

The “Book of Wisdom” Contains Little Wisdom and Creates Significant Risk of Bias

Mark A. Glick, David G. Mangum, and Ted Tatos*

Introduction

The patent statute directs that “[u]pon finding for the claimant the court shall award the claimant damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer”¹ The statute allows for two types of compensation to the patent owner.² Upon proper proof, the patent owner may obtain profits lost as a result of the alleged infringement, but, even without such proof, the patent owner may recover at least “a reasonable royalty for the use made of the invention by the infringer.”³ This Article addresses that second form of damages—reasonable royalty.

The Federal Circuit has endorsed three methods for determining a reasonable royalty to compensate a patent owner for the infringer’s use of the patented invention: (1) an established royalty rate, where present; (2) the analytical method, where a “normal” profit margin is deducted from the profit margin obtained by the infringer from the infringing sales; and (3) a hypothetical negotiation between a willing licensor and a willing licensee.⁴ This Article addresses the most prominent of these approaches—a hypothetical negotiation between a willing licensor and a willing licensee—and, more specifically, the extent of information the participants in such hypothetical negotiations are presumed to have.

* Professor of Economics, University of Utah; Trial Lawyer, IP Litigation Section, Parsons Behle & Latimer; and Director, Empirical Analytics, respectively. The views expressed herein are those of the authors and do not necessarily reflect the views of their respective organizations or clients.

¹ 35 U.S.C. § 284 (2012).

² *Id.*

³ *Id.*; *Panduit Corp. v. Stahlin Bros. Fibre Works, Inc.*, 575 F.2d 1152, 1157 (6th Cir. 1978).

⁴ In an earlier work, the Authors argued that the first two tests are properly viewed as parts of the willing licensor/willing licensee paradigm, rather than separate means for calculating a reasonable royalty. See Mark Glick & David Mangum, *The Economics of Reasonable Royalty Damages: The Limited, Proper Role of the So-called “Analytical Method”*, 49 J. MARSHALL L. REV. 1, 20–21 (2015) (hereinafter “Glick & Mangum”).

In the willing licensor/willing licensee approach, the damage expert posits a “hypothetical negotiation” between the plaintiff and the defendant.⁵ In this hypothetical negotiation, and based on the economic incentives and information available to the parties at the time, the damage expert arrives at a royalty rate, or a range of royalty rates, to which both parties would have agreed.⁶ The Federal Circuit has provided extensive guidance on this process, and more than one approach is possible.⁷ While some of the guidance, such as the Federal Circuit’s guarded endorsement of the fifteen *Georgia Pacific* Factors,⁸ is unduly open-ended, three basic assumptions underpin the hypothetical negotiation in Federal Circuit law:

1. The hypothetical negotiation takes place just prior to the first instance of infringement.
2. The negotiation is over a non-exclusive license.
3. It is assumed that both parties are willing participants, and both parties accept that the patent at issue is valid and infringed.⁹

The first assumption is particularly pertinent to this Article’s argument and warrants additional comment. From an economic point of view, because the goal of patent damages is to isolate value attributable solely to the invention, the time of the hypothetical negotiation should occur prior to any sunk cost investment by the parties.¹⁰ Once there is a sunk investment, the royalty negotiated by the parties will include the “hold up” costs to the infringer—a value not properly attributable to the invention.¹¹ To show why this is the case, consider the different circumstances confronting a technology developer who learns of a potentially implicated patent before and after a \$100 mil-

⁵ Mark A. Glick, Lara A. Reymann, & Richard R. Hoffman, *Intellectual Property Damages: Guidelines and Analysis*, 151–52 (Wiley 2003) (hereinafter “Glick, Reymann, & Hoffman”).

⁶ *Id.* at 151–52, 157.

⁷ See e.g., *Mahvrkar v. C. R. Bard, Inc.* 79 F.3d 1572, 1579 (Fed. Cir. 1996) (explaining basic approach); *Georgia-Pac. Corp. v. U.S. Plywood Corp.*, 381 F. Supp. 1116, 1120 (S.D.N.Y. 1970), *modified on other grounds*, 446 F.2d 295 (2d Cir. 1971), *cert. denied*, 404 U.S. 870 (1971).

⁸ See *Ericsson, Inc. v. D-Link Sys., Inc.*, 773 F.3d 1201, 1230 (Fed. Cir. 2014) (noting that Federal Circuit has “never described the *Georgia-Pacific* factors as a talisman for royalty rate calculations,” yet district courts “often parrot all 15 factors to the jury, even if some of those factors clearly are not relevant to the case at hand.”); *Whit-Serve, LLC v. Comput. Packages, Inc.*, 694 F.3d 10, 31–32 (Fed. Cir. 2012) (“We do not require that witnesses use any or all of the *Georgia-Pacific* factors when testifying about damages in patent cases.”).

⁹ See e.g., *Lucent Technologies, Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1325 (Fed. Cir. 2009); *Hanson v. Alpine Valley Ski Area, Inc.*, 718 F.2d 1075, 1079 (Fed. Cir. 1983); *Panduit Corp. v. Stahl Bros. Fibre Works, Inc.*, 575 F.2d 1152, 1158 (6th Cir. 1978).

¹⁰ Glick, Reymann, & Hoffman, *supra* note 5, at 158.

¹¹ *Id.*

lion investment in the accused process. A post-investment negotiation will include an amount meant to avoid the loss of the \$100 million investment, while a negotiation prior to that investment will reflect only the advantage of the patent over its next best substitute. Thus, the rule established by the Federal Circuit concerning the time of the hypothetical negotiation makes economic sense. The \$100 million sunk-cost investment did not result from the patent, and any amount that the alleged infringer may be willing to pay to avoid losing that investment is not properly attributable to the patent. Accordingly, amounts attributable to avoiding loss of such sunk costs are not appropriate “compensation” for the infringement, which, after all, is what the patent statute is designed to accomplish.

Further, because the hypothetical negotiation presumably takes place just prior to the initiation of infringement, only information available to or reasonably foreseeable by the negotiating parties at that time is properly included in the analysis.¹² While the propriety of this limitation on relevant information is readily understandable in theory, in practice, it becomes much more difficult. Often, one party or the other in the litigation is motivated to attempt to “inform” the process with information not available at the time of the hypothetical negotiation. If the infringer’s business related to the patent-in-suit is wildly successful, the plaintiff-patent owner argues that such imminent success was readily apparent at the time infringement began and thus should be included in the hypothetical negotiation, while the defendant emphasizes the uncertainty and risk confronting its nascent business, and touts the numerous non-patent related factors and unanticipated events that led to its success. In contrast, if the defendant-infringer’s business flops, the plaintiff-patent owner clutches desperately to the rule that only what was anticipated and foreseeable at the time of the hypothetical negotiation matters, while the defendant advocates for subsequent history to be included in the calculation. In doing so, whichever party benefits from the addition of post-hypothetical negotiation history also invariably references (whether appropriate or not) Justice Cardozo’s rhetorical flourish incanting “a book of wisdom that courts may not neglect.”¹³

When, and to what extent, is consideration of post-hypothetical negotiation information—the so-called “Book of Wisdom”—appropriate in assessing patent damages? This Article begins with a hypothetical (Part I), used throughout, to illustrate the impact that application of the Book of Wisdom has on dam-

¹² See *e.g.*, *Integra Lifesciences I, Ltd. v. Merck KGaA*, 331 F.3d 860, 870 (Fed. Cir. 2003); *Riles v. Shell Exploration & Prod. Co.*, 298 F.3d 1302, 1311 (Fed. Cir. 2002); *Hanson v. Alpine Valley Ski Area, Inc.*, 718 F.2d 1075, 1079 (Fed. Cir. 1983); *Panduit Corp.*, 575 F.2d at 1158.

¹³ *Sinclair Refining Co. v. Jenkins Petroleum Process Co.*, 289 U.S. 689, 698 (1933).

ages. As an aid in evaluating the two sides of the debate, Part II of this Article identifies what the award of a reasonable royalty aims to achieve—what the purpose of a reasonable royalty is within the larger framework of patent law.

After identifying that purpose, Part III traces the checkered history of judicial treatment of the Book of Wisdom and evaluates the stated rationale for application of the Book of Wisdom in individual cases to determine whether that application comports with the identified goals of patent damages, including the origins of the doctrine (Part III.A.), its pre-Federal Circuit roots (Part III.B.), and subsequent application by the Federal Circuit (Part III.C.). As described in Part III.D., this history provides a less-than-clear guide about when resort to the Book of Wisdom is appropriate, as reflected by the difficulties district courts have encountered in explaining and applying the doctrine.

To clear up this confusion, this Article advocates that the Federal Circuit should find opportunities to clarify the law in this area and provide clearer guidance on when resort to post-hypothetical negotiation evidence is appropriate, when it is not appropriate, and, accordingly, when such evidence should be permitted to go before the jury. Part IV of the Article demonstrates how identifying and quantifying the economic effects that application of the Book of Wisdom has on the calculation of reasonable royalty damages facilitates the crafting of such a rule. In particular, Part IV applies option theory to delineate the risk and revenue shifts that occur when applying the Book of Wisdom and analyzes whether those shifts are warranted in light of the purpose of patent damages.¹⁴

Finally, based upon this analysis, this Article concludes that application of the Book of Wisdom, more often than not, confuses rather than enhances the reasonable royalty calculation process and frequently results in damage awards that over-compensate patentees with concomitant detrimental effects on incentives for innovation. As a result, this Article recommends that the Federal Circuit reduce use of the Book of Wisdom doctrine and permit consideration of post-hypothetical negotiation facts only upon proof that such events were known or reasonably anticipated at the time of the hypothetical negotiation.

I. A Guiding Hypothetical

In order to elucidate the law and economics underlying the Book of Wisdom, the following hypothetical demonstrates a typical situation in which potential application of the Book of Wisdom arises. Suppose an inventor develops and obtains a patent on a new drill bit that allows for deeper hydrocarbon extraction than was previously available. An oil-drilling services company copies the

¹⁴ Option theory describes the various mechanisms used to calculate the fair value of an option. See generally RICHARD BREALEY & STEWART MYERS, PRINCIPLES OF CORPORATE FINANCE 450 (McGraw-Hill, 2d ed. 1984) (discussing valuation of an option).

drill bit and begins drilling operations. The first infringement occurs in 2012; the plaintiff files suit in 2014, and a trial date is set for 2016. Both sides file expert damages reports in 2015, each premised on calculating a reasonable royalty under the willing licensor/willing licensee approach, but advancing divergent opinions on whether the court should consider post-hypothetical negotiation events under the Book of Wisdom. Thus, the timeline embedded in the hypothetical is as follows:

Infringement		Complaint		Trial Date
2012	2013	2014	2016	2016

Figure 1: Timeline for Hypothetical Patent Suit

During 2012, at the inception of infringement, the future of deep drilling appears bleak because of the success of natural gas fracking, permitting increased extraction from shallower reservoirs. Then, in 2013, the federal government unforeseeably bans fracking in the United States due to earthquake concerns. As a result, 2014 through 2016 are banner years for deep drilling. Finally, evidence shows that, in 2014, after the filing of the complaint, a competitor develops a superior substitute for the patented drill bit at issue and offers the technology to the public through a licensing program.

Are either of these post-initiation of infringement events—(1) the unforeseen fracking ban that greatly increased the demand for deep drilling technology; or (2) the competitor’s superior substitute—properly considered in the reasonable royalty calculation? To simplify the math, suppose that both experts agree on a 20% royalty rate but differ on the royalty base to which that rate should apply.¹⁵ The plaintiff’s expert invokes the Book of Wisdom and seeks to calculate royalty damages based on actual sales, while the defendant’s ex-

¹⁵ The royalty rate that a party in a negotiation would agree to implicitly assumes an expectation concerning the output produced using the infringing technology—the royalty base. The reason for this is that the infringing party is interested in the incremental expected profits from use of the infringing technology. No rational infringing licensee will pay in a royalty more than the expected incremental profits from the technology’s use. On the other hand, no rational patent owner will accept less than its incremental lost profits due to the infringement. *See* Glick, Reymann, & Hoffman, *supra* note 5, at 157. In the case of the otherwise infringing licensee, expected incremental profits can involve both cost reductions and volume increases. Thus, the expected volume increase resulting from use of the patented technology must be part of the calculus in determining the total amount of dollars the licensee-infringer is willing to pay. The rate is established by dividing the amount the parties agree to by expected or actual output. If the infringement resulted solely in the reduction of variable costs, the rate could be expressed as a per unit royalty without consideration of the expected output. But if there are fixed investments, the fixed costs per unit are a function of the output expansion.

pert holds tight to the rule that the hypothetical negotiation is presumed to have occurred at the onset of infringement and bases her royalty damages on expected sales and profits as of 2012.

The plaintiff contends that, because the infringer's actual revenue for wells using the infringing drill bit was \$1 billion, this is the correct royalty base on which to apply the 20% royalty rate. Because he uses actual revenue numbers over the entire infringing period, plaintiff's damages expert argues that no additional consideration of the availability of alternative drill bit technology post-2014 is required. Damages according to the plaintiff's expert are simply 20% of \$1 billion, or \$200 million.

The defendant's expert argues that the royalty base must be based on the expectations of the negotiating parties in 2012—the time of the hypothetical negotiation at the onset of infringement—not on actual revenues. Because she limits information to the time of the hypothetical negotiation, she ignores any effects from both the unforeseeable fracking ban and the 2014 new competitive option to the patent. Evidence shows that, at the onset of infringement in 2012, both parties expected revenues of \$10 million per year from use of the patented technology.¹⁶ Accordingly, defendant's expert uses this as the royalty base in her analysis. She multiplies the \$10 million per year estimate by four years (the time from initial infringement to trial) to arrive at a \$40 million total royalty base figure. She then applies the 20% royalty rate to the \$40 million royalty base, resulting in \$8 million in damages.¹⁷

Which expert is correct? Are reasonable royalty damages \$200 million or \$8 million, or somewhere in between? To evaluate which approach is correct, one must first understand the goal of the exercise.

II. The Objectives of Patent Damages

From an economic point of view, the goal of the patent system is to overcome the public goods problem that impacts investment in innovation. A public good is a good that: (1) is not depleted by an additional user; and (2) the use of which by additional users (absent the intervention of the legal system) cannot be prevented.¹⁸ These types of goods suffer from underinvest-

¹⁶ This expectation by the parties would be the result of a formal or informal expected value calculation. The expected value represents the present value of various probability-weighted possible income streams. For example, if the patent had an 11% chance of generating \$50 million, a 22% chance of generating \$20 million, and a 67% chance of generating only \$200,000, the expected value would be equal to 11% times \$50 million, plus 22% times \$20 million, plus 67% times \$200,000, which equals \$10 million.

¹⁷ This Article leaves the issue of discounting aside for now in order to focus on the impact of post-negotiation information. *But see* Part IV, *infra*.

¹⁸ Glick, Reymann, & Hoffman, *supra* note 5, at 62–66.

ment in market economies.¹⁹ A new invention is like a public good; the costs of development, including research, development, and previous failures, are private. Yet, once the invention becomes public, it can easily be copied without incurring these expenses, and one person’s use of the invention does not exclude others from using the invention.²⁰ As a consequence, the inventor (absent legal intervention) cannot appropriate the full market benefit of the invention, thus resulting in suboptimal incentives to innovate.²¹

The patent system attempts to remedy the public goods problem by creating a property right in a new invention, called a patent. The aim of this property right is to give inventors the ability to reap the profits from their invention in the market. Because the only recourse a patent owner has in the face of infringement is to bring a patent infringement suit, the level of damages awarded in patent suits is crucial for creating optimal incentives for investment in new technology by patent owners. To properly align incentives, the judicial process should result in the patentee receiving the same financial benefits it would have received in the market.²² In other words, the patent owner should be made no worse or better off than it would have been absent the infringement.²³

Thus, the value of a patent is measured by the expected market benefit resulting from its use.²⁴ In a reasonable royalty context, the value of the patent is what a willing licensee would pay over the next best alternative, or the incremental profits the patent owner could make over the profits that would accrue from use of the next best substitute.²⁵ As William Lee and Douglas Melamed describe it:

There is a virtual consensus among scholars that the optimal reasonable royalty remedy—in the light of both incentives needed to invent and those needed to develop commercial products and to innovate further upon earlier inventions—is one that most closely restores the parties to the position they would have been in had they been able to negotiate a patent license before infringement (i.e., *ex ante*). At that time, the would be licensee would have been willing to pay for a license not more than the incremental value of the patent over the next-best alternative in light of the intended uses of the patented technology and the anticipated profits therefrom.²⁶

¹⁹ *Id.*

²⁰ *Id.*

²¹ *Id.*

²² FEDERAL TRADE COMMISSION, THE EVOLVING IP MARKETPLACE: ALIGNING PATENT NOTICE AND REMEDIES WITH COMPETITION 57–58 (2011) (hereinafter “FEDERAL TRADE COMMISSION”).

²³ *Id.* at 141–42.

²⁴ *Id.* at 140–43.

²⁵ *Id.*

²⁶ William F. Lee & A. Douglas Melamed, *Breaking the Vicious Cycle of Patent Damages*, 101 CORNELL L. REV. 385, 392 (2016) (hereinafter “Lee & Melamed”).

The Patent Act is entirely consistent with this economic principle when it calls for damages “adequate to compensate for infringement.”²⁷ The Supreme Court has also defined appropriate compensation as “the difference between [the patent owner’s] pecuniary condition after infringement, and what his condition would have been if infringement had not occurred.”²⁸ Federal Circuit case law also aligns with economic theory on this point. For example, in *Ericsson, Inc. v. D-Link Systems, Inc.*,²⁹ the court recognized that “[w]hat is taken from the owner of a utility patent (for purposes of assessing damages under § 284) is only the patented technology, and so the value to be measured is only the value of the infringing features of an accused product.”³⁰

The goal is to fairly compensate, but not over compensate, patentees. Securing proper incentives for innovation cannot be accomplished in a system that unduly favors patentees over accused infringers.³¹ Overcompensation of patent owners is as dangerous to innovation as is under-compensation.³² Often, several inventions and methods must work together to obtain useful innovations.³³ Inflated damages awards can reduce the return to investing in follow-on innovations.³⁴ Overcompensation can also cause firms to incur high transaction costs because of excessive efforts to avoid infringement of low-value patents.³⁵ Finally, excessive compensation can reduce the incentive to challenge invalid patents or overbroad interpretations of patent claims by patent owners.³⁶ Rewarding patent owners based solely on the market benefits from the patent thus creates socially efficient incentives for innovation in a market economy.

But what about the incentives of the infringer? Courts often focus on the incentives of the infringer rather than innovation generally when discussing reasonable royalties.³⁷ The concern sometimes expressed is that if the

²⁷ 35 U.S.C. § 284 (2006).

²⁸ *Yale Lock Mfg. Co v. Sargent*, 117 U.S. 536, 552 (1886).

²⁹ 773 F.3d 1201 (Fed. Cir. 2014).

³⁰ *Id.* at 1226; See also *Virnet X, Inc. v. Cisco Sys., Inc.*, 767 F.3d 1308, 1326 (Fed. Cir. 2014); Amy Landers, *Patent Claim Apportionment, Patentee Injury and Sequential Investigation*, 19 GEO. MASON L. REV. 471, 483–84 (2012).

³¹ FEDERAL TRADE COMMISSION, *supra* note 22, at 144–47.

³² *Id.*

³³ *Id.*

³⁴ *Id.*

³⁵ *Id.*

³⁶ *Id.* at 146–47.

³⁷ See, e.g., *Fromson v. Western Litho Plate & Supply Co.*, 853 F.2d 1568, 1574–75 (Fed. Cir. 1988), *overruled on other grounds by* *Knorr-Bremse Systeme Fuer Nutzfahrzeuge GmbH v. Dana Corp.*, 383 F.3d 1337, 1338 (Fed. Cir. 2004) (en banc); *Panduit Corp. v. Stahlin Bros. Fibre Works, Inc.*, 575 F.2d 1152, 1158–59 (6th Cir. 1978).

infringer pays only what it would have paid in a hypothetical negotiation, the infringer has no incentive to license the patent.³⁸ Instead, it can infringe with the hope of not being caught, knowing that, even if caught, it will be forced to pay only what it would have paid for a license anyway.³⁹ But the patent statute has other means to deal with willful infringers, through the award of enhanced damages and attorney fees in exceptional cases.⁴⁰ Indeed, it makes no sense from a retribution or a deterrence perspective to increase damages beyond compensation to deter an innocent infringer. As Brian Love writes, “[i]t goes without saying that, regardless of the punishment imposed, it is impossible to deter someone who does not know he or she is committing a wrongful act.”⁴¹ Moreover, there is evidence that the vast majority of infringement is inadvertent.⁴² Thus, imposing enhanced damages through higher than objectively justified reasonable royalty awards without requiring proof of willfulness makes little sense. An infringer who made a conscious decision to forego licensing despite a high likelihood that its conduct was infringing is subject to enhanced damages, but an innocent infringer should not be penalized by a reasonable royalty greater than the value of the patent.

It might still be argued that negligent infringers will take suboptimal precautions to avoid infringement without increased damages. This can be illustrated by the famous Learned Hand Formula for negligence, where negligence is defined as inadequate levels of precaution:

$$B < PL$$

where B is the cost of precaution, P is the probability of being held liable,

³⁸ *Fromson*, 853 F.2d at 1574–75 (noting that willing licensor/willing licensee “methodology risks creation of the perception that blatant, blind appropriation of inventions patented by individual, nonmanufacturing inventors is the profitable, can’t lose course”).

³⁹ *Panduit*, 575 F.2d at 1158–59 (“Determination of a reasonable royalty . . . cannot, without injustice, be treated as though the infringer had elected [this option] in the first place.”).

⁴⁰ FEDERAL TRADE COMMISSION, *supra* note 22, at 160, 174–75; *accord* *Fromson*, 853 F.2d at 1576 (recognizing increased damages under § 284 and attorney fee awards under § 285 as available “means for recognizing that an infringer is unlike a true ‘willing’ licensee”); *Machinery Corp. of Am. v. Gullfiber AB*, 774 F.2d 467, 472 (Fed. Cir. 1985) (noting that ability to award triple damages and attorney fees “will discourage infringement by anyone thinking that all he would be required to pay if he loses the suit would be a royalty”).

⁴¹ Brian J. Love, *The Misuse of Reasonable Royalty Damages as a Patent Infringement Deterrent*, 74 MO. L. REV. 909, 934 (2009).

⁴² Lee & Melamed, *supra* note 26, at 404–09.

and L is the compensation to the plaintiff.⁴³ If damages are set at L, but P is small, then firms may take inadequate efforts to guard against infringement.⁴⁴

The Authors are unaware of any empirical evidence one way or the other on this point. However, if levels of precaution are a concern, it makes more economic sense to require certain precautionary measures, such as performing a pre-infringement patent search or obtaining an opinion letter to establish non-willfulness, than it does to encourage overcompensation through inflated damages awards. Finally, the injunctive relief remedy is a strong disincentive to inadequate precaution.⁴⁵ Even innocent infringers face a permanent injunction on a business line that infringes a patent, despite significant non-retrievable investments in the business.⁴⁶

It follows from the above that the objective of calculating a reasonable royalty using the willing licensor/willing licensee approach should be to calculate the economic value that the patent owner lost by the failure of the infringer to take a license to the patented technology at market rates. Indeed, the willing licensor/willing licensee test measures this value by asking what the parties would have agreed to at the time of infringement, thus establishing a bargaining range for the royalty that could have resulted from the parties' negotiation.⁴⁷ A rational infringer will pay no more than the patent adds to the infringer's profits above use of the next-best substitute. A rational patent owner, in turn, will only agree to a royalty that makes it no worse off than foregoing licensing altogether.⁴⁸

In fact, this approach is very close to the standard business valuation approach. The accepted definition of "fair market value" is:

[t]he amount at which property would change hands between a willing seller and a willing buyer when neither is acting under compulsion and when both have reasonable knowledge of the relevant facts.⁴⁹

In this respect, it is akin to the valuation literature's definition of "investment value."⁵⁰ Moreover, the valuation literature is unanimous that unforeseeable knowledge at the time of the valuation date must be ignored; only "known

⁴³ United States v. Carroll Towing Co., 159 F.2d 169, 173 (2d Cir. 1947).

⁴⁴ See RICHARD POSNER, ECONOMIC ANALYSIS OF LAW 164–67 (Little, Brown & Co., 4th ed. 1992).

⁴⁵ FEDERAL TRADE COMMISSION, *supra* note 22, at 143–44.

⁴⁶ *Id.*

⁴⁷ Glick, Reymann, & Hoffman, *supra* note 5, at 156–57.

⁴⁸ Glick & Mangum, *supra* note 4, at 33.

⁴⁹ SHANNON P. PRATT, ROBERT F. REILLY, & ROBERT P. SCHWEIHS, VALUING A BUSINESS 28 (McGraw-Hill, 4th ed. 2000) (quoting American Society of Appraisers, Business Valuation Standards—Definitions).

⁵⁰ *Id.* at 30–31. This makes sense because the hypothetical negotiation is over a non-exclusive license. As a result, it is assumed that any more efficient licensee could also have

or knowable” information may be considered.⁵¹ For example, the AICPA’s official advice to valuation analysts includes the following:

Generally, the valuation analyst should consider only circumstances existing at the valuation date and events occurring up to the valuation date. An event that could affect the value may occur subsequent to the valuation date, such an occurrence is referred to as a subsequent event. Subsequent events are indicative of conditions that were not known or knowable at the valuation date, including conditions that arose subsequent to the valuation date. The valuation would not be updated to reflect those events or conditions.⁵²

Accordingly, to preserve appropriate incentives for innovation, patentees should be compensated for infringement in an amount equal to what they lost as a result of the infringement. In circumstances where the patentee is unable to make the showing required to establish lost profits damages, the amount lost by the patentee is the royalty it otherwise would have received had the infringer licensed the patent rather than proceed with its infringing conduct. If the patentee is compensated materially less or more than its market losses, incentives to innovate (both by patentees and other market participants) are skewed.

So, how does this pertain to the Book of Wisdom? What is the net economic effect of applying the Book of Wisdom and permitting consideration of post-hypothetical negotiation events in the calculation of a reasonable royalty? The future is always unknown, or at least uncertain. As a result, projected future revenues are worth less than known current revenues, because there is always a risk that circumstances will change and the projected future revenues will not come to fruition. Of course, projections can also be wrong to the downside, and actual revenues may exceed projected expectations. The point is that those negotiating patent licensing agreements, whether in the actual world or mimicked in the hypothetical world, must do so in the face of uncertainty, and the risks attendant in that uncertainty will necessarily affect the negotiations and the licensing terms reached.

The effect of application of the Book of Wisdom doctrine—replacing uncertain projections with actual performance—is to remove, or at least reduce, risk that otherwise would have impacted the parties’ negotiations and the resulting license terms. But is removal or reduction of that risk justified? Does it properly reward and therefore incent innovation, or does it tend to over- or under-compensate patent owners in a way that skews behavior to

been licensed by the patentee. This focuses the value concept on the market value loss caused by the infringement.

⁵¹ AMERICAN INSTITUTE OF CERTIFIED PUBLIC ACCOUNTANTS, CONSULTING SERVICES EXECUTIVE COMMITTEE, STATEMENT ON STANDARDS FOR VALUATION SERVICES: VALUATION OF A BUSINESS, BUSINESS OWNERSHIP INTEREST, SECURITY OR INTANGIBLE ASSET 20 (2007).

⁵² *Id.* (emphasis omitted).

the detriment of societal utility, decreasing incentives to innovate or design-around by either patent owners or legitimate competitors?

In the next section, this Article analyzes cases where the Book of Wisdom has been invoked to ascertain the rationale given by those courts for permitting consideration of post-hypothetical negotiation events, examining whether such consideration advanced or detracted from societal utility in fostering innovation. Then, in Part IV, this Article undertakes to quantify the economic effects resulting from application of the Book of Wisdom using option theory, as a precursor to proposing what the rule governing consideration of post-hypothetical negotiation facts should be.

III. Judicial Application of the Book of Wisdom

The “Book of Wisdom” has frequently been invoked in patent cases since Justice Cardozo coined the term in 1933, but is it properly suited to such cases? Does application of the doctrine advance or hamper achievement of the purposes of the patent statute? Part A below discusses the *Sinclair Refining* case, in which the doctrine first emerged. Parts B and C then examine the pre-Federal Circuit and Federal Circuit applications of the doctrine, recounting the court’s rationale for application of the Book of Wisdom in each case and then evaluating whether, given the facts of each case, application of the doctrine was consistent with the stated compensatory intent of the patent statute or whether the award likely over- or under-compensated the patent owner with its concomitant negative effects on incentives to innovate. Finally, by examining district court efforts to apply the doctrine, Part D evaluates whether current Federal Circuit jurisprudence provides coherent guidance for proper application of the Book of Wisdom in light of the goals of the patent statute, or whether the court, given its role in bringing uniformity and predictability to application of the nation’s patent laws, should provide further guidance on this subject.

A. Genesis of the Book of Wisdom Doctrine

The Book of Wisdom doctrine traces its origin to the Supreme Court’s 1933 decision in *Sinclair Refining Co. v. Jenkins Petroleum Process Co.*,⁵³ a breach of contract case presenting a discovery dispute.⁵⁴ *Sinclair Refining* involved an experimental still for cracking petroleum oils to produce gasoline loaned by Jenkins Petroleum to Sinclair Refining.⁵⁵ The parties had agreed that any improvements to the still resulting from Sinclair’s work would belong to Jen-

⁵³ 289 U.S. 689 (1933).

⁵⁴ *Id.*

⁵⁵ *Id.* at 690.

kins.⁵⁶ In alleged breach of that agreement, Sinclair caused its employees to file patent applications on their work and to assign those patent applications to Sinclair.⁵⁷ Jenkins brought suit for breach of contract and sought specific performance, requiring assignment of one of those patents, the Isom patent, to Jenkins.⁵⁸

Proper understanding of the case and its import is complicated by the fact that it occurred prior to the merger of courts of law and equity.⁵⁹ The lower court rejected Jenkins’s request for specific performance for insufficient evidence, but it ordered the case transferred to the law side of the court and permitted Jenkins to proceed on a claim for damages.⁶⁰ In support of its damages claim, Jenkins sought discovery into the number of cracking stills constructed by Sinclair under the Isom patent, and the amount of petroleum products and profits generated thereby.⁶¹ Sinclair opposed the discovery, arguing that subsequent sales and uses of the patented device had no bearing on the value of the patent at the time of the alleged breach.⁶²

The district court rejected the requested discovery, but the court of appeals reversed in a split decision, holding that, “in ascertaining the value of the patent at the time of the breach, the triers of the facts would be at liberty to consider the commercial use that had been made of the patented device.”⁶³ The court of appeals, however, placed significant restrictions on the use Jenkins could make of the discovered evidence at trial, permitting its use only to “show the general facts about the Isom invention, not specific instances of profitable use,” unless Sinclair “should deny the utility and commercial success of the invention,” in which case broader evidence of Sinclair’s profitable use of the invention would be “highly significant.”⁶⁴

The Supreme Court affirmed, noting that, under the lower court’s discovery order, “[o]nly the most general facts are to be discovered in advance of trial. The bill [of discovery] is to be retained, however, to be available in case of need.”⁶⁵ However, the very limited nature of the court of appeals’ decision, and, consequently, the Supreme Court’s affirmation thereof, is easily lost in Justice Cardozo’s subsequent rhetorical flourish describing the Court’s rationale. Indeed, it is hard (but important) to remember that only the availability of

⁵⁶ *Id.*

⁵⁷ *Id.*

⁵⁸ *Id.* at 690–91.

⁵⁹ *Id.* at 691.

⁶⁰ *Id.*

⁶¹ *Id.*

⁶² *Id.* at 691–92.

⁶³ *Id.* at 692.

⁶⁴ *Id.* (internal quotations omitted).

⁶⁵ *Id.* at 697.

discovery was at issue and that the underlying case was one for alleged breach of contract for not assigning a patent application, not patent infringement and the assessment of reasonable royalty damages therefor.⁶⁶

In his inimitable style, Justice Cardozo intoned:

A patent is a thing unique. There can be no contemporaneous sales to express the market value of an invention that derives from its novelty its patentable quality. . . . But the absence of market value does not mean that the offender shall go quit of liability altogether. The law will make the best appraisal that it can, summoning to its service whatever aids it can command. . . . At times the only evidence available may be that supplied by testimony of experts as to the state of the art, the character of the improvement, and the probable increase of efficiency or saving of expense. . . . This will generally be the case if the trial follows quickly after the issue of the patent. But a different situation is presented if years have gone by before the evidence is offered. Experience is then available to correct uncertain prophecy. Here is a book of wisdom that courts may not neglect. We find no rule of law that sets a clasp upon its pages, and forbids us to look within.⁶⁷

Those seeking additional support for considering post-breach or post-inception of infringement facts in assessing damages at the time of breach or infringement may also find refuge in Justice Cardozo's statement that "[t]o correct uncertain prophecies in such circumstances is not to charge the offender with elements of value non-existent at the time of his offense. It is to bring out and expose of light the elements of value that were there from the beginning."⁶⁸ Moreover, with particular relevance to the market value approach and, by extension, the willing licensor/willing licensee approach, Justice Cardozo stated:

An imaginary bid by an imaginary buyer, acting upon the information available at the moment of the breach, is not the limit of recovery where the subject of the bargain is an undeveloped patent. Information at such time might be so scanty and imperfect that the offer would be nominal. The promisee of the patent has less than fair compensation if the criterion of value is the price that he would have received if he had disposed of it at once, irrespective of the value that would have been uncovered if he had kept it as his own. Formulas of measurement declared *alio intuitu* may be misleading if wrested from their setting and applied to new conditions. . . . The market test failing, there must be reference to the values inherent in the thing itself, whether for use or

⁶⁶ See J. Gregory Sidak, *How Relevant is Justice Cardozo's 'Book of Wisdom' to Patent Damages?*, 17 COLUM. SCI. & TECH. L. REV. 246, 251 (2016):

Sinclair was not a patent-infringement case but rather a breach-of-contract case. Because the breach concerned the failure to assign a patent application, the Court evaluated whether, in determining damages for breach of contract, it was proper to allow the plaintiff to conduct discovery of information about the use of the patented technology after the date of the breach.

⁶⁷ *Sinclair*, 289 U.S. at 697–98 (citations omitted).

⁶⁸ *Id.* at 698.

for exchange. . . . These will not be known by first imagining a forced sale, and then accepting as a measure its probable results. The law is not so tender to sellers in default.⁶⁹

But are these stated rationales truly applicable to the calculation of reasonable royalty damages? They are not. Justice Cardozo’s analogy to a patentee being essentially compelled to “dispose of his patent at once rather than keeping it as his own,” has limited application when what is at issue is an award of reasonable royalty damages computed on a hypothetical nonexclusive license.⁷⁰ Patentees able to satisfy the elements for recovery of lost profits damages are able essentially to “keep” the patent “as [their] own.”⁷¹ But, for non-practicing entities, such is justifiably not an option because, even in the real world, fully exploiting the patent themselves was not an option, and all they have been deprived of by the alleged infringement are the royalties they would otherwise have received.⁷²

But what of Justice Cardozo’s suggestion that considering profits from subsequent use of an invention is “not to charge the offender with elements of value non-existent at the time of his offense,” but rather to “bring out and expose to light the elements of value that were there from the beginning”?⁷³ Does that rationale have validity when what is at issue is not the full value of the patent, but rather just compensation for a non-exclusive license? Again, this Article concludes not. The invention’s use by the alleged infringer proves that it had some known value at the time of the hypothetical negotiation. But, part and parcel of that value is the attendant risk of whether a business premised in whole or in part on that invention will be successful (and the degree of that success).⁷⁴ That risk is borne by the alleged infringer, not the patentee.⁷⁵ Accordingly, there is scant justification for compensating the patentee for a risk it did not bear. And any damages approach that includes an amount attributable to that risk over-compensates the patentee and skews the underlying incentives to innovate.

B. Pre-Federal Circuit Application of the Book of Wisdom

Other commentators have extensively documented the dubious foundation for application of the Book of Wisdom to reasonable royalty patent cases

⁶⁹ *Id.* at 699 (citations omitted).

⁷⁰ *Id.*

⁷¹ *Id.*

⁷² FEDERAL TRADE COMMISSION, *supra* note 22, at 143.

⁷³ *Sinclair*, 289 U.S. at 698.

⁷⁴ *See* discussion *supra* Part II.

⁷⁵ *See id.*

provided by the *Sinclair Refining* case,⁷⁶ yet subsequent cases appear to have found Justice Cardozo's catchy turn of phrase hard to resist. Indeed, application of the Book of Wisdom to reasonable royalty patent cases pre-dates the Federal Circuit. In 1972, ten years before creation of the Federal Circuit, the en banc Court of Claims, which at the time housed several future Federal Circuit judges, adopted a commissioner's opinion awarding damages for patent infringement against the Government.⁷⁷ Finding no established royalty rate for the patent in question, Commissioner Colaianni resorted to a "willing seller-willing buyer approach," which the commissioner recognized "[i]n effect . . . requires the synthesization of a hypothetical negotiation at the time of defendant's infringement."⁷⁸ The commissioner's opinion, adopted in full by the court, continued:

In sum, this approach attempts to consider all reasonable factors that each side would urge to advance its own best interests in an arm's-length negotiation. *However, quite significantly, this hypothetical approach has the advantage of considering facts which in an actual negotiation would not have as yet occurred and would thus be, at best, speculative.*⁷⁹

What did the commissioner and, by extension, the en banc Court of Claims cite as authority for its sojourn into admittedly "at best, speculative"⁸⁰ terrain? Justice Cardozo's *Sinclair Refining* Book of Wisdom.⁸¹

Eight years later, Commissioner Colaianni, then a trial judge on the Court of Claims, cited his own *Amerace Esna* opinion as authority in the accounting phase of another patent infringement case against the government, *Jamesbury Corporation v. United States*.⁸² Jamesbury owned the patent on a new type of

⁷⁶ See Sidak, *supra* note 66, at 251:

Justice Cardozo never addressed the question of whether the hypothetical-negotiation methodology in patent law should rely on information that became available only after the infringement of the patent. It is therefore inappropriate to cite *Sinclair* in a patent case to justify reliance on information that postdates the hypothetical negotiation when calculating a reasonable royalty for patent infringement.

D. Christopher Holly, *The Book of Wisdom: How to Bring a Metaphorical Flourish Into the Realm of Economic Reality by Adopting a Market Reconstruction Requirement in the Calculation of a Reasonable Royalty*, 19 J. PAT. & TRADEMARK OFF. SOC'Y 156, 178–81 (2010).

⁷⁷ *Amerace Esna Corp. v. United States*, 462 F.2d 1377, 1378 (Ct. Cl. 1972) ("Since the court agrees with the commissioner's opinion, findings of fact and recommended conclusions of law, as hereinafter set forth, it hereby adopts the same as the basis for its judgment in this case.").

⁷⁸ *Id.* at 1380.

⁷⁹ *Id.* at 1380–81 (emphasis added).

⁸⁰ *Id.* at 1381.

⁸¹ *Id.*

⁸² Nos. 189-63 and 520-71, 1980 WL 20818 (Ct. Cl. Feb. 7, 1980).

floating ball valve.⁸³ At the request of the U.S. Navy, Jamesbury shared its new ball valve design and test results with the Electric Boat Division of General Dynamics Corporation, a government contractor supplying nuclear submarines to the Navy.⁸⁴ General Dynamics had not previously even considered using ball valves in its submarines, but, over the next seventeen years, supplied in excess of 100,000 infringing valves to the Navy at a net cost of \$87,300,000.⁸⁵

Jamesbury sued the Navy for “unlicensed use of its patented invention.”⁸⁶ The Navy argued for a sliding scale royalty of 3% on the first nearly \$40 million of ball valves and a 1% royalty on the remainder.⁸⁷ Jamesbury requested “a flat 10% royalty rate.”⁸⁸ Judge Colaianni awarded a flat 6.5% rate, reducing the rate in recognition of the large amount of procurement, but expressly declined to impose a sliding scale royalty post hoc.⁸⁹ He reasoned:

Had the parties contemplated such a large amount of procurement of infringing valves, the Government would undoubtedly have used this to negotiate for the lowest royalty possible. . . . In an actual license negotiation this might be done by a sliding scale royalty since the parties could not know what the extent of procurement would be. However, *now that I am aided by the benefit of hindsight*, it seems unnecessary to create such a fictional sliding scale royalty.⁹⁰

As support for his resort to hindsight, Judge Colaianni cited his own opinion in *Amerace Esna*, endorsed by the en banc Court of Claims, as well as *Sinclair Refining*, which he described as endorsing “[t]he imprudence of ignoring all available information[,]” “albeit in a different context.”⁹¹

Thus, prior to the creation of the Federal Circuit, courts occasionally used the Book of Wisdom to justify consideration of post-hypothetical negotiation facts in fashioning “just compensation” awards for the government’s use of patented technology.⁹² While in *Jamesbury*, the court in part justified its reasoning as a substitute for the sliding scale royalty that the parties may have otherwise negotiated in the face of uncertainty over the extent of likely future use of the invention, in neither case did the court require any showing that the post-negotiation events were reasonably foreseeable to the parties at the time infringement began.

⁸³ *Id.* at *1.

⁸⁴ *Id.*

⁸⁵ *Id.*

⁸⁶ *Id.*

⁸⁷ *Id.* at *3.

⁸⁸ *Id.*

⁸⁹ *Id.* at *12, 15.

⁹⁰ *Id.* at *11 (emphasis added; internal citations omitted).

⁹¹ *Id.*

⁹² *E.g., id.* at *12.

C. Federal Circuit Application of the Book of Wisdom

Shortly after its creation by the Federal Courts Improvement Act of 1982, litigants called upon the Federal Circuit to review a patent damages award in *Hanson v. Alpine Valley Ski Area, Inc.*⁹³ *Hanson* involved infringement of a patent on snow-making equipment.⁹⁴ Finding no basis for determining the profits that the patentee, Hanson, lost as a result of the infringement, the lower court proceeded to calculate a reasonable royalty using the willing licensor/willing licensee rule,⁹⁵ ultimately arriving at a royalty based on one-third of the savings that the patented method produced.⁹⁶ The defendant-infringer, Alpine, appealed.⁹⁷

In upholding the lower court's award, the en banc Federal Circuit, in an opinion authored by Judge Friedman, pronounced two holdings of particular relevance to this discussion. First, quoting the Sixth Circuit's *Panduit* decision, the Federal Circuit endorsed the notion that "[t]he key element in setting a reasonable royalty . . . is the necessity for return to the date when the infringement began."⁹⁸ Second, and even more directly pertinent to the Book of Wisdom, the court rejected the defendant-infringer's contention that the awarded royalty was unreasonable because it would not have allowed it to make a profit, holding:

The issue of the infringer's profit is to be determined not on the basis of a hindsight evaluation of what actually happened, but on the basis of what the parties to the hypothetical license negotiations would have considered at the time of the negotiations. 'Whether, as events unfurled thereafter, [Alpine Valley] would have made an actual profit, while paying the royalty determined as of [1972], is irrelevant.'⁹⁹

Thus, the court declined to examine the reasonableness of the awarded royalty other than on the basis of facts knowable at the time of the hypothetical negotiation.¹⁰⁰ The clasp on the Book of Wisdom remained closed.¹⁰¹

⁹³ 718 F.2d 1075 (Fed. Cir. 1983).

⁹⁴ *Id.* at 1076.

⁹⁵ *Id.* at 1077.

⁹⁶ *Id.*

⁹⁷ *Id.* at 1076.

⁹⁸ *Id.* at 1079 (quoting *Panduit Corp. v. Stahl Bros. Fibre Works, Inc.*, 575 F.2d 1152, 1158 (6th Cir. 1978)).

⁹⁹ *Id.* at 1081 (quoting *Panduit*, 575 F.2d at 1164) (emphasis added).

¹⁰⁰ *Id.*

¹⁰¹ It appears that neither party in *Hanson* advocated for application of the Book of Wisdom and the court expressed some doubt about Alpine Valley's non-profitability assertions. *Id.* Further, only the patentee Hanson introduced expert testimony on what a willing licensor and willing licensee would have considered pertinent at the time of the hypothetical negotiation. *Id.* at 1079–80.

The admissibility of post-negotiation profit information in a reasonable royalty determination came before the Federal Circuit again just over a year later in *Trans-World Manufacturing Corp. v. Al Nyman & Sons, Inc.*¹⁰² Trans-World involved claims of patent infringement on the design of point-of-sale racks for eyeglasses.¹⁰³ The Federal Circuit, without explicit reference to the Book of Wisdom and evidently not recognizing the conflict with its prior *Hanson* decision,¹⁰⁴ held that the district court erred in refusing to admit evidence of the defendant-infringer’s profits on the sale of eyeglasses sold using the infringing display racks because “[e]vidence of the infringer’s actual profits generally is admissible as probative of his anticipated profits” and thus was relevant to determining a reasonable royalty.¹⁰⁵ The *Trans-World* panel did not require and pointed to no evidence that the level of profits achieved by the infringer were reasonably foreseeable at the time infringement began to support the alleged probative nature of those profits as to what the parties may have anticipated.¹⁰⁶

Justice Cardozo’s Book of Wisdom made its first express appearance in a Federal Circuit opinion in *Fromson v. Western Litho Plate & Supply Co.*¹⁰⁷ There, the court vacated and remanded a reasonable royalty damage award entered after a bench trial in which the lower court awarded a royalty of only 0.825%, which the district court calculated based on one-third of one-quarter of what the Federal Circuit described as an “arbitrarily selected . . . 10% standard profit.”¹⁰⁸ Describing the willing licensor/willing licensee test based on a hypothetical negotiation, Chief Judge Markey, writing for the court, observed:

The methodology encompasses fantasy and flexibility; fantasy because it requires a court to imagine what warring parties would have agreed to as willing negotiators; flexibility because it speaks of negotiations as of the time infringement began, *yet permits and often requires a court to look to events and facts that occurred thereafter and that could not have been known to or predicted by the hypothesized negotiators.*¹⁰⁹

As support for the notion that the willing licensor/willing licensee test “permits and often requires” consideration of post-hypothetical negotiation facts and events, including ones “that could not have been known to or predicted by the hypothesized negotiators,” the court included a lengthy quote from Justice

¹⁰² 750 F.2d 1552, 1568 (Fed. Cir. 1984).

¹⁰³ *Id.* at 1555.

¹⁰⁴ The panel’s omission of any discussion of *Hanson* is particularly noteworthy because Judge Friedman authored both decisions.

¹⁰⁵ *Trans-World*, 750 F.2d at 1568.

¹⁰⁶ *Id.*

¹⁰⁷ 853 F.2d 1568 (Fed. Cir. 1988), *overruled on other grounds by* Knorr-Bremse Systeme Fuer Nutzfahrzeuge GmbH v. Dana Corp., 383 F.3d 1337 (Fed. Cir. 2004) (en banc).

¹⁰⁸ *Id.* at 1569–70, 1579 (internal citations omitted).

¹⁰⁹ *Id.* at 1575 (emphasis added).

Cardozo's *Sinclair Refining* opinion, including his Book of Wisdom prose, and cited the Federal Circuit's *Trans-World* opinion as being in "accord."¹¹⁰ The panel acknowledged in a footnote that, in two prior cases, one of which was *Hanson*, "a reasonable royalty was determined without reference to events following initial infringement," but it discounted the apparent discrepancy by noting that the infringers' "evidence of low use and low profits . . . was given little or no weight."¹¹¹

Two years later, in *Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co.*,¹¹² an opinion also authored by Chief Judge Markey, the Federal Circuit, citing *Trans-World*, upheld a lower court's rejection of a plaintiff's reasonable royalty damages claim "based on the infringer's anticipated profits which bear no relationship to the actual profits," and it affirmed the lower court's modest award of \$10,000 in reasonable royalty damages.¹¹³ The court held that the magistrate judge had properly rejected plaintiff's damages expert's opinion that "was based on a nonexistent or at best woefully incomplete understanding of the market and on an estimate of anticipated profits that bore no relation to actual profits, [the expert] having no knowledge of the latter."¹¹⁴

A subsequent panel of the Federal Circuit later distinguished and narrowed the reach of both *Lindemann* and *Trans-World*, reasoning that neither case

require[s] that estimates of sales revenues, as referenced in a hypothetical negotiation at the time infringement began, must later bear a close relation to actual sales revenue. Such a proposition would essentially eviscerate the rule that recognizes sales expectations at the time when infringement begins as a basis for a royalty base as opposed to an after-the-fact counting of actual sales.¹¹⁵

That case, *Interactive Pictures v. Infinite Pictures*, involved a claim of patent infringement between two movie production companies over the use of software controlling a computer equipped with a fisheye camera.¹¹⁶ Plaintiff Interactive's damages expert, Dr. Donald L. Martin, premised his reasonable royalty opinion on a fully paid-up license, "covering a term of five years, at a rate of 10% of gross revenue."¹¹⁷ Dr. Martin offered the jury two royalty base figures: an upper range based on a five-year annual projection of total sales contained in the defendant-infringer Infinite's business plan dated two

¹¹⁰ *Id.* at 1575–76.

¹¹¹ *Id.* at 1576 n.13.

¹¹² 895 F.2d 1403 (Fed. Cir. 1990).

¹¹³ *Id.* at 1405, 1407–08.

¹¹⁴ *Id.* at 1407. Further, it was unclear where plaintiff's expert had obtained his anticipated gross profit number and some evidence suggested that his number was grossly overstated. *Id.* at 1408.

¹¹⁵ *Interactive Pictures Corp. v. Infinite Pictures, Inc.*, 274 F.3d 1371, 1385 (Fed. Cir. 2001).

¹¹⁶ *Id.* at 1373.

¹¹⁷ *Id.* at 1384.

months before infringement began, and a lower range based on that same business plan but projecting annual increases at the average rate of growth in the economy over the last twenty years.¹¹⁸

The jury opted for the lower range, awarding \$1 million in reasonable royalty damages.¹¹⁹ Defendant-infringer Infinite appealed, claiming that Dr. Martin’s projection of future sales was “speculative, as it was based on an outdated business plan and its optimistic assumptions of future revenue growth” that did not comport with Infinite’s actual sales performance.¹²⁰ While Infinite did not invoke the Book of Wisdom doctrine to support its resort to actual sales performance to contradict its pre-infringement projections,¹²¹ it theoretically could have, assuming the doctrine applies both when actual sales are less than as well as greater than pre-infringement projections; that is, when application of the Book of Wisdom favors the defendant-infringer (as was the case in *Lindemann*), not just when it favors the plaintiff-patentee (as was the case in *Trans-World* and *Fromson*). In practice, however, it seems that the doctrine is much more frequently invoked to the benefit of plaintiff-patentees.¹²²

Interactive Pictures is no exception. There, the Federal Circuit affirmed the jury’s award, stating:

We have previously upheld awards of damages premised on a lump sum royalty payment based on an infringer’s expected sales. We have also endorsed the conceptual framework of a hypothetical negotiation between the patentee and the infringer as a means for determining a reasonable royalty. When that framework is employed, *the negotiation must be hypothesized as of the time infringement began*. . . . In this case, the 1996 business plan and its projections for future sales were prepared by Infinite two months before infringement began. Thus, rather than being outdated for purposes of the hypothetical negotiation, those projections would have been available to Infinite at the time of the hypothetical negotiation. *The fact that Infinite did not subsequently meet those projections is irrelevant to Infinite’s state of mind at the time of the hypothetical negotiation*. Nor does Infinite’s subsequent failure to meet its projections imply that they were grossly excessive or based only on speculation or guesswork.¹²³

This outcome is fully consistent with the Federal Circuit’s rule, as stated in *Hanson* and elsewhere, relying on the parties’ expectations at the time of the hypothetical negotiation, even when contradicted by actual subsequent performance.¹²⁴ This makes sense. The projections contained in the defendant-

¹¹⁸ *Id.*

¹¹⁹ *Id.*

¹²⁰ *Id.*

¹²¹ *Id.*

¹²² See *infra* note 180.

¹²³ *Interactive Pictures*, 274 F.3d at 1384–85 (internal citations omitted) (emphasis added).

¹²⁴ *Hanson v. Alpine Valley Ski Area, Inc.*, 718 F.2d 1075, 1079 (Fed. Cir. 1983) (“The key element in setting a reasonable royalty . . . is the necessity for return to the date when the infringement began.”) (quoting *Panduit Corp. v. Stahlin Bros. Fibre Works, Inc.*, 575

infringer's nearly contemporaneous business plan are highly probative of the expectations of at least one of the two participants in the hypothetical negotiation.¹²⁵ In contrast, the defendant-infringer's actual sales performance is probative of neither, coming well after the time of the hypothetical negotiation.¹²⁶ As a result, there is a much stronger case for the admission of negotiation-contemporaneous sales and profit projection evidence than there is for evidence of subsequent actual sales and profit performance. But, to be consistent and properly align incentives to innovate, whichever rule is applied—whether post-negotiation actual performance is to be considered or not—courts must apply the rule uniformly, regardless of who benefits from inclusion or exclusion of post-negotiation evidence.

Seven months after its decision in *Interactive Pictures*, the Federal Circuit vacated and remanded a reasonable royalty damage award it characterized as “excessive and unsupported by evidence” in *Riles v. Shell Exploration & Production Co.*¹²⁷ The patent at issue in that case permitted the anchoring of fixed offshore oil drilling platforms without the need for mud mats for leveling and supporting the jacket on the sea floor.¹²⁸ Not expressly invoking the Book of Wisdom but nonetheless relying on post-hypothetical negotiation evidence, the plaintiff-patent owner's damages expert premised each of his damages models on the value of the entire Shell platform, whether measured by its \$84 million installation cost or the gross revenues generated from its use, rather than the value attributable to the patented anchoring method over the next best alternative available at the time infringement began.¹²⁹ In essence, the damages expert's approach imbued the hypothetical negotiation with bargaining leverage attributable to Shell's sunk cost investment in the drilling platform and the revenue being generated therefrom, leverage that would not have existed just prior to the time infringement began, at the time of the required hypothetical negotiation.¹³⁰ Citing to *Hanson*, the Federal Circuit, in an opinion authored by Judge Rader, held:

A reasonable royalty determination for purposes of making a damages evaluation must relate to the time infringement occurred, and not be an after-the-fact assessment. Clearly, [plaintiff's expert's] models did not reflect what royalty rate a hypothetical negotiation between Shell and Riles would have yielded at the time the infringement

F.2d 1152, 1158 (6th Cir. 1978)); *Wang Labs, Inc. v. Toshiba Corp.*, 993 F.2d 858, 870 (Fed. Cir. 1993).

¹²⁵ *Interactive Pictures*, 274 F.3d at 1385.

¹²⁶ *Id.*

¹²⁷ 298 F.3d 1302, 1305 (Fed. Cir. 2002).

¹²⁸ *Id.* at 1305–06.

¹²⁹ *Id.* at 1311–12.

¹³⁰ *Id.*

began. Instead, the models reflected [the expert’s] assessment of the worth of Shell’s oil rig at the time of the trial.¹³¹

This is clearly the proper outcome, but why wasn’t the Book of Wisdom available to require, or at least permit, consideration of “events and facts that occurred thereafter and that could not have been known to or predicted by the hypothesized negotiators[?]”¹³² Is it simply that the plaintiff-patentee failed to argue for its application?

The Federal Circuit, in another opinion authored a year later by Judge Rader, *Integra Lifesciences I, Ltd. v. Merck KGaA*,¹³³ cited extensively to *Riles* and *Hanson* in setting aside and remanding a \$15 million reasonable royalty jury award for lack of substantial evidence concerning the appropriate date for the hypothetical negotiation.¹³⁴ The court recognized that, “factoring in the rapid development of biological arts,” “[t]he value of a hypothetical license negotiated in 1994 could be drastically different from one undertaken in 1995”¹³⁵ The court remanded the case for further proceedings before the district court “to ascertain the date on which the hypothetical negotiation in advance of infringement would have occurred[,]” noting that “correct determination of this date is essential for properly assessing damages.”¹³⁶ Of course, this date is much less important if one applies the Book of Wisdom and considers post-hypothetical negotiation events and performance in the reasonable royalty calculus.¹³⁷

The Book of Wisdom made a subsequent, albeit unconventional, appearance in the 2009 Federal Circuit opinion in *Lucent Technologies, Inc. v. Gateway, Inc.*¹³⁸ There, the Federal Circuit reversed and remanded for a new trial a jury award of lump-sum reasonable royalty damages of \$357,693,056.18 for an admittedly minor feature of Microsoft’s Outlook program—a “date-picker” feature.¹³⁹ The court found the jury award unsupported by substantial evi-

¹³¹ *Id.* at 1313 (internal citations omitted).

¹³² *Fromson v. Western Litho Plate & Supply Co.*, 853 F.2d 1568, 1575 (Fed. Cir. 1988), *overruled on other grounds by* *Knorr-Bremse Systeme Fuer Nutzfahrzeuge GmbH v. Dana Corp.*, 383 F.3d 1337, 1338 (Fed. Cir. 2004) (en banc).

¹³³ 331 F.3d 860 (Fed. Cir. 2003), *vacated and remanded on other grounds*, 545 U.S. 193 (2005), *on remand*, 496 F.3d 1334 (Fed. Cir. 2007).

¹³⁴ *Id.* at 862.

¹³⁵ *Id.* at 870.

¹³⁶ *Id.*

¹³⁷ Interestingly, the *Integra* majority was much less strict in eschewing any consideration of post-hypothetical negotiation facts when those facts supported its position, referencing a later acquisition of the patent-owning entity for \$20 million and commenting that the \$15 million damage verdict “seems unbalanced in view of the overall acquisition price.” *Id.* at 871.

¹³⁸ 580 F.3d 1301 (Fed. Cir. 2009).

¹³⁹ *Id.* at 1308.

dence.¹⁴⁰ Both sides' experts had relied on the willing licensor/willing licensee approach to calculating reasonable royalty damages.¹⁴¹ Lucent's expert argued for an 8% running royalty on sales of Microsoft Outlook, while Microsoft's expert opined that the parties would have agreed to a lump-sum payment of \$6.5 million.¹⁴²

Microsoft argued that how often the date-picker tool was in fact used by consumers was irrelevant because "such facts postdate the time of the hypothetical negotiation."¹⁴³ While ultimately ruling in Microsoft's favor and setting aside the jury's damages award, the Federal Circuit rejected this portion of Microsoft's argument, citing both Sinclair Refining's reference to "a book of wisdom" and its own decision in *Fromson*, reasoning that "neither precedent nor economic logic requires us to ignore information about how often a patented invention has been used by infringers. Nor could they since frequency of expected use and predicted value are related."¹⁴⁴ The court's reference to "expected use" is revealing, since Lucent offered evidence of actual, not expected, use, and neither party proffered evidence regarding what level of use the parties reasonably expected at the time infringement began.¹⁴⁵ In any event, the court was careful to emphasize that its "case law affirms the availability of post-infringement evidence as probative [only in] certain circumstances" and that "[c]onsideration of evidence of usage after infringement started can, under appropriate circumstances, be helpful to the jury and the court in assessing whether a royalty is reasonable" because such "data may provide information that the parties would frequently have estimated during the negotiation."¹⁴⁶ The *Lucent Technologies* panel's references to "expected use," "appropriate circumstances," and "frequently estimated data" are a far cry from the *Fromson* panel's earlier implication that the Book of Wisdom "permits and often requires a court to look to events and facts that occurred thereafter and that *could not have been known to or predicted by* the hypothesized negotiators."¹⁴⁷

More recently, in *Aqua Shield v. Inter Pool Cover Team*,¹⁴⁸ the Federal Circuit vacated and remanded a district court's royalty damage award because, while "[t]he district court correctly noted that the infringer's actual profits earned

¹⁴⁰ *Id.* at 1335.

¹⁴¹ *Id.* at 1325.

¹⁴² *Id.* at 1323.

¹⁴³ *Id.* at 1333.

¹⁴⁴ *Id.*

¹⁴⁵ *Id.* at 1327.

¹⁴⁶ *Id.* at 1333–34 (emphasis added).

¹⁴⁷ *Fromson*, 853 F.2d 1568, 1575 (Fed. Cir. 1988) (emphasis added).

¹⁴⁸ 774 F.3d 766 (Fed. Cir. 2014).

during the period of infringement can be relevant to the inquiry, . . . it erred in the use it made of [the infringer’s] profit figures.”¹⁴⁹ The lower court had used the infringer’s actual profits as an effective cap on the reasonable royalty damage award.¹⁵⁰

The Federal Circuit reversed, holding that:

What an infringer’s profits actually turned out to have been during the infringement period may be relevant, but only in an indirect and limited way—as some evidence bearing on a directly relevant inquiry into anticipated profits. . . . [T]he core economic question is what the infringer, in a hypothetical pre-infringement negotiation under hypothetical conditions, would have *anticipated* the profit-making potential of use of the patented technology to be, compared to using non-infringing alternatives. If a potential user of the patented technology would expect to earn X profits in the future without using the patented technology, and X + Y profits by using the patented technology, it would seem, as a *prima facie* matter, economically irrational to pay more than Y as a royalty—paying more would produce a loss compared to forgoing use of the patented technology.¹⁵¹

While the court in *Aqua Shield* applied this reasoning in setting aside a small damages award at the behest of the plaintiff-patentee,¹⁵² its statement of the rule and reasoning is equally applicable to the situation where inclusion of unanticipated and unexpectedly high infringer profits leads to an inflated damages award. In any event, the court’s focus on anticipated rather than actual profits, while entirely appropriate, contrasts markedly from prior statements of the court suggesting that the Book of Wisdom requires “a court to look to events and facts that occurred thereafter and that could not have been known to or predicted by the hypothetical negotiators.”¹⁵³ This is true notwithstanding the fact that the *Aqua Shield* panel expressly cited to *Sinclair Refining* and the Book of Wisdom in reaching its decision.¹⁵⁴

Most recently, the Federal Circuit referenced the Book of Wisdom in a decision dealing with the award of prejudgment interest, *Comcast IP Holdings I LLC v. Sprint Communications Company, L.P.*¹⁵⁵ In that case, Sprint challenged the award of prejudgment interest on a \$7.5 million reasonable

¹⁴⁹ *Id.* at 770 (citing *Trans-World Mfg. Corp. v. Al Nyman & Sons, Inc.*, 750 F.2d 1552, 1568 (Fed. Cir. 1984) for proposition that actual profits can be relevant).

¹⁵⁰ *Id.* at 772 (“[T]he district court did not err in considering [the infringer’s] profits. But it did err in treating the profits [the infringer] actually earned during the period of infringement as a royalty cap. That treatment incorrectly replaces the hypothetical inquiry into what the parties would have anticipated, looking forward when negotiating, with a backward-looking inquiry into what turned out to have happened.”).

¹⁵¹ *Id.* at 770–71 (emphasis original).

¹⁵² *Id.* at 768.

¹⁵³ *Fromson*, 853 F.2d at 1575.

¹⁵⁴ *Aqua Shield v. Inter Pool Cover Team*, 774 F.3d 766, 772 (Fed. Cir. 2014).

¹⁵⁵ *Comcast IP Holdings I LLC v. Sprint Comm’n. Co.*, 850 F.3d 1302 (Fed. Cir. 2017).

royalty damages award for infringement of three patents running from 2006, the date of first infringement of the first of those patents, even though the latter two patents did not issue until 2012.¹⁵⁶ The Federal Circuit noted that, “[w]hile in other contexts Sprint’s contentions might be well taken, they are not here,” because “[t]he parties’ experts agreed that any damage award should take the form of a lump sum royalty payment” and “the jury was told that the lump sum royalty payment should run from the date of the earliest relevant hypothetical negotiation.”¹⁵⁷

The jury was also told that the hypothetical negotiators would have employed the ‘book of wisdom,’ looking forward in time from the date of the first hypothetical negotiation to account for ‘all information that would have been relevant to the parties in coming to and arriving at a deal.’ Both experts agreed that this information would have included the issuance of any later patent relating to the same technology.¹⁵⁸

Whether the Federal Circuit would have endorsed such an application of the Book of Wisdom had the parties not essentially stipulated to it is unclear.

D. District Court Efforts to Make Sense of the Federal Circuit’s Book of Wisdom Jurisprudence

Given this somewhat erratic reference to and application of the Book of Wisdom in Federal Circuit decisions, it is little surprise that district court decisions likewise reflect some confusion regarding the doctrine’s application. Indeed, Judge Sleet of the District of Delaware expressly acknowledged the seemingly inconsistent lines of Federal Circuit authority in *Honeywell International, Inc. v. Hamilton Sundstrand Corp.*¹⁵⁹ In that case, Honeywell sued Hamilton for infringement of a patent on technology used in regional jet aircraft.¹⁶⁰ The regional jet market experienced an unexpected increase in demand after the events of September 11, 2001. Honeywell sought to include post-2001 sales projections of the accused product in its damages calculation, despite the fact that the alleged infringement, and therefore the presumed hypothetical negotiation, commenced pre-2001.¹⁶¹ Inclusion of the later sales projections increased the requested lump-sum reasonable royalty demand from roughly \$17 million to roughly \$28 million.¹⁶²

Hamilton sought to exclude the post-hypothetical negotiation projections, while Honeywell argued for their inclusion relying on “the ‘book of wisdom’

¹⁵⁶ *Id.* at 1308–09.

¹⁵⁷ *Id.* at 1314.

¹⁵⁸ *Id.* (internal record citations omitted).

¹⁵⁹ 378 F. Supp. 2d. 459 (D. Del. 2005).

¹⁶⁰ *Id.* at 462.

¹⁶¹ *Id.* at 463.

¹⁶² *Id.*

concept set forth by the Supreme Court over seventy years ago in *Sinclair*, and adopted by the Federal Circuit in *Fromson*.¹⁶³ Judge Sleet traced the history of the Book of Wisdom doctrine from *Sinclair Refining* to *Fromson*, finding in that history a preference for flexibility in calculating and awarding patent damages “adequate to compensate for the infringement.”¹⁶⁴ Judge Sleet also discussed the *Hanson*, *Interactive Pictures*, *Riles* and *Integra* line of cases,¹⁶⁵ noting at the conclusion of that process that “the court is presented with two cases [*Fromson* and *Integra*], both of which are binding, that dictate opposite results.”¹⁶⁶

In the end, Judge Sleet was “persuaded that the result dictated by *Fromson* [was] the most sensible,”¹⁶⁷ and he permitted Honeywell’s damages calculations including the post-hypothetical negotiation sales projections to go before the jury, reasoning that four policies favored that approach:

First, it promotes flexibility in damage calculations by not erecting an unnecessarily rigid barrier to relevant post-negotiation information. Second, it discourages infringement by placing the risk of success on the infringer. Third, it protects the *quid pro quo* underlying patent law by preventing a premature valuation of the patent. Finally, it permits a damage award more in keeping with the plain language of § 284 by adequately compensating the plaintiff for ‘the use made of the invention’ by the defendant.¹⁶⁸

But, as detailed above, discouraging infringement and adequately compensating invention are not the only policy considerations at play here.¹⁶⁹ There are significant societal costs to over-compensating patent owners.¹⁷⁰ Because of this, the law also aims not to unduly restrict competition and other aspects of the patent law—most notably, enhanced damages for willful and deliberate infringement and attorney fee awards, in exceptional cases—provide effective disincentives to conscious infringing activities.¹⁷¹

Other district court decisions reveal similar confusion in understanding and applying the Book of Wisdom. Some decisions hew more closely to the doctrine’s roots, permitting post-negotiation value evidence only in the absence of more contemporaneous evidence or upon a showing that such evidence is probative of what the parties would have understood at the time of the

¹⁶³ *Id.*

¹⁶⁴ *Id.* at 464–65.

¹⁶⁵ *Id.* 465–69.

¹⁶⁶ *Id.* at 469. Judge Sleet did not have the benefit of either the *Lucent Technologies* or the *Aqua Shield* decisions at the time he issued his ruling.

¹⁶⁷ *Id.*

¹⁶⁸ *Id.* at 469–70.

¹⁶⁹ See *supra* Part II.

¹⁷⁰ *Id.*

¹⁷¹ *Id.*

hypothetical negotiation.¹⁷² Others, in contrast, appear to view the doctrine as an open door, permitting essentially all post-negotiation evidence to be considered by the jury.¹⁷³

In *Spectralytics, Inc. v. Cordis Corp.*,¹⁷⁴ Judge Patrick Schiltz of the District of Minnesota let stand, over post-trial motions, a jury's reasonable royalty damages award in excess of \$22 million, despite being "initially troubled by the jury's verdict," finding that "[t]he reasonable-royalty damages awarded by the jury are certainly generous, but they have a sufficient basis in the evidence at trial and do not reflect a miscarriage of justice."¹⁷⁵ The jury found Cordis liable for infringement of a Spectralytics patent covering an apparatus for

¹⁷² *St. Clair Intellectual Prop. Consultants Inc. v. Canon, Inc.*, Civ. A. No. 03-241 JFF, 2004 WL 2213562, at *2 (D. Del. Sept. 28, 2004) (Under the Book of Wisdom, "courts may consider events after the date infringement began as a basis for inferring what the pre-infringement negotiated value of a license would have been[,] therefore, "[d]ue to the lack of evidence of the value of the inventions in April, 1995, [plaintiff's damages expert] uses evidence of subsequent events as a basis from which to infer what the pre-infringement negotiated value of a license would have been.").

¹⁷³ *See, e.g., Metaswitch Networks, Ltd. v. Genband US LLC*, No. 2:14-cv-744-JRG-RSP, 2016 WL 874737, at *6 (E.D. Tex. Mar. 5, 2016) (citing *Aqua Shield v. Inter Pool Cover Team*, 774 F.3d 766, 772 (Fed. Cir. 2014) as support for the proposition that "it is well-settled that post-hypothetical-negotiation evidence can act as a 'book of wisdom' to inform the royalty rate the parties would have agreed to"); *Genband US LLC v. Metaswitch Networks Corp.*, No. 2:14-cv-33-JRG-RSP, 2016 WL 125503, at *4 (E.D. Tex. Jan. 9, 2016) (citing *Aqua Shield*, 774 F.3d at 772, in permitting plaintiff's damages expert to rely on "post-infringement evidence to support his opinions about the pre-infringement hypothetical negotiation" because "courts have recognized that such evidence can constitute a relevant 'book of wisdom' and may be properly relied upon"); *France Telecom S.A. v. Marvell Semiconductor Inc.*, No. 12-cv-04967-WHO, 2014 WL 4272771, at *1 (N.D. Cal. Aug. 28, 2014) (relying on *Lucent Technologies, Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1333–34 (Fed. Cir. 2009) to deny motion in limine to preclude defendant-accused infringer from "argu[ing], based on actual use of the patented method (i.e., the 'book of wisdom'), that a running royalty would not exceed a certain amount"); *Ariba, Inc. v. Emptoris, Inc.*, 567 F. Supp. 2d 914, 917–18 (E.D. Tex. 2008):

The jury may consider the infringer's actual sales and revenue up to the date of trial as part of the 'book of wisdom.' . . . "If [post-hypothetical negotiation evidence] helps the expert's client, only an incompetent would have failed to bring these facts before the jury when *reading from his or her version of the 'book of wisdom.'*"

(emphasis added); *Cummins-Allison Corp. v. SBM Co., Ltd.*, 584 F. Supp. 2d 916, 918 (E.D. Tex. 2008) ("[E]ven a minimally competent damages expert will have included in pre-trial calculations every advantageous change in profits, sales, and other conditions that occurred prior to trial under the 'book of wisdom' rubric.").

¹⁷⁴ 650 F. Supp. 2d 900 (D. Minn. 2009).

¹⁷⁵ *Id.* at 907.

making stents by cutting a piece of metal tubing with a laser, and it awarded \$22.35 million in damages based on a 5% royalty on sales to Cordis of stents cut with infringing devices.¹⁷⁶ Cordis challenged the jury’s damages award as “grossly excessive,” because the award well-exceeded the cost of available non-infringing alternatives and, indeed, exceeded the entire value of Spectralytics as a company, as reflected by the price paid for the company in a subsequent transaction.¹⁷⁷

Judge Schiltz rejected Cordis’s argument that the jury verdict was unsustainable as a matter of law because no reasonable willing licensee would have agreed to pay more than the cost of the next-best alternative, reasoning:

Because the lifetime cost of a percentage royalty cannot be known with certainty at the time of the license negotiation, there is no logical reason why the amount of royalties that are in fact paid out in the years following the negotiation could not exceed the cost of noninfringing alternatives available at the time of the negotiation.¹⁷⁸

Judge Schiltz further rejected Cordis’s argument that, under the Book of Wisdom doctrine, the parties are presumed to have known the extent of future sales as a “mischaracteriz[ation of] the law,” and further declined to give credence to Spectralytics’s damages expert’s arguable acquiescence to Cordis’s characterization of the Book of Wisdom doctrine as the product of “confusing answers” given to “misleading questions.”¹⁷⁹ Judge Schiltz then proceeded to quote Justice Cardozo’s entire Book of Wisdom discussion in *Sinclair Refining*, finding:

Two aspects of this passage are noteworthy. First, in it Justice Cardozo advocates looking to future events to avoid undercompensating patentees, not to limit their compensation (as Cordis advocates here).¹⁸⁰ Second, Justice Cardozo does not suggest that all future events are known with certainty at a hypothetical negotiation; to the contrary, he says

¹⁷⁶ *Id.* at 903–04.

¹⁷⁷ *Id.* at 907.

¹⁷⁸ *Id.* at 911.

¹⁷⁹ *Id.* at 911–12.

¹⁸⁰ *Id.* at 913. This candid assessment of the Book of Wisdom as being designed to benefit patentees to the detriment of infringers (whether intentional or not), rather than to unbiasedly inform the hypothetical negotiation process to reflect the “true value” of the patented technology as revealed by subsequent events, is revealing. It is also borne out in the case law as the doctrine appears to be disproportionately applied to permit post-hypothetical negotiation facts to be considered when they benefit the hypothetical willing licensor, while strictly holding to the rule that only information known or reasonably foreseeable to the parties at the time of the hypothetical negotiation is relevant when post-negotiation events would otherwise benefit the hypothetical willing licensee. *See, e.g.,* Interactive Pictures Corp. v. Infinite Pictures, Inc., 274 F.3d 1371, 1384–85 (Fed. Cir. 2001) (rejecting defendant-infringer’s attempt to challenge reasonable royalty damages award based on proof of modest actual profit levels); *Fromson v. Western Litho Plate & Supply Co.*, 853 F.2d 1568, 1575–76 (Fed. Cir. 1988) (relying on Book of Wisdom in setting aside damage award at request of

that the purpose of looking at future events is “to bring out and expose to light the elements of value that were there from the beginning.”¹⁸¹

Judge Schlitz similarly rejected Cordis’s argument that Spectralytic’s post-hypothetical negotiation acquisition by a third party, Preco, at a fraction of the jury’s damages award rendered that award unsustainable as a matter of law, concluding that “the fact that Preco paid only \$4 million to buy Spectralytics in 2003—and nothing specifically for the ’277 patent—[did] not in any way undermine [the] jury’s finding that a hypothetical license negotiation in 1998 would have resulted in Spectralytics receiving over \$22 million in royalties” because, unlike the uncertainties at play at the time of the 2003 acquisition, the patent is presumed to be valid and infringed for purposes of the hypothetical negotiation.¹⁸²

Spectralytics is an interesting case because the court permitted the submission of evidence of the post-hypothetical negotiation acquisition price to the jury without any proof that the acquisition was reasonably foreseeable at the time of the hypothetical negotiation. And it did so even though such evidence could only benefit the defendant-infringer, and despite the fact that such evidence was arguably irrelevant because of the validity and infringement assumptions mandated by the willing licensor/willing licensee test. Yet, the jury still successfully discounted that evidence in reaching a verdict that the district judge candidly acknowledged he found “initially troubl[ing].”¹⁸³

Judge Philip Simon of the Northern District of Indiana directly confronted the issue of proper application of the Book of Wisdom in *BASF Corp. v. Aristo, Inc.*¹⁸⁴ In that case, BASF accused a competitor, Aristo, of infringing a BASF patent on a method of coating ceramic substrates for use in catalytic

plaintiff-patentee), *overruled on other grounds by* Knorr-Bremse Systeme Fuer Nutzfahrzeuge GmbH v. Dana Corp., 383 F.3d 1337, 1338 (Fed. Cir. 2004) (en banc); Trans-World Mfg. Corp. v. Al Nyman & Sons, Inc., 750 F.2d 1552, 1568 (Fed. Cir. 1984) (permitting plaintiff-patentee to present evidence of defendant-infringer’s actual profits without proof that profit level was reasonably foreseeable at the time infringement began); Hanson v. Alpine Valley Ski Area, Inc., 718 F.2d 1075, 1081 (Fed. Cir. 1983) (rejecting defendant-infringer’s attempt to challenge reasonable royalty award on basis that awarded royalty would not permit it to make a profit); Honeywell International, Inc. v. Hamilton Sundstrand Corp, 378 F. Supp. 2d 459, 469–70 (D. Del. 2005) (invoking Book of Wisdom to permit evidence of unforeseeable, post-hypothetical negotiation increase in sales to go before jury because “it discourages infringement by placing the risk of success on the infringer”). This bias makes no economic sense for the reasons detailed in Part II, above.

¹⁸¹ *Spectralytics, Inc. v. Cordis Corp.*, 650 F. Supp. 2d 900, 913 (D. Minn. 2009) (internal citation omitted).

¹⁸² *Id.* at 916.

¹⁸³ *Id.* at 907.

¹⁸⁴ No. 2:07 CV 222 PPS, 2012 WL 2529213 (N.D. Ind. June 29, 2012).

converters.¹⁸⁵ Each party sought to exclude the other’s damages expert under *Daubert*.¹⁸⁶ Both damages experts calculated damages based on a reasonable royalty and both had applied the willing licensor/willing licensee test.¹⁸⁷ But, the experts had fundamentally different positions on “the amount of information the parties should be imagined to have had at the point the hypothetical royalty negotiation is imagined to have taken place.”¹⁸⁸ Catalytic converters are sold in two markets—an Original Equipment Manufacturer (“OEM”) market, including automobile manufacturers, and an aftermarket, including automotive repair and replacement companies.¹⁸⁹ BASF sold almost exclusively in the OEM market, and Aristo sold exclusively in the aftermarket.¹⁹⁰ However, the parties did not dispute that Aristo began using the accused method “with hopes of entering the OEM market[]” and that “Aristo [was] altogether unsuccessful in [its] efforts to crack the OEM market.”¹⁹¹

BASF’s expert calculated damages focusing on the OEM market, relying on the undisputed fact that Aristo commenced its allegedly infringing activities in order to enter that market.¹⁹² Accordingly, BASF’s expert described the relevant inquiry as, “What would Aristo pay to enter the OEM market? and What would BASF need to allow competition in the OEM market product niche?”¹⁹³ The expert gave no consideration to the fact that Aristo was ultimately unsuccessful in entering the OEM market, because that fact post-dated the hypothetical negotiation.¹⁹⁴ Aristo’s expert, in contrast, invoked the Book of Wisdom to include in his analysis the “practical reality that Aristo only sold substrates in the aftermarket and never entered the OEM market.”¹⁹⁵ Each side argued that the other’s approach was wrong as a matter of law and that the competing expert’s opinion should not be permitted to go before the jury.¹⁹⁶

Who was right? In Judge Simon’s view, neither was right, and he let both experts testify, leaving to the jury to determine which was the most credible.¹⁹⁷ In doing so, Judge Simon noted that both positions found some support in controlling law:

¹⁸⁵ *Id.* at *8–9.

¹⁸⁶ *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993).

¹⁸⁷ *BASF*, 2012 WL 2529213, at *5.

¹⁸⁸ *Id.* at *6.

¹⁸⁹ *Id.* at *9–10.

¹⁹⁰ *Id.*

¹⁹¹ *Id.*

¹⁹² *Id.* at *10–11.

¹⁹³ *Id.* at *11.

¹⁹⁴ *See id.*

¹⁹⁵ *Id.*

¹⁹⁶ *See id.* at *12–13.

¹⁹⁷ *Id.* at *13.

It is clear that experts are supposed to imagine the reasonable royalty negotiation taking place on the date infringement began, which means that the parties would have no knowledge of events after the date of infringement that might impact the hypothetical negotiation—a sort of blank slate approach. [Citing *Panduit*.] But there is also caselaw that cuts in the other direction that allows experts to consider events after the date infringement began. This rule has the corny moniker of the ‘Book of Wisdom[.]’ [Citing *Sinclair Refining, Fromson, and Lucent*.]¹⁹⁸

Summing up this conflicting law, Judge Simon continued:

Thus, the amount of information that the parties are imagined to have at the hypothetical royalty negotiation exists on a spectrum. On one end the infringing party is treated as a blank slate; on the other end it is treated as having perfect hindsight. Where any given case should properly fall on this spectrum is ‘determined by the circumstances of each case.’ BASF states this point well in its briefing on these motions: ‘there is no bright-line test for whether an expert’s reliance on post-negotiation facts is appropriate or not, [and] the Federal Circuit has endorsed a case-by-case, fact-driven analysis to make that determination.’¹⁹⁹

Judge Simon’s assessment is correct—no bright-line test exists in the Federal Circuit’s jurisprudence, nor should it. The pertinent question, however, is whether the court has given sufficient guidance on when resort to post-negotiation evidence is appropriate and when it is not. This Article maintains it has not. And, confronted with such uncertainty, district court judges are prone to do what Judge Simon did in *BASF* and simply let the jury decide which expert’s approach is more persuasive.²⁰⁰

But who should make this determination—judges or juries? If the latter, what foundational evidence must be present to let the issue go to the jury and how should the jury be instructed in that regard? Has the Federal Circuit given sufficient guidance on when resort to post-hypothetical negotiation evidence is appropriate and when it is not? Regrettably, the answer to this question also is no. Finally, does the current approach reflect good policy, and will it reliably result in predictable outcomes consistent with the policies underlying patent law? Again, it will not.

Before undertaking to suggest a revised or clarified rule for application of the Book of Wisdom, it is helpful to identify and quantify the effect that application of the Book of Wisdom has on the reasonable royalty calculation. One is then in the position to evaluate whether that effect is consistent with the policies underlying patent damages or not. The next section applies option theory to identify and quantify those effects.

¹⁹⁸ *Id.* at *6–7 (citing *Panduit Corp. v. Stahl Bros. Fibre Works*, 575 F.2d 1152, 1158 (6th Cir. 1978); *Sinclair Refining Co. v. Jenkins Petroleum Process Co.*, 289 U.S. 689, 698 (1933); *Fromson v. Western Litho Plate & Supply Co.*, 853 F.2d 1568, 1575 (Fed. Cir. 1988)).

¹⁹⁹ *Id.* at *8 (internal citations omitted).

²⁰⁰ *See id.* at 13.

IV. Quantifying the Impact of the Book of Wisdom on Reasonable Royalty Damages Using Option Theory

As discussed in Part II above, application of the Book of Wisdom changes the risk profile that participants in the hypothetical negotiation would have otherwise faced. Specifically, it introduces survivorship bias²⁰¹ by removing the risk that the plaintiff would have had to incur to earn the damage amount that results from application of the Book of Wisdom. This, in turn, impacts the damage numbers and resulting incentives for innovation.

Changes in risk result in real differences in damages, because risky dollars are worth less than certain dollars.²⁰² Avoiding risk also costs money, a cost known as the risk premium.²⁰³ Foregoing risk requires either giving up the reward commensurate with undertaking the risky bet or paying someone to insure against the risky bet not paying off.²⁰⁴ By ignoring the difference between certain and uncertain outcomes, application of the Book of Wisdom awards the plaintiff the value of a certain successful outcome when the infringement only deprived the plaintiff of a risky outcome.²⁰⁵ This is particularly true if courts apply the Book of Wisdom inconsistently, invoking it only when the post-negotiation facts benefit the plaintiff-patentee and not the defendant-infringer.²⁰⁶ Such application reflects survivor (or “survivorship”) bias, that is,

²⁰¹ Survivorship bias is an analytical fallacy where only the successful outcomes are analyzed, while minimizing the impact of, or even ignoring, the unsuccessful ones. Financial indices represent one commonly cited example of survivorship bias. Such indices often set certain parameters that dictate inclusion in or exclusion from the index. When one company falls outside of such parameters, i.e., “fails”, it can be excluded and replaced with another company whose financials fall within the acceptable inclusion range, i.e., “succeeds”. Thus, indices can give a false impression of success and financial viability, as the only companies analyzed are those that met the inclusion criteria, i.e., succeeded. Those that failed were excluded and thus never analyzed. Simply put, the cohort does not remain constant.

²⁰² MARK HIRSCHHEY, *FUNDAMENTALS OF MANAGERIAL ECONOMICS* 636 (South-Western, 9th ed. 2009).

²⁰³ *Id.* at 638.

²⁰⁴ *Id.*

²⁰⁵ See Franklin M. Fisher & R. Craig Romaine, *Janis Joplin’s Yearbook and the Theory of Damages*, 5 J. Acct. Auditing & Fin. 145, 154 (1990):

The violation did not merely deprive the plaintiff of the stream of returns that would have accompanied the asset. It also relieved plaintiff of the uncertainty surrounding that stream. . . . The way in which both effects can be taken into account is to value the asset as of the time of the violation

²⁰⁶ A good example of this phenomenon is the Fifth Circuit decision in *University Computing Co. v. Lykes-Youngstown Corp.*, 504 F.2d 518 (5th Cir. 1974), a trade secrets case. There, post-hypothetical negotiation information placed the infringer’s profits well *below* those expected at the time infringement began. Relying on an early patent case from the

reliance on outcomes that have “survived,” which yields misleading and either overly optimistic or overly pessimistic results, as detailed below.²⁰⁷

The net result skews the incentives otherwise resulting from competitive markets. Competitive markets place a value on avoiding risk, and, inversely, provide incentives of greater reward to those willing to undertake additional risk. Riskier stocks must compensate rational investors with the promise of higher returns in order to induce them to choose that stock over an equivalent bond.²⁰⁸ Consumers regularly purchase insurance at market rates to avoid market, property, or personal risks. Financial economics has made great strides in its ability to decompose the risks inherent in financial assets and separately price such risk.²⁰⁹ As a result, financial analysis tools can decompose the damages calculated using the Book of Wisdom, and parties can identify and value the risk reduction that the doctrine otherwise ignores.²¹⁰

In particular, option theory provides a means to identify the nature and magnitude of the risk shifts caused by application of the Book of Wisdom. This is because the potential award of reasonable royalty damages is analogous to

Supreme Court, *In re Cawood Patent*, 94 U.S. 695 (1877), the court noted “the Supreme Court has held in a patent case that the lack of actual profits does not insulate the defendants from being obliged to pay for what they have wrongfully obtained in the mistaken belief their theft would benefit them.” 504 F.2d at 536. The court articulated the rationale for this rule as follows: “the risk of defendants’ venture, using the misappropriated trade secret, should not be placed on the injured plaintiff, but rather the defendants must bear the risk of failure themselves.” *Id.* at 536. But, in actuality, the relevant “risk” is both an upside risk and a downside risk. What if the defendant had achieved higher than anticipated profits? Should it then be required to pay damages based on those higher profits? There is no economically defensible rationale for placing the downside risk on the defendants without placing the total risk on the defendants.

²⁰⁷ See GARY SMITH, *STANDARD DEVIATIONS: FLAWED ASSUMPTIONS, TORTURED DATA, AND OTHER WAYS TO LIE WITH STATISTICS* (Overlook Duckworth 2014).

²⁰⁸ This is as much an economic reality as it is a mathematical one. Consider two possible investment choices, A and B. If A promises a return of \$100 with a probability (risk) of 50%, i.e., a coin toss, the expected value is \$50. Now, suppose B promises a return of \$80. If the probability of B were also 50%, the expected value would be \$40. No investor would choose B, because he/she could undertake the same risk (a coin toss) and achieve a greater expected value, \$50, by choosing investment A. For an investor to be indifferent between the two investment options, the probability of achieving the promised \$80 return from option B must be such that the expected value would also be \$50. Because the return investment B offers is less than A, B’s risk must be lower, i.e., the probability of earning the return must be higher.

²⁰⁹ MARCELO BIANCONI, *FINANCIAL ECONOMICS, RISK, AND INFORMATION* 161–62 (World Scientific, 2nd ed. 2012).

²¹⁰ See Mark Glick & Avner Kalay, *How to Value A Lost Opportunity*, 11 *GEO. MASON L. REV.* 673 (2003).

creating an option that gives the plaintiff the right, but not the obligation, to bring a lawsuit for damages. As demonstrated below, the nature of the option that the plaintiff receives is markedly different when the royalty is calculated using the Book of Wisdom than when the Book of Wisdom is not applied. The difference between the two options results from the risk shifts caused by application of the Book of Wisdom.

In option theory, a European option grants its holder the right, but not the obligation, to buy (“call option”) or sell (“put option”) an asset at or for a specified price on a specified future date.²¹¹ The price at which the future purchase or sale is made is referred to as the “strike price” or the “exercise price,” and the date when the right must be exercised is called the “expiration date.”²¹² Generally, when an option investor expects a stock’s price to rise, he/she purchases a call option (long position).²¹³ In contrast, when an option investor expects a stock’s price to fall, the investor will likely “short” the stock by purchasing a put option, committing himself/herself to sell the stock at a future date at today’s price.²¹⁴

The prices at which investors trade options in the market are commonly determined through the Black-Scholes Options Pricing Model.²¹⁵ An example of a Black-Scholes calculation follows, using the facts from the hypothetical set forth in Part I above, to illustrate the impact of the Book of Wisdom. The option values depend significantly on four factors, each of which is relevant in any damages calculation.²¹⁶ These factors provide the nexus between damage calculations in intellectual property cases and the call option (“C”) and put option (“P”) values:

1. The spot price (“S”), i.e., the current value of the stock. This corresponds to the value of the company or the expected value of the cash flows as of the date of first infringement. In the hypothetical, this value is \$8

²¹¹ Fisher Black & Myron Scholes, *The Pricing of Options and Corporate Liabilities*, 81 J. POL. ECON. 637 (1973).

²¹² *Id.*

²¹³ *Id.* at 638.

²¹⁴ *Id.* For example, suppose someone purchased a call option with a strike price of \$5 on AT&T stock. If, on the expiration date, the price of the stock exceeds the strike price, the holder of the call exercises the option. If the AT&T stock price is \$10 on the exercise date, the holder will exercise, because he/she can buy a \$10 share of stock for only \$5, thus pocketing a \$5 profit per share. In contrast, the holder of a put option (short position) benefits if AT&T’s stock price falls, because he/she can sell the stock for more than the market price at expiration and pocket the difference as profit. If the holder has a put with the same strike price and AT&T stock is \$2 on the exercise date, the holder will exercise the put and sell his/her share of AT&T for \$5 and keep the \$3 difference.

²¹⁵ *Id.*

²¹⁶ *See id.* at 638–39, 644.

million [\$40 million (\$10 million in cash flows per year for four years) multiplied by a 20% royalty rate]. It thus directly correlates to the damages figure proffered by the defendant's expert, without applying the Book of Wisdom, and prior to the application of any pre-judgment interest.

2. Volatility, which is the standard deviation of the assets' returns and a measure of the assets' riskiness, or uncertainty of outcome. In the case of patent damages, the asset is the royalty base or the defendant's sales. The higher the volatility, the more the stock can move within a given period. In terms of calculating patent damages, higher volatility would be reflected in a broader range of expected infringing sales, for example, ranging between \$2 million and \$12 million per year, rather than between \$5 million and \$7 million. Under traditional damages theory, the greater the uncertainty surrounding the future cash flows, the greater the discount rate that must be applied to them. The reason for this is that a prospective investor would require a higher interest rate in order to lend money to a riskier company than one with more certain expected cash flows.
3. Time ("t"), i.e., the time from the day the option is granted until it expires. In the hypothetical, this corresponds to the time from the date of first infringement to the date of trial.
4. The strike price ("X"), i.e., the price at which the option is exercised. In the hypothetical, this corresponds to the \$200 million damages figure advanced by plaintiff's expert applying the Book of Wisdom (the \$1 billion in actual sales multiplied by the 20% royalty rate). The \$200 million damages figure reflects the value of a 20% royalty on the defendant-infringer's \$1 billion in actual sales, discounted to the date of first infringement, using a *risk-free rate of interest*. (In the formula, $X * e^{-rt}$, "r" is the risk free rate of interest).

The put-call parity theorem establishes a relationship between the call ("C") and put ("P") options, the current price ("S", i.e., the defendant's damages amount), and the strike price discounted to present value (" $X * e^{-rt}$ ", i.e., the plaintiff's damages amount). It states that:

$$C + X * e^{-rt} = S + P$$

Equation 1: Put-call Parity Theorem

Where C is the value of a call option, X^*e^{-rt} is the discounted present value of the exercise price,²¹⁷ S is the fair market value of the asset on the date the option is granted, and P is the value of a put option.²¹⁸

Applying option theory to the original hypothetical permits one to quantify the effect of application of the Book of Wisdom. By invoking the Book of Wisdom, the plaintiff’s damage expert took the 2016 actual gross sales royalty base of \$1 billion and applied a 20% royalty rate to arrive at \$200 million in damages prior to discounting. In contrast, the defendant’s damage expert took the present value of the expected gross sales royalty base as of the time of the hypothetical negotiation in 2012 of \$40 million, then applied a 20% royalty rate to arrive at damages of \$8 million.²¹⁹

²¹⁷ In the term e^{-rt} , the base “ e ” refers to the mathematical constant 2.71828, also known as Euler’s number. It is a special case of the exponential function $f(x) = b^{xc}$. It is the rate of growth if all of the return were continually compounded on progressively smaller time periods. For example, suppose we have \$1 and grow it at 100% interest per year. After 1 year, we have \$2. However, what if the 100% annual growth rate were compounded monthly instead of once at the end of the year? We would have $(\$1+100\%/12)^{12} = \2.61 . If we compounded daily, we would substitute 365 for 12 in the formula and obtain \$2.71 at the end of the year. Now, what if we compounded every second of the year, i.e. 31,557,600 times a year? We would obtain \$2.71828, the value of “ e ”. Thus, as we make the compounding more and more frequent, we get closer and closer to the value of “ e ”, which is the limit of the growth function $(1+1/n)^n$, where n equals the number of periods compounding occurs in a year (i.e., 12 = monthly). This is why “ e ” is used as the base for continuous compounding or discounting.

²¹⁸ Appendix 1 further explains the put-call parity theorem.

²¹⁹ The final calculation would likely include prejudgment interest. It is notable that the Book of Wisdom eliminates the ability to use prejudgment interest correctly. Prejudgment interest is the interest due to the plaintiff for the period of time between the injury date and the date of trial. That is, both the \$8 million and the \$200 million, discounted to the date of first infringement, would be brought forward to the date of trial applying prejudgment interest. The patent statute authorizes the court to award pre-judgment interest through the words “together with interest and costs as fixed by the court.” 35 U.S.C. § 284. In *General Motors v. Devex*, 461 U.S. 648 (1983), the Supreme Court held that these words require the award of prejudgment interest in most cases:

The standard governing the award of prejudgment interest under § 284 should be consistent with Congress’ overriding purpose of affording patent owners complete compensation. In light of that purpose, we conclude that prejudgment interest should ordinarily be awarded. In the typical case an award of prejudgment interest is necessary to ensure that the patent owner is placed in as good a position as he would have been had the infringer entered into a royalty agreement.

Id. at 655. See also *Paper Converting Mach. Co. v. Magna-Graphics Corp.*, 745 F.2d 11, 23 (Fed. Cir. 1984) (prejudgment interest “is to compensate for the delay a patentee experiences in obtaining money he would have received sooner if no infringement had occurred”).

How does the Book of Wisdom result in the difference between \$200 million and \$8 million in reasonable royalty damages, and how does this relate to option theory? The obvious difference lies in the royalty bases used under the two approaches. By invoking the Book of Wisdom, plaintiff's expert gives the plaintiff the benefit of the actual sales through 2016, with no discount for the risk that existed in 2012—at the time infringement began and at which time the hypothetical negotiation presumably occurred—that sales at that level would be achieved. In essence, by applying the Book of Wisdom, plaintiff's expert awarded it a free put option—the right to sell its 2012 patent infringement claim asset at its 2016 value with no accounting for the uncertainty that existed in 2012 that such sales levels would be achieved. Defendant's expert's approach, in contrast, compensates plaintiff only for what the defendant took from it at the time defendant's infringement began—the expected value impact of the patent.²²⁰

That application of the Book of Wisdom results in granting the plaintiff-patent owner a free put option can also be demonstrated mathematically by realigning the terms of the put-call parity theorem as follows:

$$X^*e^{-rt} = S + P - C$$

Equation 2: Rearranged put-call parity theorem

Recall from the discussion above that X^*e^{-rt} is the discounted present value of the exercise price as of the option grant date. It is thus an appropriate substitute for plaintiff's damages approach in the hypothetical, as it equates to plaintiff's expert's proposed 2016 damages of \$200 million discounted back to 2012 using a risk free rate of return. S is the fair market value of the asset on the date the option is granted. In the hypothetical, it is the value of a license granted to the defendant-infringer on the date infringement began, in light of all of the information available to the parties at that time and their respective expectations. It is thus a near-perfect substitute for defendant's damages

²²⁰ How the Book of Wisdom insulates the plaintiff-patentee from the risk it would have otherwise incurred can also be explained using standard damages analysis. Suppose an expert were to calculate the expected damages at the time infringement began using a forecast of future cash flows equal to those actually achieved by the defendant-infringer (i.e., \$1 billion in the hypothetical). The expert would consider the significant uncertainty associated with achieving \$1 billion in future cash flows and apply a substantial discount rate, especially given the fact that the expected value of the future cash flows in the hypothetical was only \$8 million at the onset of infringement. Indeed, an extremely high discount rate (approximately 80.5%) would have to be applied to equate \$200 million in royalty revenues in 2016 to \$8 million in anticipated royalty revenues as of 2012, at the onset of infringement. Application of the Book of Wisdom essentially removes this standard discounting step from traditional damages analysis.

expert’s proposed reasonable royalty award, which, *before* it is brought forward to 2016, including prejudgment interest, totals \$8 million.

Returning to the rearrangement of the put-call parity theorem in Equation 2, it is readily apparent that the difference between plaintiff’s expert’s approach applying the Book of Wisdom and defendant’s expert’s approach limiting the analysis to information available at the time of the hypothetical negotiation is reflected in the “+ P – C” on the right side of the equation. Recall that P reflects the value of a put option, while C reflects the value of a call option. In circumstances like those posited in the hypothetical, where actual sales performance greatly exceeds what the parties could have reasonably anticipated at the time of the hypothetical negotiation, the call option is unlikely to have any significant value. Accordingly, the “- C” part of Equation 2, the option to buy the asset for S in four years if the price hits X, is unlikely to have any material effect on the equation, because the probability of the asset reaching the level of sales associated with X is virtually zero.²²¹ Indeed, if infringing sales are insignificant, it is unlikely that suit will even be brought and, if brought, extremely unlikely that the plaintiff-patent owner will seek to invoke the Book of Wisdom.²²² In contrast, when infringing sales exceed the parties’ reasonable expectations at the time infringement began, the “+ P” part of the equation (the value of the put option) can be very significant, often dwarfing S, the expected value at the time infringement began.

For example, in the hypothetical, “S”, the expected value of the license at the time infringement began, was \$8 million (\$40 million royalty base multiplied by the 20% royalty rate), while plaintiff’s damages claim applying the Book of Wisdom totaled \$200 million (\$1 billion royalty base multiplied by 20% royalty rate). The \$192 million difference reflects the value of the put option—plaintiff’s ability, thanks to the Book of Wisdom, to sell its 2012 patent infringement claim asset at its 2016 value with no accounting for the risks that existed in 2012, including the risk that market factors would not align in such a fashion as to render \$1 billion in gross sales.

Therefore, setting aside the de minimis value of the call option, reveals the following relationship between the two approaches:

²²¹ In the case of an unexpected unfavorable impact on sales, the opposite happens. The put becomes valueless and the call become valuable. Since the call is subtracted from plaintiff’s damages, the plaintiff is undercompensated in this scenario if the Book of Wisdom is applied.

²²² While it is possible that the defendant infringer may seek to apply the Book of Wisdom in such circumstances, as detailed in Part III above, courts have generally resisted efforts by defendant infringers to reduce their liability by claiming that their infringing conduct did not render the economic benefits they anticipated at the time infringement began.

Plaintiff's damage theory <i>with</i> the Book of Wisdom	=	Defendant's damage theory <i>without</i> the Book of Wisdom	+	The value of a put option
--	---	---	---	---------------------------

Thus, for all intents and purposes, applying the Book of Wisdom awards the plaintiff a free put. The free put is insurance given to the plaintiff of an unexpected increase in value without the downside risk that the plaintiff would not have achieved that increase in the actual world.

One can calculate the value of the free put given to the plaintiff under the Book of Wisdom using the Black-Scholes formula. One only need to specify a risk free rate of return and a volatility number (which measures the degree of actual risk). The results appear in Table 1 below.²²³

Table 1: Black Scholes Options Pricing Model

Input	Value	Description
Date of Breach	1/1/2012	Date Infringement Began
Date of Trial	1/1/2016	Date of Trial
Time (t)	4.00	Years from First Infringement to Trial
Spot Price (S)	\$8.00	Value at time of First Infringement (millions) - Defendant's calculation
Strike Price (X)	\$200.00	Exercise Value at Trial (millions) – Plaintiff's calculation
Risk-Free Rate (r)	3%	Risk-free interest rate
Dividend Yield (q)	0.00%	Dividend yield as a percentage
Sigma (Volatility)	50.00%	Volatility of Cash Flows (uncertainty)
Results are shown below:		
Call price (C)	\$0.01	$\leftarrow \exp(-q^*T)*S*N(d1) - X*\exp(-r^*T)*N(d2)$
Put price (P)	\$169.38	\leftarrow call price - $\exp(-q^*T)*S + X*\exp(-r^*T)$: by Put-Call parity
Put-Alternate Calculation	\$169.38	$\leftarrow X*\exp(-r^*T)*N(-d2) - \exp(-q^*T)*S*N(-d1)$: direct formula

As expected, the value of the call option is nearly zero, while the value of the put option is close to the strike price.²²⁴ Why? Because, to purchase the right

²²³ The calculation also involves two additional inputs, the risk-free rate and dividend payments, both of which are largely peripheral to the discussion.

²²⁴ In contrast, when the defendant-infringer's actual sales are unexpectedly low (i.e., its business essentially fails), the call option becomes valuable. For example, suppose the infringer earned a relatively meager \$10,000 in profits rather than \$200 million. Then, the holder of the patent, knowing the Book of Wisdom would be applied, would likely forego bringing the case for such a small benefit, especially given likely legal and expert fees that would have

to sell an asset currently worth \$8 million for \$200 million in four years would require that the seller of the option be well-compensated to undertake a risk that will, with almost near certainty, result in a loss. Indeed, given the inputs above, the probability that the put will end up in the money after four years (that is, that the buyer will exercise the put) is nearly 100%. In other words, there is virtually no chance that the value of the cash flows, starting at \$8 million at the time of the breach, having an annualized volatility of 50%, will finish at or above \$200 million in four years. Thus, the probability of a call option finishing in the money is also nearly zero, meaning that the call option is nearly worthless relative to the value of the put.

In terms of the rearranged put-call parity formula, one can observe the effect of the free put as follows:

$$\begin{aligned} X^*e^{-rt} &= S + P - C \\ \$200M * e^{-3\% * 4} &= \$8M + \$169.38M - \$0.01 \\ \$177.37M &= \$177.37M \end{aligned}$$

Thus, in the hypothetical, the plaintiff's expert's damages calculation applying the Book of Wisdom (\$200 million; \$177.37 million, when discounted to present value using a risk free rate of return), is equal to the defendant's expert's damages calculation without the Book of Wisdom (\$8 million), plus the \$169.38 million put option minus the relatively worthless call option (\$0.01 million, or \$10,000). From this calculation it is readily apparent that, when the Book of Wisdom is applied, the vast majority of the compensation

to be incurred. Even if the case were to settle for the exact amount of profits calculated using the Book of Wisdom, i.e., \$10,000, the plaintiff would still be worse off, because other possible outcomes yielding higher profits would be ignored. We can observe this process mathematically through put-call parity. Discounting the \$10,000 in profits as of the date of first infringement, we obtain: $\$8,869 = \$8 \text{ million} + \$0 - \7.991 million . That is, the value of the put is zero, and the entire difference between the \$8 million valuation as of the date of first infringement and the infringer's profit is equal to the call option, which is now nearly equal to the entire \$8 million valuation. Thus, as the “P-C” portion of the equation implies, the Book of Wisdom gives the plaintiff a put option and requires that it give up a call. But, in the case where infringing sales are unexpectedly low, the put is worthless, and the holder would not give up the call in the real world, as doing so would run counter to its own benefit. Rather, a rational plaintiff, using the benefit of hindsight achieved through application of the Book of Wisdom, would hold the call, knowing that it is already “in the money” and would almost certainly remain so throughout the four-year life of the option. In other words, at the time of first infringement, the plaintiff, knowing that the call option grants it the right to buy a patent currently worth \$8 million for \$10,000 in 4 years, would, of course, hold on to the call option, not give it up. Accordingly, application of the Book of Wisdom in the case of lower than anticipated infringing sales is inconsistent with the general assumption that consumers behave in a rational, profit-maximizing manner.

received by the plaintiff-patentee arises not from the value of the future cash flows attributable to its patent, but rather from removal of the otherwise attendant risk—the value of the free put option.

Thus, application of the Book of Wisdom gives the plaintiff much more than the value of the patent, because it relieves the plaintiff of risk he/she otherwise would have faced in an actual licensing situation. That is, application of the Book of Wisdom in this scenario substantially overcompensates the plaintiff for the value of its patent. This is significant because overcompensating patentees distorts market incentives that guide innovation decisions. The free put granted to patentees from application of the Book of Wisdom is an unjustified windfall that, as evidenced by the hypothetical, can greatly exceed the value of the patent. Such overcompensation encourages excessive patent infringement filings, forces market participants to be overly cautious to avoid innocent infringement, and discourages complementary innovation that builds on the patent.

Incentives are similarly distorted when post-negotiation events are unexpectedly unfavorable. In such circumstances (assuming consistent application of the Book of Wisdom), the patent owner remains undercompensated, making patent owners less likely to secure and enforce intellectual property rights, thus similarly distorting innovative incentives.

Conclusion

In light of the foregoing, what should the rule be? When should courts admit post-hypothetical negotiation facts into evidence and consider them as part of the reasonable royalty determination, and when should they not? The correct approach is that undertaken in the more recent Federal Circuit cases (*Lucent* and *Aqua Shield*) and not the approach stated in *Fromson*. In those more recent cases, the court acknowledges that actual performance may be relevant in an “indirect and limited way”—as some evidence on the “directly relevant inquiry into anticipated profits”²²⁵—but, unfortunately, the court provides little, if any, guidance on when courts should admit such evidence and when they should exclude it. Admitting such evidence without justification risks confusing the process in much the same way that permitting evidence of the entire market value of a multi-component product risks skewing the analysis when only one minor component is patented—it “cannot help but skew the damages horizon for the jury and make a patentee’s proffered damages amount appear modest by comparison.”²²⁶

²²⁵ *Aqua Shield v. Inter Pool Cover Team*, 774 F.3d 766, 770 (Fed. Cir. 2014).

²²⁶ *Uniloc USA, Inc. v. Microsoft Corp.*, 632 F.3d 1292, 1320 (Fed. Cir. 2011)); *See also* *Ericsson, Inc. v. D-Link Systems, Inc.*, 773 F.3d 1201, 1226–27 (Fed. Cir. 2014).

To avoid such risks, this Article proposes a more definitive standard for when the Book of Wisdom should apply, precluding resort to post-negotiation evidence unless and until there is proof that such post hoc events were within the reasonable expectations of at least one of the negotiating parties at the time of the hypothetical negotiation. Absent such proof, courts should eschew the doctrine. Indeed, as demonstrated herein, without such clarification, application of the Book of Wisdom risks over- or under-compensating patentees to the detriment of incentives for innovation.

Appendix 1—Further Explanation of the Put-Call Parity Theorem

In the absence of arbitrage and dividends, the put-call parity theorem for European options can be stated as follows: the value of a fiduciary call is equal to that of a protective put. The value of a fiduciary call is equal to the value of a call option plus the present value of the strike price at the time of the grant or the time of the hypothetical negotiation. The value of the strike price as of the time of the hypothetical negotiation, corresponds to the damages claimed by a plaintiff-patentee when applying the Book of Wisdom, prior to the application of any prejudgment interest. The value of a protective put is equal to the price of the stock on the grant/hypothetical negotiation date plus a put option. In other words, a rational investor is indifferent between holding a call option plus the cash equivalent of the present value of the strike price (i.e., the fiduciary call), and holding a put option plus the underlying asset.

To show why this is the case, the following demonstrates how payoff changes in both scenarios as the value of the underlying asset changes. As noted above, the put-call parity concept involves four parts: a call option, a put option, cash, and the underlying asset itself (e.g., share of stock, commodity, etc.). Table 1 below demonstrates how the call and put option values at expiration change as the value of the underlying asset changes. Of course, the value of cash remains constant as the latter takes different values.

Assume there is a strike price of \$5 for both call and put options. If the price of the underlying asset falls below \$5, the value of the put option is the difference between the underlying asset and the strike price. The value of the call option is zero. If the price of the underlying asset is greater than \$5, the value of the call option is the difference between the underlying asset and the strike price, and the put option value is zero. The value of the cash, i.e., the present value of the strike price, remains the same \$5, as the price of the underlying asset or stock changes. In Table 2 below, as the underlying asset value changes from \$0, to \$5, and to \$10, the value of the fiduciary call always equals that of the protective put at each value of the underlying asset.

Assuming strike price of \$5:

Appendix Table 1: Fiduciary Call

Cash	Call Option		Expiration Value		Fiduciary Call Value	Underlying Asset Price
\$5	\$0	+	\$5	=	\$5	\$0
\$5	\$0	+	\$5	=	\$5	\$5
\$5	\$5	+	\$10	=	\$10	\$10

Appendix Table 2: Protective Put

Underlying Asset	Put Option		Expiration Value		Protective Put Value	Underlying Asset Price
\$0	\$5	+	\$5	=	\$5	\$0
\$5	\$0	+	\$5	=	\$5	\$5
\$10	\$0	+	\$10	=	\$10	\$10

Note that, for every value of the underlying asset, the fiduciary call equals the protective put. This is “put-call parity”.

The relationship detailed above resolves neatly into the put-call parity formula:

$$C + X^*e^{-rt} = S + P$$

Equation 1

Where:

C is the value of the call option,

X is the strike price,

r is the risk free rate of return (i.e., constant-maturity Treasury bill rate),

t is the time to the expiration date;

Xe^{-rt} is therefore the strike price discounted to present value,

S is the value of the asset (i.e., spot price), and

P is the value of the put option.