leads precisely to the kind of mistakes that courts have made in formulating the doctrine of *res ipsa loquitur*. Courts that review cases of barrels falling on bystanders, sponges left inside of surgical patients, and airplanes lost at sea seem to have relied on this heuristic to develop legal doctrine. A barrel falling on a bystander closely resembles other incidents of negligence. This similarity leads courts to infer that negligence caused the barrel accident. In making this inference courts neglect the relevance of the base rate of negligence.

The development of *res ipsa loquitur* arose from concerns other than just conditional probabilities. [\[FN142\]](#) Early courts might have been concerned about the ability of plaintiffs to obtain access to evidence needed to prove their case, although modern discovery rules reduce the importance of this concern. Also, the courts in these cases might simply have felt that the defendants would be better able, under the circumstances, to bear the risk of injury. The formulation that these courts relied upon, however, provides no guarantee that the defendants are good insurers in such cases.

It might be that the courts simply failed to state clearly what they meant. In fact, a current draft of the American Law Institute's Restatement (Third) of Torts has adopted a new and accurate ***93** formulation of the doctrine. [\[FN143\]](#) It asserts that a fact-finder may infer that the defendant was negligent when the cause of the plaintiff's damages is "a type of accident that usually happens because of the negligence of one of the class of actors to which the defendant belongs." [\[FN144\]](#) This formulation targets the appropriate conditional probability--that of the likelihood of negligence given the accident. The formulations in *Byrne v. Boadle* [\[FN145\]](#) and the earlier Restatements mistakenly relied on the probability of non-negligence given the accident. The new formulation might well be what the judges in earlier cases had in mind, but failed to articulate properly. This failure is of a type that

the representativeness heuristic predicts that people will be prone to make, thereby suggesting that the heuristic has played a role in the development of the law.

III Ignorance or Adaptation?

The inconsistent judicial response to cognitive illusions presents a problem for the application of psychology to law. This inconsistency suggests that other considerations swamp psychological influences on the development of the common law. Closer analysis, however, reveals a pattern: courts tend to identify and adapt to the influence of cognitive illusions on the determination of issues that juries are likely to resolve and ignore or fall prey to the influence of cognitive illusions on the determination of issues that judges are likely to resolve. Judges are more likely to identify errors of judgment that the jury might commit than those that they would commit themselves. This pattern is consistent with the observation that taking an "outsider" perspective on a decision-making problem reduces the influence of cognitive illusions. [\[FN146\]](#)

A. Identifying Cognitive Illusions: Trial by Judge Versus Jury

The pattern of identifying the influence of cognitive illusions on jury decision making and not judicial decision making occurs with both of the cognitive phenomena discussed in this paper: the hindsight bias and the representativeness heuristic.

***94** 1. Hindsight Bias: Judge Versus Jury

Courts take note of the influence of the hindsight bias in cases that involve jury trials. In tort actions, courts always judge in hindsight, but seem to understand the problems associated with doing so. Courts suppress information that could not have been known beforehand, such as subsequent remedial measures, and allow defendants to use their reliance on ex ante standards of conduct as defenses. [\[FN147\]](#) In fact, in medical-malpractice cases, compliance with custom is a complete shield to liability. [\[FN148\]](#) In areas of law as diverse as patents and securities fraud, judicial opinions and judicial rulings reflect a concern with judging in hindsight. [\[FN149\]](#) Although some types of these cases, particularly those concerning patents, can be equitable actions in which the issues are resolved by judges, the courts know that they must adopt rules that are sometimes implemented by juries. In those types of cases that frequently require jury trials, the courts worry about the problem of determining liability in hindsight.

Suits brought by beneficiaries against trustees, however, are invariably actions brought in equity, not law. [\[FN150\]](#) Consequently, these cases cannot be jury trials. Under these circumstances, recognizing that the hindsight bias influences how a fact-finder interprets the facts and making some adjustment requires that judges acknowledge that the bias influences their decision making. This puts the judge squarely inside the decision-making problem, making it hard to identify the influence of a cognitive illusion. The difficulty of identifying one's own susceptibility to cognitive illusions might explain why courts in trusts cases are so vulnerable to the hindsight bias.

The development of the business judgment rule in corporate law presents a problem for this explanation. Under the business judgment rule, officers and directors of corporations are not liable to their shareholders for negligent business decisions. [\[FN151\]](#) Courts commonly justify this doctrine on the grounds that judging ***95** business decisions in hindsight is necessarily biased. [\[FN152\]](#) Judges recognize that even sound business decisions in foresight can seem foolish in hindsight. [\[FN153\]](#) In most jurisdictions, suits by shareholders against corporate officers must be brought in equity, just like actions by beneficiaries against trustees. Thus, the business judgment rule was developed primarily for bench trials, arguably making it an example of courts identifying a cognitive illusion in judges.

Unlike actions by beneficiaries against trustees, however, suits by shareholders against corporate officers are not uniformly bench trials. In the nineteenth century, as the doctrine developed, a few jurisdictions did not consider such actions equitable in nature. In fact, one of the earliest American cases adopting the business judgment rule was an appeal from a jury trial. [\[FN154\]](#) Furthermore, the business judgment rule is sometimes misapplied in ways that

suggest vulnerability to the influence of the hindsight bias. The Delaware Supreme Court arguably fell prey to the hindsight bias in holding the corporate board liable for a breach of their duty of care to the shareholders in *Smith v. Van Gorkum*. [FN155] The holding in the case was widely criticized, [FN156] and, ultimately, the Delaware legislature acted to alter the court's application of the doctrine. Thus, even though the development of the business judgment rule looks like an example of courts adapting well to the hindsight bias in cases involving judges, the occasional availability of jury trials aided development of the doctrine and, when juries are not available, courts are still vulnerable to missteps.

Thus, despite a few wrinkles, the distinction between judge and *96 jury trials maps onto the circumstances in which courts adapt or fail to adapt to the hindsight bias.

2. The Representativeness Heuristic: Judge Versus Jury

Likewise, even though cases involving *res ipsa loquitur* are commonly jury trials, the application of *res ipsa loquitur* combines law making and fact-finding functions into one decision maker. In deciding to apply *res ipsa loquitur*, courts are essentially deciding that the facts mean that the defendant is more likely than not to be negligent. Even though a jury might later decide that evidence the defendant provides rebuts this initial determination, the shift in the burden of proof is the product of judicial fact-finding.

By contrast, probabilistic forensic evidence is likely to be evaluated by a jury. Judges might be more likely to suspect that a jury will rely excessively on the representativeness heuristic than realize that they would do so themselves. The judicial assessment of forensic evidence in cases involving allegations of child sexual abuse confirm the theory that judges do not readily spot biases in themselves. Judges confuse "consistent with" and "probative" in precisely the way the representativeness heuristic predicts. Contrasting the child sexual abuse cases with the history of admissibility of DNA evidence shows that judges worry about the way juries react to probabilistic evidence, but express no concern with their own probabilistic reasoning skills.

3. Other Cognitive Phenomena: Framing and Anchoring

Many cognitive processes other than the hindsight bias and the representativeness heuristic can produce errors of judgment in the courts. [FN157] These could also provide potential tests of the theory that courts identify systematic sources of error in juries but not in judges. Some cognitive processes, however, might have completely escaped the notice of courts, regardless of the decision-making body. Cognitive psychologists have identified decision-making processes that are not as intuitive as the hindsight bias or the representativeness heuristic and might have escaped judges' attention.

For example, courts do not recognize and adapt to the cognitive *97 process known as "anchoring." Anchoring refers to the tendency, when making quantitative judgments for arbitrary numeric reference points, to influence judgments. [FN158] For example, in one study, psychologists Tversky and Kahneman asked subjects to estimate the percentage of countries in the United Nations that are African, but only after first spinning a "wheel of fortune" to provide an arbitrary starting point for the subjects' estimates. The subjects were told that they would first be asked to determine whether the percentage obtained from the wheel was accurate, and then asked to provide their own estimates. For half of the subjects, the wheel provided them with an anchor of 10% and the other half started with 65%. Subjects in the former group gave a median estimate of 25%, while subjects in the latter group gave a median estimate of 45%. [FN159]

Several studies document the effects that anchors have on determinations of damage awards in civil lawsuits. [FN160] These studies reveal that the amount that plaintiffs request in damages influence the determination of civil damage awards. This occurs even when the anchor is wholly absurd, such as asking for more than a billion dollars in an individual personal-injury lawsuit. [FN161] Likewise, statutory damage caps have a much more profound effect on damage awards than merely truncating awards at the amount of the cap--they raise and lower the size of awards, depending upon whether the cap is high or low, relative to the likely award. [FN162] Recent data also suggests that anchors influence judges as well. [FN163]

***98** Despite these effects, courts have expressed no recognition of the effect of anchors in any kind of case. [FN164] Judges instruct juries that the damage requests by attorneys should be given no weight, but in light of the evidence that meaningless, arbitrary anchors influence decision making, this instruction is unlikely to be of any value. Likewise, courts that have had to contend with statutory damage caps have largely failed to recognize that these caps can influence awards. [FN165] Even plaintiff's attorneys do not really understand the effects of anchors. Many seem to realize that their requests will have an effect on juries, [FN166] but plaintiffs might carefully limit their requests, so as not to seem greedy. The truth, as one study put it, is that "the more you ask for, the more you get." [FN167] The subtleties of how anchors affect decision making might simply lie beyond the basic intuitions of judges. Consequently, they do not identify the bias either in themselves or in juries.

Similarly, courts have failed to address the problem of psychological framing in a systematic way. Framing refers to the tendency to treat gains differently from losses. [FN168] Because many choices that involve losses can easily be recast as gains (and vice versa), this disparity can lead to arbitrariness in decision making. For example, doctors and patients make different choices about medical treatments depending upon whether the risks associated with treatment are described as likelihood of dying or likelihood of surviving. [FN169] A review of a variety of areas of law reveals that courts also treat gains and losses very differently. [FN170] These differences can be arbitrary. For example, courts generally refuse to enforce contractual terms providing specific penalties for nonperformance ***99** of a contract, but are willing to enforce bonuses for on-time performance. [FN171] In the jury context, courts do not believe that attorney requests to the jury to measure pain and suffering damages as the amount the plaintiff would be willing to pay (gains frame) as being any different from the amount that the plaintiff would be willing to accept (loss frame), even though the two produce stunningly different results.

Like anchoring, framing seems to lie beyond the ability of courts to identify, regardless of whether the issue involves a judge or a jury. Framing is difficult to grasp intuitively, and studies show that subjects shown two problems that are identical except for a restructuring of the frame often see the problems as different. [FN172] Understanding the influence of framing requires that people understand how a problem can easily be recast as a gain or as a loss and then understand that the problem would feel different if recast.

In sum, there are cognitive biases that operate outside the ability of courts to identify altogether. As is the case with representativeness and the hindsight bias, however, some biases can be identified, but the identification seems to occur only in cases likely to involve jury trials.

B. Outsider Versus Insider Perspectives in the Courts

Courts identify cognitive illusions that might affect juries and adapt to them, but fail to identify cognitive illusions that affect judges and fall prey to them. This account of the circumstances that lead courts to identify illusions of judgment has an intuitive appeal and empirical support. Intuitively, it might be easier to spot illusions that affect someone else than affect oneself. Although psychologists have not collected much data that directly tests this theory, what data there is supports it. [FN173] Also, there is some indirect evidence with respect to the hindsight bias. The bias cannot be eliminated by warning people about the influence of the bias; when warned about its effects, people quickly agree that others are susceptible to its effects, but believe that they themselves have made internal corrections. [FN174]

***100** The theory that jury trials facilitate recognition of cognitive illusions is consistent with the distinction that cognitive psychologists have made between insider and outsider perspectives on decision making. When a person fails to see that a problem is one of a type of problem, they treat the problem as unique, leaving them vulnerable to cognitive illusions. Psychologists refer to this as being inside the problem. Inside the problem, irrelevant details take on greater importance and lead people astray. For example, in the analysis of forensic evidence, people taking an insider view might argue that the probability that any defendant with a certain set of characteristics is guilty is irrelevant, because they want to know the probability that this particular defendant is guilty. This inside perspective leads people to rely on their feelings as to whether the defendant is guilty: feelings that might be the erroneous products of over-reliance on the representativeness heuristic. Someone who views this decision as one of a class of decisions, however, would see the relevance of the statistical evidence and be more inclined to give it appropriate

weight. [\[FN175\]](#)

The distinction between insider and outsider perspectives also explains why appellate courts do not identify cognitive biases in judges. Judges find it easier to identify with other judges than with juries. Even though the standard of review of judicial fact-finding is generally less deferential than the standard of review of jury fact-finding, appellate courts are more likely to overturn the outcome of a jury trial than a bench trial. [\[FN176\]](#)

Rather than reflecting a deeper psychological phenomenon, however, the split between courts identifying cognitive illusions in juries but not in judges could reflect a belief that judges are not susceptible to systematic errors of judgment. If judges think juries are error prone they might actively seek cognitive illusions that influence juries, whereas they simply trust judges.

Although it is possible that judges make better decisions than juries, there is little evidence to support this belief. As noted in the introduction, judges encounter little or no feedback on the quality of their decisions, making it difficult for them to learn decision making on the job. Furthermore, research indicates that judges, like everyone else, are susceptible to illusions of judgment. Several studies show that judges commit the hindsight bias ***101** in legal contexts. [\[FN177\]](#) Also, a recent study of 167 federal magistrate judges shows that judges are subject to the same range of cognitive illusions that influence other professionals, including framing effects, egocentric biases, anchoring effects, errors caused by the representativeness heuristic, and the hindsight bias. [\[FN178\]](#) Finally, as noted earlier in this Article, analysis of judicial opinions in trusts cases suggests that even when writing publicly available opinions, judges can fall prey to the hindsight bias. The data indicate that judges are not immune to illusions of judgment, although they might be less susceptible to them than laypersons.

The distinction between insider and outsider perspectives also suggests that the legislature might play an important role in adapting to cognitive illusions. In the case of the hindsight bias, legislative action to adopt the UPIA has proven necessary to wrest the court out of the grip of the hindsight bias. Legislatures could also introduce new biases as well. In the case of the effect of anchoring, legislation creating damage caps creates anchors that might unintentionally influence damage awards. Legislatures are probably best viewed as both a source of outside reform that might ameliorate bias, but might be subject to their own biases as well. [\[FN179\]](#)

As a final implication of the problem of the tendency of insider perspectives to invite bias into the courtroom, consider the issue of jury nullification. When a jury nullifies, it effectively decides both the law and the facts. As such, a jury that considers nullifying might be unable to identify any illusions of judgment that lead it to its verdict choice. Although what little empirical data that is available on nullification suggests that jurors take a principled approach to nullification, [\[FN180\]](#) the analysis in this Article suggests that encouraging nullification is an invitation to bias.

***102 Conclusion**

When courts do identify cognitive illusions, it is not altogether clear that they adopt sensible solutions. Courts might overreact to them, particularly if their abilities to identify cognitive illusions arises from a belief that juries are incompetent. For example, even if juries place too much weight on statistical evidence, as the representativeness heuristic predicts, withholding such evidence from them might be inappropriate. Absent an accurate quantification of the size of the bias that representativeness heuristic creates relative to the normative influence of statistical forensic evidence, a court could not be certain that withholding such evidence might do more to undermine the accuracy of the process than admitting such evidence. Likewise, without a quantification of the size of the hindsight bias, it is not clear that withholding the fact of subsequent remedial measures is appropriate.

Despite these problems, the adjudication process is better served when courts are aware of the cognitive biases that influence decision making than when they disregard them or fall prey to them. Courts might overreact to the perception that illusions cloud judgment, but identifying a bias in judgment allows for public debate on the appropriate remedy. Whether it is the separation of making procedural rules from fact-finding or just judicial skepticism about the jury process, something about the jury system enables courts to identify illusions of judgment that might plague the legal system. This separation reveals potential imperfections in the process, and possibly

inspires adaptations that might otherwise have been ignored.

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[FN1]. See Daniel Kahneman & Amos Tversky, *On the Reality of Cognitive Illusions*, 103 *Psychol. Rev.* 582, 582 (1996); Amos Tversky & Daniel Kahneman, *Judgment Under Uncertainty: Heuristics and Biases*, 185 *Sci.* 1124, 1124 (1974).

[FN2]. See Kahneman & Tversky, *supra* note 1, at 582; Tversky & Kahneman, *supra* note 1, at 1124.

[FN3]. See Robert Sekuler & Randolph Blake, *Perception* 283-90 (3d ed. 1994) (describing the phenomenon of apparent motion).

[FN4]. See, e.g., Elizabeth F. Loftus, *Creating Childhood Memories*, 11 *Applied Cognitive Psychol.* S75 (1997) (describing research on suggestive questioning that leads people to falsely believe that they had once gotten lost in a shopping mall as a child).

[FN5]. See Baruch Fischhoff, *Hindsight not= Foresight: The Effect of Outcome Knowledge on Judgment Under Uncertainty*, 1 *J. Experimental Psychol.* 288 (1975).

[FN6]. See Chip Heath et al., *Cognitive Repairs: How Organizational Practices Can Compensate for Individual Shortcomings*, 20 *Res. in Organizational Behav.* 1 (1998).

[FN7]. See Shari Seidman Diamond, *Foreword to Handbook of Psychology and Law* v, vi-vii (Dorothy K. Kagehiro & William S. Laufer eds., 1992) ("In some... cases, the courts have ignored, distorted, or rejected psychological findings."); John Monahan & Laurens Walker, *Social Science Research in Law: A New Paradigm*, 43 *Am. Psychologist* 465, 465 (1988) ("[Psychologists] complain that their research is either ignored or misconstrued"); Mark A. Small, *Legal Psychology and Therapeutic Jurisprudence*, 37 *St. Louis U. L.J.* 675, 686-93 (1993) (describing the content of the majority of articles in the leading journal of psychology and law). See generally, *The Use/Nonuse/Misuse of Applied Social Research in the Courts* 28-51 (Michael J. Saks & Charles H. Baron eds., 1980) (arguing that the courts misunderstand psychological phenomena). For a recent example of this use of psychology, see Jon D. Hanson & Douglas A. Kysar, *Taking Behavioralism Seriously: The Problem of Market Manipulation*, 74 *N.Y.U. L. Rev.* 630, 715-21 (1999); Jon D. Hanson & Douglas A. Kysar, *Taking Behavioralism Seriously: Some Evidence of Market Manipulation*, 112 *Harv. L. Rev.* 1420, 1553-67 (1999) (arguing that cognitive psychological research supports a significant change in products liability law).

[FN8]. Heath et al., *supra* note 6, at 4.

[FN9]. See, e.g., Steven L. Johnson & Stanley N. Roscoe, *What Moves, the Airplane or the World?*, 14 *Hum. Factors* 107 (1972) (discussing perceptual illusions created by air travel).

[FN10]. Courts should also consider the effects of visual and mnemonic illusions that might have influenced the parties and witnesses who appear before them as well. For example, courts should be concerned about the limitations of human perception when determining whether a defendant in an accident was negligent, and should worry about the accuracy of the perception and memory of witnesses.

[FN11]. See Paul Slovic et al., Facts Versus Fears: Understanding Perceived Risk, in Judgment Under Uncertainty: Heuristics and Biases 463, 475-78 (Daniel Kahneman et al. eds., 1982).

[FN12]. See Dale Griffin & Amos Tversky, The Weighing of Evidence and the Determinants of Confidence, 24 Cognitive Psychol. 411, 412 (1992) ("[E]xpert prediction [is] 'often wrong, but rarely in doubt.'").

[FN13]. Heath et al., *supra* note 6, at 4.

[FN14]. M. Hynes & E. Vanmarcke, Reliability of Embankment Performance Predictions, in Proceedings of the ASCE Engineering Mechanics Division Specialty Conference, Waterloo, Ontario, Canada (1976), cited in Heath et al., *supra* note 6, at 4.

[FN15]. See Richard A. Posner, An Economic Approach to the Law of Evidence, 51 Stan. L. Rev. 1477, 1494 (1999) ("The literature on these illusions provides some basis for thinking that market settings tend to dispel or at least reduce them, but none for thinking that government processes have similar effects.") (footnotes omitted).

[FN16]. To be sure, alternative dispute resolution techniques have become popular, but these require some level of cooperation by the disputants. In a case in which parties are unwilling to cooperate, there is no adequate substitute for judicial authority.

[FN17]. Even apart from any market pressures, judges might face other pressures to be accurate, such as promotion or re-election. The literature on judicial decision-making processes contains mixed evidence as to whether such pressures have an effect on American judges. See John Blume & Theodore Eisenberg, Judicial Politics, Death Penalty Appeals, and Case Selection: An Empirical Study, 72 S. Cal. L. Rev. 465, 497-502 (1999) (reporting mixed evidence that appellate judges respond to election pressures in death penalty cases); Gregory C. Sisk et al., Charting the Influences on the Judicial Mind: An Empirical Study of Judicial Reasoning, 73 N.Y.U. L. Rev. 1377, 1487- 93 (1998) (reporting that opportunity for promotion influences judicial decision making in separation of powers cases).

[FN18]. See Kevin M. Clermont & Theodore Eisenberg, Appeal from Judge or Jury Trial: Defendants' Advantage, ___ Am. L. & Econ. Rev. ___ (forthcoming 2000) (parties appeal less than 30% of final judgments from trials in federal courts).

[FN19]. There is a difference between recognizing and adjusting to a bias in decision making in the courts, and recognizing and adjusting the law in the face of a bias that plagues decision makers outside of the courts. This paper focuses mainly on the former. See Jeffrey J. Rachlinski, The "New" Law and Psychology: A Reply to Critics, Skeptics, and Cautious Supporters, 85 Cornell L. Rev. 739, 753-60 (2000) (discussing the different analyses of cognitive biases in and out of the courtroom).

[FN20]. See Christine Jolls et al., A Behavioral Approach to Law and Economics, 50 Stan. L. Rev. 1471 (1998);

Donald C. Langevoort, Behavioral Theories of Judgment and Decision Making in Legal Scholarship: A Literature Review, 51 *Vand. L. Rev.* 1499 (1998); Cass R. Sunstein, Behavioral Analysis of Law, 64 *U. Chi. L. Rev.* 1175 (1997); Russell B. Korobkin & Thomas S. Ulen, Law and Behavioral Science: Removing the Rationality Assumption from Law and Economics, 88 *Cal. L. Rev.* 1051 (2000).

[FN21]. See Melvin Aron Eisenberg, The Limits of Cognition and the Limits of Contract, 47 *Stan. L. Rev.* 211, 225-36 (1995); Larry T. Garvin, Adequate Assurance of Performance: Of Risk, Duress, and Cognition, 69 *U. Colo. L. Rev.* 71, 149-52 (1998); Larry T. Garvin, Disproportionality and the Law of Consequential Damages: Default Theory and Cognitive Reality, 59 *Ohio St. L.J.* 339, 404-06 (1998); see also Rachlinski, *supra* note 19, at 760-63 (responding to Professor Hillman's critique of the use of psychology in contract law). But see Robert A. Hillman, The Limits of Behavioral Decision Theory in Legal Analysis: The Case of Liquidated Damages, 85 *Cornell L. Rev.* 717, 729-36 (2000) (arguing that cognitive psychology cannot fully account for the contours of contract law).

[FN22]. Donald C. Langevoort, Organized Illusions: A Behavioral Theory of Why Corporations Mislead Stock Market Investors (and Cause Other Social Harms), 146 *U. Pa. L. Rev.* 101, 157-63 (1997).

[FN23]. Daniel Kahneman & Dan Lovallo, Timid Choices and Bold Forecasts: A Cognitive Perspective on Risk Taking, 39 *Mgmt. Sci.* 17, 24-27 (1993).

[FN24]. *Id.*

[FN25]. See Justin Kruger & Thomas Gilovich, "Naive Cynicism" in Everyday Theories of Responsibility Assessment: On Biased Assumptions of Bias, 76 *J. Personality & Soc. Psychol.* 743, 744 (1999).

[FN26]. See Fischhoff, *supra* note 5. For review of research on the hindsight bias, see Scott A. Hawkins & Reid Hastie, Hindsight: Biased Judgments of Past Events After the Outcomes Are Known, 107 *Psychol. Bull.* 311, 311-14 (1990); Jeffrey J. Rachlinski, A Positive Psychological Theory of Judging in Hindsight, 65 *U. Chi. L. Rev.* 571, 576-88 (1998).

[FN27]. Rachlinski, *supra* note 26, at 602-24 (describing judicial adaptations to the influence of the hindsight bias).

[FN28]. Baruch Fischhoff, For Those Condemned to Study the Past: Heuristics and Biases in Hindsight, in Judgment Under Uncertainty: Heuristics and Biases 335, 341 (Daniel Kahneman et al. eds., 1982).

[FN29]. Fischhoff, *supra* note 5, at 289-93.

[FN30]. *Id.* at 290-92.

[FN31]. See Jay J. Christensen-Szalanski & Cynthia Fobian Willham, The Hindsight Bias: A Meta-analysis, 48 *Organizational Behav. & Hum. Decision Processes* 147, 150 (1991); Rachlinski, *supra* note 26, at 578-79.

[FN32]. But see David Mazursky & Chezy Ofir, "I Could Never Have Expected It To Happen": The Reversal of the Hindsight Bias, 46 *Organizational Behav. & Hum. Decision Processes* 20 (1990); Bas Verplanken & Rik G. M.

Pieters, Individual Differences in Reverse Hindsight Bias: I Never Thought Something Like Chernobyl Would Happen. Did I? 1 J. Behav. Decision Making 131 (1988). Although both studies purport to have discovered reversals of the hindsight bias, both have been criticized, and in fact did not uncover true reversals of the effect. Rachlinski, supra note 26, at 580 n.31.

[FN33]. See Rachlinski, supra note 26, at 577-78 (reviewing studies).

[FN34]. See id. at 586-88 (reviewing studies).

[FN35]. Ralph Hertwig et al., The Reiteration Effect in Hindsight Bias, 104 Psychol. Rev. 194, 201 (1997) (one of the co-authors of this paper, Professor Gigerenzer, is generally skeptical of cognitive biases).

[FN36]. Hawkins & Hastie, supra note 26, at 314; Rachlinski, supra note 26, at 582-86.

[FN37]. See Hawkins & Hastie, supra note 26, at 314; Rachlinski, supra note 26, at 584-86.

[FN38]. See David Wasserman, et al., Hindsight and Causality, 17 Personality & Soc. Psychol. Bull. 30, 31 (1991) (testing this theory).

[FN39]. See id.

[FN40]. Rachlinski, supra note 26, at 577.

[FN41]. Id. at 590-91.

[FN42]. Kim A. Kamin & Jeffrey J. Rachlinski, Ex Post not= Ex Ante: Determining Liability in Hindsight, 19 Law & Hum. Behav. 89, 94-97 (1995).

[FN43]. Merrie Jo Stallard & Debra L. Worthington, Reducing the Hindsight Bias Utilizing Attorney Closing Arguments, 22 Law & Hum. Behav. 671 (1998); Reid Hastie et al., Juror Judgments in Civil Cases: Hindsight Effects on Judgments of Liability for Punitive Damages, 23 Law & Hum. Behav. 597 (1999); Susan J. LaBine & Gary LaBine, Determinations of Negligence and the Hindsight Bias, 20 Law & Hum. Behav. 501 (1996).

[FN44]. Hal R. Arkes & Cindy A. Schipani, Medical Malpractice v. the Business Judgment Rule: Differences in Hindsight Bias, 73 Or. L. Rev. 587, 630-36 (1994); Hastie et al., supra note 43, at 611-12; Jolls et al., supra note 20, at 1529-32.

[FN45]. Rachlinski, supra note 26, at 586-88.

[FN46]. Id.

[FN47]. Lynn Hasher et al., I Knew It All Along: Or, Did I?, 20 J. Verbal Learning & Verbal Behav. 86, 88-94 (1981).

[FN48]. Stallard & Worthington, *supra* note 43, at 674-80. This study is of note for legal scholars, as the authors claim to have developed a means of eliminating the hindsight bias in a legal setting. Stallard and Worthington's study, however, achieved this result by altering the determination that their subjects had to make.

[FN49]. Rachlinski, *supra* note 26, at 587.

[FN50]. *Id.*

[FN51]. See *id.* at 594-95.

[FN52]. Hastie et al., *supra* note 43, at 611; Jolls et al., *supra* note 20, at 1529-32.

[FN53]. Rachlinski, *supra* note 26, at 623-24.

[FN54]. See Fed. R. Evid. 407 advisory committee's note (indicating that subsequent remedial measures are barely relevant and are suppressed out of a belief that fact-finders will give them more weight than is appropriate); see also Flaminio v. Honda Motor Co., 733 F.2d 463, 471 (7th Cir. 1984) ("It is only because juries are believed to overreact to evidence of subsequent remedial measures that the admissibility of such evidence could deter defendants from taking such measures.").

[FN55]. See, e.g., Cain v. Rijken, 300 Or. 706, 720, 717 P.2d 140, 149 (1986) ("Proof aided by hindsight... is insufficient to establish negligence."); DiLeo v. Ernst & Young, 901 F.2d 624, 628 (7th Cir. 1990) ("There is no 'fraud by hindsight...'") (quoting Denny v. Barber, 576 F.2d 465, 470 (2d Cir. 1978)). See generally Rachlinski, *supra* note 26, at 615-17 (discussing these cases). The exception to this policing against hindsight is the doctrine of *res ipsa loquitur*, which has its own problems, as discussed *infra* Section II.C.

[FN56]. See Rachlinski, *supra* note 26, at 613-15.

[FN57]. Restatement (Second) of Torts § 288 (1965) (discussing the effect of regulations) and § 295A (discussing the effect of compliance with custom).

[FN58]. See W. Page Keeton et al., Prosser and Keeton on the Law of Torts § 32, at 189 (5th ed. 1984).

[FN59]. See Rachlinski, *supra* note 26, at 619-20 (reviewing this doctrine).

[FN60]. *Id.* at 607-23.

[FN61]. Likewise, the civil engineering practice of multiplying a building's safety factor by three to eight might be an over-reaction to the difficulty of determining the appropriate foundation strength.

[FN62]. I especially thank Professor Mitu Gulati for this comment made at the symposium.

[FN63]. See Terry Connolly & Edward W. Bukszar, *Hindsight Bias: Self- Flattery or Cognitive Error?*, 3 J. Behav. Decision Making 205 (1990) (describing research showing that the evaluation of investment decision is influenced by the hindsight bias).

[FN64]. 3 Austin Wakeman Scott & William Franklin Fratcher, *The Law of Trusts* § 227, at 433 (4th ed. 1988).

[FN65]. See John H. Langbein, *The Uniform Prudent Investor Act and the Future of Trust Investing*, 81 Iowa L. Rev. 641, 643 (1996).

[FN66]. Mayo Adams Shattuck, *The Development of the Prudent Man Rule for Fiduciary Investment in the United States in the Twentieth Century*, 12 Ohio St. L.J. 491, 492 (1951).

[FN67]. *Id.* A settlor could contract around the legal-list rule and a trustee could invest in securities not included on the list and risk liability, which could perhaps be compensated by a higher fee. See Jeffrey N. Gordon, *The Puzzling Persistence of the Constrained Prudent Man Rule*, 62 N.Y.U. L. Rev. 52, 75-76 (1987).

[FN68]. *26 Mass. (9 Pick.) 446 (1830)*.

[FN69]. *Id.* at 461 (emphasis added).

[FN70]. A bond investment returning a fixed five percent return is a terrible investment if inflation is eight percent.

[FN71]. Roger G. Ibbotson & Rex A. Sinquefeld, *Stocks, Bonds, Bills, and Inflation: Historical Returns (1926-1978)* 7-12 (1989) (three percent versus nine percent on average between the 1920's and 1970's).

[FN72]. Shattuck, *supra* note 66, at 501-04.

[FN73]. *Id.* at 496-501.

[FN74]. See Scott, *supra* note 64, § 227.6, at 444 (identifying investments considered imprudent); see also *Restatement (Second) of Trusts* § 227 cmt. f (1959).

[FN75]. *First Ala. Bank v. Martin*, 425 So. 2d 415 (Ala. 1982); *Estate of McCredy*, 470 A.2d 585 (Pa. Super. 1983); *Steiner v. Hawaiian Trust Co.*, 393 P.2d 96 (Haw. 1964); see also Gordon, *supra* note 67, at 70-74 (discussing these cases).

[FN76]. Restatement (Second) of Trusts § 227 cmt. f (1959); Scott, supra note 64, § 227.6, at 444.

[FN77]. Gordon, supra note 67, at 58-62.

[FN78]. In re Morgan Guaranty Trust Co., 396 N.Y.S.2d 181 (1977).

[FN79]. Id.

[FN80]. See Gordon, supra note 67, at 59-62.

[FN81]. Id. at 54-55; Langbein, supra note 65, at 645.

[FN82]. Gordon, supra note 67, at 70-74; Langbein, supra note 65, at 645.

[FN83]. Restatement (Third) of Trusts: Prudent Investor Rule § 227 (1992).

[FN84]. Unif. Prudent Investor Act § 2(b) (1994).

[FN85]. Langbein, supra note 65, at 641-42.

[FN86]. Rachlinski, supra note 26, at 595-602 (explaining the effects of negligence influenced by the hindsight bias). Alternatively, trustees could fully diversify and risk incurring surcharges for those investments that perform poorly; the trustees would then pass the cost of these surcharges on to all of their beneficiaries. See Gordon, supra note 67, at 83-84.

[FN87]. See Jeffrey J. Rachlinski, Regulating in Foresight versus Judging Liability in Hindsight: The Case of Tobacco, 33 Ga. L. Rev. 813, 830-31 (1999).

[FN88]. Id. at 831-38.

[FN89]. See Jonathan Baron & John C. Hershey, Outcome Bias in Decision Evaluation, 54 J. Personality & Soc. Psychol. 569 (1988).

[FN90]. See Edward C. Halbach, Jr., Trust Investment Law in the Third Restatement, 77 Iowa L. Rev. 1151, 1152 (1992).

[FN91]. See Gordon, supra note 67, at 73 (documenting this problem).

[FN92]. Chase v. Pevear, 419 N.E.2d 1358, 1368 (Mass. 1981).

[FN93]. First Ala. Bank v. Martin, 425 So. 2d 415, 428 (Ala. 1982).

[FN94]. In re Estate of Collins, 139 Cal. Rptr. 644, 649 (Cal. Ct. App. 1977) (the first mortgage was for \$90,000 and the property, at the time of the second mortgage of \$50,000, was valued at \$107,000; but the real estate market was rapidly rising at the time).

[FN95]. In re Estate of Chamberlain, 156 A. 42, 43 (N.J. Prerog. Ct. 1931) ("It was common knowledge, not only amongst bankers and trust companies, but the general public as well, that the stock market condition at the time of testator's death was an unhealthy one, that values were very much inflated and that a crash was almost sure to occur.").

[FN96]. Gordon, *supra* note 67, at 66-74.

[FN97]. *Id.* at 59-62; Halbach, *supra* note 90, at 1152.

[FN98]. To be sure, the courts make other mistakes in these cases. For example, they fail to understand how to evaluate a portfolio (although this might be related to the hindsight bias). See Gordon, *supra* note 67, at 70-74. The new Restatement is also designed to address this problem. See Langbein, *supra* note 65, at 645-49.

[FN99]. See Gordon, *supra* note 67, at 72-73.

[FN100]. The new Restatement version of the prudent-investor rule, of course, raises its own problem with the hindsight bias. It is by no means a bright-line rule, and the adequacy of diversification or rate of return of a portfolio will inevitably be judged in hindsight in those cases in which a beneficiary is dissatisfied.

[FN101]. 419 N.E.2d 1358, 1368 (Mass. 1981).

[FN102]. 425 So. 2d 415, 428 (Ala. 1982).

[FN103]. 139 Cal. Rptr. 644 (Cal. Ct. App. 1977).

[FN104]. See Ward Edwards & Detlof von Winterfeldt, Cognitive Illusions and Their Implications for the Law, 59 S. Cal. L. Rev. 225, 232-38 (1986); Jonathan J. Koehler & Daniel N. Shaviro, Veridical Verdicts: Increasing Verdict Accuracy Through the Use of Overtly Probabilistic Evidence and Methods, 75 Cornell L. Rev. 247, 255-56 (1990).

[FN105]. Amos Tversky & Daniel Kahneman, Judgments of and by Representativeness, in Judgment Under Uncertainty: Heuristics and Biases 84, 84-87 (Daniel Kahneman et al. eds., 1982).

[FN106]. See Daniel Kahneman & Amos Tversky, On the Psychology of Prediction, 80 Psychol. Rev. 237 (1973);

Tversky & Kahneman, *supra* note 1, at 1124-27; Tversky & Kahneman, *supra* note 105.

[FN107]. Kahneman & Tversky, *supra* note 106, at 237-38.

[FN108]. *Id.* at 238-43.

[FN109]. *Id.* at 238-39.

[FN110]. *Id.* at 241-43.

[FN111]. Ward Casscells et al., Interpretation by Physicians of Clinical Laboratory Results, 299 *New Eng. J. Med.* 999, 999-1000 (1978).

[FN112]. This problem is based on a discussion in David M. Eddy, Probabilistic Reasoning in Clinical Medicine: Problems and Opportunities, in *Judgment Under Uncertainty: Heuristics and Biases* 249, 252-59 (Daniel Kahneman et al. eds., 1982).

[FN113]. *Id.*

[FN114]. See Casscells et al., *supra* note 111, at 1000.

[FN115]. For a discussion of the Bayesian process, see *infra* note 122.

[FN116]. William C. Thompson, Are Juries Competent to Evaluate Statistical Evidence?, 52 *Law & Contemp. Probs.* 9, 25-28 (1989) (referring to this problem as the "prosecutor's fallacy").

[FN117]. Kahneman & Tversky, *supra* note 106, at 243-45. But see Jonathan J. Koehler, The Base Rate Fallacy Reconsidered: Descriptive, Normative, and Methodological Challenges, 19 *Behav. & Brain Sci.* 1, 1-10 (1996) (arguing that base rate neglect is not the product of the representativeness heuristic).

[FN118]. But see Koehler, *supra* note 117, at 5-10 (arguing that sometimes people pay close attention to the base rate statistics).

[FN119]. See Tversky & Kahneman, *supra* note 1; Kahneman & Tversky, *supra* note 106 (describing these phenomena).

[FN120]. See Thompson, *supra* note 116, at 25-28 (referring to this as the "prosecutor's fallacy").

[FN121]. *Id.*

[FN122]. Such an inference would require applying Bayes Theorem, which can be stated as follows: $P(H/E) = [P(E/H)P(H)]/P(E)$. It is easier to calculate first the probability that the defendant is guilty given the evidence and then subtract the result from 1.0 to obtain the probability that the defendant is innocent. Suppose that the decision-maker had no evidence pertaining to the defendant's guilt or innocence prior to the presentation of the fact of the blood match other than that the perpetrator was known to be a resident of a town with a population of 100,000. If the defendant is also from this town, then the prior probability of guilt, or $P(H)$, is 1/100,000. The probability of a blood match (assuming away lab error) if the defendant is guilty is 1.0. The unconditional probability of the evidence itself is 1/20. Plugging these three values into Bayes Theorem reveals that the probability that the defendant is guilty given the evidence of a blood match is 1/5,000 (or .02 percent). Hence, given this evidence, the probability that the defendant is innocent is 99.98 percent.

[FN123]. See Koehler, *supra* note 117, at 6-7 (citing studies).

[FN124]. Thompson, *supra* note 116, at 31 (discussing the "defense attorney's fallacy" that because evidence is only probabilistic, it is not relevant).

[FN125]. See Michael Graham, *Handbook of Federal Evidence* § 901.1 (4th ed. 1996).

[FN126]. See Michael J. Saks & Jonathan J. Koehler, What DNA "Fingerprinting" Can Teach the Law About the Rest of Forensic Science, 13 *Cardozo L. Rev.* 361, 362 (1991); Michael J. Saks, Merlin and Solomon: Lessons From the Law's Formative Encounters with Forensic Identification Science, 49 *Hastings L.J.* 1069, 1086-90 (1998).

[FN127]. See Jonathan J. Koehler, DNA Matches and Statistics: Important Questions, Surprising Answers, 76 *Judicature* 222, 222-23 (1993).

[FN128]. See William C. Thompson, Evaluating the Admissibility of New Genetic Identification Tests: Lessons from the "DNA War", 84 *J. Crim. L. & Criminology* 22, 42-51 (1993) (discussing cases).

[FN129]. State v. Schwartz, 447 N.W.2d 422 (Minn. 1989); Rivera v. State, 840 P.2d 933 (Wyo. 1992).

[FN130]. See Richard Lempert, After the DNA Wars: Skirmishing with NRC II, 37 *Jurimetrics J.* 439 (1997).

[FN131]. See Koehler & Shaviro, *supra* note 104, at 272-79.

[FN132]. Thompson, *supra* note 116, at 28-30.

[FN133]. See Thomas D. Lyon & Jonathan J. Koehler, The Relevance Ratio: Evaluating the Probative Value of Expert Testimony in Child Sexual Abuse Cases, 82 *Cornell L. Rev.* 43 (1996).

[FN134]. Id. at 50-54.

[FN135]. Id. at 51-52.

[FN136]. David Kaye, Probability Theory Meets Res Ipsa Loquitur, 77 Mich. L. Rev. 1456 (1979) (documenting the inconsistencies between probability theory and res ipsa loquitur).

[FN137]. Restatement (Second) of Torts § 328(D) (1965).

[FN138]. Kaye, supra note 136, at 1465.

[FN139]. Id. at 1461-64.

[FN140]. The facts are modeled after those found in Byrne v. Boadle, 159 Eng. Rep. 299 (Ex. 1863).

[FN141]. A better formulation of the doctrine would exclude the possibility that the injury could occur through the lack of negligence.

[FN142]. See Mark F. Grady, Res Ipsa Loquitur and Compliance Error, 142 U. Pa. L. Rev. 887 (1994) (presenting an economic justification for the doctrine).

[FN143]. See Restatement (Third) of Torts § 15 (1998).

[FN144]. Id.

[FN145]. Byrne v. Boadle, 159 Eng. Rep. 299 (Ex. 1863).

[FN146]. Kahneman & Lovallo, supra note 23, at 24-27.

[FN147]. See Rachlinski, supra note 26, at 615-18.

[FN148]. W. Page Keeton et al., Prosser and Keeton on the Law of Torts § 32, at 189 (5th ed. 1984).

[FN149]. See Rachlinski, supra note 26, at 607-18.

[FN150]. See George Gleason Bogert & George Taylor Bogert, The Law of Trusts & Estates § 862 (2d ed. 1995).

[FN151]. See Principles of Corporate Governance: Analysis and Recommendations § 4.01(c), at 177-78 (1994).

[FN152]. See Rachlinski, supra note 26, at 619-23 (documenting judicial references to the problems of judging

liability in hindsight in cases applying the business judgment rule).

[FN153]. Joy v. North, 692 F.2d 880, 886 (2d Cir. 1982).

[FN154]. Godbold v. Branch Bank, 11 Ala. 191 (1847). Also, in the last quarter-century, the prospect of a jury trial in a derivative action has grown. The U.S. Supreme Court has held that the Seventh Amendment requires that jury trials be available for damages actions brought in the federal courts. Ross v. Bernhard, 396 U.S. 531 (1970). Although this ruling also affects any action against a trustee brought in the federal courts, such actions might be less common than derivative suits against corporate officers, and therefore would have less effect on the development of trusts and estates law than corporate law.

[FN155]. Smith v. Van Gorkum, 488 A.2d 858 (Del. 1985).

[FN156]. See E. Norman Veasey & Julie M.S. Seitz, The Business Judgment Rule in the Revised Model Act, the Trans Union Case, and the ALI Project--A Strange Porridge, 63 Tex. L. Rev. 1483, 1499 (1985).

[FN157]. See Edwards & von Winterfeldt, *supra* note 104 (reviewing cognitive biases relevant to the courts); Michael J. Saks & Robert F. Kidd, Human Information Processing and Adjudication: Trial by Heuristics, 15 L & Soc'y Rev. 123 (1980).

[FN158]. See Tversky & Kahneman, *supra* note 1, at 1128-30.

[FN159]. *Id.* at 1128.

[FN160]. John Malouff & Nicola S. Schutte, Shaping Juror Attitudes: Effects of Requesting Different Damage Amounts in Personal Injury Trials, 129 J. Soc. Psychol. 491, 495 (1989); see also Gretchen B. Chapman & Brian H. Bornstein, The More You Ask For, the More You Get: Anchoring in Personal Injury Verdicts, 10 J. Applied Cognitive Psychol. 519 (1996); Reid Hastie, et al., Juror Judgments in Civil Cases: Effects of Plaintiff's Requests and Plaintiff's Identity on Punitive Damage Awards, 23 Law & Hum. Behav. 445 (1999); Jennifer K. Robbennolt & Christina A. Studebaker, Anchoring in the Courtroom: The Effects of Caps on Punitive Damages, 23 Law & Hum. Behav. 353 (1999); J.J. Zuehl, The Ad Damnum, Jury Instructions, and Personal Injury Damage Awards (1982) (unpublished manuscript, on file with the University of Chicago Law Review), cited in Michael S. Kang, Comment, Don't Tell Juries About Statutory Damage Caps: The Merits of Nondisclosure, 66 U. Chi. L. Rev. 469, 483-84 (1999).

[FN161]. Chapman & Bornstein, *supra* note 160, at 525-26.

[FN162]. Robbennolt & Studebaker, *supra* note 160, at 358-61.

[FN163]. Chris Guthrie et al., Inside the Judicial Mind, 86 Cornell L. Rev. (forthcoming May 2001).

[FN164]. Cass R. Sunstein et al., Assessing Punitive Damages (with Notes on Cognition and Valuation in Law), 107 Yale L. J. 2071, 2109-11 (1998).

[FN165]. Kang, *supra* note 160, at 480-92.

[FN166]. *Id.*

[FN167]. Chapman & Bornstein, *supra* note 160, at 519.

[FN168]. See Daniel Kahneman & Amos Tversky, Choices, Values, and Frames, 39 *Am. Psychologist* 341, 342-44 (1984) [hereinafter Kahneman & Tversky, Choices]; Daniel Kahneman & Amos Tversky, Prospect Theory: An Analysis of Decision Under Risk, 47 *Econometrica* 263, 268-69 (1979); Amos Tversky & Daniel Kahneman, The Framing of Decisions and the Psychology of Choice, 211 *Sci.* 453, 453-55 (1981); Amos Tversky & Daniel Kahneman, Rational Choice and the Framing of Decisions, 59 *J. Bus.* S251, S257-S260 (1986).

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[FN171]. See Rachlinski, *supra* note 19, at 754.

[FN172]. Kahneman & Tversky, Choices, *supra* note 168, at 344.

[FN173]. See Kruger & Gilovich, *supra* note 25, at 744.

[FN174]. Baruch Fischhoff, Perceived Informativeness of Facts, 3 *J. Experimental Psychol.: Hum. Perception and Performance* 349, 354-56 (1977).

[FN175]. Kahneman & Lovallo, *supra* note 23, at 24-25.

[FN176]. See Clermont & Eisenberg, *supra* note 18 (appellate courts are more likely to overturn a jury verdict than a verdict by a judge).

[FN177]. John C. Anderson et al., Evaluation of Auditor Decisions: Hindsight Bias Effects and the Expectation Gap, 14 *J. Econ. Psychol.* 711 (1993); Marianne M. Jennings et al., Outcome Foreseeability and Its Effects on Judicial Decisions (unpublished manuscript). But see Reid Hastie & W. Kip Viscusi, What Juries Can't Do Well: The Jury's Performance as a Risk Manager, 40 *Ariz. L. Rev.* 901, 914-16 (1998).

[FN178]. Guthrie et al., *supra* note 163.

[FN179]. Id.

[FN180]. See Keith E. Niedermeier et al., Informing Jurors of Their Nullification Power: A Route to a Just Verdict or Judicial Chaos?, 23 Law and Hum. Behav. 331, 333-48 (1999).

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