No. 00-1543

IN THE

Supreme Court of the United States

FESTO CORPORATION,

Petitioner,

v.

SHOKETSU KINZOKU KOGYO KABUSHIKI CO., LTD a/k/a
SMC CORPORATION AND SMC PNEUMATICS

Respondent.

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF
APPEALS FOR THE FEDERAL CIRCUIT

BRIEF OF AMICI CURIAE INTELLECTUAL PROPERTY CREATORS AND THE SOCIETY OF AMATEUR SCIENTISTS IN SUPPORT OF PETITIONER

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STATEMENT OF INTEREST OF AMICI*

Intellectual Property Creators (IPC) is a non-profit organization founded in 1994 to promote the public interest in technological innovation by assisting independent entrepeneurial inventors. IPC serves as a clearinghouse for inventors on matters of patent law and enforcement. It also seeks to influence law and

* Letters from the parties consenting to the filing of this brief have been filed with the Clerk of the Court. This brief was not authored in whole or in part by counsel for either of the parties.

public policy to encourage innovation, presenting the perspective of the small inventor before Congress and as *amicus curiae* before this Court and the lower federal courts.

Among IPC's founding members are several inductees in the National Inventors Hall of Fame. The founding members include: Dr. Raymond Damadian, the inventor of magnetic resonance scanning; Dr. Wilson Greatbatch, the inventor of the implantable cardiac pacemaker; Stan Mason, the inventor of Masonware, the granola bar, and the first shaped, disposable diapers (among others); and Paul Heckel, a software developer, inventor, and author. Many of IPC's members or their assigns have been involved in litigation to enforce their patents against would-be copyists. *See, e.g., Fonar Corp. v. General Electric Co.*, 107 F.3d 1543 (Fed. Cir. 1997), *cert. denied*, 522 U.S. 908 (1997) (Dr. Damadian); *Telectronics Proprietary, Ltd. v. Medtronic, Inc.*, 687 F. Supp. 832 (S.D.N.Y. 1988) (successor to Greatbatch patent).

The Society for Amateur Scientists is a membership organization founded in 1994 and incorporated in the State of California as a non-profit scientific research and educational corporation. It joins world-class professionals and citizen scientists with ordinary people to promote the spirit of scientific discovery. Officers and members of the Board of Advisors include distinguished scientists, inventors, and academics including a Nobel Laureate, Dr. Douglas D. Osheroff, a winner of the Guggenheim Medal, Dr. Paul MacCready, many John D. and Catherine T. MacArthur Fellows, including Dr. Shawn Carlson and Professor Robert Scott Root-Bernstein, and several members of the National Academy of Sciences.

This case presents questions vital to the effectiveness of the patent system in promoting technological innovation. Amici bring the unique perspective of the independent scientist and inventor who, for reasons developed below, play a critical role in the advancement of science and technology.

SUMMARY OF ARGUMENT

The Federal Circuit's en banc decision in *Festo* severely limits—indeed, for all practical purposes eviscerates—the more than 150-year-old doctrine of equivalents. This will prove devastating to the independent scientist and small inventor, putting at risk the flow of new inventions that has contributed so much to America's preeminence in science and technology. Studies in the history and sociology of innovation have repeatedly shown that the independent or maverick "outsider" is one of the most important sources of scientific and technological advancement. For reasons well documented both in the philosophy of science and, more recently, in cognitive science, it is those who toil outside the mainstream of established institutions and assumptions who are best able to "think outside the box" and envision new ways of doing things. The abrupt and ill-considered change in the incentive structure worked by the decision below will be particularly devastating to such innovators and, therefore, is likely to have a deleterious effect on America's competitive position.

The decision below privileges certainty for the copyist or follow-on producer over certainty and security for the inventor or creator. This creates a perverse incentive structure: It encourages the exploitation of discoveries made by others and—simultaneously and necessarily—reduces incentives for the successful inventor to come up with those discoveries in the first place. This misallocation of incentives is exacerbated in the case of independent, entrepeneurial inventors who are likely to be undercapitalized relative to the manufacturing corporations responsible for follow-on products. The manufacturer can already compete on size, service, volume, and financing. Under the decision below, it can now add to its competitive advantage the ability (in effect) to allocate the risks and costs of discovery to the original inventor. Because the decision below encourages free riding by follow-on producers and actively decreases incentives to inventors, the net effect can only be an overall decrease in innovation.

Without the adequate patent protections embodied in the doctrine of equivalents, the independent inventor has little or no hope of reaping the benefits of his or her creation. Indeed, had *Festo* been the law in 1914, the Wright Brothers would never have seen a penny from their invention of the airplane.

The decision below trades adequate incentives for inventors for the illusory certainty of the literal language of the patent. For the better part of 200 years, our best judges—Marshall, Holmes, Hughes, Hand, Cardozo, Frankfurter—have recognized and cautioned against the deceptive simplicity of literal language. Indeed, until the decision below, one might have said that the doctrine of equivalents itself represented the time-tested wisdom of 150 years of judicial experience with the limitations of literal language. One might have thought that such a decisive break with the received wisdom would be justified by some new, more scientific, more precise understanding of language. But just the opposite is true: The striking advances in cognitive science over the last thirty years have revealed both the remarkable complexity of ordinary language and the degree to which the everyday experience of literal language actually reflects rather complicated cognitive processes. Thus, as Judge Linn argued in partial dissent below, the en banc majority's rigid, bright-line rule, "simple as it is hoped to be" (*Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., Ltd.*, 234 F.3d 558, 620 (Fed. Cir. 2000)), can only prove illusive in application. Studies in the cognitive sciences have shown that the necessarily flexible and adaptive way in which human minds *actually* work depends upon purpose, context, and function. Because these considerations are integral to meaning, there can be no necessary relation between technical precision and legal certainty. To the contrary, reliance on literal meaning is as likely to undermine certainty as promote it. To paraphrase Judge Hand, this is the very phenomenon that led to the doctrine of equivalents in the first place.

ARGUMENT

I. THE EFFECT OF THE DECISION BELOW WILL BE A NET DECREASE IN SCIENTIFIC AND TECHNOLOGICAL INNOVATION

In 1853, Justice Curtis described as an already "familiar rule" what has since come to be known as the "doctrine of equivalents."[1] The Federal Circuit's en banc decision in *Festo* severely limits that rule by: (1) extending the doctrine of prosecution history estoppel to any amendment relating to patentability; (2) creating a presumtion that *any* amendment is related to patentability; (3) making that presumption largely irrebutable by barring evidence outside the prosecution history record that might bear on the reason for amendment; and (4) ruling that "once an element of a claim is narrowed by amendment for a reason related to patentability, that element's scope of coverage will not extend beyond its literal terms."[2] The court below held, in other words, that estoppel acts as a "complete bar" to the doctrine of equivalents. Since virtually all patents are amended during the application process, the ruling below would—for all practical purposes—repeal the doctrine of equivalents.

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[1] *Winans v. Denmead*, 56 U.S. (15 How.) 330, 342 (1853):

> It is generally true, when a patentee describes a machine, . . . that he is understood to intend to claim, and does by law actually cover, not only the precise forms he has described, but all other forms which embody his invention; it being a familiar rule that, to copy the principle or mode of operation described, is an infringement, although such copy should be totally unlike the original in form or proportions.

[2] *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., Ltd.*, 234 F.3d 558, 577, 566, 568, 569 (Fed. Cir. 2000).

In support of this radical reformation of the patent laws, the en banc court offered the beguilingly simplistic assertion that its new rule would encourage innovation. It reasoned that the certainty and predictability of a complete bar would "stimulate investment in improvements and design-arounds because the risk of infringement will be easier to determine."[3]

This conclusion is almost certainly wrong. Logically, the complete bar approach can have only one of two consequences: *Either* (1) it will work no change in the level of innovation, just shifting the risk and other costs of innovation onto the party—in this case, the original inventor—least able to bear it; *or* (2) it will result in a net decrease in innovation because, simply put, the effect of this cost-shifting will be that there are fewer inventions to improve or design-around.

The court below reasoned that the certainty of a complete bar will reduce the transaction costs of litigation over the scope of the patent. But, this conclusion assumes that the relevant choice is between litigation and no-litigation; it already presupposes the point of view of the copyist. From the point of view of the patent holder, the relevant choice is between license and no-license. To put the point another way, as long as there is a profit to be extracted from an improvement or design-around, the parties (i.e., the inventor and the follow-on producer) have adequate incentive to bargain to their mutual advantage.[4] If, for example,

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[3] *Id.* at 577. The court reasoned that

> under the complete bar approach, technological advances that would have lain in the unknown, undefined zone around the literal terms of a narrowed claim under the flexible bar approach will not go wasted and undeveloped due to fear of litigation. The public will be free to improve on the patented technology and design around it without being inhibited by the threat of a lawsuit. . . .

[4] *Cf.* Ronald H. Coase, *The Problem of Social Cost,* reprinted in R.H. COASE, THE FIRM, THE MARKET, AND THE LAW 95-156 (1988) (first ap-

the improvement or design-around enables the producer to manufacture the item more cheaply, then it can bargain with the inventor for a license to produce.[5] With or without a complete bar, worthwhile improvements and design-arounds will occur.[6]

What the ruling below does—and, to be clear, *all* it does—is shift the costs of development (including the initial risk of failure) onto the inventor. The court below took a myopic view, considering risk only from the perspective of a copyist making a decision to manufacture a potentially infringing product. But any reasonable analysis of the relationship between risk, incentive structure, and innovation must consider *all* the risks, including the substantial risks that the inventor takes in pursuing an invention.

Ex ante, there is no difference between a 10% chance of a $100 profit and a 100% chance of $10 profit. The process of

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pearing in 1960). The exception to the statement in the text is the set of cases where the transaction costs of negotiation exceed the value of the improvement. Given the profits attainable through mass production over the life of the patent, however, this is not likely to be a large set of cases.

[5] Conversely, if the value of the invention exceeds the value of the design-around or improvement, the inventor can bargain with the manufacturer *not* to produce. This latter point makes plain exactly how much of a red herring the *Festo* court's transaction cost analyis really is: The potential producer (who, obviously, already knows about the invention) can easily identify and engage in negotiations with the inventor. But the inventor would need first to identify and then to bargain with each and every potential producer. Analyzed from a Coasian perspective, the ruling below shifts the costs to the party who faces the highest information and transaction costs and who is otherwise least able to bear them.

It remains true that, as the court below observed, there may be uncertainty about the scope of a patent. But there is no reason to think that uncertainty would fail to be reflected in the price of any negotiated license.

[6] Of course, if the design-around adds no value—i.e., if it is merely an attempt to avoid patent liability—then there is no real public interest in its production.

developing and bringing a new product to market is notoriously filled with uncertainties Will it work? Is there a market for the product? Will some competing product prove better or more acceptable to the consumer? Can the product be manufactured and delivered to consumers in a cost-effective manner? Under the prior patent regime, the inventor assumes these risks in the hope of obtaining monopoly profits for the period of any resulting patent. Once the product has been perfected and a market identified, the follow-on producer who can successfully exploit this market does so with reduced risk and—under the prior patent regime—with a profit margin concomitantly reduced by the royalties it pays to the patent holder. The ruling below inverts this scheme. Under that ruling, the follow-on producer faces 10% of the risk and is nevertheless free to take the lion's share of the profits. The inventor, who faced all of the risk, is left holding the bag.

Thus, the decision below encourages free riding by follow-on producers and sharply reduces incentives to inventors. It is elementary economics that if you increase the cost of (or reduce the rewards for) something, less of that thing will be produced. The net effect of the decision below can only be an overall decrease in innovation.

It might be argued that, even under the ruling below, inventors still retain the benefits of the monopoly afforded by the literal terms of the patent and, therefore, that they will have sufficient incentive to innovate. But this argument fails for at least three reasons.

First: The ruling below puts a premium on avoiding amendments during the application process so as not to lose the benefits of the doctrine of equivalents. The stated purpose is to reduce the transaction costs of subsequent litigation to clarify the scope of the patent. In effect, then, the ruling below front-ends the costs of patent litigation onto the application process—increased costs that the small inventors can ill afford, as Judge Linn observed.[7] Thus, even on this more favorable assumption, it remains true that the effect of the decision below will be to depress innovation because inventors face sharply increased costs.

Second: As a practical matter, the literal terms of the patent will provide no protection to the patent holder because, as Judge Hand observed, "it is always, or almost always, possible to change the form of these as they appear, and yet cull the full advantage of the discovery."[8] Under the ruling below, the inventor faces almost certain economic failure. Previously, the doctrine of equivalents protected the patent holder from copies "which, substantially on the same principle and in the same mode of operation, accomplish the same result . . . ."[9] By making the literal terms of the patent the touchstone, the decision below frees the copyist to design a revised product that achieves exactly the same

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[7] *See Festo*, 234 F.3d at 620 (Linn, C. J., concurring in part and dissenting in part) (noting that the majority's "new bright line rule . . . wrongfully sets in place a regime that increases the cost and complexity of patent prosecution to the detriment of individual inventors, start-up companies, and others unable to bear these increased costs.").

These increased costs, moreover, are economically inefficient. Currently, only a small percentage of patents are ever litigated. But inventors who hope to have their patents benefit from the protections of the doctrine of equivalents will be incurring these increased costs in *every* case.

[8] *Royal Typewriter Co. v. Remington Rand, Inc.*, 168 F.2d 691, 693 (2d Cir. 1948); *see also Winans*, 56 U.S. at 342-43 ("[T]he property of inventors would be valueless, if it were enough for the defendant to say, your improvement consisted in a change of form; you describe and claim but one form; I have not taken that, and so have not infringed.").

[9] *Winans*, 56 U.S. at 346. Under the decision below, inventors will retain value in their patents only to the extent that the original invention maintains some marginal practical or technological advantage over the copy. But this will often be illusive. Consider the facts in *Winans*: Plaintiff had invented and patented a new railroad car for carrying coal whose circular design better distributed the pressure of the load thus doubling each car's capacity. Defendants then made an octagonal car that "for all practical purposes . . . was as good as the other. . . ." *Id.* at 340.

results as the patented device in exactly the same way without fear of patent litigation. The copyist will always be able to produce this revised product more cheaply than the original inventor because—even if all other things were equal—it can free ride on the inventor's research and development costs.[10]

Third: All other things are rarely equal. The fact of the matter is that the inventor is already at a significant disadvantage relative to to follow-on producer. On one hand, as Chief Judge Markey has observed:

> Many giant corporations have no need of a patent system. They may obtain patents, but only as a defense against some little machine shop operator who might otherwise invent and patent something the public would demand and the big corporation would have to negotiate for, instead of just adding the item to its product line. Many large corporations would be glad to compete on size, nationwide service, high volume, strong finance, and prompt delivery. They can kill off smaller competitors on any of those bases, unless the small competitor has a patent on a product somebody wants to buy.[11]

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[10] As Judge Linn argued below:

> [C]onstraining limitations amended for a statutory purpose to their literal terms, is likely to encourage insubstantial changes to an established product, rather than investment in break-through technological advancements. Such a rule, therefore, promotes free riding and undercuts the return on a patentee's investment.

Festo, 234 F.3d at 627; *cf.* Hon. Howard T. Markey, *Some Patent Problems: Philosophical, Philological, and Procedural*, 80 F.R.D. 203, 210 (1979) ("Patents are not favored by commercial jackals who want to jump in at the last minute and profit from the efforts of others.").

[11] Markey, *surpra* note 10, at 210. So, too, large corporations have less of

On the other hand, many important industrial innovations are made by individual inventors or small firms who then license their work to big corporations.[12] It may be conventional to think of corporate research and development departments such as Bell Labs or government programs such as the Manhattan Project as the source of major scientific and technological innovations. But the fact of the matter is otherwise. The Manhattan Project itself owed its genesis to the discoveries of Leo Szilard, a little known scientist whose work was first brought to official attention in a 1939 letter from Albert Einstein to President Roosevelt.[13] In fact, a surprising number of inventions and a disproportionate amount of the truly innovative science comes from independents with extremely limited resources operating outside established institutions (and, often, at the geographical margins as well).[14] Some

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a need for the doctrine of equivalents because they have the resources to file, if necessary, hundreds of patents around the issue.

[12] Edward B. Roberts, *Influences on Innovation: Extrapolations to Biomedical Technology,* in BIOMEDICAL INNOVATION 50, 66 (Edward B. Roberts, Robert I. Levy, Stan N. Finkelstein, Jay Moskowitz, & Edward J. Sondick, eds. 1981).

[13] WILLIAM LANOUETTE, GENIUS IN THE SHADOWS: A BIOGRAPHY OF LEO SZILARD, THE MAN BEHIND THE BOMB 194-213 (1994); *see also* SPENCER R. WEART & GERTRUD WEISS SZILARD, EDS., LEO SZILARD: HIS VERSION OF THE FACTS—SELECTED RECOLLECTIONS AND CORRESPONDENCE (1978). Szilard, once a student of Einstein's, patented a linear accelerator in 1928 and the cyclotron in 1929, filed for a patent on the electron microscope in 1931, and patented the nuclear chain reaction in 1934 and the nuclear reactor (with Enrico Fermi) in 1954. LANOUETTE, *supra*, at 94, 101-02, 139-58, & 331. A facsimile of Einstein's letter to the President can be found online at: Gene Dannon, *Leo Szilard Online*, http://www.dannen.com/ae-fdr.html.

[14] ROBERT S. ROOT-BERNSTEIN, DISCOVERING: INVENTING AND SOLVING PROBLEMS ON THE FRONTIERS OF SCIENTIFIC KNOWLEDGE 366-72 (1989). *See also* AUTUMN STANLEY, MOTHERS AND DAUGHTERS OF INVENTION: NOTES FOR A REVISED HISTORY OF TECHNOLOGY (1993) (detailing the technological innovations made by women over the course of the centuries).

of these individuals are total outsiders or "mavericks" who work independently of or at odds with institutions; in addition to Szilard, examples include James Lovelock, the inventor of ultra-senstive chemical detectors,[15] and John J. Wild, the inventor of the sonagram.[16]

It is easy to see why outsiders would be more fecund sources of discovery and invention. For one thing, they are characterologically disposed to independent thinking.[17] For another, they operate free of the constraints of institutional arrangements, regulations, and expectations; as Root-Bernstein observes, "as long as the decisions concerning funding [are] bureaucratized there is no hope for the maverick. He will be selected out."[18] Einstein, for example, is said to have remarked that the best places for a scientist to work are the patent office or a lighthouse.[19]

Most importantly, it is generally only the outsider who is able to think outside the reigning scientific paradigms—i.e., the set of concepts, understandings, assumptions, frames of refer-

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[15] LEWIS WOLPERT & ALISON RICHARDS, PASSIONATE MINDS: THE INNER WORLD OF SCIENTISTS 71-80 (1997).

[16] John J. Wild, *The Origin of Soft-Tissue Ultrasonic Echoing and Early Instrumental Application to Chemical Medicine*, in INVENTIVE MINDS: CREATIVITY IN TECHNOLOGY 115, 117-21 (Robert J. Weber & David N. Perkins eds., 1992) (hereinafter "WEBER & PERKINS").

[17] *See Sex and Physics: A Talk with Dennis Overbye,* The Edge, April 2, 2001 ("Would Einstein be a string theorist? Strings seem to have taken physics departments by storm and they are almost the only game in town, but Einstein had this deep-seated need to be an outsider.") available online at: http://www.edge.org/3rd_culture/overbye/overbye_index.html

[18] ROOT-BERNSTEIN, *supra* note 14, at 376.

[19] *Id*. at 392. 3M, a company known for its innovativeness, makes use of much the same insight with its policy permitting "bootlegging"—allowing researchers to spend 15 per cent of their time on their own projects. *See* Rosalinde Sharpe, *The Post-it Is that Rare Thing: A Genuine Invention*, The Independent (London), April 20, 1996, at 42.

ence, habits of mind, ways of proceeding, and conventional wisdoms that constitue any professional community.[20] In his classic study of scientific revolutions, Thomas Kuhn observed that:

> Almost always the men who achieve these fundamental inventions . . . have been either very young or very new to the field whose paradigm they change. And perhaps the point need not have been made explicit, for obviously these are the men who, being little committed by prior practice to the traditional rules of normal science, are particularly likely to see that those rules no longer define a playable game and to conceive another set that can replace them.[21]

Kuhn's insights have been corroborated and extended by work in cognitive science that demonstrates both the degree to which our categories and concepts are entrenched and the ways in which they define our expectations and perceptions and, therefore, shape what we think possible, what we deem credible, what we perceive accurate, what we find persuasive.[22] For this reason, it

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[20] Spencer Silver (who invented the unique adhesives that led to the production of 3M's now ubiquitous "Post-it" notes) is reported to have said that: "If I had thought about it, I wouldn't have done the experiment. The literature was full of examples that said you can't do this." Ernest Murray, *Commentary: I'm Glad I Didn't Say That*, Cox News Service, May 14, 1999.

[21] THOMAS S. KUHN, THE STRUCTURE OF SCIENTIFIC REVOLUTIONS 90 (2d ed. 1970). Indeed, Kuhn added that: "This generalization about the role of youth in fundamental scientific research is so common as to be a cliché." *Id.* at 90 n.15. The principal exception to this rule of thumb is the scientist who returns to something of a novice by periodically changing fields. ROOT-BERNSTEIN, *supra* note 14, at 386-87.

[22] *See* STEVEN L. WINTER, A CLEARING IN THE FOREST: LAW, LIFE, AND MIND (forthcoming Univ. of Chicago Press, September 2001) (hereinafter "A CLEARING IN THE FOREST"); GEORGE LAKOFF, WOMEN, FIRE, AND DANGEROUS THINGS: WHAT CATEGORIES REVEAL ABOUT THE MIND

is often *only* the newcomer or outsider who is capable of "thinking outside the box" and seeing the way to true innovations. But such people are likely to have the least resources for coping with the competition of a potentially infringing product from a large corporate producer.

The experience of the Wright Brothers dramatically illustrates every aspect of the dynamics working against true innovators.[23] The airplane was the Wright's first patent. But their application was repeatedly rejected by the Patent Office,[24] and had to be amended several times. The mainstream view at the time was that the key to achieving flight was to solve the problem of aircraft stability. The Wrights rejected that conventional wisdom. Their research suggested that the key was to figure out how to achieve control of the plane. In the course of building a working airplane, the Wrights made many important inventions. But, the crucial one—still used in fixed-wing airplanes today—was the

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(1987). As one early commentator explains, the world

> is never approached as if it were *sui generis*, but rather is seen through these stock structures. Once the principal features of a given phenomenon suggest a particular stock structure, that structure shapes our expectations and responses. This use of stock structures resolves ambiguity and complements "given" information with much "assumed" information.

Gerald P. López, *Lay Lawyering*, 32 UCLA L. REV. 1, 6 (1984). López's article is one of the first to apply cognitive science to law. For a chronology of the field, see Steven L. Winter, *Making the Familiar Conventional Again*, 99 MICH. L. REV. ___ (2001) (review essay).

[23] *See* Rodney Worrel, *The Wright Brothers' Pioneer Patent*, 65 J. AM. BAR ASSOC. 1512 (1979); TOM CROUCH, THE BISHOP'S BOYS: A LIFE OF WILBUR AND ORVILLE WRIGHT (1989); FRED HOWARD, WILBUR AND ORVILLE: A BIOGRAPHY OF THE WRIGHT BROTHERS (1987).

[24] Among the reasons for rejection given by the patent officer was that "the device described was clearly 'inoperative' and 'incapable of performing its intended function.'" CROUCH, *supra* note 23, at 246.

invention of wing-warping as a mechanism of control. This mechanism enabled them to warp an airplane's wings to change their angle of attack into the wind so as to bank the airplane to the right or left. This gave the pilot lateral control for turns and the ability to recover from instability caused by wind gusts. When the Wrights made their famous 59-second flight at Kitty Hawk, they had spent about $1100 to build their airplane. In contrast, the Aerodrome (which had ignominiously belly-flopped into the Potomac only a few weeks earlier) was built by Samuel Pierpoint Langley of the Smithsonian with a $50,000 grant from Congress.

In 1907, with the encouragement of Alexander Graham Bell, a motorcycle manufacturer named Glenn Curtiss entered the airplane manufacturing business with $360,000 in start-up funds raised from investors. Curtiss set out to design around the Wright's wing-warping patent. He invented and patented ailerons, which are control surfaces hinged to a wing's trailing edges. The Wrights sued. Henry Ford referred Curtiss to his patent litigator, W. Benton Crisp. The defense argued both that the Wright's invention was not novel and that Curtiss's ailerons (which were not connected to the rear rudder as was the Wright's wing-warping mechanism) were different in form and operation from the Wright's patent. The district court rejected both claims, holding that the Wright Brothers were "entitled to . . . the application of a range of equivalents that will include an aeroplane appropriating substantially the same instrumentalities and the same principle of operation."[25] Because Curtiss's ailerons operated together with the rudder to "restor[e] equilibrium in substantially

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[25] *Wright Co. v. Herring-Curtiss Co.,* 204 F. 597, 606 (W.D.N.Y. 1913), *aff'd*, 211 F. 654 (2d Cir. 1914). *See also Wright Co. v. Herring-Curtiss Co.*, 177 F. 257 (W.D.N.Y 1910) (granting preliminary injunction), *rev'd*, 180 F. 111 (2d Cir. 1910) (reversing injunction because of "sharp conflict of evidence" such that "infringement was not so clearly established as to justify a preliminary injunction").

the same way," the court found that the Wright's patent had been infringed.[26] In a parallel case, Learned Hand found infringement on the same grounds.[27]

The Wright Brothers' story is in many ways typical of the difficulties faced by small inventors. Much the same story can be told with respect to Philo T. Farnsworth, the inventor of television.[28] The Wright Brothers' story is *not* typical, however, in one very significant respect: They succeeded where many other inventors fail. Farnsworth, for example, was not so fortunate despite initial success in patent litigation against RCA.[29] Amici are aware of scores of independent inventors who have asserted their patent and nevertheless suffered a similar fate. And, that was *with* the benefits of the doctrine of equivalents. Without it, independent inventors simply don't stand a chance.

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[26] *Wright v. Herring-Curtiss,* 204 F. at 614.

[27] *Wright Co. v. Paulhan*, 177 F. 261 (S.D.N.Y 1910) (granting preliminary injunction). The Wright Brothers' saga did not end there, however. The Smithsonian let Curtiss rebuild Langley's Aerodrome to see if it could have flown in 1903 and thereby demonstrate the Wright Brothers' lack of priority. Curtiss reconstructed the plane using knowledge of aeronautics gained in the intervening years, making several changes from the original design. Even so, it was never clear whether the modified Aerodrome flew for it took off just outside camera range. The controversy over who flew first was not finally settled until 1942, 30 years after Wilbur had died of typhoid fever, when the Smithsonian published an article detailing the changes in design made by Curtis and admitting that the Wright Brothers were first. CROUCH, *supra* note 23, at 489; HOWARD, *supra* note 23, at 393.

[28] GEORGE EVERSON, THE STORY OF TELEVISION: THE LIFE OF PHILO T. FARNSWORTH, 152-154, 199-203 (1949); Evan I. Schwartz, *Who Really Invented Television?* Technology Review, September/October 2000, available online at: http://www.technologyreview.com/magazine/sep00/schwartz.asp. *See also* DONALD GODFREY, PHILO T. FARNSWORTH: THE FATHER OF TELEVISION (2001).

[29] EVERSON, *supra* note 29, at 214 (noting that RCA spent ten times what Farnsworth did and that: "We wisely did not venture to enter into competition with [RCA] in any field other than that of patent strength.").

II. RELIANCE ON THE LITERAL LANGUAGE OF THE PATENT IS MISPLACED, IS AS LIKELY TO UNDERMINE CERTAINTY AS ADVANCE IT, AND WILL CERTAINLY LEAD TO ARBITRARY RESULTS

The decision below trades adequate incentives for inventors for the illusory certainty of the literal language of the patent. Yet, as we have just seen, the doctrine of equivalents is itself the product of 150 years of accumulated judicial wisdom responding to the inadequacy of literal language as a protection for inventors. Such a decisive break with the received wisdom should, at the very least, be supported by some new, more scientific evidence about the efficacy of literal language. But just the opposite is true: Developments in cognitive science over the last thirty years have demonstrated that the everyday experience of literal language is, in fact, a remarkably complex and surprisingly delicate phenomenon. Particularly in the context of technological innovation, which by definition is always changing, it makes little or no sense to rely on the illusory certainty of literal language.

The basic point is quite familiar. As Chief Justice Marshall observed: "Such is the character of human language, that no word conveys to the mind, in all situations, one single definite idea."[30] This is particularly true in recondite endeavors such as science and technology for the reason that, with characteristic insight, Justice Cardozo identified: "Words after all are only symbols, and the significance of the symbols varies with the knowledge and experience of the minds receiving them."[31]

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[30] *McCulloch v. Maryland*, 17 U.S. (4 Wheat.) 316, 414 (1819). *Cf. Monaco v. Mississippi*, 292 U.S. 313, 322 (1934) (Hughes, C.J.) ("Behind the words of the constitutional provisions are postulates which limit and control.").

[31] *Cooper v. Dasher*, 290 U.S. 106, 109 (1933).

Over the last thirty years, cognitive science has made striking advances in the study of the mind. It is not possible to catalogue them here.[32] But, consider just a few of the well-documented empirical findings that bear on the question of literal language. First, categories (including word-categories) display a variety of prototype effects—i.e., some category members are reliably rated better examples of the category than others; these prototypical cases are learned earlier, are easier to recall, and figure prominently in reasoning.[33] Second, categorization is an evolutionary adaptation that arose because it enabled more successful functioning. Concretely, this means that—as a pragmatic function—categorization is flexible and dynamic rather than definitional and static.[34] Third, and relatedly, meaning and categorization are socially motivated processes—i.e., context and purpose are built-in, constitutive elements of meaning. This is how we can accommodate the motivational and situational demands of real-life judgments.[35] Fourth, meaning and categoriza

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[32] *See* A CLEARING IN THE FOREST, *supra* note 22.

[33] Eleanor Rosch, *Principles of Categorization*, in COGNITION AND CATEGORIZATION 27 (Eleanor Rosch & Barbara B. Lloyd eds., 1978); LAKOFF, *supra* note 22, at 39-90.

[34] To the initiate, it might seem that evolutionary success requires mental representations that "correspond" with or "mirror" reality. But we would need significantly larger brains if that were the case. In fact, a computer cannot store—nor is it possible to specify—all of the necessary and sufficient conditions for the vast amount of common sense knowledge that the average human utilizes daily; this is one of the most difficult problems faced by those working in artificial intelligence. *See* HUBERT L. DREYFUS, WHAT COMPUTERS *STILL* CAN'T DO: A CRITIQUE OF ARTIFICIAL REASON 52-53 (2d ed. 1979); Dorothy Holland & Naomi Quinn, *Culture and Cognition*, in CULTURAL MODELS IN LANGUAGE AND THOUGHT 3, 19 (D. Holland & N. Quinn eds., 1987). The interactional and other non-correspondence ways in which the mind works yield quite significant cognitive efficiencies. *See* A CLEARING IN THE FOREST, *supra* note 22, at 35, 96-97 & 244-45.

[35] The implications of these finding for law are developed in A CLEARING

tion are grounded in our pragmatic physical and social knowledge of the world. Meaning, therefore, can be highly domain specific; expertise consists in richer experiential knowledge (and, concommitantly, more extensive models of) specialized domains.

We can illustrate these points with some familiar legal examples. Consider, first, the voluntariness of a confession. A person, overburdened by guilt, walks into a police station and confesses to a crime. Rare as this case may be, it is easily and uncontroversially identifiable as a voluntary confession. The clarity, salience, and stability of this prototypical case may make it seem as if there is a readily identifiable literal meaning to the term "voluntary." But, as the Court knows only too well, the voluntariness of a confession is not so much a factual question as a conceptual one: It cannot be decided without focussing "upon the crucial element of police overreaching."[36]

This example is particularly instructive because it reveals the ways in which the psychologically simple may nevertheless be cognitively and conceptually complex. Note that in this case, the prototypical scenario is factually quite rare. Thus, its salience and stability is not a function of its frequency or familiarity (though it can be in the case of other categories). Here, the prototype effect is produced by our culturally-shared models of human behavior. In other words, the apparent simplicity and lucidity of the prototypical case is actually a product of rather complex processes of intelligibility that draw on tacit understandings about context, purpose, and motivation. This reflects the more fundamental point that language and meaning are not merely representational,

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IN THE FOREST, *supra* note 22, at 139-222 & 295-351.

[36] *Colorado v. Connelly*, 479 U.S. 157, 163 (1986); *see also Miller v. Fenton*, 474 U.S. 104, 112 (1985) (reaffirming that "the ultimate question whether, under the totality of the circumstances, the challenged confession was obtained in a manner compatible with the requirements of the Constitution is a matter for independent federal determination").

but entail complex knowledge of context, function, value, and purpose. "This is so," as Justice Frankfurter explained in an earlier confession case, "because the concepts by which language expresses an otherwise unrepresentable . . . reality are themselves generalizations importing preconceptions about the reality to be expressed."[37]

Note, too, that knowledge of the prototype provides very little guidance to the decisionmaker. Prototype effects, in other words, work better as touchstones for inclusion than as rules of exclusion. Standing alone, the fact that a car is certainly a "vehicle" covered by a rule prohibiting vehicles in the park tells us little about how we should handle a bicycle, a moped, or a child's electric automobile. To make that assessment, the decisionmaker must understand the social motivation for the rule and must apply it in light of those purposes. She may do so tacitly, as when one recognizes automatically that the rule does not apply to a child's tricycle, or explicitly, as the Court must do in the confession cases. But, in either event, there is no literal meaning that can be mechanically applied.

We can reinforce and extend the point with another example. Consider a rule prohibiting "live animals on the bus."[38] Does it bar a live goldfish in a sealed plastic bag? A specimen case of microscope slides containing live paramecia? Both goldfish and paramecia are literally animals.[39] But, then, so too are

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[37] *Culombe v. Connecticut*, 367 U.S. 568, 604-05 (1961) (Opinion of Frankfurter, J.).

[38] The example comes from Frederick Schauer, *Formalism*, 97 YALE L.J. 509, 533 n.70 (1988). The complete argument appears in A CLEARING IN THE FOREST, *supra* note 22, at 101-03 (categories), 194-207 (rules), & 297-309 (perjury).

[39] THE RANDOM HOUSE DICTIONARY OF THE ENGLISH LANGUAGE 82 (2d ed. unabridged 1987) defines "animal" as an organism that "can move voluntarily, actively acquire food and digest it internally, and have sensory . .

humans: We are rational animals, to be sure; but, as mammals with sensory systems who respond to stimuli and move voluntarily, we too fit the literal definition. If, in the confession case, the literal meaning of the relevant terms provides too little information, here the literal scope of the category "animal" provides too much: It potentially covers the entire domain that runs from paramecia all the way to Homo sapiens. To decide how much of the literal reach of the category to include in the rule, one must interpolate one's social knowledge of the category "bus"—what it is for, who uses it, what types of problems or disturbances might concern its passengers, etc. This is how we know automatically that the rule prohibiting live animals on the bus cannot possibly apply to *us;* it is how we know *without having even to consider it* that humans are not animals for purposes of the rule. By the same token, it is this general background knowledge that makes the paramecium and goldfish cases seem silly to all but the most rigid bureaucratic mind-set.

To summarize, the experience of prototype effects creates the impression that there are clear, readily-available literal meanings for most language terms. But this experience of immediate comprehension in fact involves complex processes of intelligibility that draw on tacit knowledge of the relevant domain including context, purpose, social understandings and assumptions, models of behavior, etc. Moreover, the prototypical case is necessarily only a subset of the array of cases comprehended by the sense of any word-category; the immediately apparent literal meaning of a term can be vastly over- or under-inclusive. Thus, even everyday comprehension is a dynamic and flexible process that uses tacit knowledge for making contextual judgments about

. systems that allow them to respond rapidly to stimuli." It further notes that "some classification schemes include protozoa . . . that have motility and animallike nutritional modes."

what to include and what to exclude from a term's purview.

One might think that in science and technology, at least, things must be different. It may be conventional to think of science as a series of discoveries about the nature of such things that brings us closer and closer to an accurate representation of reality. But even Popper rejected that view.[40] Because science and technology are human endeavors, they are subject to the laws of human language and thought. Self-declaring literal meaning is no more available in science and technology than elsewhere; science and technology progress nevertheless because they are pragmatic functions that operate in the same flexible, dynamic ways as other human cognitive processes.

Consider, for example, Newton's Second Law of Motion: $f = ma$. Scientists can and do discuss it unproblematically. But, as Kuhn observes:

> It is not quite the case that logical and mathematical manipulation are applied directly to $f = ma$. That expression proves on examination to be a law-sketch or a law-schema. As the student or the practicing scientist moves from one problem situation to the next, the symbolic generalization to which such manipulations apply changes. For the case of free fall, $f = ma$ becomes $mg = m(d^2s/dt^2)$; for the simple pendulum it is transformed to $mg \sin(theta) = -ml(d^2(theta)/dt^2)$; for a pair of interacting harmonic oscillators it becomes two equations, the first of which may be written $m_1(d^2s_1/dt^2) + k_1s_1 = k_2(s_2 - s_1 + d)$; and for more complex situations, such as the gyroscope, it takes still other forms. . . . Yet, while learning to identify forces, masses, and accelerations in a va-

[40] KARL R. POPPER, THE LOGIC OF SCIENTIFIC DISCOVERY 35-38 (1959).

> riety of physical situations not previously encountered, the student has also learned to design the appropriate version of $f = ma$ through which to interrelate them, often a version for which he has encountered no literal equivalent before. . . .[41]

What is true of science is also true in other technological and engineering contexts. Consider an example integral to the issue at hand: the blueprint. "Blueprints are planning documents for buildings, machines, or other structures that translate purposes, and design solutions for reaching those purposes, into 'formal' documents."[42] One might think that a blueprint, of all things, must be a rigorously accurate representation of the structure to be built. But even in this most concrete of "real-world" domains, where one might most expect objective correspondence with a harshly determinate reality, formal meaning is a function of informal, practical knowledge—i.e., craft traditions and practices. The formal language (i.e., the conventions) of the blueprint in fact permits quite a lot of ambiguity: Much of what the blueprint "specifies" is actually left to the know-how of the relevant craft, and there are understood tolerances for differences in performance.

> Thus just as a cookbook recipe for a bread relies on one knowing what "smooth and elastic" bread dough feels like. . . , the blueprint relies on a plumber knowing how to fit a one per cent grade of a waste pipe into a frame of a wall as that frame has been actually built (up to 0.2 percent out of plumb). The semantics of the abstractions in the first instance are given by craft know-

[41] KUHN, *supra* note 21, at 188-89 (postscript to the second edition).

[42] ARTHUR L. STINCHCOMBE, WHEN FORMALITY WORKS: AUTHORITY AND ABSTRACTION IN LAW AND ORGANIZATION 56 (forthcoming Univ. of Chicago Press 2002).

> ledge, quite often craft knowledge that the architects or engineers themselves do not have. . . .
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> Thus embedded in the abstractions are meanings derived from work systems, crafts or factories, outside the building as such.[43]

In much the same way, the "literal" terms used in the blueprint change with variances in materials. For example, the term "outside corner"— which designates the point from which one measures the location of a window opening—changed with the

> switch from masonry (especially brick) bearing walls to wood frame bearing walls with brick veneer. . . . [O]ne now specifies the dimensions for locating window openings from the outside corner of the wooden frame, rather than the outside corner of the house, which will not nowadays be there when the opening is built.[44]

Far from literal, the formal language of the blueprint presupposes or "embeds" practical knowledge that is flexible, functional, and context or convention-dependent: "[T]he drawings and documents are tied together by their embedding in a language of the purposes of building, much of it distinctive of the different trades and describing particular purposes best pursued with that trade's technologies."[45]

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[43] *Id*. at 59-60.

[44] *Id.* at 61. *Cf. Towne v. Eisner*, 245 U.S. 418, 425 (1918) (Holmes, J.) ("A word is not a crystal, transparent and unchanged, it is the skin of a living thought and may vary greatly in color and content according to the circumstances and the time in which it is used.").

[45] STINCHCOMBE, *supra* note 42, at 67. At best, literal or "plain meaning is the extreme value (namely, zero) of a variable that describes the variance of meaning in a linguistic community, given a text." *Id.* at 55. In other words, literal or plain meaning is just the limiting value (rarely achievable) of a variable that describes the degree of ambiguity of a given term within a linguistic community. In the case of construction blueprints, Stinchcombe

Until the decision below, one could have said that patent law embodied just these insights about language and meaning. Thus, in *Machine Co. v. Murphy,* the Court said that, in determining infringement under the doctrine of equivalents, the decisionmaker should

> look at the machines or their several devices or elements in the light of what they do, or what office or function they perform, and how they perform it, and to find that one thing is substantially the same as another, if it performs substantially the same function in substantially the same way to obtain the same result. . . .[46]

So, too, in *Graver Tank*, the Court reconfirmed that the doctrine must be applied with an eye to purpose, context, and function: "Consideration must be given to the purpose for which an ingredient is used in a patent, the qualities it has when combined with the other ingredients, and the function which it is intended to perform."[47] This "triple identity" or "function-way-result" test —perhaps more suitable for analyzing mechanical devices as the Court noted in *Warner-Jenkinson*[48]—represents the accumulated wisdom of 150 years of judicial experience. That cognitive science should now corroborate what judges all along have known is hardly surprising; rather, it reflects yet another layer of sig-

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puts that value at approximately10%—so that "the estimate for the building made by the architect come[s] reasonably near the bids made by the contractors on the same set of documents." *Id.* at 71.

[46] *Machine Co. v. Murphy*, 97 U.S. 120, 125 (1878).

[47] *Graver Tank & Mfg. Co. v. Linde Air Products Co.*, 339 U.S. 605, 609 (1950). Though this Court had rejected so-called "functional" claims in *Halliburton Oil Well Cementing Co. v. Walker*, 329 U.S. 1 (1946), Congress amended the statute in 1952 to once again make them possible, 35 U.S.C. § 112 (2001), as this Court noted in *Warner-Jenkinson Co. v. Hilton Davis Chemical Co.*, 520 U.S. 17, 27-28 (1997).

[48] *Warner-Jenkinson*, 520 U.S. at 39-40.

nificance in Holmes celebrated insight that, "The life of the law has not been logic: it has been experience."[49]

It is not that there can never be a clear-cut, literal meaning. When the relevant category or concept is a formal one—such as the pH level specified in the patent at issue in *Warner-Jenkinson*[50]—it is possible to have the clarity and precision of meaning that the court below craved. But, this Court should not be misled by one example: There are many more categories like "voluntariness," "animal," "$f = ma$," and "outside corner" than like "pH level." In that much larger class of cases, the assumed certainty of literal meaning will, at best, prove chimerical; at worst, it will be distorting and lead to arbitrary results. Because technical language derives its meaning from the practices, conventions, functions, and purposes of scientific or craft specialities, a court cannot do justice to a patent claim with a literal reading that precludes appeal to the practical and functional considerations that form the very basis of meaning. Thus, in *Warner-Jenkinson*, this Court held that "a skilled practitioner's knowledge of the interchangeability between claimed and accused elements" is relevant to the question of equivalence, reasoning that:

> Much as the perspective of the hypothetical "reasonable person" gives content to concepts such as "negligent" behavior, the perspective of a skilled practitioner provides content to, and limits on, the concept of "equivalence."[51]

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[49] OLIVER WENDELL HOLMES, JR., THE COMMON LAW 5 (Mark Howe ed. 1963) (1881). For discussion of some of the ways in which Holmes's insights about language and law anticipated findings made by cognitive science many decades later, see A CLEARING IN THE FOREST, *supra* note 22, at 36-42.

[50] *Warner-Jenkinson*, 520 U.S. at 21-24.

[51] *Id.* at 37. *Cf.* RICHARD A. POSNER, THE PROBLEMS OF JURISPRUDENCE 48 (1990) (noting that "[s]tandards that capture lay intuitions about right

Just the same can be said with respect to the literal meaning of a patent. Literalism of the sort adopted by the court below simply misapprehends how humans reason and understand.[52] Because it would deprive decisionmakers of the basis for ascertaining the scope and meaning of a patent, it is as likely to undermine certainty as advance it.

Moreover, these distorting effects will be most pronounced in cases of true innovation. As Judge Rader noted in his separate opinion below: "Without a doctrine of equivalents, any claim drafted in current technological terms could be easily circumvented after the advent of an advance in technology."[53] When a patent involves minor technological improvements to a pre-existing invention, it is at least plausible for a savvy inventor and a skilled patent lawyer to anticipate the range of possible applications that needs to be protected and draft a claim accordingly. In such cases, the nature of the product and its market are already established. But, when an invention changes fundamentally the nature of the product—as occurred, for example, with the invention of the transistor and the integrated circuit—or when it

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behavior" such as the negligence standard "may produce greater legal certainty than a network of precise but technical, nonintuitive rules covering the same ground").

[52] *Compare* Thomas S. Kuhn, *Second Thoughts on Paradigms*, in THE STRUCTURE OF SCIENTIFIC THEORIES 459, 482 (Frederick Suppe ed., 1974) ("Shared examples can serve cognitive functions commonly attributed to shared rules."), *with* H. L. A. HART, THE CONCEPT OF LAW 124 (1961) ("[T]he authoritative general language in which a rule is expressed may guide only in an uncertain way much as an authoritative example does.").

[53] *Festo*, 234 F.3d at 619 (Rader, C. J., concurring in part and dissenting in part). Judge Rader gave the example of the vulnerability, after the development of transistor technology, of a pre-1948 patent using the terms "anode" and "cathode" from the earlier tube technology. "[W]ithout a doctrine of equivalents, infringers in 1949 would have unfettered license to appropriate all patented technology using the out-dated terms. . . ." *Id.*

creates an entirely new market, this simply cannot be done.

In fact, true innovators often do not know what they have really invented. Joseph Priestly was the first to isolate oxygen. But, it was Antoine Laurent Lavoisier who showed that Priestly had actually discovered oxygen, and not "dephlogisticated air" as Priestly claimed to his dying day.[54] Similarly, Max Planck employed the idea of quantized electrons to develop what we now call quantum theory, but he explicitly denied that the energy in atoms was quantized into discrete packets. It was Einstein who insisted that quantization was more than a mathematical formalism and who drew out its implications (leading to the photoelectric cell familiar in many electronic sensing devices).[55] Spencer Silver, a 3M research scientist, was working on a new water-soluble adhesive. The experiment failed; instead of forming a film, the adhesive formed particles. Seven years later, one of his colleagues used that adhesive to create the now-ubiquitous Post-it note—which can be reused because the adhesive is contained in tiny bubbles of urea-formaldehyde resin that break under pressure.[56]

Invention, in other words, is a *process*. Inventions don't just spring into being; they unfold.[57] The significance of a discovery or invention often depends on what others in the field have found or seen—each new patentable innovation altering the

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[54] KUHN, *supra* note 21, at 54-56.

[55] THOMAS S. KUHN, BLACK BODY THEORY AND THE QUANTUM DISCONTINUITY, 1894-1912, 182-201 (1978).

[56] Joe Schwarcz, *Everyday Chemistry: What Makes a Situation Sticky*, The Washington Post, December 8, 1999, at H01; Amy Ellis Nutt, *Indispensable Post-it Notes Didn't Stick at First; 20 Years Later, Billions Have Been Sold, Posted,* The Times-Picayune, April 16, 2000, at F14.

[57] DONALD BRABEN, TO BE A SCIENTIST: THE SPIRIT OF ADVENTURE IN SCIENCE AND TECHNOLOGY 11-17 (1994); ROOT-BERNSTEIN, *supra* note 14, at 203; David N. Perkins & Robert J. Weber, *Conclusion: Effable Invention,* in WEBER & PERKINS, *supra* note 16, at 319.

possibilities inherent in all related innovations. Sometimes, significant inventions change the field in ways that remain beyond the inventor's own comprehension. The more innovative, fundamental, or revolutionary is an invention or discovery the greater the changes it will cause and the less it will be possible to foresee the range of its uses, applications, and adaptations.[58] A patent law sensitive to the need to encourage innovation would not qualify protection on an extra-human prescience able to reduce the unforeseen to literal terms. To do so would be to fail to protect the most important inventions and discoveries—potentially putting at risk the flow of new inventions that have contributed so much to America's preeminence in science and technology.[59]

In *Royal Typewriter*, Learned Hand faced the limitations of literal language pointblank: "It is true that a boundary cannot be drawn with precision; and the draftsman of claims is always in something of a dilemma—the dilemma which has led to the very 'doctrine of equivalents' itself. . . ."[60] For Hand, the antinomy between literal formalism and functional description was simply "inherent in the whole doctrine. It may be that it will disappear, but nothing so far satisfies us that as yet it has."[61] Fifty years later, cognitive science has made significant strides in delineating the quite remarkable, flexible, and dynamic (i.e., non-literal) pro-

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[58] Moreover, it is not just inventors and their patent attorneys who must make such extra-human predictions, it is also the patent examiner. Yet, as the number of patent filings steadily increases, the number of scientists trained each year—and, therefore, the pool of qualified potential patent examiners—decreases. Donald Quigg, *Technology on the Move: The Role of Patents*, in WEBER & PERKINS, *supra* note 16, at 313.

[59] Quigg notes that an increasing number of U.S. patents are going to foreign corporations: In 1968, approximately 20% of patents filed in the United States were by citizens of other nations; by 1988, it was 48%; now it is over half. *Id.* at 312.

[60] *Royal Typewriter*, 168 F.2d at 693.

[61] *Id.* at 694.

cesses through which human brains successfully accommodate the diversity and complexity of everyday life. What lies at the heart of these mechanisms is the capacity to expand or adjust our concepts relative to need; we can do so because context, function, and purpose are built-in, constitutive dimensions of meaning and categorization. The court below would substitute the illusory precision of literal meaning for the functional, context-sensitive, purpose-oriented inquiry that has characterized the doctrine of equivalents for its more than 150 year history. That is bad law, bad science, and bad policy. The decision below should be overruled.

CONCLUSION

For the foregoing reasons, amici respectfully submit that the judgment of the Federal Circuit should be reversed.

Respectfully submitted,

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