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EMPIRICAL EVIDENCE ON THE VALIDITY OF LITIGATED PATENTS

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I. INTRODUCTION

All patent lawyers have their own ideas about how patent litigation works. Juries are better than judges for certain types of cases, they might think. Courts are reputed to be tougher on patents in one district than in another, or in one area of technology than another. The Federal Circuit is pro-patent, according to some views, or anti-patent according to others. All of this "common knowledge" is anecdotal. It is based on the lawyer's personal experience, or stories she has heard. It may be true, or it may be a myth.

Because patent litigation tends to be exceptionally costly, with legal expenses often exceeding one million dollars per party, lawyers and clients should be eager for more systematic data and fewer anecdotes about how patents actually fare in the courts and why.[1] In the present study, our hope is to contribute both to the scholarly empirical literature on the patent system at work and to offer patent practitioners harder evidence either to confirm, or to contradict, their assumptions about the courts' decision-making in patent cases. To do this, we have produced a database of all written, final validity decisions by either district courts or the Federal Circuit reported in the *United States Patents Quarterly* ("*U.S.P.Q.*") during an almost eight-year period from early 1989 through 1996.[2] We use this

[1] One illustration of the generally recognized high cost of patent litigation is found in Blonder-Tongue Lab. v. University of Ill. Found., 402 U.S. 313, 169 U.S.P.Q. (BNA) 513 (1971). In *Blonder-Tongue*, the Supreme Court adopted the doctrine of collateral estoppel for judicial decisions of patent invalidity, so that a finding of invalidity in one infringement case renders the patent invalid for all purposes and thus useless by the patent owner against other alleged infringers. *See id.* at 350, 169 U.S.P.Q. (BNA) at 527. One of the Court's reasons for applying collateral estoppel instead of mutuality of estoppel was the extreme expense of patent litigation. *See id.* at 334-36, 169 U.S.P.Q. (BNA) at 521-22. It bears mentioning that the Court's observation was made before the dramatic rise in such costs during recent years. *See also* Josh Lerner, *Patenting in the Shadow of Competition*, 38 J.L. & ECON. 463, 470-71 (1995) (discussing the direct and indirect costs of patent litigation).

[2] The relevant volumes of *U.S.P.Q.* are 10-40 *U.S.P.Q.2d*, inclusive. Although we did not extend the full study through 1997, we did include any 1997 Federal Circuit case reported in volumes 41-44 of *U.S.P.Q.2d* producing a final judgment on validity in a case that had been in our population as a district court decision. Thus, in a small number of

database to develop many descriptive statistics about these patent validity decisions, to test a number of hypotheses about what accounts for the success or failure of challenges to patent validity, and to produce a regression model to determine the predictive power of our findings. Throughout the study we examine a greater number of variables than in any modern study of patent litigation.

It is also worth noting what we do not do. This is a study confined to the final results of patent litigation, and to validity litigation at that. It is therefore a subset of the much larger universes of cases that are filed, of patents that are issued, and of inventions that are made. We hope that our study will be of interest to litigators, clients, and judges who are involved in patent litigation, but we doubt it sheds much light, except perhaps very indirectly, on the nature of innovation, patent office procedure, or litigation settlement.

Our study is structured as follows. Part II briefly surveys the existing empirical work on patent litigation. Part III describes the data set, explains what information we collected and the methodology we have used, and identifies some of the limitations inherent in this data set. Parts IV and V contain descriptive statistics about the data set, our findings on each of the hypotheses we have tested, and the results of our regression model that attempts to predict the outcome of patent litigation based on the factors we have tested. Finally, in Part VI we draw some general conclusions about the universe of patent validity decisions and suggest avenues for further research.

II. EXISTING LITERATURE

The lack of empirical evidence on the function and impact of the patent system has long been lamented.[3] In recent years, a number of

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instances, we substituted 1997 Federal Circuit decisions for earlier district court decisions in the population.

[3] George Priest complained twelve years ago that there was virtually no useful economic evidence on the impact of intellectual property. *See* George Priest, *What Economists Can Tell Lawyers About Intellectual Property*, 8 RES. L. & ECON. 19 (1986). Even earlier, Fritz Machlup told Congress that economists had essentially no useful conclusions to draw on the nature of the patent system. *See* STUDY OF SENATE SUBCOMM. ON PATENTS,

scholars have begun to address this deficiency in a variety of ways. First, several researchers have focused attention on how firms in various economic sectors perceive and use patents. A prominent example is the study by Levin et al. (1987).[4] The authors surveyed a large number of high-level research and development executives in over one hundred industries to identify preferences among patents, secrecy, lead time, and other methods of protecting the competitive advantages of important new processes and products. Although there was significant variance among industries, executives across industries did not view patents as the most effective means of encouraging innovation; indeed, in some industries executives considered patents as the least effective contributor to innovation.[5]

TRADEMARKS, AND COPYRIGHTS, SENATE COMM. ON THE JUDICIARY, 85TH CONG., 2D SESS., AN ECONOMIC REVIEW OF THE PATENT SYSTEM 15 (Comm. Print 1958) (prepared by Fritz Machlup). For some of the disagreements among historians over the impact of the patent system on innovation, see ROBERT P. MERGES ET AL., INTELLECTUAL PROPERTY IN THE NEW TECHNOLOGICAL AGE 125-27 (1997).

These complaints may be unfair. There is increasing attention in academic circles to the relationship between patents and innovation. Our study is one piece in this much larger puzzle, albeit one focused on a portion of the problem that Priest might not consider the most important one.

[4] Richard C. Levin et al., *Appropriating the Returns from Industrial Research and Development*, 3 BROOKINGS PAPERS ON ECON. ACTIVITY 783 (1987).

[5] *See id.* at 798. Not surprisingly, patents were viewed as much less effective for processes than for products. *See id.* at 794-95. Among the most important reasons the authors found for the perceived limitations on the effectiveness of patents were the ease of inventing around both process and product patents and doubts about patentability of processes. *See id.* at 803. Given these findings, Levin and his colleagues were led to question why firms patent so much and at an increasing rate; however, their research did not explore this question in depth.

A recent study by Cohen et al. (1998) directly addresses the question of why firms patent. *See* Wesley M. Cohen et al., Appropriability Conditions and Why Firms Patent and Why They Do Not in the American Manufacturing Sector (April 17-18, 1998) (unpublished manuscript, presented at the Stanford Workshop on Intellectual Property and Industry Competitive Standards, Stanford Law School). The Cohen study updates the Levin study and finds that, across many manufacturing sectors, patents are viewed as substantially less effective for appropriating the

Several other authors have evaluated patent acquisition and licensing strategies in various industries through case studies.[6] One especially interesting study of licensing by Lerner (1995) examined the patenting behavior of 419 new biotechnology firms with varying litigation costs.[7] One of Lerner's key findings was that firms with relatively higher litigation costs

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value of product innovations than all other alternatives (secrecy and lead time being the most preferred alternatives). The study finds a number of reasons why firms nonetheless seek patents. Unsurprisingly, the most important reason given by respondents was to prevent others from copying. *See id.* at 16. The authors recognize, however, that the importance of this reason could have been exaggerated because many respondents may have viewed this as the most "socially desirable response." *See id.* The second most important reason was "blocking," or preventing other firms from patenting related technology. *See id.* Blocking and related defensive motives may help to explain the finding in our study that patent litigation commonly occurs long after the issuance of a patent. *See infra* notes 91-100 and accompanying text. For another test of possible explanations why firms increasingly seek patents, see Samuel Kortum & Josh Lerner, *Stronger Protection or Technological Revolution: What is Behind the Recent Surge in Patenting?* (Working Paper No. 6204, National Bureau of Economic Research 1997) (rejecting the explanation that changes in patent law have prompted the surge in patenting).

For an interesting variant on the industry patent study, which examines renewal data and multi-country filings as a proxy for the value firms place on patents, see Jean O. Lanjouw et al., *How to Count Patents and Value Intellectual Property: Uses of Patent Renewal and Application Data* (Working Paper No. 5741, National Bureau of Economic Research 1996); *cf.* Mark Schankerman & Ariel Pakes, *Estimates of the Value of Patent Rights in European Countries During the Post-1950 Period*, 96 ECON. J. 1052 (1986) (attempting to value patents in Europe).

[6] *See, e.g.*, Rebecca S. Eisenberg, *Public Research and Private Development: Patents and Technology Transfer in Government-Sponsored Research*, 82 VA. L. REV. 1663 (1996); Josh Lerner & Robert P. Merges, *The Control of Technology Alliances: An Empirical Analysis of the Biotechnology Industry*, 46 J. Indus. Econ. 125 (1998); Robert P. Merges, *Contracting Into Liability Rules: Institutions Supporting Transactions in Intellectual Property Rights*, 86 CAL. L. REV. 1293 (1996); Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839 (1990); David J. Teece, *Profiting From Technological Innovation: Implications for Integration, Collaboration, Licensing and Public Policy*, 15 RES. POL. 285 (1986).

[7] *See* Lerner, *supra* note 1.

are less likely to seek patents in those subclasses[8] in which there had been many patent damage awards to rivals, especially to rivals with lower litigation costs.[9]

There have been a smaller number of empirical studies on patent litigation. Two of these studies cover relatively early periods. The first, by P. J. Federico (1956), provided validity and infringement data for litigated patents reported in the *U.S.P.Q.* during the years 1925-1954, with more in-depth study of patents litigated during the years 1948-1954.[10] Although Federico did not attempt to examine a large number of variables, he did examine overall validity rates in a relatively thorough manner, and in the 1948-1954 portion of the study he explored the courts' treatment of uncited and cited prior art.[11]

The other study, first published by Koenig in 1974 and then updated through 1980, constitutes the most extensive set of data ever gathered on

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[8] The reference to subclasses is to sublevels within the patent classification system maintained by the United States Patent & Trademark Office ("PTO"). There are over 120,000 subclasses. Lerner's finding means that firms with relatively high litigation costs are more likely to use litigation-avoidance patenting strategies.

[9] *See* Lerner, *supra* note 1, at 477-78. Using a number of ingenious data collection and testing methods, particularly in estimating relative litigation costs, Lerner contributes not only to the literature on patenting strategy, but also to the literature on the various effects that litigation and other dispute resolution costs have on the behavior of firms.

[10] P. J. Federico, *Adjudicated Patents, 1948-54*, 38 J. PAT. OFF. SOC'Y 233 (1956).

[11] *Id.* at 236 (finding that courts upheld the validity of patents in only about 30-40% of the cases in which validity was an issue). Federico also concluded that the prior art before the courts was often more effective than that used by the PTO in issuing the patent, based on his observation that accused infringers were generally more successful in convincing courts to invalidate patents on the basis of uncited prior art than on the basis of cited prior art. *See id.* at 249. Our data confirm this observation, although the explanation Federico offers is by no means the only one. *See infra* notes 83-86 and accompanying text.

patent litigation.[12] Koenig collected all patent cases reported in the *U.S.P.Q.* in the years 1953-1978 to produce an array of descriptive statistics. She also selected a random sample of 150 patents from the years 1953-1967 for more in-depth study. In addition to finding that most courts held patents invalid and noting the wide disparity of validity rates across regional circuits, she also found that obviousness (or "lack of invention") was the most frequently used basis for judicial invalidation of patents.[13]

Of the recent contributions to the empirical literature on patent litigation, the work by Lanjouw and Lerner (1996) on injunctive relief in patent cases is notable.[14] Lanjouw and Lerner evaluate a sample of 252 patent suits to test the hypothesis that preliminary injunctive relief in patent litigation is used to impose costs on rivals.[15] Coolley (1993) has also produced a useful empirical study of a purely descriptive nature on patent infringement damages.[16] Lanjouw and Schankerman (1997) evaluate data about litigated patents provided by the PTO to determine the ways in which

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[12] GLORIA K. KOENIG, PATENT INVALIDITY: A STATISTICAL AND SUBSTANTIVE ANALYSIS (rev. ed. 1980). Koenig also notes other early studies, but these earlier studies appear to add nothing meaningful to the work of Federico and Koenig. *See id.* at 3-4 to 3-10. Like Federico's data for 1925-1954, Koenig's data for 1953-1978 reveal that district and circuit courts found patents valid only about 35% of the time. *See id.* at 4-41, n.35.2.

[13] *See id.* at 5-70 to 5-78. Koenig also studied the many kinds of prior art relied on by courts and the ways in which uncited prior art played a role in the courts' decisions. *See id.* at 5-25 to 5-69.

[14] Jean O. Lanjouw & Josh Lerner, *Preliminary Injunctive Relief: Theory and Evidence From Patent Litigation* (Working Paper No. 5689, National Bureau of Economic Research 1996).

[15] *See id.* at 2 (concluding that the data are consistent with the hypothesis that preliminary injunctive relief is a predatory weapon in patent cases).

[16] Ronald B. Coolley, *Overview and Statistical Study of the Law on Patent Damages*, 75 J. PAT. & TRADEMARK OFF. SOC'Y 515 (1993). This study analyzed several factors from 152 decisions between 1982-1992 in which the amount of damages was reported. Although unstated in the article, it appears that both district court and Federal Circuit decisions were included. The article also did not define the source of its data set, but apparently included decisions reported in West reporters, *U.S.P.Q.*, and the LEXIS electronic database. *See id.* at 533-37.

litigated patents differ from the general patent pool.[17] At least two other studies[18] have attempted, with mixed success, to empirically analyze the decision-making behavior of the United States Court of Appeals for the Federal Circuit.[19]

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[17] Jean O. Lanjouw & Mark Schankerman, *Stylized Facts of Patent Litigation: Value, Scope and Ownership* (Working Paper No. 6297, National Bureau of Economic Research 1997).

[18] *See* Ronald B. Coolley, *What the Federal Circuit Has Done and How Often: Statistical Study of the CAFC Patent Decisions- 1982-1988*, 71 J. PAT. & TRADEMARK OFF. SOC'Y 385 (1989); Donald R. Dunner et al., *A Statistical Look at the Federal Circuit's Patent Decisions: 1982-1994*, 5 FED. CIR. B.J. 151 (1995).

The Coolley study of Federal Circuit decision-making is quite difficult to use as a basis for any type of conclusion. It did not identify the source of its data, did not attempt any kind of precise definition of its data set, and has a number of data comparability problems. Some of these problems stem from the inclusion of design patent decisions, decisions on appeal from all lower tribunals over which the Federal Circuit has appellate jurisdiction, and inclusion of all subjects of Federal Circuit decisions and all types of Federal Circuit judgments.

The study by Dunner et al., on the other hand, provides much more useful descriptive statistics. This research had the avowed objective of determining whether the Federal Circuit was "biased" in favor of patents. *See* Dunner et al., *supra*, at 151. Specifically, Dunner examines whether the Federal Circuit is generally more pro-patent than its predecessor patent appeals courts, namely, the regional circuits and the Court of Customs and Patent Appeals ("C.C.P.A."). Dunner's study was based on 1302 Federal Circuit decisions of all kinds, many unreported; however, the source of the data set is not clear. Although the study was based on a very large data set that may present data comparability problems, one portion of it did segregate Federal Circuit decisions on patent validity. *See id.* at 154-55. Like other studies of the Federal Circuit, the Dunner study found a much higher validity rate than had been found in district court and regional court of appeals decisions prior to the Federal Circuit's creation. This was found to be true both overall and with respect to the individual grounds of novelty and statutory bars, obviousness, and description and claim adequacy. *See id.*

[19] Congress created the Federal Circuit in 1982 to serve, *inter alia*, as the only United States court of appeals to review district court patent cases. Although not relevant to our study, the same legislation also gave the

III. DESCRIPTION OF STUDY

A. *Population*[20]

Our defined population contains 299 patents litigated in 239 different cases. These cases represent all written, final validity decisions by either district courts or the Federal Circuit reported in the *U.S.P.Q.* during an almost eight-year period from early 1989 through 1996. We present several more detailed observations about this population and its limitations in this section.[21]

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decisions of the PTO's Board of Patent Appeals and Interferences in instances in which the Board had affirmed the patent examiner's rejection of a patent application. This latter form of appellate jurisdiction had previously been within the province of the United States Court of Customs and Patent Appeals, which was abolished by the 1982 legislation. *See* Federal Courts Improvement Act of 1982, Pub. L. No. 97-164, 96 Stat. 37 (1982) (codified as amended at 28 U.S.C. § 1295 (1994)).

[20] This is a population study rather than a sample study. The general parameters of that population are noted above, and we have included every case within this definition. There are several reasons for this decision. First, because we have defined a population in relatively narrow terms to ensure data comparability, the size of our data set is small enough that sampling is unnecessary. Second, when using reported cases as data sources, there are intractable problems with treating the grouping of cases as a representative random sample, regardless of how carefully one has defined the grouping. Although it is self-evident that any grouping of cases represents a subset of something larger, i.e., a population of something, it is practically impossible to assure that the grouping is a representative sample, much less a random one.

Despite the use of a population, we were able not only to generate a large number of descriptive statistics, but also to perform statistical testing. As discussed in more detail in Part III.C., one can perform hypothesis testing and prediction from a population by treating the population as a subset of a "superpopulation"—in this case the hypothetical population of all past and future validity decisions—without any pretense that the data set is a representative sample of that superpopulation. *See* M.E. Thompson, *Superpopulation Models*, 9 ENCYCLOPEDIA OF STATISTICAL SCIENCE 93 (1988) (discussing the concept of a "superpopulation").

[21] Although a few of our decisions about the population definition were due to practical constraints on data collection, most were made to ensure

We have studied only validity decisions on issued United States patents. Our study does not include decisions on unenforceability due to misuse, inequitable conduct, estoppel, or the like. Nor does it include infringement decisions.[22] Because the population is limited to issued United States patents, it does not include appeals from the rejection of a patent application by the PTO Board of Patent Appeals and Interferences.[23] Because it is limited to judicial decisions on the validity of U.S. patents, it does not include either the decisions of foreign courts or decisions of, or appeals from, the United States International Trade Commission ("ITC").[24]

The population consists only of *final* decisions that resulted in written opinions. Where there is more than one decision in a case, we have reported the last final decision ruling on the validity of that patent. For example, final Federal Circuit decisions supersede trial court decisions in the population. In such a case, the "final" validity decision we have reported is the Federal Circuit ruling.[25] Where the Federal Circuit remands a case,

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[22] We suspect most litigated infringement cases include at least one validity argument, however.

[23] The inclusion of appeals from the PTO would introduce data into the population that are not comparable with data derived from infringement actions in the district courts or the Federal Circuit. The proceedings, the burdens of proof, and the nature of the parties are entirely different. Three of the more important examples of data comparability problems are the purely *ex parte* nature of PTO Board proceedings, the absence of juries, and the absence of the strong presumption of validity that is present when a court considers an issued patent.

[24] For many purposes one could plausibly characterize a Federal Circuit decision reviewing a patent validity determination in an ITC exclusion order as a judicial validity decision. We did not do so, however, because there are enough differences between ITC adjudication and district court litigation to have introduced data comparability problems into the study. The most important examples are the absence of jury trials in ITC adjudications and the extra requirements for relief—such as proof of domestic industry—in ITC actions. In any event, the number of these decisions found in, and then excluded from, our population was extremely small.

[25] We have also collected information on the trial court ruling and use this information to test a number of variables in the study. The case is only reported once in the population, however, even if it produced two or more opinions. We must note that, even though we included only the highest-

and there is subsequently a final trial court decision on the validity of the patent that is reported in the specified volumes of the *U.S.P.Q.*, we have included the trial court rather than the Federal Circuit decision in the population. Where there is no final decision on a patent–for example in rulings denying summary judgment or motions to dismiss, or appeals that result in a remand for further decision-making that is not subsequently reported–we have not included the case in the population. Similarly, a case is not included if it settles before a final decision on validity. Cases that settle after a final decision that is not vacated remain in the population. Finally, although the definition of the population includes final decisions rendered from early 1989 through 1996, we have replaced district court rulings in this time frame with later, Federal Circuit decisions where appropriate.[26]

The population is defined in terms of patents, not cases. Many of the cases we studied produced final decisions on a number of different patents. We treat each of those patents as a separate unit for purposes of our analysis, just as it would be under patent law.[27]

Our population consists of reported written decisions. This is broader than "published" decisions, as that term is used in local court rules. The population includes cases denominated "not for publication" by the Federal Circuit, as well as district court opinions that are not included in the Federal Supplement. At the same time, it is not as comprehensive as "all decisions" in patent validity cases. Some decisions consist only of jury verdicts or unwritten conclusions on the validity of a patent by a district court judge. We have excluded these decisions from the population, both because they do not produce intelligible data for most of the hypotheses we test, and because any effort to include all such cases necessarily would

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level final validity decision in the population, we did find it necessary in many instances to study earlier decisions in the same case to obtain additional detail on matters such as the particular prior art references relied on in the final decision.

[26] *See supra* note 2 for the details of this extension of our data set.

[27] Indeed, in one case, different *claims* of the patent produced different reported final decisions on validity. In that case, we have treated the two claim sets as two different patents for purposes of some of the hypotheses. We note this treatment where appropriate.

involve very unsystematic collection, which would produce only a haphazard subset of the cases and almost certainly would introduce various instances of data incomparability.

If we did our study several years from now, the population of validity decisions almost certainly would be much larger, although there is nothing to indicate that our results would differ.[28] The reason is that, prior to the Supreme Court's 1993 decision in *Cardinal Chemical Co. v. Morton International, Inc.*,[29] the Federal Circuit followed the practice of refusing to entertain validity issues once it had determined that no infringement had occurred.[30] Moreover, in such a case, the Federal Circuit also vacated any decision on validity that had been rendered by the district court.[31] The Supreme Court overturned the practice, in part because the Federal Circuit is not a court of last resort and thus a finding of noninfringement does not moot validity issues that have been properly raised.[32] After the Court's decision in *Cardinal Chemical*, validity should be an issue in practically every litigated patent dispute, and we would expect to see more final decisions on validity.[33]

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[28] The data set we use is more than large enough for valid statistical analysis.

[29] 508 U.S. 83, 26 U.S.P.Q.2d (BNA) 1721 (1993).

[30] *See id.* at 92 n.12, 26 U.S.P.Q.2d (BNA) at 1725 n.12 (noting that the Federal Circuit's practice of refusing to entertain validity claims under these circumstances had become very firmly engrained).

[31] *See id.* at 89-92, 26 U.S.P.Q.2d (BNA) at 1724-26.

[32] *See id.* at 97, 26 U.S.P.Q.2d (BNA) at 1727.

[33] Technically, the Supreme Court held that the Federal Circuit's practice was improper only when the accused infringer sought a declaratory judgment of invalidity, either as a counterclaim to the patentee's infringement suit or as a declaratory judgment action initiated by the accused. The Court's ruling does not apply to a patent infringement suit in which the defendant raises invalidity solely as an affirmative defense. *See id.* at 93-94, 26 U.S.P.Q.2d (BNA) at 1726. As a practical matter, however, it seems likely that most accused infringers will desire a finding of invalidity rather than only a finding of noninfringement, and will not limit themselves to raising invalidity only as a defense. Although this is

B. *Data Collected*

For each patent in the population, we collected the following information, to the extent it was relevant and could be discerned from the court's opinion:[34]

- case name, citation, and patent number;
- whether the patent was finally held valid or invalid;[35]
- whether the finder of fact held the patent valid or invalid;

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[34] In a small number of cases this was impossible. Some court opinions simply did not contain enough information to enable us to understand what issue was being litigated or on what basis. In those few cases, we have included as much information as we could discern. As a result, a few cases in the database include information about validity but not about the particular grounds, or a ruling on obviousness but not the nature of the prior art that was at issue.

In most cases in which deficiencies of this nature were found, however, we could solve the problem by gathering more detail from earlier decisions in the same case. Thus, when we encountered a Federal Circuit case with inadequate detail on matters such as the precise pieces of prior art that were relied upon in making a validity decision, we usually were able to find the necessary detail in the district court's opinion, or sometimes even in a preliminary decision by the district court.

As an aside, we are disturbed by the lack of information in some reported decisions in the federal courts. Although the federal judiciary certainly owes no sensitivity to the needs of social science researchers, we would expect that Rule 52(a) of the Federal Rules of Civil Procedure would compel a more detailed set of findings than some of these decisions provide. *See* FED. R. CIV. P. 52(a) (requiring that "the court shall find the facts specifically. . .").

[35] Strictly speaking, courts generally refer to patents as "invalid" or "not invalid" because an issued patent carries a strong presumption of validity that can only be overcome by clear and convincing evidence. *See, e.g.*, Applied Materials, Inc. v. Advanced Semiconductor Materials Am., Inc., 98 F.3d 1563, 1569, 40 U.S.P.Q.2d (BNA) 1481, 1485 (Fed. Cir. 1996). For convenience, however, we use the terms "invalid" and "valid" in the study. The reader should understand "valid" in the litigation context to mean "not invalid."

- whether the finder of fact was a jury, a judge in a bench trial, a judge ruling on a pre-trial motion, or a judge granting judgment as a matter of law ("JMOL");[36]

- whether there was an appeal and, if so, whether the fact finder's decision was affirmed or reversed;[37]

- whether the different claims in the patent were "disaggregated" (i.e., treated differently for validity purposes) by the court, either because the court found one set valid and the other invalid or because the court rendered a final ruling on one set, but remanded the other set for a further decision;

- whether the court decided litigated validity issues on each of the following grounds: enablement or written description;[38] claim indefiniteness; best mode; patentable subject matter; utility; section 102 prior art;[39] section 102 non-art; obviousness; double-patenting; incorrect inventorship; and

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[36] Where a judge denies a JMOL motion after a jury trial, we have treated the case as involving a decision by a jury.

[37] As noted, if a Federal Circuit case produced no final decision on any aspect of validity but was remanded for further proceedings, the case is excluded from the population. *See supra* Part III.A.

[38] We have treated these two grounds for decision together in the database.

[39] We have divided section 102 decisions into two categories. The first, which we call "section 102 prior art" decisions, includes section 102(a) novelty determinations, section 102(b) determinations that depend on the prior art of another rather than the patentee's own actions, and section 102(e) prior art. The second category, denominated "section 102 non-art" decisions, includes the statutory bars of section 102(b) to the extent they are triggered by the patentee's own actions, abandonment under section 102(c), derivation under section 102(f), and priority decisions under section 102(g). Although all section 102 decisions are in some sense based on "prior art," we think it is useful to distinguish between 102 decisions that involve patents, published references, or public use by another, on one hand, and statutory bars and non-art grounds for invalidation, on the

broadening of claims during reexamination (for each of these grounds of decision, we have indicated whether the finder of fact determined the patent to be valid or invalid *on this ground*,[40] and whether the final decision in the case held the patent valid or invalid on this ground);

- for obviousness and section 102 prior art cases, whether the decision was made primarily on the basis of cited prior art, uncited prior art, or both (in the case of obviousness, we also tested whether secondary considerations played a significant role in the decision);

- whether the subject matter of the patented invention was general (also referred to as mechanical), electrical, chemical, pharmaceutical, biotechnology, computer-related, or software;[41]

- whether the inventor or the assignee of the patent resides outside the United States;

- the total number of prior art references cited on the face or inside the patent, and the breakdown between patent and non-patent references;

- for cases litigated on obviousness or section 102 prior art grounds, the number of references relied upon by the

[40] Because a patent need only be invalid on one ground to be invalidated, some courts may hold a patent invalid on, for example, obviousness grounds while rejecting challenges under section 102 prior art and enablement. In such cases, we have listed the patent as finally invalid, but have recorded each of the subject matter decisions, e.g., invalid on obviousness grounds, valid on section 102 prior art grounds, and valid on enablement grounds. For this reason, the data set contains some rulings of "validity" on particular grounds even in invalid patents, although not the reverse. For the same reason, the number of validity decisions on each particular ground will not necessarily total to the number of final validity decisions.

[41] Note that a patent can fall into more than one category. For example,

defendant, and the breakdown between cited and uncited prior art references;

- the amount of time the patent spent in prosecution before the PTO from the first U.S. filing date to which priority is claimed to issuance (i.e., "time in prosecution"), the amount of time elapsed between issuance and the final decision on validity (i.e., "delay"), and the total time from first filing to final decision on validity (i.e., "lag").

C. *Methodology*

We use three different statistical approaches to evaluate the data we have produced. Because we have defined a population and included all the members of that population in our data set, the normal tests designed to evaluate the statistical significance of the data do not apply. Within the population, all the numbers we reproduce are by definition "statistically significant."[42] Thus, some of the data we produce are descriptive statistics about the population, such as what percentage of patents were invalid and how many patents were challenged on enablement grounds. These descriptive statistics also include data relating one variable to another, for example, comparing the percentage of jury decisions finding a patent valid with the percentage of bench trial decisions finding a patent valid. These statistics are interesting for what they reveal about the population of judicial validity decisions during a recent eight-year period. As a matter of pure statistics, however, they do not *predict* anything about future litigation.

Because one of our interests is the predictive significance of the data we have collected, we also have evaluated the data set in a second way, as noted earlier.[43] This approach defines our population as a subset of an indeterminate "superpopulation" consisting of final reported validity decisions across a range of time. We then apply the techniques of statistical inference to the population to test a number of hypotheses about the

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[42] Unlike a sample study, all differences found in a population study are statistically significant. Such differences may nevertheless be small enough to have no practical significance to lawyers.

[43] *See supra* note 20.

relationship between validity and other factors in the superpopulation. We detail the results in Part IV. Appendix A contains the full list of hypotheses.

Finally, we combine a number of these hypotheses into a logistic regression model designed to determine how well the factors we have identified predict the outcome of patent cases.[44] We report the results of this predictive model in Part V. Appendix B contains statistics for the model.

D. *Limitations*

The study contains a number of limitations and potential biases. Some of these relate to our definition of the population, while others are inherent in the project of categorizing and interpreting data about litigation.

1. Population Biases

First, one might quibble with the population we have chosen. It would probably be desirable to evaluate all judicial patent validity decisions, whether or not they result in reported written opinions. Some might even suggest that written decisions are likely to have biases in their results, although it is not obvious to us what those biases would be. However, we doubt whether most of the data we collected for this study is in fact available for unwritten decisions. Furthermore, we do not know of a reliable way to identify all final patent validity decisions in U.S. courts. We suspect that the haphazard collection of some, but not all decisions, or decisions from particular districts, is at least as likely to produce biased results as the approach we take.[45]

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[44] We use logistic regression here because virtually all of the variables in the model are binary, and the rest can be converted to binary data. *See, e.g.*, AMIR D. ACZEL, COMPLETE BUSINESS STATISTICS 558-59 (1989) (discussing use of logistic regression model when the response to a set of independent variables is in the binary form, e.g., "yes or no" or "success or failure").

[45] Some limited data, such as fact finder and final validity decision, could perhaps be collected for such a study. If someone conducts such a study, it would be useful to compare those limited results with ours to determine whether such a bias in fact exists.

Although we explained the necessity of excluding Federal Circuit appeals from PTO and ITC decisions from our population,[46] we note that some types of cases are more likely to arise in appeals from the PTO than in normal litigation and therefore may be underrepresented in our population. For example, the numerous patentable subject matter decisions involving software patents are largely absent from our population, because they usually arose in appeals from the PTO's refusal to issue a patent on section 101 grounds.

Finally, the fact that we have included only final decisions on validity has introduced some bias into our population. In particular, the percentage of decisions that are affirmed on appeal in this population is extraordinarily high. We suspect this is because we have excluded remands in cases that later settle or that are later decided without written opinion. Because many reversals by the Federal Circuit result in a remand, not an outright reversal, the "affirmed or reversed" statistic is probably unreliable.[47]

This does not mean, however, that excluding remands was a mistake. Allowing non-final decisions to be included in the database would have introduced a host of other problems. It would have required us to further fragment the data set by measuring each case according to the procedural posture in which it arose. It would also have made the calculation of hard numbers of validity and invalidity impossible and would have required the exercise of more judgment in categorizing cases, hence introducing more possibility for error.

2. Inherent Limitations

We have already noted some of the problems inherent in converting written opinions into hard numbers.[48] In a few cases, it was impossible to discern enough information even to identify the issues being decided in a case. In other cases, determining how a case should be categorized required the exercise of judgment. For example, in characterizing the subject matter

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[46] *See supra* notes 23-24.

[47] We discuss the ways we have sought to deal with this problem *supra* Part III.A.

[48] *See supra* notes 34 and 41.

of an invention as "pharmaceutical" or "software," we necessarily had to make a judgment as to what those categories should include. Similarly, some of the categories we have established, such as reliance by the courts on particular pieces of prior art, or on secondary considerations of nonobviousness, require analysis of the court's opinion. We are aware that others might disagree with our judgment in any given case. However, we do not believe there is any reason to believe that our evaluation of these cases is biased in any systematic way.[49] We have, of course, retained our complete data set and will make it available to those wishing to conduct similar research.

We are also limited in what we can test by the inherent nature of the litigation process. We suspect that there are numerous variables that affect patent validity decisions that are not included in this study for the simple reason that there is no obvious, rigorous way to test them. The skill of the lawyers on each side, the composition of the jury, the interests and experience of the judges, the demeanor of the witnesses, the financial resources of both parties, and the quality of the patent itself are all likely determinants of validity in at least some cases. They are not considered here because there simply is no data available that would allow us to test these things.[50] This does not mean that the data we have are problematic in any way, but it does mean that they cannot possibly tell the whole story.

Finally, a word of caution is in order regarding our hypothesis testing on the population to make predictions about the superpopulation. We conducted these tests because we suspect that practitioners and scholars are at least as interested in what is likely to happen prospectively over time as in what happened in a circumscribed historical time period, no matter

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[49] The authors worked closely together to personally study every decision and every patent. Although we received various kinds of help from our research assistants and statistician, we did not delegate any of these tasks involving the exercise of judgment. We studied many other cases and patents before ultimately discarding them due to failure to meet the strict parameters of our population. Moreover, in order to gather richer detail about matters such as the specific prior art relied upon by a court, we sometimes studied earlier decisions in the same case.

[50] There have been some admirable efforts to construct proxies for a few of these variables. *See, e.g.*, Lerner, *supra* note 1; Lanjouw & Lerner, *supra* note 14 (offering firm size and prior patent litigation as proxies for litigation resources).

how recent that historical period. However, even the best predictive efforts in this area encounter fundamental limitations imposed by the fact that law and the litigation process change over time. A study that did not foresee the creation of the Federal Circuit in 1982 would not have given accurate predictions about patent validity. Similarly, efforts to predict the future from our data assume static legal rules and systems that simply does not exist. The recent changes in the law of software patents may serve as a good example. There are remarkably few software patents in the population, but changes in case law in this field since 1994 are just starting to have an effect on patent litigation, and the numbers may be much higher in the future. By its very nature, our population study cannot take these changes into account. All we can do is warn the reader to be aware of them.

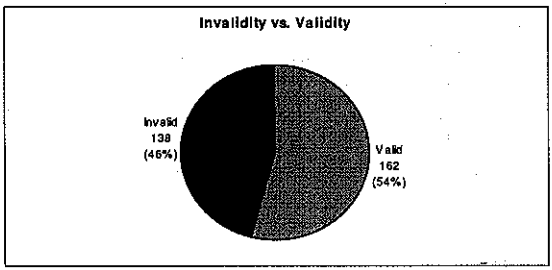
IV. RESULTS

We have evaluated a number of characteristics of these cases in order to identify possible predictors of patent validity. We will discuss each of these factors separately, and then in the context of the logistic regression model.

A. *Overall Validity*

Of the 300 final validity decisions in the data set,[51] 162 (54%) found the patent valid, and 138 (46%) found the patent invalid. Figure 1 summarizes these results.

Figure 1.



[51] Although there were 299 litigated patents reported, one of those patents produced two different final validity results for two different sets of claims. We have therefore counted that patent twice, as both a final valid and a final invalid result. In other cases, where $n = 300$, it is for the same reason.

This result is broadly consistent with other recent work on overall patent validity, which has generally found that courts determining the validity of patents since creation of the Federal Circuit adjudge approximately 55% of them to be valid.[52] As those prior studies have noted, this validity rate is significantly higher than it was before the Federal Circuit was created.[53]

For predictive purposes, we tested the following hypothesis:

Hypothesis 1: Issued patents are not more likely to be held valid than invalid.

We set $H_0\, q = 0.5$, where q is the probability of final invalidity. The observed probability was $q = 0.46$. The G-square p-value for the test was greater than 0.1, however, indicating that we cannot predict with confidence that patents in general are more likely to be held valid than invalid.[54] From

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[52] *See, e.g.*, Donald R. Dunner, *The United States Court of Appeals for the Federal Circuit: Its First Three Years*, 13 AIPLA Q.J. 185, 186-87 (1985); Mark A. Lemley, *An Empirical Study of the Twenty-Year Patent Term*, 22 AIPLA Q.J. 369, 420 (1994) (finding 56% of all litigated patents held valid during the period 1989-1994); Robert P. Merges, *Commercial Success and Patent Standards: Economic Perspectives on Innovation*, 76 CAL. L. REV. 803, 822 (1988).

[53] Before creation of the Federal Circuit, studies had found that only about 35% of litigated patents were held valid on average. The percentages were similar in the district courts and the courts of appeal. *See* KOENIG, *supra* note 12, at 4-18 to 4-19, 4-22 to 4-23. At the court of appeals level, validity rates varied widely among circuits, ranging from around 10% to over 55%. *See id.* at 4-32. Koenig's data covered the 1953-1978 period. Federico's study presented validity and infringement data for the years 1925-1954, although his more in-depth study covered only the 1948-1954 period. Koenig's validity data for 1953-1978 closely track those of Federico for 1925-1954. *See* Federico, *supra* note 10, at 244.

[54] The p-value is a measure of the confidence with which a hypothesis can be rejected. Hypotheses in our study are generally in the null form. The null hypothesis posits "no difference" or "no relationship." If the null hypothesis is rejected, then one can state with confidence that there is a difference or a relationship. A rejection of the null hypothesis with a p-value of .01 means that such rejection can be made with 99% confidence; a rejection with a p-value of .05 or less means that such rejection can be

the perspective of an outsider to the patent system, it may be surprising that once a patent has been issued, the chance that a court will hold it valid is only slightly better than even.[55]

B. *Grounds For Attacking Validity*

Of the 138 patents held invalid in the population, the majority of the grounds for invalidity were rooted in the prior art. Table 1 shows the breakdown of the findings of invalidity, grouped by grounds of invalidity.

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made with 95% confidence; a rejection with a p-value of .10 or less means that such rejection can be made with 90% confidence. P-values less than .05 are viewed as an indication that the null hypothesis can be rejected with sufficient confidence and that any differences or relationships are statistically significant. Depending on several factors, one may view p-values up to .10 as supporting rejection with statistical significance. However, one should always view p-values greater than .10 for the null hypothesis as showing that any observed differences or relationships are not statistically significant.

We have tested our hypotheses using both chi-square p-values (the "Pearson statistic") and G-square p-values (the "likelihood-ratio statistic"). Although both are reported in the results of our logistic regression analysis (Appendix B), we refer only to the G-square p-value in our discussion. The two are very similar and for most purposes interchangeable. Although there can occasionally be reasons for choosing between the two, the choice is more typically a matter of personal preference, as it was here. The important thing is to use either one consistently throughout a study. *See* THOMAS D. WICKENS, MULTIWAY CONTINGENCY TABLES ANALYSIS FOR THE SOCIAL SCIENCES 17-50 (1989) (discussing thoroughly tests of relatedness). For a discussion of the choice between the chi-square and G-square p-values, see *id.* at 38-39.

[55] This fact, although true, is somewhat misleading. First, it may still be the case that the PTO is effective in weeding out some invalid patents. For example, if only 25% of the patent applications objectively *should* result in valid patents, and if the PTO threw out two-thirds of the invalid applications, the validity rate of those patents that were issued would still be only 50%. Second, it may be that cases select themselves for litigation based on uncertainty as to outcome, and that cases involving obviously valid or obviously invalid patents are likely to settle. *See* ROBERT COOTER & THOMAS ULEN, LAW AND ECONOMICS 484-87 (2d ed. 1996). This latter explanation has trouble accounting for the change in validity rates over time, however.

Table 1

Invalidity of Patents, by Grounds of Invalidity

Number of Invalid Patents in Sample: 138

Note: Because a patent may be invalid on more than one ground, the numbers and percentages in Table 1 exceed 100%.

Ground of Invalidity	Number	Percentage of Invalid Patents
Patentable Subject Matter	1	0.7%
Utility	1	0.7%
Enablement / Written Description	13	9.4%
Claim Indefiniteness	8	5.8%
Best Mode	16	11.5%
Sec. 102 Prior Art	37	26.8%
Sec. 102 Non-Prior Art	43	31.1%
Obviousness	58	42.0%
Double Patenting	5	3.6%
Re-Examination	1	0.7%
Incorrect Inventorship	1	0.7%

By far the largest number of invalidity determinations were made on the basis of obviousness (58, or 42.0% of all cases finding invalidity), which comports with the results of earlier studies.[56] The second largest number were made on the basis of section 102 non-prior art (43, or 31.1%). Together, sections 102 and 103 accounted for 138 out of 191 total determinations of invalidity. Section 112 accounts for virtually all of the remaining grounds; 45 out of 191 determinations were made on the basis of enablement, written description, claim indefiniteness, or best mode. The remaining grounds for attacking validity resulted in very few invalidity findings.

We also tested the number of times particular grounds of invalidity were asserted in the population, as described in the court opinion, and the

[56] *See* KOENIG, *supra* note 12, at 5-50; Federico, *supra* note 10, at 249.

success rates of each ground discussed by the court.[57] Table 2 and Figure 2 present the results for both inquiries.

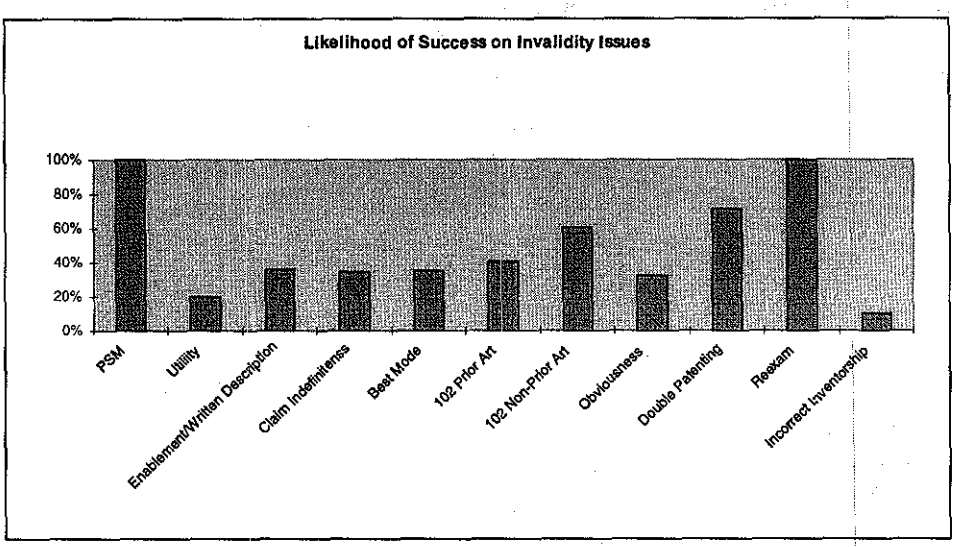
Table 2

Success of Particular Grounds of Invalidity

Ground of Invalidity	Number of Decisions	Number of Decisions Holding Patents Invalid	Percentage of Decisions Holding Patents Invalid
Patentable Subject Matter	1	1	100.0%
Utility	5	1	20.0%
Enablement/ Written Description	36	13	36.1%
Claim Indefiniteness	23	8	34.8%
Best Mode	45	16	35.6%
Sec. 102 Prior Art	91	37	40.7%
Sec. 102 Non-Prior Art	71	43	60.6%
Obviousness	160	58	36.3%
Double Patenting	7	5	71.4%
Re-Examination	1	1	100.0%
Incorrect Inventorship	10	1	10.0%

[57] It is likely that in some cases, the court in rendering its decision did not discuss some of the invalidity arguments made by a party at all. Those arguments are not included in the numbers that follow.

Figure 2



The five most popular grounds of invalidity that defendants asserted, as measured by those issues actually decided by the courts, are obviousness (asserted in 160 out of 300 cases), section 102 prior art (asserted in 91 out of 300 cases), section 102 non-prior art (71 out of 300 cases), best mode (45 out of 300 cases), and enablement/written description (36 out of 300 cases).

The most successful grounds in percentage terms are not necessarily those most often asserted. Some high success rates are simply due to the small number of instances, as shown by the 100% success rates of objections to patentable subject matter and broadening claims during reexamination, both of which result from having only one case in the population.[58] Among grounds that were argued more often, the most successful objections to validity were double-patenting (successful five times out of seven, or 71.4% of the time), section 102 non-prior art (successful 43 times out of 71, or 60.6% ofthe time), and section 102 prior art (successful 37 times out of 91, or 40.7% of the time). The least successful grounds were incorrect inventorship (successful one time out of ten, or 10.0% of the time), utility (successful one

[58] Obviously, defendants should not conclude from this data that asserting such claims is a sure route to invalidity.

time out of five, or 20% of the time), and obviousness (successful 58 times out of 160, or 36.3% of the time). It is perhaps instructive that the ground of invalidity most often asserted against patents is also one of the least likely to succeed.[59]

C. *Judge Versus Jury*

The role of jury trials in patent cases has increased dramatically over the past twenty years. Federal Judicial Center statistics indicate that in 1978, only 8.3% of all patent cases were tried to a jury, while in 1994, the last year for which statistics are available, fully 70% of all patent trials were held before juries.[60] This represents a fundamental change in the nature of patent litigation. Apparently somebody—presumably patentees—thinks trial by jury will benefit them.

The data bear out this assumption. There are significant differences between the validity rates reported by different triers of fact. Of the 298 patents litigated in the population, juries decided the validity of 73 (24.5%), judges decided 143 (48.0%) during a bench trial, and judges decided 82 (27.5%) during pre-trial motions.[61] Figure 3 depicts this distribution. It is worth noting that because of the population definition, these numbers may actually underestimate the number of patent validity cases tried to a jury. We suspect that jury verdicts are less likely than bench trials to result in reported written opinions, unless the opinion is written in the context of denying a post-trial motion.

The differences between the pre-trial, bench, and jury decisions are striking. Table 3 reflects the number and percentages of patents held valid by each trier of fact.

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[59] On the other hand, perhaps the frequency of its assertion is responsible for the low success rate.

[60] *See* HERBERT F. SCHWARTZ, PATENT LAW & PRACTICE 130 (2d ed. 1995).

[61] We have grouped together summary judgments and directed verdicts as "pre-trial motions." Also, the validity of one case was decided on motion for JMOL.

Figure 3

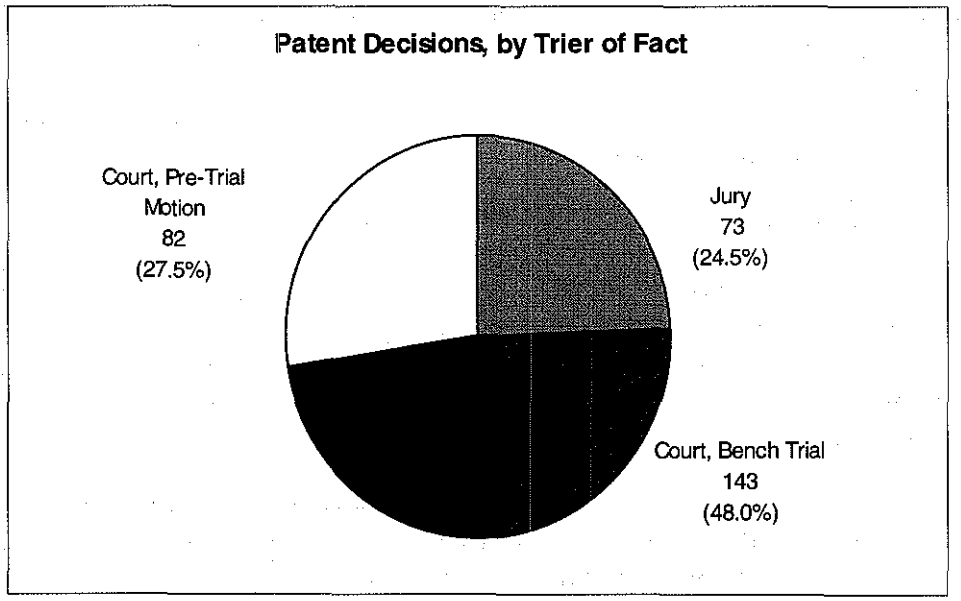

Table 3

Patent Validity, by Trier of Fact

Trier of Fact	Number and Percentage of Decisions	Number and Percentage of Decisions Held Valid	Number and Percentage of Decisions Held Invalid
Jury	73 (24.5%)	49 (67.1%)	24 (32.9%)
Court, Bench Trial	143 (48.0%)	82 (57.3%)	61 (42.7%)
Court, Pre-Trial Motion	82 (27.5%)	23 (28.1%)	59 (72.0%)

Juries held valid more than two-thirds of the patents tried before them (49 of 73, or 67.1%). By contrast, just over one quarter of the cases decided on pre-trial motion were decided in favor of the patentee (23 of 82, or 28.1%). Although some of this reflects the procedural nature of pre-trial motions—the better cases are more likely to make it to trial, and the weaker cases to be dismissed early—that is not the whole explanation. Given that

patents receive a strong presumption of validity,[62] it is reasonable to expect that patentees would be entitled to pre-trial judgment of validity with some frequency. Instead, it appears that pre-trial rulings disposing of validity issues largely favor the defendant, and jury verdicts favor the patentee. There is also a lesser, but still notable, difference between the 57.3% validity rate in bench trials and the 67.1% validity rate in jury trials.

Our test of this data for prediction about the superpopulation reveals the strong predictive significance of these findings. We tested the following hypothesis:

Hypothesis 2: There is no difference between the likelihood that a patent tried to a jury, a patent tried to a court, and a patent resolved before trial will be found invalid by the finder of fact.

The hypothesis was rejected with great confidence (G-square p-value < 0.001). These numbers confirm the conventional wisdom that juries are likely to favor patentees and unlikely to second-guess the decision of the PTO.

The differences between pre-trial, bench, and jury decisions also carry over to the type of invalidity argument each is likely to find persuasive. As Table 4 demonstrates, juries are largely receptive to arguments based on prior art; 62.5% of the jury findings of invalidity were premised on obviousness, and 37.5% were premised at least in part on section 102 prior art arguments. Only in one case (4.2%) did a jury find invalidity on the basis of enablement or written description violations.[63] By contrast, judges in bench trials were much more receptive to enablement and written description arguments; 19.7% of all invalidity determinations in bench trials were made on this basis. Judges in bench trials were

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[62] *See* 35 U.S.C. § 282 (1994) (establishing a presumption of validity for an issued patent). This presumption can be overcome only by clear and convincing evidence of invalidity. *See, e.g.*, Kahn v. General Motors Corp., 135 F.3d 1472, 1480, 45 U.S.P.Q.2d (BNA) 1608, 1614 (Fed. Cir. 1998); Glaverbel Societe Anonyme v. Northlake Mktg. & Supply, Inc., 45 F.3d 1550, 1555, 33 U.S.P.Q.2d (BNA) 1496, 1499 (Fed. Cir. 1995).

[63] As noted above, the percentages total to more than 100% because many fact finders found invalidity on more than one ground.

somewhat less likely to find invalidity on the basis of prior art; only 42.6% of judicial findings of invalidity were made on the basis of obviousness, and 19.7% on the basis of section 102 prior art.

Table 4

Patent Invalidity, by Trier of Fact and Ground for Invalidity

Trier of Fact and Ground	Number of Decisions Held Invalid	Percentage of Decisions Held Invalid
Jury		
Enablement / Written Description	1	4.2%
Claim Indefiniteness	2	8.3%
Best Mode	3	12.5%
Sec. 102 Prior Art	9	37.5%
Sec. 102 Non-Prior Art	4	16.7%
Obviousness	15	62.5%
Court, Bench Trial		
Enablement / Written Description	12	19.7%
Claim Indefiniteness	5	8.2%
Best Mode	9	14.8%
Sec. 102 Prior Art	12	19.7%
Sec. 102 Non-Prior Art	14	23.0%
Obviousness	26	42.6%
Court, Pre-Trial Motion		
Enablement / Written Description	0	0.0%
Claim Indefiniteness	1	1.7%
Best Mode	4	6.8%
Sec. 102 Prior Art	15	25.4%
Sec. 102 Non-Prior Art	23	39.0%
Obviousness	13	22.0%

The rulings on pre-trial motions differ significantly from both jury and bench trials. No court found a patent invalid on the basis of enablement on a pre-trial motion, and only 22.0% of the courts' pre-

trial findings of invalidity were made on the basis of obviousness. The largest single ground of invalidity in pre-trial decisions was on the basis of section 102 non-prior art, such as on sale bars and the like.

The predictive significance of these data for the superpopulation was uneven. In only two cases were the differences in findings by subject matter statistically significant. One was in the case of section 102 prior art, where we rejected the following hypothesis (G-square p-value = 0.042):

Hypothesis 2c: There is no difference between the likelihood that a patent tried to a jury, a patent tried to a court, and a patent resolved before trial will be found invalid on section 102 prior art grounds by the finder of fact.

The other was in the case of section 102 non-prior art decisions, where we rejected the following hypothesis (G-square p-value < 0.001):[64]

Hypothesis 2f: There is no difference between the likelihood that a patent tried to a jury, a patent tried to a court, and a patent resolved before trial will be found invalid on section 102 non-prior art grounds by the finder of fact.

These differences have some important implications for patent validity litigation. Beyond the obvious implications that patentees generally want to request jury trials and defendants want to try very

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[64] In one case, section 102 cited prior art, the following hypothesis could be rejected with 90% confidence, but not with 95% confidence (G-square p-value = 0.082):

Hypothesis 2d: There is no difference between the likelihood that a patent tried to a jury, a patent tried to a court, and a patent resolved before trial will be held invalid on section 102 cited prior art grounds by the finder of fact.

hard to prevail before trial, there are also some indications of the types of arguments that are likely to be most persuasive in each forum. Juries are most receptive to prior art arguments and respond to very little else. Judges in bench trials are somewhat less impressed by prior art arguments, but are more willing to hear enablement, written description, and a variety of other, more "technical" defenses. Finally, judges in pre-trial motions are unlikely to invalidate a patent on the basis of obviousness or enablement, presumably because both generally require resolution of significant factual questions. They are more receptive to arguments of statutory bar.

D. *Subject Matter Of The Invention*

We also tested the inventions litigated in the population by subject matter. We divided them into several categories. The first three categories—general, chemical, and electrical patents—are mutually exclusive and track the classification scheme used by the PTO.[65] In addition, we categorized certain patents as pharmaceutical or biotech (both overlapping subsets of the chemical group), or as software or computer-related (both overlapping subsets of the electrical group) based on our own evaluation of the subject matter. We reprint the numbers and percentages of each type of patent in the population, as well as the validity statistics for each group, in Table 5.

[65] The general category tracks the mechanical classification used by the

Table 5

Patent Validity, by Subject Matter

Subject Matter	Number and Percentage of Decisions	Number and Percentage of Decisions Held Valid	Number and Percentage of Decisions Held Invalid
Biotech	9 (3.0%)	5 (55.6%)	4 (44.4%)
Chemical	69 (23.0%)	38 (55.1%)	32 (46.4%)
Computer-Related	26 (8.7%)	17 (65.4%)	9 (34.6%)
Electrical	57 (19.0%)	30 (52.6%)	27 (47.4%)
General	173 (57.7%)	94 (54.3%)	79 (45.7%)
Pharmaceutical	11 (3.7%)	8 (72.7%)	3 (27.3%)
Software	3 (1.0%)	1 (33.3%)	2 (66.7%)

The first thing that is striking about these statistics is the nature of the patents that were litigated during this period. The majority of the patents litigated (173, or 57.7%) were classed as general inventions; only a much smaller number were chemical (69, or 23.0%) or electrical (57, or 19.0%) inventions. Contrast this with the number of patents issued. There, the evidence indicates that general patents are significantly less than half of the total number of patents issued.[66] It is evident that litigation most commonly involves run-of-the-mill mechanical inventions, not chemical or electrical inventions.[67]

The numbers of specialized inventions we have identified bear out this conclusion. Biotechnology, pharmaceuticals, computer, and software patents are "hot" areas in patent law. Firms, practitioners, and scholars spend a great deal of time thinking about these types of patents. Our population includes relatively few litigated patents in these areas: only eleven pharmaceutical patents (3.7% of the total), nine biotech patents

[66] *See* Lemley, *supra* note 52 at 394 tbl. 4 (874 out of 2,081 patents in sample were classified as general, 604 as chemical, and 603 as electrical).

[67] Although it is conceivable that there is a large number of chemical and electrical patents that are litigated, but that do not face an invalidity defense, we find it extremely unlikely that that is the case.

(3.0% of the total), twenty-six computer-related patents (8.7% of the total), and three software patents (1.0% of the total).[68] Even these small numbers are overstated because many of these categories overlap.

These are several possible explanations for this phenomenon. First, it may be that the new and dynamic nature of technology in areas such as biotechnology and software leads firms to settle disputes through cross-licensing or other means, because litigation is time-consuming and affects a firm's ability to move quickly in further developing the technology and fully appropriating its value. Second, in some of these areas there may be the type of litigation cost asymmetries identified by Lerner for new biotechnology firms, which lead those firms to pursue a patent strategy that avoids litigation risk.[69] Third, the data may reflect reluctance to litigate early in an uncertain field. If this is correct, recent developments in the law governing biotechnology and software patents may well lead to more patent litigation in the future.[70] Fourth, and perhaps most straightforward, at least a partial explanation of the dearth of validity litigation in these

[68] By contrast, Lanjouw and Schankerman conclude that "litigation is particularly frequent in new technology areas." Lanjouw & Schankerman, *supra* note 17, at 26. It is not clear what explains these different results. It may be that high-technology patents are commonly litigated, but only rarely litigated to final judgment.

[69] *See* Lerner, *supra* note 1, at 465-66.

[70] Because of the recent development of both biotechnology and software patent law, and in particular because of the changes to software patent law resulting from *In re* Alappat, 35 F.3d 1526, 31 U.S.P.Q.2d (BNA) 1545 (Fed. Cir. 1994) (in banc), it may be that these numbers will grow in the future. For example, a number of software patent validity decisions were handed down in 1997, after the closing date for the population. *See, e.g., In re* Dossel, 115 F.3d 942, 42 U.S.P.Q.2d (BNA) 1181 (Fed. Cir. 1997); Robotic Vision Sys., Inc. v. View Eng'g, 112 F.3d 1163, 42 U.S.P.Q.2d (BNA) 1144 (Fed. Cir. 1997); *In re* Zurko, 111 F.3d 887, 46 U.S.P.Q.2d (BNA) 1691 (Fed. Cir. 1997), *reh'g in banc*, 142 F.3d 1447, 46 U.S.P.Q.2d (BNA) 1691 (Fed. Cir. 1998); Lockwood v. American Airlines, 107 F.3d 1565, 41 U.S.P.Q.2d (BNA) 1961 (Fed. Cir. 1997); Fonar v. General Elec. Co., 107 F.3d 1543, 41 U.S.P.Q.2d (BNA) 1801 (Fed. Cir. 1997); IGT v. Global Gaming Tech., 42 U.S.P.Q.2d (BNA) 1144 (D. Nev. 1997).

areas may be found in the natural lag time between filing a patent and getting a final validity decision.[71]

The comparison between the validity of different types of inventions was less illuminating. The large categories have strikingly similar validity rates; 55.1%, 52.6%, and 54.3% for chemical, electrical, and general patents, respectively. Although the other groups have some wider variation in validity numbers (pharmaceutical patents were 72.7% valid, software patents only 33.3% valid), the small size of the populations in those groups makes it impossible to predict a sustained difference in validity with any accuracy. Indeed, our test of the following hypothesis demonstrates that although there are differences in the numbers, one cannot predict with confidence that any group of patents is either more, or less, likely to be found valid.[72]

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[71] *See infra* Part IV.I.

[72] For greater statistical accuracy, we divided the subject matter classifications into nine mutually exclusive categories, as noted in Table 5A.

Table 5A
Patent Validity, by Mutually Exclusive Subject Matter

Category	Number of Decisions	Percentage of Decisions Held Invalid (%)
General	173	45.7%
Chemical, but not Pharmaceutical or Biotech	53	47.2%
Chemical and Pharmaceutical, but not Biotech	8	37.5%
Chemical and Biotech, but not Pharmaceutical	6	66.7%
Chemical and Pharmaceutical and Biotech	3	0.0%
Electrical, but not Software or Computer	34	55.9%
Electrical and Software, but not Computer	1	1.0%
Electrical and Computer, but not Software	20	30.0%
Electrical and Software and Computer	2	50.0%

Hypothesis 3: There is no difference between the likelihood that a chemical invention, an electrical invention, a general invention, a pharmaceutical invention, a biotechnological invention, a computer-related invention, and a software invention will be held invalid.

We also tested the grounds for invalidity of each of these types of inventions. These findings were somewhat more interesting. We present the data in Table 6.

The Chi-square test for independence produced a p-value of 0.3916, indicating that the null hypothesis 3 could not be rejected.

On the choice between Chi-square and G-square tests in this situation, see WICKENS, *supra* note 54, at 38-39.

Table 6

Patent Invalidity, by Subject Matter and Ground

Note: Because a patent may be invalid on more than one ground, the numbers and percentages in Table 6 exceed 100%. Not all grounds for invalidity are listed in this Table.

Subject Matter and Ground	Number of Decisions Held Invalid	Percentage of Decisions Held Invalid
Biotech	4	44.4%
Enablement / Written Description	4	100.0%
Claim Indefiniteness	1	25.0%
Best Mode	0	0.0%
Sec. 102 Prior Art	0	0.0%
Sec. 102 Non-Prior Art	0	0.0%
Non-Obviousness	0	0.0%
Chemical	32	46.4%
Enablement / Written Description	8	25.0%
Claim Indefiniteness	3	9.4%
Best Mode	6	18.8%
Sec. 102 Prior Art	12	37.5%
Sec. 102 Non-Prior Art	6	18.8%
Non-Obviousness	12	37.5%
Computer-Related	9	34.6%
Enablement / Written Description	1	11.1%
Claim Indefiniteness	2	22.2%
Best Mode	0	0.0%
Sec. 102 Prior Art	2	22.2%
Sec. 102 Non-Prior Art	3	33.3%
Non-Obviousness	3	33.3%

Subject Matter and Ground	Number of Decisions Held Invalid	Percentage of Decisions Held Invalid (%)
Electrical	27	47.3 %
Enablement / Written Description	1	3.7%
Claim Indefiniteness	2	7.4%
Best Mode	0	0.0%
Sec. 102 Prior Art	7	25.9%
Sec. 102 Non-Prior Art	7	25.9%
Non-Obviousness	14	51.9%
General	79	45.7
Enablement / Written Description	4	5.1%
Claim Indefiniteness	3	3.8%
Best Mode	10	12.7%
Sec. 102 Prior Art	18	22.8%
Sec. 102 Non-Prior Art	30	38.0 %
Non-Obviousness	32	40.5%
Pharmaceutical	3	27.3%
Enablement / Written Description	1	33.3%
Claim Indefiniteness	0	0.0%
Best Mode	1	33.3%
Sec. 102 Prior Art	1	33.3%
Sec. 102 Non-Prior Art	0	0.0%
Non-Obviousness	1	33.3%
Software	2	66.7%
Enablement / Written Description	0	0.0%
Claim Indefiniteness	0	0.0%
Best Mode	0	0.0%
Sec. 102 Prior Art	0	0.0%
Sec. 102 Non-Prior Art	0	0.0%
Non-Obviousness	1	50.0%

Some of the differences are apparent. Compare the treatment of enablement and best mode in chemical and electrical cases, for example. In chemical cases, 25.0% of all invalidity findings are made on the basis of enablement or written description, and another 18.8 % are on the basis of best mode. In electrical cases, by contrast, only 3.7% of the invalidity findings result from enablement or written description, and none from best mode.

We ran two tests of these relationships. The first tested for independence in the invalidity probabilities between general, electrical, and chemical patents. The test found no statistically significant difference between the overall probabilities of invalidity of each of the three types of patents (G-square p-value = 0.97).[73] The second test was of independence in the invalidity probabilities between the nine mutually exclusive categories of patents defined above. The test also found no statistically significant differences (G-square p-value = 0.26). That is, the following hypothesis could not be rejected:

Hypothesis 3': There is no difference between the likelihood that a chemical invention, an electrical invention, and a general invention will be held invalid.

We tested these same groups and hypotheses for each ground of invalidity as well. Most of these tests also demonstrated no statistically significant relationship.[74] However, a few of the relationships met the standard threshold of significance ($p < 0.05$). In particular, the following hypothesis was rejected (G-square p-value = 0.041):

Hypothesis 3h': There is no difference between the likelihood that a chemical invention, an electrical invention, and a general invention will be held invalid on obviousness grounds due to cited prior art.

In this test, 28% of the general inventions, 23% of the chemical inventions, and 60% of the electrical inventions in which cited prior art was argued as grounds for obviousness were found invalid on that ground.

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[73] The full data for each of these tests are reported in Appendix A.

[74] The full set of test results is reprinted in Appendix A.

Other differences of statistical significance were double patenting and best mode. For example, the following hypothesis was rejected (G-square p-value = 0.034):

Hypothesis 3j': There is no difference between the likelihood that a chemical invention, an electrical invention, and a general invention will be held invalid for double patenting.

In this test, 100% of the general inventions, 33% of the chemical inventions, and none of the electrical inventions in which double-patenting was argued were held invalid on that ground.[75] In addition, we also rejected the following hypothesis (G-square p-value = 0.026):

Hypothesis 3*l*': There is no difference between the likelihood that a chemical invention, an electrical invention, and a general invention will be held invalid for failure to disclose best mode.

In this test, 39% of the general inventions, 50% of the chemical inventions, and none of the electrical inventions in which best mode violations were argued were found invalid on this ground.[76]

Despite these significant results, the overall validity rates and the general grounds of invalidity are remarkably congruent across different types of inventions. This result may prove surprising to some—including us—who expected a greater divergence in patent law is treatment of different fields of invention.

E. *Foreign Versus Domestic Inventors*

We also collected data from the population on the number of cases in which either the inventor or the assignee named on the patent resided outside the United States. We classified an invention as "foreign" for our

[75] The number of such cases was very small: four general, three chemical, and one electrical case.

[76] Hypotheses 3h and 3j were also rejected in the parallel analysis of nine mutually independent groups of inventions; hypothesis 3*l* was not.

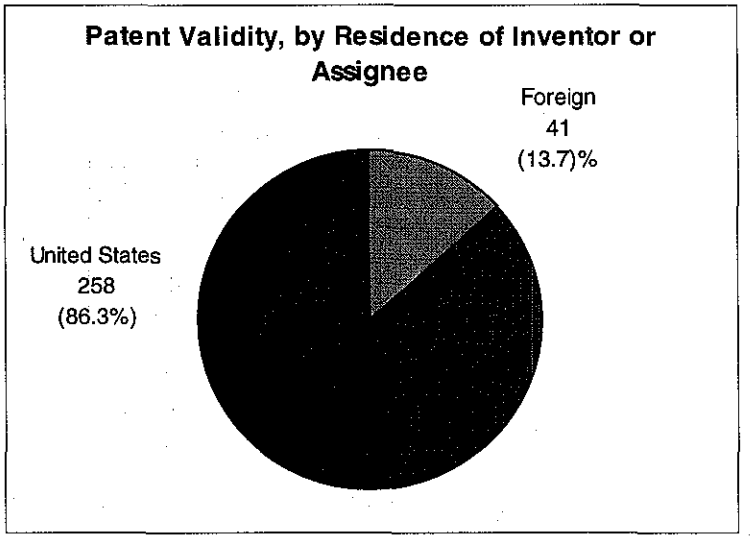
purposes if either the inventor or the assignee was foreign.[77] We present the results of this analysis in Table 7, and in graphical form in Figure 4.

Table 7

Patent Validity, by Residence of Inventor or Assignee

Residence of Inventor or Assignee	Number and Percentages of Decisions	Number and Percentages of Decisions Held Valid	Number and Percentages of Decisions Held Invalid
Foreign	41 (13.7%)	24 (58.5%)	17 (41.5%)
United States	258 (86.3%)	138 (53.5%)	121 (46.9%)

Figure 4



The overwhelming majority of patents actually adjudicated in the United States have neither foreign inventors nor foreign owners. The data released by the PTO on the origins of all patents obtained in the U.S. show

[77] If anything, this definition is overinclusive. One could argue that a patent with a foreign inventor but a U.S. owner was "domestic" in a

a consistent pattern: between 42% and 48% of all patents issued in the U.S. are of foreign origin.[78] Yet less than 14% of the litigated patents are of foreign ownership. For whatever reason, foreign owners obtain U.S. patents, but do not sue to enforce them very often.[79]

One reason foreign owners might not sue might be a fear that they would have difficulty persuading an American jury to grant them relief.[80] In fact, however, the population data on validity do not justify that fear. Table 7 demonstrates that foreign patent owners actually do better than their American counterparts when they choose to enforce their patents. These data show that 58.5% of the foreign-owned or invented patents litigated were held valid in the population, while only 53.5% of the U.S.-owned and invented patents were held valid. This difference is not

[78] For recent data in representative years through 1995, see Patent and Trademark Office, 1996 Annual Report, Additional Information (visited Nov. 21, 1997) <http://www.uspto.gov/web/offices/com/annual>. Data for those representative years are:

Year	U.S.-Owned Patents	Foreign-Owned Patents	Total Patents	Foreign-Owned Patents As Percentage of Total Patents
1983	32,871	23,989	56,860	42.2%
1986	38,126	32,734	70,860	46.2%
1989	50,185	45,354	95,539	47.5%
1992	59,760	49,968	109,728	45.5%
1995	64,562	49,679	114,241	43.5%

[79] This is consistent with the findings of Lanjouw and Schankerman, who find that domestic patent owners are considerably more likely than foreign patent owners to be involved in litigation. *See* Lanjouw & Schankerman, *supra* note 17, at 5.

[80] *See* Toshiko Takenaka, *The Role of the Japanese Patent System in Japanese Industry*, 13 UCLA PAC. BASIN L.J. 25 (1994) (arguing that patent systems are biased towards nationals). Of course, there are other possible explanations. Foreign nationals may be unfamiliar with, or simply not

statistically significant, however. The following hypothesis cannot be rejected (G-square p-value = 0.529):

Hypothesis 4: There is no difference between the likelihood that a foreign invented or owned patent and a domestic invented and owned patent will be held invalid.

Still, the intuitive sense of many patent lawyers that foreign inventors or companies will not appear sympathetic to the trier of fact does not seem to be borne out in practice.[81]

F. *Claim Disaggregation*

Most patents have multiple claims, both different sets of independent and "dependent" claims that narrow the scope of independent claims. Writing multiple claims has real costs, both in attorney time and in payments to the PTO, which charges its fees on a per-claim basis. The goal of multiple independent claims may be either to sweep the net of the invention more broadly so as to catch more potential infringers, or to help insure some valid scope for the patent by formulating the claim in alternative ways. The goal of dependent claims, which virtually every patent includes, is solely to preserve the validity of the patent by giving patentees a narrower alternative claim in case their broad independent claims are held invalid.

We have tested how often these multiple claims make a difference in validity litigation—that is, how often courts actually "disaggregate" their decision on the validity of a patent by claim, producing one validity

[81] It is possible that there is a relationship between these two findings. Perhaps such as that the reason so few foreign-owned or invented patents are litigated is because foreign companies expect resistance, and only the "best" foreign-owned patents ever make it to court. The data we have collected do not provide a way to test this hypothesis.

It is also possible that foreign patent owners who are in fact large multinational corporations could "disguise" their nationality by litigating under the name of an American subsidiary, calling domestic employees as witnesses, and the like.

holding on one set of claims and a second holding on another.[82] The results are striking. Courts actually disaggregated claims in only seven of the 299 patents litigated (2.3%). Furthermore, most of these were not instances of "true" claim disaggregation because they did not produce two different *final* decisions on patent validity. In six of the seven cases, the court produced a final holding on validity with respect to one set of claims, and a *non-final* decision, such as a remand or denial of a pre-trial motion, with respect to another set. In only one case in the population (0.3%) did a court actually hold that one set of claims was valid and the other set invalid.

Some litigators have indicated to us that they are not terribly surprised by this result because, in their experience, claim disaggregation is rarely even argued by a patentee. Indeed, in many cases courts will not even permit patentees to argue multiple claims, requiring them instead to select one or two "representative claims." In such a case, the value of a dependent claim may lie primarily in the strategic flexibility it provides patentees to choose such a representative claim before trial. Nonetheless, it seems that patent prosecutors are spending a great deal of time, effort and money writing long strings of dependent claims that are of dubious value in litigation.

G. *Prior Art Citations*

Patent applicants are required to disclose to the PTO during the application process all material prior art of which they are aware.[83] In addition, the Examiner conducts a search of the relevant classes for prior art. The final patent lists the prior art identified through either method on the cover or in the text of the patent application itself. Lawyers frequently speculate on the relationship between prior art cited in the patent and the patent's strength. A common theory is that patents in which the Examiner

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[82] Our use of the term "claim disaggregation" is distinguished from the doctrine of "claim differentiation." As explained by Chisum, "[t]he doctrine of 'claim differentiation' is a specific application of the general principle that in construing the language in one claim of a patent, due consideration must be given to the language in other claims in the patent." 5 DONALD S. CHISUM, CHISUM ON PATENTS: A TREATISE ON THE LAW OF PATENTABILITY, VALIDITY AND INFRINGEMENT § 18.03[6], at 18-70 (July 1998).

[83] *See* 37 C.F.R. § 1.56 (1996).

has considered a great deal of prior art are stronger than other patents, because attacking the patent on the basis of this prior art would mean revisiting the Examiner's conclusions. Furthermore, some have suggested that patents are stronger if they cite a great deal of "nonpatent" prior art—prior art in the form of journal articles, commercial products, and the like—because that art truly represents the state of the technology. We tested the relationship between prior art and patent validity.

We first determined the distribution of prior art citations in the population. Table 8 reflects that distribution.

Table 8

Distribution of Prior Art Citations

Statistical Measure	Cited Patent Prior Art	Cited Non-Patent Prior Art	Total Cited Prior Art
Mean	12.2	4.4	16.6
Median	9.0	0.0	10.0
Standard Deviation	12.3	28.6	32.9

Table 8 demonstrates both that there is tremendous variation in the number of prior art references cited in the patents in the population, and that the great majority of the prior art cited to, or by, patent examiners consists of other patents. Indeed, the median number of nonpatent art citations is zero, meaning that only a minority of patents in the population cite *any* nonpatent art.[84]

[84] One possible explanation for why Examiners tend to cite patent prior art more often than they cite nonpatent prior art is that Examiners have immediate, on-line access to the full text of U.S. patents on their desktop computers. Examiners do not have such convenient access to nonpatent prior art documents. Although Examiners do perform on-line searches of the nonpatent art, to obtain nonpatent documents the Examiners must order the nonpatent documents and wait for the documents to be delivered to them. An Examiner can devote only a finite period of time to the examination of a given application, usually no more than one to two days. Thus, given the time constraints under which Examiners are forced to work, citation of patent prior art can often expedite examination

We examined the relationship between total cited prior art, cited patent prior art, cited nonpatent prior art, and the validity of the patent.[85] Table 9 presents the results.

Table 9

Relationship of Prior Art Citations to Validity

	Mean	Median	Standard Deviation
Total Cited Prior Art in Valid Patents	18.9	10.0	43.1
Total Cited Prior Art in Patents Invalid on § 102 Prior Art or Obviousness	15.0	12.0	13.7
Cited Patent Prior Art in Valid Patents	12.5	9.0	13.6
Cited Prior Art in Patents Invalid on § 102 Prior Art or Obviousness	13.6	10.5	11.7
Cited nonpatent PA in Valid Patents	6.3	0.0	38.5
Cited nonpatent PA in Patents Invalid on § 102 Prior Art or Obviousness	1.4	0.0	3.2

The data do not demonstrate a simple relationship between cited prior art and patent validity. Although patents held invalid on prior art grounds tended to cite less nonpatent prior art than valid patents did (1.4 nonpatent prior art references cited on average in invalid patents, compared to 6.3 in valid patents), the reverse is true for patent prior art (13.6 in invalid patents, and 12.5 in valid patents). The end result is that

[85] For this test, we used a subset of the general population: those validity decisions made on the basis of prior art (obviousness and section 102 prior art cases). There were 202 patents in this group.

none of the relationships proves statistically significant. None of the following hypotheses can be rejected:[86]

Hypothesis 5: There is no relationship between the number of cited prior art references in a patent and its invalidity on section 102 prior art or section 103 obviousness grounds.

Hypothesis 5a: There is no relationship between the number of cited patent prior art references in a patent and its invalidity on section 102 prior art or section 103 obviousness grounds.

Hypothesis 5b: There is no relationship between the number of cited nonpatent prior art references in a patent and its invalidity on section 102 prior art or section 103 obviousness grounds.

Thus, although it is true that not much nonpatent prior art is cited in the patents in the population, we cannot draw robust conclusions about the relationship between cited prior art and patent validity.

H. *Cited Versus Uncited Art*

Another issue of significance relates not to prior art cited in the patent, but to prior art upon which defendants rely in litigation. It is received wisdom among patent lawyers that it is much easier to invalidate a patent on the basis of "uncited" prior art, i.e., art that the Examiner did not consider during prosecution. The rationale is that the trier of fact will be reluctant to second-guess the Examiner about an art reference that the Examiner has already considered, but that the trier of fact may be willing to invalidate a patent based on information that was not available to the Examiner.

To test this assumption, we compared the validity determinations made primarily on the basis of cited art and those made primarily on the

[86] We used the log odds of final invalidity based on cited art, calculated in the logistic regression model described below. The p-values for

basis of uncited art.[87] Table 10 reports the data on which these tests were conducted.

Table 10

Cited vs. Uncited Prior Art References in Cases Involving Patent Validity Under Sec. 102 Prior Art or Obviousness

Statistical Measure	Number of Prior Art References Argued	Number of Cited Prior Art References Argued	Number of Uncited Prior Art References Argued
Mean	2.8	1.2	1.6
Median	2.0	0.0	1.0
Standard Deviation	2.9	2.0	2.1

Cited vs. Uncited Prior Art References in Cases Involving Patents Held Valid Under Sec. 102 Prior Art or Obviousness

Statistical Measure	Number of Prior Art References Argued	Number of Cited Prior Art References Argued	Number of Uncited Prior Art References Argued
Mean	2.9	1.4	1.5
Median	2.0	0.0	1.0
Standard Deviation	3.1	2.2	2.2

Cited vs. Uncited Prior Art in Cases Involving Patents Held Invalid Under Sec. 102 Prior Art or Obviousness

Statistical Measure	Number of Prior Art References Argued	Number of Cited Prior Art References Argued	Number of Uncited Prior Art References Argued
Mean	2.8	0.9	1.9
Median	2.0	0.0	1.0
Standard Deviation	2.6	1.6	2.1

[87] Once again, the population for this test is the 202 patents in which prior art issues were at stake. The determination of which prior art references were "primarily" relied upon by the courts necessarily involved some very difficult judgment calls in interpreting the courts' opinions. We have excluded cases from this test where it was not possible to make that

The first thing worth noting is that most prior art attacks ultimately rely on a relatively small number of references (2.8, on average).[88] Furthermore, most of the references that are argued at trial are uncited references; indeed, in the majority of prior art-related cases, no cited art is relied upon at all. In the cases where patents were actually held invalid, defendants disproportionately relied upon uncited prior art (1.9 uncited references on average, compared with 0.9 cited references).

[88] The distribution of total prior art argued in litigation is represented in Figures 6A and 6B for patents held valid and invalid, respectively.

Figure 6A

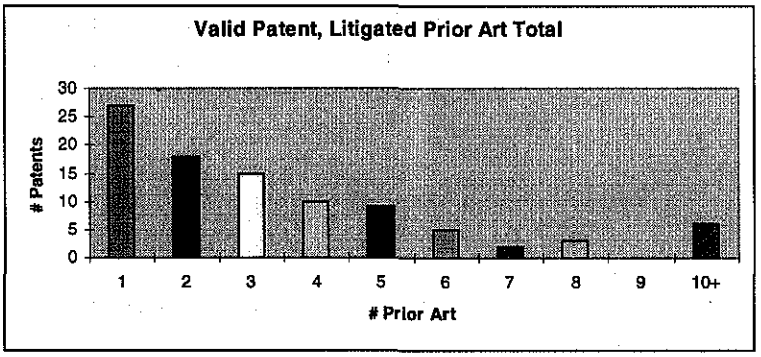
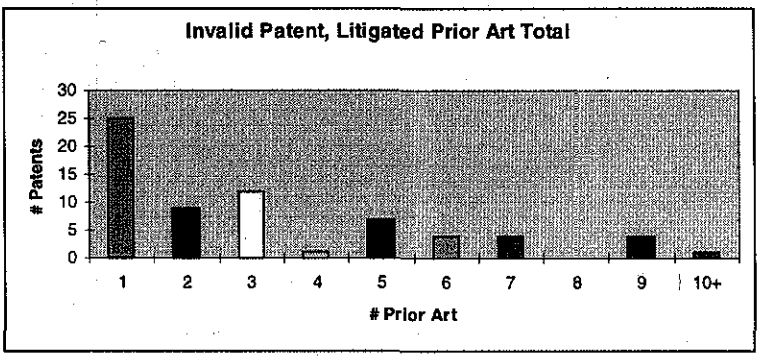


Figure 6B



The graphs weakly suggest that patents are held invalid most often when the least prior art is cited, a curious result and one that might suggest to accused infringers the value of parsimony.

Statistical tests in the superpopulation indicate with a fair degree of confidence that reliance on uncited art was more likely to lead to a finding of invalidity than reliance on cited art. We tested the following hypothesis:

Hypothesis 6: There is no difference between the likelihood that a patent will be held invalid on section 102 prior art or section 103 obviousness grounds because of cited prior art and the likelihood that it will be held invalid on section 102 prior art or section 103 obviousness grounds because of uncited prior art.

The probability of invalidity based on uncited art was 40.8%, while the probability of invalidity based on cited art was 29.6%.[89] Based on these numbers, the G-square p-value for the hypothesis was 0.057. The null hypothesis can be rejected with 90% confidence, but cannot be rejected with 95% confidence. The likely result therefore confirms the conventional wisdom and the results of earlier work, which concluded that uncited prior art is a more effective tool for invalidating patents than cited prior art.[90]

I. *Elapsed Time From Application To Final Judgment*

We evaluated several measures of elapsed time before the final judgment in the case, in an effort to determine whether any of these measures had any relationship to validity. Our collection of these data was motivated by several factors. First, the length and importance of the time a patent spends in prosecution has been hotly debated because beginning in 1995 the expiration date of a patent is measured from the date the original application is filed, not the date the patent issues.[91] Some have accused the PTO of "selling out" inventors by supporting this change, while those on the other side complain of "submarine patents" that languished in prosecution for decades at the behest of the inventor, only to "surface" and "torpedo" a

[89] For this test, $n = 267$, because in some cases defendants relied on *both* cited and uncited art. Where that occurred, we listed the case in both categories.

[90] *See* KOENIG, *supra* note 12, at 5-50; Federico, *supra* note 10, at 249.

[91] *See* 35 U.S.C. § 154(a) (1996).

mature industry.[92] Second, information about a technology changes over time, making it reasonable to assume that factfinders might look less favorably upon old patents than upon newer ones.

We define three measures to test various hypotheses about elapsed time. The first is "time in prosecution," meaning the total time elapsed from the earliest filing of a patent application (or parent or grandparent application upon which the current application relies for priority) to the issuance of the patent. The second is "delay," meaning the total elapsed time between the date the patent issues and the date the validity of the patent is finally decided in litigation.[93] The final measure is "lag," meaning the total elapsed time between the filing of a patent application and the final validity decision. Lag is simply "time in prosecution" plus "delay."

Tables 11, 12, and 13 present the descriptive statistics for all three measures. For each measure, we have presented the mean, median and distribution over the entire population and for four subsets of the population: valid patents, invalid patents, patents held valid over a prior art claim, and patents held invalid on the basis of a prior art claim.

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[92] For a discussion of this debate, see Lemley, *supra* note 52, at 377-78.

[93] Delay is therefore a function of two periods of time: the amount of time between issuance and the filing of a lawsuit, and the amount of time it takes to resolve the lawsuit, including appea, if any. The first period is generally within the control of the patentee, although it may depend on the patentee's knowledge of infringing activity. The second period is only indirectly within the patentee's control.

We emphasize that by using the term "delay," we do not intend to imply anything about either the propriety of waiting to file suit or the state of mind of the patent owner.

Table 11

Lag Time and Patent Validity

Time Between Filing and Final Validity Decision (in years)

Statistical Measure	All Patents	Valid Patents	Invalid Patents	Patents Valid Under Sec. 102 Prior Art and Sec. 103	Patents Invalid Under Sec. 102 Prior Art and Sec. 103
Mean	12.3	12.1	12.4	12.4	12.2
Median	11.3	11.1	11.5	11.8	11.5
Standard Deviation	5.7	5.3	6.1	5.1	5.6

Table 12

Delay and Patent Validity

Time Between Issue of Patent and Final Validity Decision (in years)

Statistical Measure	All Patents	Valid Patents	Invalid Patents	Patents Valid Under Sec. 102 Prior Art and Sec. 103	Patents Invalid Under Sec. 102 Prior Art and Sec. 103
Mean	8.6	8.7	8.5	8.8	8.6
Median	7.8	8.0	7.5	8.2	7.8
Standard Deviation	5.1	5.0	5.2	4.8	5.2

Table 13

Time in Prosecution and Patent Validity

Time Between Earliest Filing and Final Validity Decision (in years)

Statistical Measure	All Patents	Valid Patents	Invalid Patents	Patents Valid Under Sec. 102 Prior Art and Sec. 103	Patents Invalid Under Sec. 102 Prior Art and Sec. 103
Mean	3.6	3.5	3.9	3.6	3.6
Median	2.7	2.7	2.8	2.8	2.8
Standard Deviation	3.0	2.6	3.4	2.7	2.6

The average time in prosecution for litigated patents in the population is 3.6 years, although the lower median (2.7 years) indicates that a few patents spent a great deal of time in prosecution, raising the mean. The average delay after issuance is 8.6 years, and the average lag between filing and resolution is 12.3 years.

The lag and delay statistics are quite interesting, because it appears that most patents litigated to judgment involve fairly old technology. This may be of some significance in the debate over what the patent system contributes to innovation. Litigation does not appear to provide early, certain protection to inventors.[94] In fact, it appears that most patent litigation involves inventions that not only are fairly old, but also have been patented for several years before enforcement.[95] One possible explanation for this finding is that many firms may build patent portfolios over time to give them more freedom of action in their markets, resorting to litigation only when that freedom is subsequently challenged, either by a patent suit by a rival or by a shifting marketplace.[96] In other words, many firms obtain patents with no immediate purpose or early need to enforce them, but rather to fence out competitors and potential competitors.

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[94] Of course, the patent system may still provide *ex ante* incentives to innovate, and both up front licensing and preliminary injunctions provide significant relief to patent owners in many cases.

[95] This prevalence of old technology may help to explain why so few "hot" fields of invention are represented in the litigation population. It may be several years before we start to see significant numbers of software or biotechnology patents litigated to judgment.

[96] This is implicitly supported by a recent study. *See* Cohen, *supra* note 5. In the study, Cohen et al. found that firms generally view patents as less effective than other means of obtaining value from new product innovations, secrecy and lead time being the most important. *See id.* at 10. One of the most important motives for patenting was defensive, i.e., preventing other firms from patenting related innovations. *See id.* at 17. This defensive motive perhaps provides a partial explanation for the fact that most patent validity decisions occur a long time after the patent issues.

The fact that most patents are quite old by the time they are litigated to judgment also highlights the importance of careful claim drafting. Claims that are broadly drafted, i.e., that lack unnecessary limitations and are not overly tied to the current implementation of an invention, are more likely to stand the test of time. And it is precisely those patents that turn out to be important in litigation.

The large lags and delays we found may also explain another mildly surprising finding. Given the increasing complexity, cost, and interdisciplinary nature of research and development in many cutting-edge technologies today, one might expect the number of inventors per patent to have increased dramatically. There is reason to believe that this is happening as we write. In our population, however, only 138 out of 299 patents listed more than one inventor, compared to 161 listing a single inventor. Although the highest number of inventors was eight, the mean number was only 1.8.

The amount of time the patents spent in prosecution is also significant. The findings here are broadly consistent with Lemley's prior work on the subject, which tested a smaller population and found the average time in prosecution to be 1274 days (approximately 3.5 years) and the median time in prosecution to be 1012 days (approximately 2.8 years) for litigated cases.[97] By contrast, that study found a much shorter time in prosecution in a sample of *all* issued patents, not just those that were litigated.[98] As noted in that study, this discrepancy may result either from the lag (if patents are issued now more quickly than they were in the past) or from the fact that "important" patents (of which litigation to judgment might be a predictor) actually do spend longer in prosecution.[99]

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[97] *See* Lemley, *supra* note 52, at 420 tbl.8.

[98] *See id.* at 388 tbl.2.

[99] *See id.* at 421-22 (noting both hypotheses).

The data demonstrate no significant relationship whatsoever between patent validity and lag, delay, or time in prosecution. The lag, delay, and time in prosecution statistics for valid patents are all quite close to those for invalid patents, under either population subset. As one might expect from looking at this data, each of the following hypotheses we tested from these data cannot be rejected:[100]

Hypothesis 7: Delay between issuance of a patent and decision in the case has no effect on the validity of the patent.

Hypothesis 7a: Delay between issuance of a patent and decision in the case has no effect on the validity of the patent on section1 02 prior art or section 103 obviousness grounds.

Hypothesis 8: Lag between original application for a patent and decision in the case has no effect on the validity of the patent.

Hypothesis 8a: Lag between original application for a patent and decision in the case has no effect on the validity of the patent on section 102 prior art or section 103 obviousness grounds.

Hypothesis 9: Time in prosecution (measured from original application to issue date of current patent) has no effect on the validity of the patent.

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[100] The p-values for the predictors in the logistic regression model are, respectively:

Hypothesis 7,	$p = 0.731$
Hypothesis 7a,	$p = 0.818$
Hypothesis 8,	$p = 0.733$
Hypothesis 8a,	$p = 0.821$
Hypothesis 9,	$p = 0.220$
Hypothesis 9a,	$p = 0.983$

Hypothesis 9a: Time in prosecution (measured from original application to issue date of current patent) has no effect on the validity of the patent on section 102 prior art or section 103 obviousness grounds.

There is no demonstrable relationship between the validity of a patent and the time it spends in prosecution, delay in filing suit or bringing the case to judgment, and the total lag between invention and judgment.

J. *Appeals*

In addition to measuring the final validity of patents, we also tested how various trial court decisions fared on appeal. Table 14 presents affirmance and reversal data for Federal Circuit decisions in the population.

Table 14

Federal Circuit Affirmance and Reversal

	Number of Decisions	Percentage
Appealed	146	48.8%
Affirmed	126	86.3%
Reversed	25	17.1%
Not Appealed	153	51.2%

Approximately one-half of the cases in the population are appellate decisions (146 out of 299). The high percentage of appellate decisions reflects two facts. First, we replaced district court decisions with appellate court decisions wherever there were such decisions. Second, appellate courts are more likely than district courts to produce written decisions.

Of the 146 appellate decisions, the overwhelming majority (126, or 86.3%) affirmed the district court judgment; only 25 (17.1%) reversed the

district court.[101] On the basis of these numbers, we can clearly reject the following hypothesis (G-square p-value <0.01):

Hypothesis 10: The decision of the finder of fact in patent cases is not more likely to be affirmed than reversed on appeal.

However, we think that this result is in significant part an artifact of our population choice. Because we have included only final reported decisions in the population, appellate decisions that remand a case, but do not reverse the validity finding outright, are not included in the population. We suspect that if we included remands in our population definition, the percentage of affirmances would drop sharply.

The population definition does allow us to test how various trial court decisions fare on appeal, however. We first tested whether trial court decisions holding a patent valid were more likely to be affirmed than decisions holding a patent invalid. Table 15 presents the results.

Table 15

Trial Court Affirmance and Reversal

	Number of Decisions	Appealed	Affirmed	Reversed	Not Appealed
Valid	155	68 (43.9%)	61 (89.7%)	7 (10.3%)	87 (56.1%)
Invalid	144	78 (54.2%)	65 (83.3%)	18 (23.1%)	66 (45.8%)

Although the affirmance rates for both trial court decisions of validity and of invalidity are quite high, there is a noticeable discrepancy: the Federal Circuit more commonly reverses trial court findings of invalidity than findings of validity. The statistical tests in the population bear out this observation. We tested the following hypothesis:

Hypothesis 10a: The decision of the finder of fact holding a patent valid is not more likely to be affirmed on appeal than

[101] The numbers and percentages do not total perfectly because in some cases the district court's decision was both affirmed and reversed.

the decision of the finder of fact holding a patent invalid.

The result was a G-square p-value = 0.056, meaning that the hypothesis could be rejected with greater than 90% confidence, but not with 95% confidence.[102] This finding bears out the received wisdom that the Federal Circuit is more likely to favor patentees on appeal and confirms the findings of previous studies that the court is substantially more likely to affirm a district court's finding of validity than invalidity.[103] This finding is in stark contrast to that of studies using data from the regional circuits prior to creation of the Federal Circuit.[104]

We also broke down appellate decisions into categories based on the trier of fact. Table 16 reports the results of that division.

Table 16

Patent Validity on Appeal, by Trier of Fact

Trier of Fact	Number of Decisions	Appealed	Affirmed	Reversed	Not Appealed
Jury	73	45 (61.6%)	39 (86.7%)	6 (13.3%)	28 (38.4%)
Court, Bench Trial	143	68 (47.6%)	61 (89.7%)	11 (16.2%)	75 (52.4%)
Court, Pre-Trial Motion	82	32 (39.0%)	25 (78.1%)	8 (25.0%)	50 (61.0%)
Court, JMOL	1	1 (100.0%)	1 (100.0%)	0 (0.0%)	0 (0.0%)

[102] The test of hypothesis 10a characterized cases that included both affirmances and reversals as two separate decisions for purposes of testing. The result was that *n* (trial valid) = 68 and *n* (trial invalid) = 83 in the test, and the respective percentages affirmed on appeal were 89.7% for trial validity decisions and 78.3% for trial invalidity decisions in the test.

[103] *See* Dunner et al., *supra* note 18, at 154 (finding this to be true both overall and within the separate invalidity categories of section 102 (novelty or statutory bars), section 103 (obviousness), and section 112 (disclosure or claim adequacy)).

[104] *See* KOENIG, *supra* note 12, at 4-39 to 4-40.

The results show that district court decisions on pre-trial motion are the least likely to be appealed, but that when they are appealed they are the most likely to be reversed (reversal in 25.0% of all appealed cases). By contrast, bench and jury trials show about the same reversal rate (13.3% for juries and 16.2% for bench trials).

Table 17 shows the results of considering both variables together, i.e., trier of fact and the result below.

Table 17

Appellate Court Affirmance or Reversal of Trial Court, by Trier of Fact Below and Decision

Trier of Fact	Jury	Court (Bench Trial)	Court (Pre-Trial Motion)	Court (JMOL)
	Trial Court Below Held Patent Valid			
Number of Decisions	49	82	23	1
Appealed	28 (57.1%)	32 (39.0%)	7 (30.4%)	1 (100.0%)
Affirmed	23 (82.1%)	30 (93.8%)	7 (100.0%)	1 (100.0%)
Reversed	5 (17.9%)	2 (6.3%)	0 (0.0%)	0 (0.0%)
Not Appealed	21 (42.9%)	50 (61.0%)	16 (69.6%)	0 (0.0%)
	Trial Court Below Held Patent Invalid			
Number of Decisions	24	61	59	0
Appealed	17 (70.8%)	36 (59.0%)	25 (42.4%)	0 (0.0%)
Affirmed	16 (94.1%)	31 (86.1%)	18 (72.0%)	0 (0.0%)
Reversed	1 (5.9%)	9 (25.0%)	8 (32.0%)	0 (0.0%)
Not Appealed	7 (29.2%)	25 (41.0%)	34 (57.6%)	0 (0.0%)

The data suggest some notable differences in the treatment of findings of validity and invalidity. No pre-trial decisions holding a patent valid were reversed on appeal. By contrast, 32% of the pre-trial decisions

holding a patent invalid were reversed on appeal. Similarly, only 6.3% of the bench trial decisions holding a patent valid were reversed on appeal, compared with 25% of the bench trial decisions holding a patent invalid. The same cannot be said of jury verdicts. On appeal from jury verdicts, 17.9% of jury validity decisions were reversed, compared with only 5.9% of the jury invalidity decisions.

The small population size of some of these groups makes it harder to find statistical significance in the superpopulation. None of the following hypotheses could be rejected with confidence based on this data (G-square p-values were 0.425, 0.163, and 0.108 respectively):

Hypothesis 10c: The decision of the court in a bench trial in a patent case is not more likely to be affirmed on appeal than the decision of a jury or the decision of a court on pre-trial motion holding a patent invalid.

Hypothesis 10d: The decision of the court in a bench trial in a patent case holding a patent valid is not more likely to be affirmed on appeal than the decision of a jury or the decision of a court on pre-trial motion holding a patent invalid.

Hypothesis 10e: The decision of the court in a bench trial in a patent case holding a patent invalid is not more likely to be affirmed on appeal than the decision of a jury or the decision of a court on pre-trial motion holding a patent invalid.

In short, it appears that the Federal Circuit is somewhat more hospitable to patentees than to accused infringers. The Federal Circuit gives somewhat more deference to decisions at trial than to pre-trial rulings. It tends to favor jury findings of invalidity, and judicial findings of validity, perhaps intuitively recognizing that juries are predisposed to find validity. But none of the relationshops are statistically significant in the superpopulation.

K. *Multiple Patents In Suit*

The 299 patents in the population were litigated in 239 suits. In several cases, the same suit decided the validity of two or more patents. These patents were often, but not always, related to each other. We set out to determine whether different patents litigated together in the same lawsuit were more likely to stand or fall together than chance would predict. Table 18 presents the data regarding multiple patents in suit.

Table 18

Patent Validity in Decisions Involving Multiple Patents

Number of Decisions	Number of Decisions Deciding More Than One Patent	All Valid	All Invalid	Mixed Validity
239	45 (18.8%)	24 (53.3%)	15 (33.3%)	6 (13.3%)

These data show remarkable agreement. In 86.7% of the cases with multiple patents in suit, the patents in the case were either all held valid together or all held invalid together. Courts produced "mixed" results in only 6 of 45 cases (13.3%).

Using these data, we tested the following twin hypotheses:

Hypothesis 11: In cases in which more than one patent is litigated, there is no relationship between the validity of one patent in the case and the validity of remaining patents in the case.

Hypothesis 12: In cases in which more than one patent is litigated, there is no relationship between the invalidity of one patent in the case and the invalidity of remaining patents in the case.

These hypotheses were rejected with great confidence (G-square p-value < 0.001). Whether it is because the patents themselves are closely related, or because triers of fact tend to make decisions as a whole, it clearly appears that asserting multiple patents in the same suit is an all-or-nothing proposition.

L. *Where Patent Cases Are Litigated*

We also examined the districts in which patents were most likely to be litigated. Of the 108 federal district courts in the country, just over half (56) issued one or more final patent validity decisions during the period of our study. Twenty-five of these districts litigated the validity of more than five patents during this period. The districts in which patents were most commonly litigated were the Southern District of New York, the Northern District of Illinois, the Eastern District of Michigan, the Central District of California, and the District of Delaware. Table 19 lists the twenty-five most active jurisdictions.[105]

[105] Although we report the number of litigated patents, not the number of cases, we have evaluated the number of cases litigated in these districts, and the results are not significantly different. The District of New Jersey and the Eastern District of Pennsylvania replace the Western District of Wisconsin and the Southern District of Florida on the top ten list.

Table 19

Twenty-Five Most Active Jurisdictions

for Patent Litigation 1989 - 1996

District	Number of Patents Litigated
S.D.N.Y.	23
N.D. Ill.	20
E.D. Mich.	17
C.D. Cal.	17
D. Del.	17
D. Minn.	15
N.D. Cal.	10
E.D. Va.	9
W.D. Wisc.	8
S.D. Fla.	8
N.D. Tex.	8
E.D.N.Y.	7
S.D. Cal.	7
E.D. Pa.	7
D.N.J.	7
W.D. Tex.	6
S.D. Tex.	6
D. Or.	6
E.D. Mo.	6
D. Mass.	6
W.D. N.C.	6
M.D. Fla.	5
S.D. Ohio	5
D. Kan.	5
W.D. Pa.	5

Patterns are hard to discern in these figures. Patent litigation occurs across the geographic spectrum. However, the ten most active districts are the ones patent litigators might expect, e.g., centers of industry (the Southern District of New York, the Northern District of Illinois, the Eastern District of Michigan, the Central District of California), centers of technology (the Northern District of California, the District of Minnesota), or courts known to be patent-friendly for legal or procedural reasons (the District of Delaware, the Eastern District of Virginia). There are a few surprises, however. We would not have expected the Western District of Wisconsin to appear on the top-ten list, nor the District of Kansas to appear

in the top twenty five. By contrast, we would have predicted that the District of Massachusetts would have more patent cases than it does.

We also examined the validity rates by district for all those districts that decided the validity of five or more patents during the period of the study. Table 20 presents the results.[106]

[106] The data we report here are the percentage of patents held valid in the district court in each district, not the final determination made by any court. Because our goal is to identify "patent-friendly" and "patent-unfriendly" districts, the district court numbers are of more interest than numbers that reflect Federal Circuit decisions.

Table 20

Patent Validity, by District Court

District	Number of Patents Decided	Patents Held Valid	Patents Held Invalid
W.D. Wisc.	8	8 (100.0%)	0 (0.0%)
S.D. Fla.	8	7 (87.5%)	1 (12.5%)
E.D.N.Y.	7	6 (85.7%)	1 (14.3%)
W.D. Tex.	6	5 (83.3%)	1 (16.7%)
M.D. Fla.	5	4 (80.0%)	1 (20.0%)
S.D. Tex.	6	4 (66.7%)	2 (33.3%)
D. Or.	6	4 (66.7%)	2 (33.3%)
E.D. Mich.	17	11 (64.7%)	6 (35.3%)
D. Minn.	15	9 (60.0%)	6 (40.0%)
N.D. Cal.	10	6 (60.0%)	4 (40.0%)
S.D. Ohio	5	3 (60.0%)	2 (40.0%)
D. Kan.	5	3 (60.0%)	2 (40.0%)
S.D. Cal.	7	4 (57.1%)	3 (42.9%)
E.D. Pa.	7	4 (57.1%)	3 (42.9%)
E.D. Va.	9	5 (55.6%)	4 (44.4%)
C.D. Cal.	17	9 (52.9%)	8 (47.1%)
N.D. Tex.	8	4 (50.0%)	4 (50.0%)
E.D. Mo.	6	3 (50.0%)	3 (50.0%)
D. Del.	17	7 (41.2%)	10 (58.8%)
S.D.N.Y.	23	8 (34.8%)	15 (65.2%)
N.D. Ill.	20	5 (25.0%)	15 (75.0%)
W.D. Pa.	5	1 (20.0%)	4 (80.0%)
D. Mass.	6	1 (16.7%)	5 (83.3%)
D.N.J.	7	0 (0.0%)	7 (100.0%)
W.D.N.C.	6	0 (0.0%)	6 (100.0%)

Based on these data, patent plaintiffs would do well to eschew some of the districts historically considered "patent-friendly," such as the District of Delaware and the Eastern District of Virginia. Neither were especially likely to hold patents valid.

We should emphasize that the numbers of cases in each district are quite small and that one should not draw robust conclusions from these

data. In particular, we have not attempted any statistical test of the differences in validity rates between the districts.

V. MODEL

We developed a logistic regression model using most of the variables we have tested here in an effort to find reliable predictors of patent invalidity over time. In the model, we considered numerous factors that may serve as predictors of validity.[107]

The results were disappointing, although perhaps not surprising. Of all the factors we tested as possible predictors of invalidity, only one set showed any significant predictive value. That one set was the choice of finder of fact. Compared to pre-trial disposition, trial to either a jury or the bench were significant predictors of the validity of a patent.[108] The exponent coefficients for jury trial and bench trial were 0.359 and 0.389 respectively.[109]

The failure of most other factors as predictors of invalidity suggests that most of the variables that determine invalidity are things that our study cannot measure. Some obvious, but untested, variables include the skill of the lawyers, the amount of money each side is willing to spend on the litigation, the "hometown advantage," the skill, character, and demeanor of fact and expert witnesses, and the abilities of the patent prosecutor. There are clearly relationships of interest to lawyers between validity and many

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[107] These factors included comparisons of trial to jury, trial to bench, pre-trial disposition, JMOL disposition, chemical invention, electrical invention, general invention, pharmaceutical invention, biotechnology invention, computer-related invention, software invention, foreign inventorship or assignee, total number of cited prior art references, number of cited patent prior art references, number of cited nonpatent prior art references, total number of references argued in court, number of cited references argued in court, number of uncited references argued in court, delay, lag, time in prosecution, and appeals.

[108] Strictly speaking, trial to bench and trial to jury were negative predictors of invalidity (coefficients -1.02 for jury and -0.94 for bench trial), which amounts to the same thing. Pre-trial disposition is a positive predictor of invalidity (coefficient 0.55).

[109] For further detail on the model, see Appendix B.

of the factors we have described, but it is also evident that we have uncovered at most only a small part of the story.

VI. CONCLUSIONS

Some of the more interesting findings from the data are summarized as follows:

- Approximately 54% of all litigated patents are held valid. This percentage is significantly higher than it was before the Federal Circuit was created, but it is still "little better than a coin toss," as one commentator put it.

- Section 102 arguments, both those based on prior art and those based on the statutory bars, generally fare better in the courts than do arguments regarding obviousness.

- Defendants' best hope of invalidating a patent lies in obtaining a pre-trial ruling from the court. Bench trials are more favorable to patentees, and juries are extremely favorable to patentees.

- There is virtually no difference between the validity rates of patents in different fields of invention.

- Very few software, biotechnology, and pharmaceutical patents have actually been litigated to final judgment in the recent eight-year period. The majority of the patents that are litigated are general ("mechanical") inventions.

- Foreign inventors and owners bring very few patent cases, but when they do bring suit, they do not face discrimination by fact finders.

- In virtually no cases does the result actually turn on different treatment of multiple claims in the patent.

- Uncited prior art is more likely to invalidate a patent than previously cited prior art.

- Litigated patents are generally not newly obtained ones; on average, well over a decade elapses between the filing of a patent application and a court's ruling on the validity of the patent.

- The Federal Circuit is more likely to affirm a trial court's finding of patent validity than of patent invalidity and is more likely to affirm trial decisions than pre-trial decisions.

- Patents that are raised in the same suit almost always stand or fall together.

Some of these findings support the conventional wisdom. Juries and the Federal Circuit favor patentees, for example. But other findings ran counter to our expectations, notably the rarity of claim disaggregation and the overwhelming number of "traditional" mechanical inventions in the population. In other instances, there were simply no significant relationships to be found, although that fact might itself be considered important.

We hope that all of these findings will be useful to scholars seeking to better understand patent cases and to practitioners who must try them.

Appendix A

Hypothesis 1:

Let p be the probability of final invalidity

Ho $p = 0.5$

Observed Probability	Count	Z-value	p-value
0.46	300	-1.386	>0.1

Hypothesis 2:

Trial	Category	Probability of Trial Valid	Count
1	Jury	0.671	73
2	Bench	0.573	143
3	Pre-trial	0.28	82

Total cases: 298

Test of independence:

Statistic	p-value
G-square	< 0.001
Chi-square	< 0.001

Hypothesis 2a (Utility):

Trial	Probability of Trial Valid	Count
1	0.5	2
2	0	2
3	0	1

Total cases: 5

Test of independence:

Statistic	p-value
G-square	0.3277
Chi-square	0.3916

Hypothesis 2b (Enablement):

Trial	Probability of Trial Valid	Count
1	0.778	9
2	0.462	26
3	0	1

Total cases: 36

Test of independence:

Statistic	p-value
G-square	0.1124
Chi-square	0.1472

Hypothesis 2c (Sec. 102 Prior Art):

Trial	Probability of Trial Valid	Count
1	0.625	24
2	0.659	44
3	0.348	23

Total cases: 91

Test of independence:

Statistic	p-value
G-square	0.0418
Chi-square	0.0416

Hypothesis 2d (Sec. 102 Cited Prior Art):

Trial	Probability of Trial Valid	Count
1	0.778	9
2	0.824	17
3	0.333	6

Total cases: 32

Test of independence:

Statistic	p-value
G-square	0.0818
Chi-square	0.0643

Hypothesis 2e (Sec. 102 Uncited Prior Art):

Trial	Probability of Trial Valid	Count
1	0.5	16
2	0.625	32
3	0.353	17

Total cases: 65

Test of independence:

Statistic	p-value
G-square	0.1849
Chi-square	0.1883

Hypothesis 2f (Sec. 102 Non-Prior Art):

Trial	Probability of Trial Valid	Count
1	0.556	9
2	0.611	36
3	0.04	25

Total cases: 70

Test of independence:

Statistic	p-value
G-square	< 0.001
Chi-square	< 0.001

Hypothesis 2g (Obviousness):

Trial	Probability of Trial Valid	Count
1	0.651	43
2	0.622	82
3	0.543	35

Total cases: 160

Test of independence:

Statistic	p-value
G-square	0.6042
Chi-square	0.6014

Hypothesis 2h (Obviousness Due to Cited Prior Art):

Trial	Probability of Trial Valid	Count
1	0.696	23
2	0.712	52
3	0.5	20

Total cases: 95

Test of independence:

Statistic	p-value
G-square	0.2321
Chi-square	0.2190

Hypothesis 2i (Obviousness Due to Uncited Prior Art):

Trial	Probability of Trial Valid	Count
1	0.613	31
2	0.578	64
3	0.533	30

Total cases: 125

Test of independence:

Statistic	p-value
G-square	0.8198
Chi-square	0.8197

Hypothesis 2j (Double Patenting):

Trial	Probability of Trial Valid	Count
1	0	1
2	0.6	5
3	0	1

Total cases: 7

Test of independence:

Statistic	p-value
G-square	0.2429
Chi-square	0.3499

Hypothesis 2k (Incorrect Inventorship):

Trial	Probability of Trial Valid	Count
1	1	2
2	0.75	4
3	0.75	4

Total cases: 10

Test of independence:

Statistic	p-value
G-square	0.6033
Chi-square	0.7316

Hypothesis 2*l* (Best Mode):

Trial	Probability of Trial Valid	Count
1	0.636	11
2	0.458	24
3	0.2	10

Total cases: 45

Test of independence:

Statistic	p-value
G-square	0.1169
Chi-square	0.1301

Hypothesis 2m (Patentable Subject Matter):

Trial	Probability of Trial Valid	Count
3	0	1

Total cases: 1

No test is available

Hypothesis 2n (Indefiniteness):

Trial	Probability of Trial Valid	Count
1	0.25	4
2	0.333	12
3	0.714	7

Total cases: 23

Test of independence:

Statistic	p-value
G-square	0.1881
Chi-square	0.1936

Hypothesis 3:

Invention	Category	Probability of Final Invalidity	Count
1	General	0.457	173
2	Chemical, but not Pharmaceutical or Biotech	0.472	53
3	Chemical and Pharmaceutical, but not Biotech	0.375	8
4	Chemical and Biotech, but not Pharmaceutical	0.667	6
5	Chemical and Pharmaceutical and Biotech	0.000	3
6	Electrical, but not Software or Computer	0.559	34
7	Electrical and Software, but not Computer	1.000	1
8	Electrical and Computer, but not Software	0.300	20
9	Electrical and Software and Computer	0.500	2

Total cases: 300

Test of independence:

Statistic	p-value
G-square	0.2620
Chi-square	0.3916

Hypothesis 3a (Utility):

Invention	Probability of Final Invalidity	Count
1	0.333	3
8	0	2

Total cases: 5

Test of independence:

Statistic	p-value
G-square	0.2764
Chi-square	0.3613

Hypothesis 3b (Enablement):

Invention	Probability of Final Invalidity	Count
1	0.267	15
2	0.375	8
3	0.5	2
4	0.8	5
6	0	2
8	0.2	5

Total cases: 37

Test of independence:

Statistic	p-value
G-square	0.2055
Chi-square	0.2449

Hypothesis 3c (Sec. 102 Prior Art):

Invention	Probability of Final Invalidity	Count
1	0.391	46
2	0.478	23
3	0.5	2
5	0	3
6	0.714	7
8	0.222	9

Total cases: 91

Test of independence:

Statistic	p-value
G-square	0.1671
Chi-square	0.2463

Hypothesis 3d (Sec. 102 Cited Prior Art):

Invention	Probability of Final Invalidity	Count
1	0.143	14
2	0.4	10
3	0.25	4
5	0	3
8	1	1

Total cases: 32

Test of independence:

Statistic	p-value
G-square	0.3480
Chi-square	0.4288

Hypothesis 3e (Sec. 102 Uncited Prior Art):

Invention	Probability of Final Invalidity	Count
1	0.471	34
2	0.467	15
6	0.714	7
8	0.222	9

Total cases: 65

Test of independence:

Statistic	p-value
G-square	0.2540
Chi-square	0.2740

Hypothesis 3f (Sec. 102 Non-Prior Art):

Invention	Probability of Final Invalidity	Count
1	0.566	53
2	0.75	8
4	0	1
6	0.667	9
8	1	1

Total cases: 72

Test of independence:

Statistic	p-value
G-square	0.3963
Chi-square	0.5045

Hypothesis 3g (Obviousness):

Invention	Probability of Final Invalidity	Count
1	0.33	97
2	0.333	33
3	0.333	3
6	0.526	19
7	1	1
8	0.5	6
9	0	1

Total cases: 160

Test of independence:

Statistic	p-value
G-square	0.4121
Chi-square	0.4691

Hypothesis 3h (Obviousness Due to Cited Prior Art):

Invention	Probability of Final Invalidity	Count
1	0.276	58
2	0.25	20
3	0	2
6	0.538	13
8	1	2

Total cases: 95

Test of independence:

Statistic	p-value
G-square	0.0452
Chi-square	0.0594

Hypothesis 3*i* (Obviousness Due to Uncited Prior Art):

Invention	Probability of Final Invalidity	Count
1	0.372	78
2	0.348	23
3	0.5	2
6	0.615	13
7	1	1
8	0.5	6
9	0	1

Total cases: 125

Test of independence:

Statistic	p-value
G-square	0.4090
Chi-square	0.4809

Hypothesis 3j (Double Patenting):

Invention	Probability of Final Invalidity	Count
1	1	4
2	0.5	2
3	0	1
6	0	1

Total cases: 8

Test of independence:

Statistic	p-value
G-square	0.0501
Chi-square	0.1183

Hypothesis 3k (Incorrect Inventorship):

Invention	Probability of Final Invalidity	Count
1	0.2	5
2	0	2
3	0	2
8	0	1

Total cases: 10

Test of independence:

Statistic	p-value
G-square	0.6828
Chi-square	0.7744

Hypothesis 3*l* (Best Mode):

Invention	Probability of Final Invalidity	Count
1	0.385	26
2	0.625	8
3	0.5	2
4	0	2
6	0	4
8	0	3

Total cases: 45

Test of independence:

Statistic	p-value
G-square	0.0606
Chi-square	0.1689

Hypothesis 3m (Patentable Subject Matter):

Invention	Probability of Final Invalidity	Count
9	1	1

Total cases: 1

No test is available

Hypothesis 3n (Indefiniteness):

Invention	Probability of Final Invalidity	Count
1	0.231	13
2	0.4	5
3	0	1
4	1	1
6	0	1
8	1	2

Total cases: 23

Test of independence:

Statistic	p-value
G-square	0.1113
Chi-square	0.1837

Hypothesis 3' (with respect to General, Chemical, Electrical categories only):

Invention	Category	Probability of Final Invalidity	Count
1	General	0.457	173
2	Chemical	0.457	70
3	Electrical	0.473	57

Total cases: 300

Test of independence:

Statistic	p-value
G-square	0.9738
Chi-square	0.9738

Hypothesis 3a' (Utility):

Invention	Probability of Final Invalidity	Count
1	0.333	3
3	0	2

Total cases: 5

Test of independence:

Statistic	p-value
G-square	0.2764
Chi-square	0.3613

Hypothesis 3b' (Enablement):

Invention	Probability of Final Invalidity	Count
1	0.267	15
2	0.533	15
3	0.143	7

Total cases: 37

Test of independence:

Statistic	p-value
G-square	0.1284
Chi-square	0.1362

Hypothesis 3c' (Sec. 102 Prior Art):

Invention	Probability of Final Invalidity	Count
1	0.391	46
2	0.414	29
3	0.438	16

Total cases: 91

Test of independence:

Statistic	p-value
G-square	0.9447
Chi-square	0.9445

Hypothesis 3d' (Sec. 102 Cited Prior Art):

Invention	Probability of Final Invalidity	Count
1	0.143	14
2	0.313	16
3	0.5	2

Total cases: 32

Test of independence:

Statistic	p-value
G-square	0.3948
Chi-square	0.3951

Hypothesis 3e' (Sec. 102 Uncited Prior Art):

Invention	Probability of Final Invalid	Count
1	0.471	34
2	0.467	15
3	0.438	16

Total cases: 65

Test of independence:

Statistic	p-value
G-square	0.9753
Chi-square	0.9753

Hypothesis 3f' (Sec. 102 Non-Prior Art):

Invention	Probability of Final Invalidity	Count
1	0.566	53
2	0.667	9
3	0.7	10

Total cases: 72

Test of independence:

Statistic	p-value
G-square	0.6529
Chi-square	0.6591

Hypothesis 3g' (Obviousness):

Invention	Probability of Final Invalidity	Count
1	0.33	97
2	0.333	36
3	0.519	27

Total cases: 160

Test of independence:

Statistic	p-value
G-square	0.1910
Chi-square	0.1806

Hypothesis 3h' (Obviousness Due to Cited Prior Art):

Invention	Probability of Final Invalidity	Count
1	0.276	58
2	0.227	22
3	0.6	15

Total cases: 95

Test of independence:

Statistic	p-value
G-square	0.0408
Chi-square	0.0328

Hypothesis 3i' (Obviousness Due to Uncited Prior Art):

Invention	Probability of Final Invalidity	Count
1	0.372	78
2	0.346	26
3	0.571	21

Total cases: 125

Test of independence:

Statistic	p-value
G-square	0.2140
Chi-square	0.2076

Hypothesis 3j' (Double Patenting):

Invention	Probability of Final Invalidity	Count
1	1	4
2	0.333	3
3	0	1

Total cases: 8

Test of independence:

Statistic	p-value
G-square	0.0339
Chi-square	0.0759

Hypothesis 3k' (Incorrect Inventorship):

Invention	Probability of Final Invalidity	Count
1	0.2	5
2	0	4
3	0	1

Total cases: 10

Test of independence:

Statistic	p-value
G-square	0.4729
Chi-square	0.5738

Hypothesis 3*l*' (Best Mode):

Invention	Probability of Final Invalidity	Count
1	0.385	26
2	0.5	12
3	0	7

Total cases: 45

Test of independence:

Statistic	p-value
G-square	0.0261
Chi-square	0.0800

Hypothesis 3m' (Patentable Subject Matter):

Invention	Probability of Final Invalidity	Count
3	1	1

Total cases: 1

No test is available

Hypothesis 3n' (Indefiniteness):

Invention	Probability of Final Invalidity	Count
1	0.231	13
2	0.429	7
3	0.667	3

Total cases: 23

Test of independence:

Statistic	p-value
G-square	0.3174
Chi-square	0.3118

Hypothesis 4:

Foreign	Probability of Final Invalidity	Count
0	0.467	259
1	0.415	41

Total cases: 300

Test of independence:

Statistic	p-value
G-square	0.5294
Chi-square	0.5305

Hypothesis 5:

The analysis is based on the logistic regression model on the log odds of final art invalid.

Total cases 202

Predictor: total number of cited prior art

p-value for the predictor is 0.5431

Hypothesis 5a:

Predictor: total number of cited patent prior art

p-value for the predictor is 0.3532

Hypothesis 5b:

Predictor: total number of cited non-patent prior art

p-value for the predictor is 0.3891

Hypothesis 6:

Cited art	Probability of Final Invalidity	Count
0	0.408	152
1	0.296	115

Total cases: 267

Test of independence:

Statistic	p-value
G-square	0.0572
Chi-square	0.0584

Hypothesis 7:

The analysis is based on the logistic regression model on the log odds of final invalid.

Total cases 300

Predictor: delay

p-value for the predictor is 0.7309

Hypothesis 7a:

The analysis is based on the logistic regression model on the log odds of final art invalid.

Total cases 202

Predictor: delay

p-value for the predictor is 0.8175

Hypothesis 8:

The analysis is based on the logistic regression model on the log odds of final invalid.

Total cases 300

Predictor: lag

p-value for the predictor is 0.7325

Hypothesis 8a:

The analysis is based on the logistic regression model on the log odds of final art invalid.

Total cases 202

Predictor: lag

p-value for the predictor is 0.8206

Hypothesis 9:

The analysis is based on the logistic regression model on the log odds of final invalid.

Total cases 300

Predictor: Time in prosecution

p-value for the predictor is 0.2199

Hypothesis 9a:

The analysis is based on the logistic regression model on the log odds of final art invalid.

Total cases 202

Predictor: time in prosecution

p-value for the predictor is 0.9832

Hypothesis 10:

Let p be the probability of affirmed

Ho $p = 0.5$

Observed Probability	Count	Z-value	p-value
0.834	151	8.219	<0.01

Hypothesis 10a & b:

Trial invalid	Probability of Affirmance	Count
0	0.897	68
1	0.783	83

Total cases: 151

Test of independence:

Statistic	p-value
G-square	0.0563
Chi-square	0.0609

Hypothesis 10c:

Factor Level	Category
1	Bench
2	Jury
3	Pre-Trial Motion

Level	Probability of Affirmance	Count
1	0.847	72
2	0.867	45
3	0.758	33

Total cases: 150

Test of independence:

Statistic	p-value
G-square	0.4246
Chi-square	0.4018

Hypothesis 10d (Given Trial Validity):

Level	Probability of Affirmance	Count
1	0.938	32
2	0.821	28
3	1	7

Total cases: 67

Test of independence:

Statistic	p-value
G-square	0.1632
Chi-square	0.2163

Hypothesis 10e (Given Trial Invalidy):

Level	Probability of Affirmance	Count
1	0.775	40
2	0.941	17
3	0.692	26

Total cases: 83

Test of independence:

Statistic	p-value
G-square	0.1082
Chi-square	0.1512

Hypothesis 11 & 12

Let p be the probability of agreement

Ho $p = 0.5$

Observed Probability	Count	Z-value	p-value
0.864	44	4.824	<0.001

Appendix B

The logistic regression:

Modeled Response: The log odds of invalidity (i.e. $\log \frac{\Pr(invalid)}{1-\Pr(invalid)}$)

Only the trial factor (trial to jury, trial to bench, pre-trial disposition) is significant.

Trial Factor	Definition
TRIAL_F(1)	trial to jury
TRIAL_F(2)	trial to bench
BASELINE	pre-trial disposition

Trial Factor	Coefficients
TRIAL_F(1)	-1.0245
TRIAL_F(2)	-0.9439
Constant	0.5500

Trial Factor	EXP(Coefficient)	Interpretation
TRIAL_F(1)	0.3590	The odds that a jury decision in a patent holding the patent final invalid is 0.3590 times the odds that a pre-trial disposition in a patent holding the patent final invalid
TRIAL_F(2)	0.3891	The odds that a bench trial in a patent holding the patent final invalid is 0.3891 times the odds that a pre-trial disposition in a patent holding the patent final invalid

Variables in the equation:

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
TRIAL_F			13.1926	2	.0014	.1492	
TRIAL_F(1)	-1.0245	.3324	9.4981	1	.0021	-.1348	.3590
TRIAL_F(2)	-.9439	.2854	10.9414	1	.0009	-.1472	.3891
Constant	.5500	.2293	5.7554	1	.0164		

Classification Table for F_IVD

		Predicted			
		.00		1.00	PercentCorrect
		0	I	1	
Observed		+--------+--------+			
.00	0	I 131	I	30 I	81.37%
		+--------+--------+			
1.00	1	I 86	I	52 I	37.68%
		+--------+--------+			
				Overall	61.20%

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THE FUTURE OF THE DOCTRINE OF EQUIVALENTS

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I. OVERVIEW

Since the early nineteenth century, "claims" have been used to define the legal scope of patent protection—the proverbial "metes and bound." This legal scope has also included a penumbra of protection around that claim that is protected by what today is called the "doctrine of equivalents." Because patents are a social contract between the public and the inventors, the quid pro quo for the patent grant is a full disclosure of the invention to industry; accordingly, the public should be immediately free to use any technology outside the legal scope of the claims.[1]

In *Warner-Jenkinson Co., Inc. v. Hilton Davis Chemical Co.*[2], the Supreme Court tipped the balance slightly toward greater clarity and certainty in outlining the boundaries of the scope of the equivalents penumbra, away from patent holders' favor and toward industry's favor. The Court also deferred to the Federal Circuit to make further refinements

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[1] *See generally* Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265 (1977).

[2] 117 S. Ct. 1040, 41 U.S.P.Q.2d (BNA) 1865 (1997), *earlier proceedings*, Hilton Davis Chem. Co. v. Warner-Jenkinson Co., 62 F.3d 1512, 35 U.S.P.Q.2d (BNA) 1641 (Fed. Cir. 1995) (in banc). The case was returned to the Federal Circuit and has been further remanded to the District Court *sub nom.* Hilton Davis Chem. Co. v. Warner-Jenkinson Co., 114 F.3d 1161, 43 U.S.P.Q.2d (BNA) 1152 (Fed. Cir. 1997) (per curiam) (in banc). "Warner-Jenkinson" is used to refer to the Supreme Court opinion while "Hilton Davis" is used to refer to the 1995 Federal Circuit opinion.

The Court granted certiorari in three further equivalents cases for the purpose of vacation and remand to the Federal Circuit for consideration in light of *Warner-Jenkinson*. Shoketsu Kinzoku Kogyo Kabushiki Co., Ltd. v. Festo Corp., 117 S. Ct. 1240 (1997); Honeywell, Inc. v. Litton Sys., Inc., 117 S. Ct. 1240 (1997); United States v. Hughes Aircraft Co., 117 S. Ct. 1466 (1997). Two of the cases, *Litton* and *Hughes*, have since been decided by panels of the Federal Circuit. *See* Litton Sys., Inc. v. Honeywell, Inc., 140 F.3d 1449, 1461, 46 U.S.P.Q.2d (BNA) 1321, 1328-30 (Fed. Cir. 1998); Hughes Aircraft Co. v. United States, 148 F.3d 1384, 470 U.S.P.Q.2d (BNA) 1542 (Fed. Cir. 1998). They are discussed throughout this paper. No decision has yet issued in the third case, *Festo*.

A year prior to *Warner-Jenkinson*, the Court considered the rules for determining literal claim scope in Markman v. Westview Instruments, Inc., 116 S. Ct. 1384, 38 U.S.P.Q.2d (BNA) 1461 (1996).

on how the doctrine is applied, particularly to provide guidance on what is *not* an equivalent. Instead of setting forth a formula, as the Federal Circuit's decision had attempted, the Court proffered a kind of doctrine of "negatived equivalents."[3] In other words, the Court did not provide a doctrine of equivalents formula but instead provided a tool to be used when deciding the question.

This paper begins by analyzing the system of "claiming."[4] Determining the literal bounds of the patent claim is performed through seemingly clear rules, most recently refined in *Markman v. Westview Instruments, Inc.*[5] To the contrary, determining clear boundaries of the legal scope of protection is frustrated by the existence of the doctrine of equivalents, both by the lack of a clear test of what is an equivalent as well as by the fact that the jury determines equivalents infringement. Even after *Warner-Jenkinson*, the doctrine is left in an uncertain state.[6]

The *Hilton Davis* decision[7] at the Federal Circuit attempted a paradigm shift in the test of the doctrine, to one of an "insubstantial change indicating equivalents." That decision also perpetuated the jury determination of equivalents.[8] Grant of certiorari in *Warner-Jenkinson* held out the promise of a clear definition of equivalents and resolution of the issue of judge versus jury determination. Neither issue was directly met, particularly not a definition of what *is* an equivalent.[9] Instead, the Court helped to further limit equivalents by showing what is *not* an equivalent based upon the conflicting doctrine of "prosecution history estoppel."[10] A

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[3] For the patent context of "negatived," *see infra* note 83.

[4] *See infra* Part II.

[5] 116 S. Ct. at 1384, 38 U.S.P.Q.2d (BNA) at 1461.

[6] *See infra* Part III.

[7] *Hilton Davis*, 62 F.3d at 1512, 35 U.S.P.Q.2d (BNA) at 1641. This is the same case that on appeal became known as *Warner-Jenkinson*.

[8] *See infra* Part IV.

[9] See infra Part V.

[10] *See id.*

parallel between the problems of prosecution history and legislative history may have been the trigger point for the reversal of the Federal Circuit.[11]

Special inventions and claim categories require consideration. While a greater clarity in claim scope is provided for certain inventions, particularly mechanical combinations, questions remain for both pioneer inventions[12] and the orphans of *Warner-Jenkinson*, the areas of biotech and chemical inventions.[13] The question of equivalents of a "means" claim is also briefly considered.[14]

Post-*Warner-Jenkinson* challenges exist for the three branches of government: the judiciary is challenged to more precisely define a test for equivalents, whether it be a "substantial identity" test[15] or something else; the U.S. Patent and Trademark Office (PTO) should provide guidance and a better recorded examination process; and Congress should strengthen the patent reexamination process to permit a more fleshed out prosecution history and limit equivalents to the patentee's last resort through shifting the balance in reissue more in favor of the patentee.[16]

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[11] *See* the exchange between Justice Scalia and Hilton Davis' counsel, *infra* note 107.

[12] *See infra* Part VII.A. For a detailed study of pioneer inventions, *see* John R. Thomas, *The Question Concerning Patent Law and Pioneer Inventions*, 10 HIGH TECH. L.J. 35 (1995).

[13] *See infra* Part VII.B. A solution is proposed for biotech and chemical inventions from the "substantial identity" test that can be traced back 180 years to Justice Bushrod Washington.

[14] *See infra* Part VII.C.

[15] *See infra* Part VII.B.

[16] *See infra* Part VIII.

II. THE PATENT "CLAIM"

A. *The Statutory Deed: The Patent "Claim"*

Every patent includes at least one "claim."[17] Each claim is a separate deed to intellectual property.[18]

The patentee is obliged during patent prosecution to define the scope of protection in the patent. He must draft "one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention."[19] The principal function of each claim is to "define the scope of protection afforded by the patent. . . [C]laims are not technical descriptions of the disclosed inventions but are legal documents like the descriptions of land by metes and bounds in a deed which define the area conveyed but do not describe the land."[20]

B. *The Patent Granting Procedure*

Rare indeed is that claim that, as filed, is found acceptable by the Patent Examiner. The patent is granted only if the Patent Examiner agrees that the claim is sufficiently precise to clearly define the scope of protection

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[17] *See* 35 U.S.C. § 112, ¶ 2 (1994). In fact, there are generally plural claims in every patent. In the authors' experiences, perhaps more than ninety-five percent of all patents include multiple claims. Each claim in a patent is independently enforceable, thus, if a third party infringes only "claim 19" out of thirty claims, the remainder being invalid or not infringed, then the third party is liable for infringement of this one claim.

[18] *See generally In re* Vamco Machine and Tool, Inc., 752 F.2d 1564, 224 U.S.P.Q.2d (BNA) 617 (Fed. Cir. 1985).

[19] 35 U.S.C. § 112, ¶ 2 (1994).

[20] *Vamco*, 752 F.2d at 1577 n.5, 224 U.S.P.Q. (BNA) at 625 n.5.

in a manner such that the claim does not "read on" (or include) an embodiment that is either the same as something described in the prior literature[21] or too close to that prior literature to be patentable.[22]

A claim as filed may be defective for a variety of reasons. It could be unpatentable in view of prior art.[23] It could recite subject matter that the patent specification does not teach how to reproduce, thereby failing to "enable" the invention.[24] Or, the claim language could be too ambiguous to precisely define the outer periphery of protection—it is "indefinite."[25]

Responsive to the Examiner's "rejection" of the claims as part of an "Official Action" by the Patent Office, the patent applicant will respond with a "reply."[26] The Patent Examiner may well accept this advocacy and "allow" the application or the Patent Examiner may persist and issue a "Final

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[21] When the claimed invention is found in prior literature, it is said to lack "novelty" under 35 U.S.C. § 102 (1994). Sometimes this is referred to as "anticipation" of the claimed invention by the prior activity.

It is important to note that prior activity that is patent-defeating under 35 U.S.C. §102 need not be in the "literature" but can also be a public use or other activities that are collectively referred to as the "prior art", a term that evolved in the late nineteenth century from the longer terminology, "state of the art prior" to the invention.

[22] *See* 35 U.S.C. § 103(a) (1994); *see generally* Graham v. John Deere Co., 383 U.S. 1, 148 U.S.P.Q. (BNA) 459 (1966).

[23] *See* 35 U.S.C. § 102 (1994) (novelty); 35 U.S.C. § 103(a) (1994) (obviousness).

[24] *See* 35 U.S.C. § 112, ¶ 1 (1994) (written description, enablement, and best mode).

[25] The claim thus fails to particularly point out and distinctly claim the invention, a basis for rejection under 35 U.S.C. § 112, ¶ 2.

[26] A reply is the generic form for an argument made in reply to an Examiner's action. A reply may include arguments alone, or they may be made in combination with amendments of the claims. *See generally* 37 C.F.R. §§ 1.111-1.127 (1997).

Rejection."[27] Often, an "interview" fosters a compromise resulting in an allowance.[28]

In the majority of issued patents, there have been one or more amendments to the original claims, generally, but not always, with the result that the claims as granted are narrower than the claims as filed.[29]

C. *Crafting A Claim Interpretation Record*

What goes on at the PTO provides the tools for construction of the scope of the patent claim after grant. The literal scope of the patent is determined under principles confirmed in *Markman*.[30] The Federal Circuit has provided a hierarchy of proof to use in determining the meaning of a claim. In the *Vitronics*[31] decision, the Court stated that proof can be divided into two categories of evidence, "intrinsic" and "extrinsic," where the former

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[27] This is a vast oversimplification of the patenting process. The Patent Examiner may issue a second, non-final action. Or, there may have been a preliminary action made such as a "restriction requirement".

Beyond Final Rejection, there is a further chance for an amendment and also for an appeal to the Board of Patent Appeals and Interferences (Board). *See* 35 U.S.C. § 134 (1994). Unsatisfactory resolution from the Board can be followed by an appeal either directly to the Federal Circuit, *see* 35 U.S.C. § 141 (1994), or to a de novo proceeding in the District Court, *see* 35 U.S.C. § 145 (1994), that can lead to a Federal Circuit appeal.

Even after a patent is granted the patentee may choose to further prosecute the patent through "reexamination." *See* 35 U.S.C. §§ 302-307 (1994).

[28] The interview may be via telephone or in person. *See* 37 C.F.R. § 1.133 (1997). The process is completely informal even as to casual dress and the absence of a formal hearing room.

[29] The claims may be narrowed by substitution of new claims that replace the original claims; the claims may be physically amended; or, there may be a combination of the two.

[30] *See Markman*, 116 S. Ct. 1384, 38 U.S.P.Q.2d (BNA) 1461 (1996).

[31] Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1581-83, 39 U.S.P.Q.2d (BNA) 1573, 1576-77 (Fed. Cir. 1996).

is controlling over the latter in deciding claim interpretation.[32] Intrinsic evidence includes the claims themselves, the "specification"[33] (more properly, the "written description"), and the "prosecution history."[34] Extrinsic evidence includes all other sources for interpretation, including expert testimony, other patents, and the dictionary.[35]

The Court in *Vitronics*, and later in cases such as *Multiform Desiccants*[36] and *Digital Biometrics*,[37] reiterated pieces of established patent law. Within intrinsic evidence, the actual words of a claim are the

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[32] *Id.*; *see also*, Autogiro Co. of Am. v. United States, 384 F.2d 391, 397-99, 155 U.S.P.Q. (BNA) 697, 702-04 (Ct. Cl. 1967).

[33] The specification technically includes the entire description of the patent including the claims. *See generally* 35 U.S.C. § 112, ¶ 1 (1994). However, the term "specification" (more precisely, the written description) generally is used to refer to that portion of the patent prior to the claims. The "specification" must include a full disclosure of how to make and use the invention so that a person with average technical ability in the field could reproduce it from scratch, using only his own technical knowledge coupled with the "recipes" given in the patent specification.

[34] *See Vitronics*, 90 F.3d at 1582, 39 U.S.P.Q.2d (BNA) at 1576; *cf. Autogiro*, 384 F.2d at 398-99, 155 U.S.P.Q. (BNA) at 703-04.

The original term for prosecution history is "file wrapper," that refers to the various papers that are clipped onto the patent application in the official manilla file wrapper, including Examiners' "office actions" and patent applicants' "amendments." Although "file wrapper" had been used by the Supreme Court and patent practitioners since the last century to refer to this collection of official papers, the Federal Circuit invented the terminology "prosecution history".

[35] The dictionary provides a special form of extrinsic evidence that is normally used to interpret plain and ordinary meanings of claim limitations. *See generally Vitronics*, 90 F.3d at 1582, 39 U.S.P.Q.2d at 1576 (stating words in a claim are usually given their ordinary and customary meaning).

[36] Multiform Desiccants, Inc. v. Medzam, Ltd., 133 F.3d 1473, 45 U.S.P.Q.2d (BNA) 1429 (Fed. Cir. 1998).

[37] Digital Biometrics, Inc. v. Identix, Inc., 149 F.3d 1335, 47 U.S.P.Q.2d (BNA) 1418 (Fed. Cir. 1998).

controlling focus.[38] Thus, the ordinary meaning of a claim term to one of ordinary skill in the art is controlling, unless there is an express intent on the part of the inventor to impart a novel meaning to the claim term.[39] The inventor may decide to act as his own lexicographer, and impart a particular meaning to the claim term, in which case, that meaning will control.[40] Therefore, if the meaning of a term is sufficiently clear in the written description, then that meaning shall apply.[41] In addition, the prosecution history is relevant because it may contain contemporaneous exchanges between the patent applicant and the PTO about what the claims mean.[42] In general, the prosecution history is used to narrow the scope of the term and not to broaden its scope.[43]

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[38] *See, e.g., Digital Biometrics*, 149 F.3d at 1344, 47 U.S.P.Q.2d (BNA) at 1424; Thermalloy, Inc. v. Aavid Eng'g, Inc., 121 F.3d 691, 693, 43 U.S.P.Q.2d (BNA) 1846, 1848 (Fed. Cir. 1997) ("Nonetheless, throughout the interpretation process, the focus remains on the meaning of claim language.").

[39] *See Digital Biometrics*, 149 F.3d at 1344, 47 U.S.P.Q.2d (BNA) at 1424.

[40] *See id.* ("The written description is considered, in particular to determine if the patentee acted as his own lexicographer, as our law permits, and ascribed a certain meaning to those claims terms."); *Multiform Desiccants*, 133 F.3d at 1477, 45 U.S.P.Q.2d (BNA) at 1432 ("The inventor's words that are used to describe the invention—the inventor's lexicography—must be understood and interpreted by . . . a person in that field of technology.").

[41] *See Multiform Desiccants*, 133 F.3d at 1477-1478, 45 U.S.P.Q.2d (BNA) at 1432-33 ("When the specification explains and defines a term used in the claims, without ambiguity or incompleteness, there is no need to search further for the meaning of the term.").

[42] *See Vitronics*, 90 F.3d at 1582, 39 U.S.P.Q.2d (BNA) at 1576; *Digital Biometrics*, 149 F.3d at 1344, 47 U.S.P.Q.2d (BNA) at 1424.

[43] For example, in *Multiform Desiccants*, the Court interpreted the term "degradable" in a manner consistent with the written description, even though a more broad definition for the term was supplied by the patentee during prosecution of the application leading to the patent. *See* 133 F.3d at 1478, 45 U.S.P.Q.2d (BNA) at 1432.

In addition, a court may use extrinsic evidence to interpret the scope of the claim, such as the testimony of a technical or patent expert.[44] However, at least according to the *Vitronics* decision, such evidence is now considered inherently suspect. That decision states that, in most circumstances, resolving any ambiguity in claim terms can be handled by analyzing the intrinsic evidence and "it is improper to rely on extrinsic evidence."[45]

III. EQUIVALENTS: AN IMPRECISE PENUMBRA OF PROTECTION

The infringement battle can be engaged in a patent with a claim that not only recites clearly novel and unobvious subject matter, but also has sufficient breadth to capture any commercial embodiment a competitor may try to make. Imagine a land claim in the Gold Rush days on the Sacramento River claiming an entire riverbank: Here, it wouldn't matter where someone would want to prospect, he would infringe the land claim with his mining. On the other hand, if the claim were to cover a strip of land twenty yards on each side of the Big Oak Tree, this claim would have minimal value in the exclusion of others.

All too often, patents to new inventions cover that sparse plot by the Big Oak Tree, not often enough covering the entire riverbank.[46] In other words, the patent owner is often trapped by the wording of his claim to a patent "plot" that does not effectively block competition. Because

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[44] *See* Markman v. Westview Instruments, Inc., 116 S. Ct. at 1384, 38 U.S.P.Q.2d (BNA) at 1461.

[45] *Vitronics*, 90 F.3d at 1583, 39 U.S.P.Q.2d (BNA) at 1577.

[46] At first blush, one may ask: Why wouldn't the patentee seek the broadest claims imaginable, given that it is he, and not the Examiner, charged with drafting the claims in the first place? The answer is that a Patent Examiner diligently seeks to avoid the grant of claims that are overly broad, particularly where the outer reaches of the claim scope encompass subject matter very close to the prior art. To the extent that a claim reads on an embodiment that is viewed as unpatentable, then the entire claim is rejected. Considering the large dockets of almost every patent, claiming broadly too often geometrically increases the work of that patent attorney.

exclusivity is the essence of the patent right,[47] this will mean that too many patents are of minimal value. What incentive would a major corporation or other entity have to spend millions of dollars to develop a patented invention when, the very next day, a competitor can come out with a non-infringing product, working just outside the language of the claim?

One reason why "sparse" claims appear so much in patents is that most claims are drafted and prosecuted before commercialization of technology by the patent owner or at least before serious competition by "me too" competitors. With companies obtaining tens or hundreds, or more of patents every year, each patent document is put together and granted without the foresight necessary to provide literal protection within the ambit of the patent claim that is necessary to protect against infringers.

Furthermore, even with the greatest foresight imaginable, there are always unforeseen developments that crop up and supersede the limits of claim wording.

A. *Background To The Law Of Equivalents Infringement*

This dilemma of "sparse" claims in the issued patent, relatively narrow claims that do not literally cover competitors' products, creates problems for the patent attorney advising the patentee on infringement issues. If it has been more than two years since issuance of the patent, the claims cannot be broadened through reissue.[48] Even if less than two years have passed, reissue is a time-consuming and uncertain process, especially when the patent holder is anxious about moving against alleged infringers. The only safety hatch available to the patentee in this scenario is to rely on the doctrine of equivalents to expand the scope of the claim, enabling the patentee to capture the accused device or process.

This purpose is vastly different from the purpose the doctrine had at its beginnings. Initially, the doctrine was formulated to give patents some liberality of construction beyond their wording to protect patent owners

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[47] *See* Kitch, *supra* note 1.

[48] *See* 35 U.S.C. § 251 (1994).

from piracy of patented inventions, thereby permitting a fair use of the patent system.[49]

1. The Doctrine At Its Beginning

The need for flexibility in defining the scope of a patent beyond its literal wording became apparent with Eli Whitney's pioneer invention of the cotton gin.[50] In the earliest preserved opinion on the evasion of the patent by working outside its wording, Justice Johnson found that an improved "saw gin" was nevertheless an infringement of Whitney's cotton gin.[51]

Within the decade following Justice Johnson's cotton gin opinion, Joseph Story and Bushrod Washington[52] crafted a remedy for patentees where third parties created "colorable" variations of what is patented: Even though there was not infringement of the invention as set forth in the patent, infringement was found because permission of a "colorable" evasion of the patent right was unfair.[53]

Thereafter, a web of trial court opinions by Supreme Court justices riding circuit was woven together into the doctrine of equivalents in the

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[49] *See* Wegner, *Equitable Equivalents: Weighing the Equities to Determine Patent Infringement in Biotechnology and Other Emerging Technologies*, 18 RUTGERS COMPUTER & TECH. L.J. 1 (1992) (hereinafter Wegner, *Equitable Equivalents*).

[50] The Whitney patent scope was determined by the specification and not by limitations in claim language which was yet to be required. *See id.*

[51] *See* Wegner, *Equitable Equivalents*, *supra* note 49.

[52] Each was a member of the Supreme Court where they made important contributions. But, from the standpoint of the evolution of patent law, far more important were their positions as Circuit Judges in Boston and Philadelphia, respectively. They each had a relatively heavy load of patent infringement cases, and each put his stamp onto the evolving patent law of the United States through charges to the juries and other trial opinions.

[53] *See* Wegner, *Equitable Equivalents*, *supra* note 49.

landmark theories of George Ticknor Curtis that were widely publicized not later than 1849[54] and which became the foundation for *Winans v. Denmead*.[55]

Over the course of a full century and numerous opinions, the Supreme Court in *Graver Tank*[56] refined the doctrine of equivalents into a "triple identity" test, whereby infringement is found by an accused device falling *outside the literal claim wording* where the accused device performs substantially the same function in substantially the same way to achieve substantially the same result.[57]

2. *Graver Tank*: The Lone Modern Holding

All was quiet on the doctrine of equivalents front for most of the forty years since *Graver Tank*,[58] an odd case,[59] and the last time the Supreme Court found infringement using this doctrine. Moreover, it was the only major opinion to do so in nearly seventy years.[60]

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[54] *See id.* at 4 n.9.

[55] 56 U.S. (15 How.) 330 (1854). *Winans* is the first major Supreme Court case to recognize Curtis' theory, although it is not the origin of the doctrine as it cites back to Curtis' 1849 work. For a discussion of *Winans* in the evolution of the doctrine of equivalents, *see* Wegner, *Equitable Equivalents*, *supra* note 49, at Part II. The Supreme Court today regards *Winans* as the "seminal" case. *See Warner-Jenkinson*, 117 S. Ct. at 1053, 41 U.S.P.Q.2d (BNA) at 1875 ("Indeed, *Markman* cites with considerable favor, when discussing the role of judge and jury, the seminal *Winans* decision.").

[56] 339 U.S. 605, 85 U.S.P.Q. (BNA) 328.

[57] This test is usually identified with Graver Tank & Mfg. Co. v. Linde Air Prods. Co., 339 U.S. 605, 85 U.S.P.Q.(BNA) 328 (1950), but dates back many years earlier. *See* Wegner, *Equitable Equivalents*, *supra* note 49, at Part IV.B.

[58] 339 U.S. 605, 85 U.S.P.Q. (BNA) 328.

[59] *See* Wegner, *Equitable Equivalents*, *supra* note 49, at Part IV.C.

[60] The last major Supreme Court case (save *Graver Tank*) to find infringement under the doctrine of equivalents was Sanitary Refrigerator Co. V. Winters, 280 U.S. 30 (1929).

3. An Unclear Body Of Case Law

By the early 1980's, the doctrine of equivalents had run amok and was without realistic bounds. Early in the life of the Federal Circuit[61] the bounds were stretched beyond realistic recognition in the notorious and wrongly decided *Hughes Aircraft* case.[62] With a retreat in *Pennwalt Corp. v. Durand-Wyland, Inc.*,[63] the doctrine by the early 1990's was still too imprecise to permit competitors to determine the realistic penumbra of protection afforded beyond the claim wording.

B. *The Jury Of Peers To Determine Equivalents*

The problem created by an amorphous doctrine of equivalents is compounded by a still unanswered question of who determines whether there is or is not an equivalent. In *Hilton Davis*, the Federal Circuit stated that it is up to a jury to determine whether there is equivalents infringement.[64] In *Warner-Jenkinson*, the Supreme Court expressly refused to consider the question.[65]

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[61] The Federal Circuit came into existence October 1, 1982, as a combination of the predecessor U.S. Court of Customs and Patent Appeals and the U.S. Court of Claims. It assumed exclusive jurisdiction for patent appeals from all the district courts. *See generally* Rochelle C. Dreyfuss, *The Federal Circuit: A Case Study in Specialized Courts*, 64 N.Y.U. L. REV. 1 (1989).

[62] Hughes Aircraft Co. v. U.S., 717 F.2d 1351, 219 U.S.P.Q. (BNA) 473 (Fed. Cir. 1983), *subsequent proceedings*, 86 F.3d 1566, 39 U.S.P.Q.2d (BNA) 1065 (Fed. Cir. 1996). See particularly the dissent in the latter case by the late Judge Helen Nies explaining why the first decision was wrongly decided. *See* 86 F.3d at 1579-84, 39 U.S.P.Q.2d at 1075-79 (Nies, J., dissenting). The Supreme Court granted certiorari and vacated and remanded the case. 117 S. Ct. 1240 (1997).

[63] 833 F.2d 931, 934, 4 U.S.P.Q.2d (BNA) 1737, 1739 (Fed. Cir.1987) (in banc).

[64] 62 F.3d at 1522, 35 U.S.P.Q.2d (BNA) at 1648.

[65] 117 S. Ct. at 1053, 41 U.S.P.Q.2d (BNA) at 1875.

This exponentially complicates the problem for third parties in determining, not only the realistic scope of the doctrine of equivalents, but also the scope that a jury could reasonably reach.

C. *Protection Of Unpatentable Subject Matter*

The net result of the combination of an uncertain doctrine of equivalents, coupled with its application by juries, created the potential for a patent owner to create a vast penumbra of unrecited subject matter that was *outside the patent claim as prosecuted,* but nevertheless, could be effectively protected by the patent.

The reason that this penumbra of uncertainty effectively tilts in favor of the patentee has to do with the nature of the patent right and its relation to the real world of commerce. If the patent owner is practicing his invention *within* his own claim boundaries and makes a profit of, for example, $50,000,000 per year based upon his exclusive right to exclude others, he has every incentive to maintain that exclusivity if the profit were to drop to, say, $1,000,000 or $5,000,000 or so *with* competition.[66] In this case, the patent owner has every incentive to invest, say, $2,000,000 per year in litigation costs against a third party infringer who is operating just outside the claim wording. Even if the doctrine of equivalents attack proves unsuccessful after two to four years of litigation and a cost of, perhaps, $4,000,000 to $6,000,000 in legal fees, this is a very small price to pay for maintenance of profits at the rate of $50,000,000 per year for two or more years. Often, the competitor, who has no profit to *lose* and who may have to expend considerable time and effort to enter the market, may even settle the litigation. Even if the competitor stays in the hunt and continues to litigate, the chilling expense of patent litigation may discourage third parties from entering the fray.[67]

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[66] This is particularly true in the pharmaceutical industry where prices on drugs drop remarkably when there is no longer patent protection available.

[67] Often, there is a settlement between the first two parties and a shared exclusivity. *See, e.g.*, Imperial Chem. Indus., PLC v. Barr Labs., 795 F. Supp. 619 (S.D.N.Y. 1992), *vacated sub nom.* Imperial Chem. Indus., PLC v. Heumann Pharma GmbH & Co., 1993 WL 118931, reported in table format, 991 F.2d 811 (Fed. Cir. 1993) (nonprecedential) (Zeneca, successor to ICI, found guilty of inequitable conduct on its Tamoxifen patent.

IV. THE ATTEMPTED YET INCOMPLETE SOLUTION OF *HILTON DAVIS*

As outlined above, over the last decade a concern that the doctrine had grown unwieldy created a great deal of controversy. The cards were stacked against an alleged infringer, who had little hope to avoid a charge of infringement in many situations. Certainly a patent owner's competitor was less able to determine, *a priori*, before commercializing a potentially infringing product, that the product was conclusively outside the scope of a specific patent that seemed, on its face, to claim subject matter "different" than the new product. Starting with writings from Professors Adelman[68] and Merges[69] at the turn of the decade, scholarly attention began to focus on the doctrine.

In its continuing effort to limit and provide certainty to the doctrine, the Federal Circuit sought to refine the doctrine of equivalents in its *in banc* decision in *Hilton Davis*.[70] It attempted to develop a formalistic standard, thereby solving the entire problem. Specifically, the Federal Circuit shifted to the test of an "insubstantial" change: If the difference between the accused infringement and the patented invention is no more than

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purchased a vacatur settlement from Barr Laboratories).

[68] Martin J. Adelman & Gary L. Francione, *The Doctrine of Equivalents in Patent Law: Questions that Pennwalt Did Not Answer*, 137 U. PA. L. REV. 673 (1989). For a more recent view from Professor Adelman, *see* Martin J. Adelman, *En Banc on Claim Construction and Equivalents*, PAT. LITIG. (396 PLI/Pat 681 1994).

[69] Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839, 843-44 (1990). Professor Merges, now of Boalt Hall, working with a small institute in Boston, and the undersigned at Airlie House with a forerunner of what would become the Dean Dinwoodey Center at George Washington University, provided a series of experts' workshops that laid the foundation for a reconsideration of the doctrine of equivalents. At the urging of Professor Merges, the present writer's theories were published; *see* Wegner, *Equitable Equivalents*, *supra* note 49. The Merges work was the first major development of theories that had been laid out by Professor Kitch. *See* Kitch, *supra* note 1.

[70] 62 F.3d at 1520-22, 35 U.S.P.Q.2d (BNA) at 1647-48. The Federal Circuit also considered the issue of whether a judge or jury should make an equivalents determination, finding that this is for the jury. *See id.*

"insubstantial", then there is infringement under the doctrine of equivalents.[71]

Changing the standard from the triple identity test of *Graver Tank* to the potentially more expansive "insubstantial change" test of *Hilton Davis* could be viewed more as one of words than substance. How does one determine what is "insubstantial"? Particularly, how is a jury to make such a determination?

A. *Objective Test Without A Copying Requirement*

One of the inequities of the patent system has been that two competitors who *independently* develop parallel but *different* inventions may not both be permitted to practice their inventions if the junior parallel invention is to an equivalent structure. The relief, it is argued, should be against copyists as opposed to independent creators of parallel technology.[72]

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[71] Before *Winans*, there was a test of "substantial identity", a different way of stating that only an insubstantial change is within the scope of equivalents. *See* Wegner, *Equitable Equivalents*, *supra* note 49, at Part II.B.2. This idea was then adopted by Curtis in his 1849 treatise: "An [act of] infringement involves *substantial identity*, whether that identity is described by the terms 'same principle,' same *modus operandi*, or any other." *See* Wegner, *Equitable Equivalents*, *supra* note 49, at Part II.B.2 (emphasis added).

While the holding of *Hilton Davis* is quite narrow, there were several statements made as dicta that, while subsidiary, are quite important. For example, dictum suggests that an equivalent should be found where the equivalent is known to a worker skilled in the art. *See Hilton Davis*, 62 F.3d at 1518-19, 35 U.S.P.Q.2d (BNA) at 1645-46.

[72] *See* Wegner, *Equitable Equivalents*, *supra* note 49. For other views, see Stanley L. Amberg, *Equivalents and Claim Construction: Critical Issues En Banc in the Federal Circuit*, PATENT LITIGATION (396 PLI/Pat 681 1994); Laura A. Handley, *Refining the Graver Tank Analysis with Hypothetical Claims: A Biotechnology Exemplar*, 5 HARV. J.L. & TECH. 31, 35 n.28 (1991); Rudolph P. Hoffman, Jr., *The Doctrine of Equivalents: Twelve Years of Federal Circuit Precedent Still Leaves Practitioners Wondering*, 20 WM. MITCHELL L. REV. 1033 (1994); Robert M. Meeks, *Metaphors of Infringement and Equivalence: The Solution of Our Problems*, 2 J. INTELL. PROP. L. 279, 323 n.49 (1994); Allan M. Soobert, *Analyzing Infringement by Equivalents: A Proposal to Focus the Scope of International Patent Protection*, 22 RUTGERS COMPUTER & TECH. L.J. 189, 196-97 n.28 (1996); Richard C. Wilder, *An*

This argument was completely rejected, first in *Hilton Davis* and then on appeal in *Warner-Jenkinson*. Establishing a purely objective test for infringement provides a wider net to capture third parties as infringers, those just outside the wording of the claim who may have practiced the parallel invention even before issuance of the first party's patent.[73]

B. *Viability Of* Pennwalt *"All Elements" Rule*

The *Pennwalt*[74] "All Elements" rule is emerging as the premier corollary under the doctrine.[75] More importantly, because of this rule, there

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Overview of Changes to the Patent Law of the United States after the Patent Law Treaty, 26 J. MARSHALL L. REV. 497, n.246 (1993).

[73] For example, a "submarine" patent may issue after many years in the PTO. Before grant, the patent application was maintained in secrecy. *See* 35 U.S.C. § 122 (1994).

[74] Pennwalt Corp. v. Durand-Wayland, Inc., 225 U.S.P.Q. (BNA) 558 (N.D. Ga. 1984).

[75] The claim litigated in *Pennwalt* is particularly instructive. It recited:

> "[a]n automatic sorting apparatus comprising" a set of elements:
>
> electronic weighing means . . .
> first reference signal means . . .
> first comparison means . . .
> optical detection means . . .
> second reference signal means . . .
> second comparison means . . .
> clock means . . .
>
> *first position indicating means* responsive to a signal from said clock means and said signal from said second *comparison* means *for continuously indicating the position of an item to be sorted* while the item is in transit between said optical detection means and said electronic weighing means,
>
> *second position indicating means* . . . , and discharge means . . . .

Id. at 565.

The accused infringer copied every element of Pennwalt's fruit sorter

cannot be infringement under the doctrine of equivalents even though, as a whole, the accused infringer and the claimed invention have identical results and operate in the same overall manner. The "All Elements" rule has been cited in many decisions, not the least of which are the *Hilton Davis* and *Warner Jenkinson* decisions.

Even before *Hilton Davis*, it was clear that the "All Elements" rule of *Pennwalt*[76] was the clear choice of the Federal Circuit: If one has a claim to a combination of elements, complete removal of even one of the elements takes an accused device outside the scope of a patent, both literally *and under the doctrine of equivalents*. Several later Federal Circuit decisions, however, may evidence an uneven application of the *Pennwalt* standard.[77]

In its *Warner-Jenkinson* decision, the Supreme Court *sub silentio* followed the *Pennwalt* "All Elements" test.[78] If anything, the *Pennwalt* test has been tightened even further. Echoing what the Federal Circuit stated a decade earlier in its *in banc* pronouncement in *Pennwalt*, the Court in *Warner-Jenkinson* stated "the doctrine of equivalents must be applied to

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necessary to achieve Pennwalt's results, but eliminated the "first position indicating
means . . . ." The crux of the matter is seen from the "first position indicating means . . .," an electronic memory to keep track of the movement of the item (fruit). There is no need to "*continuously* indicat[e]" the position (as is literally required), and as the accused infringement did not meet this requirement, there was no literal infringement.

[76] Pennwalt Corp. v. Durand-Wayland, Inc., 833 F.2d 931, 4 U.S.P.Q.2d (BNA) 1737 (Fed. Cir. 1987) (in banc).

[77] For an example, prior to *Warner-Jenkinson*, see Wiener v. NEC Elecs., Inc., 102 F.3d 534, 541, 41 U.S.P.Q.2d (BNA) 1023, 1029 (Fed. Cir. 1996) ("While this court acknowledged that the doctrine of equivalents does not require a one-to-one correspondence of components, this claim contained a limitation . . . which this court could not ignore during its doctrine of equivalents' analysis." (citation omitted)).

[78] For an interesting application of the "All Elements" rule, see Corning Glass Works v. Sumitomo Elec. U.S.A., Inc., 868 F.2d 1251, 9 U.S.P.Q.2d (BNA) 1962 (Fed. Cir. 1989) (one or more elements in a claim were found to be equivalently met by a single element in an accused device, leading to a finding of infringement).

individual elements of the claim, not to the invention as a whole."[79] The Court emphasized that "It is important to ensure that the application of the doctrine, even as to an individual element, is not allowed such broad play as to effectively eliminate that element in its entirety."[80]

An argument may be made that an obviously trivial element in a claim should not rob the patentee of the full scope of protection to which he could be entitled. Of course, the opposite view is that if a limitation is truly trivial, the patent attorney should not have included it in the claim in the first place: The patentee is free to draft claims of his own choosing.[81]

A more recent reaffirmation of *Pennwalt* is found in the *Eastman Kodak* case:

> [A]n accused device outside the literal meaning of the claims may still infringe by equivalents so long as each claimed element or its substantial equivalent is found in the accused device. A patentee may prove this insubstantial change by showing that the substituted element in the accused device performs substantially the same function, in substantially the same way, to produce substantially the same result as the claimed element. *"It is important to ensure that application of the doctrine, even as to an individual element, is not allowed such broad play as to effectively eliminate that element in its entirety."*[82]

V. *WARNER-JENKINSON*: AN OVERVIEW

Review was granted in *Warner-Jenkinson* in major part to determine "what *is* the doctrine of equivalents?" What meaningful test would help

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[79] 117 S. Ct. at 1049, 41 U.S.P.Q.2d (BNA) at 1871.

[80] *Id.*

[81] This notice function is discussed later in more detail. *See infra* Part VIII.A.4.

[82] Eastman Kodak Co. v. Goodyear Tire & Rubber Co., 114 F.3d 1547, 1560-61, 42 U.S.P.Q.2d (BNA) 1737, 1746-47 (Fed. Cir. 1997) (emphasis added) (citations omitted).

provide the needed certainty in claim boundaries that the parties and the amici were seeking?

Unfortunately, despite the opportunity, the Supreme Court in *Warner-Jenkinson* failed to provide a positive definition of what the doctrine is. Instead the Supreme Court provided a tool to be used when doing the analysis, a doctrine of presumed prosecution history estoppel or, if you will, a doctrine of negatived[83] equivalents. Hence, the Federal Circuit must develop a positive test of what *is* an equivalent.[84]

Significantly, the Court in *Warner-Jenkinson* rejected an "equity trigger" argument, i.e., the test is entirely objective.[85] Copying of technology is not required to employ the doctrine.[86]

Furthermore, it would appear that the Court completely ducked a major question that may have been the principal basis for grant of certiorari: Should a judge or jury determine equivalents infringement? The Federal Circuit had taken the view that there is a jury right to a determination of equivalents infringement. The Court stated that "[b]ecause resolution of whether, or how much of, the application of the doctrine of equivalents can be resolved by the court [as opposed to a jury] is not necessary . . . to answer

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[83] "Negatived" is an unruly term. Why not "negated" or "cancelled"? The answer is apparent only to the patent attorney who has lived for several generations with an unspeakably cumbersome patent code that includes the final sentence of the test of obviousness under 35 U.S.C. § 103(a) that "[p]atentability shall not be *negatived* by the manner in which the invention was made." 35 U.S.C. § 103(a) (1994) (emphasis added).

[84] *See infra* Part VIII.A.1.b.

[85] 117 S. Ct. at 1052, 41 U.S.P.Q.2d (BNA) at 1874 ("Although *Graver Tank* certainly leaves room for petitioner's suggested inclusion of intent-based elements in the doctrine of equivalents, we do not read it as requiring them. The better view, and the one consistent with *Graver Tank*'s predecessors and the objective approach to infringement, is that intent plays no role in the application of the doctrine of equivalents."). This is a questionable construction of the origins of the doctrine. *See* Wegner, *Equitable Equivalents*, *supra* note 49.

[86] *See supra* Part IV.A.

the question presented, we decline to take it up."[87] The Court in dictum nevertheless approved of the Federal Circuit's handling of the issue.[88] The Court explained that "[t]here was ample support in our prior cases for [the Federal Circuit's] holding."[89] The Federal Circuit, absent specific guidance *away* from what it had decided just two years earlier in *Hilton Davis*, is unlikely to change its decision that a determination of equivalents infringement is for the jury.

Perhaps more importantly, the major thrust of the Court's opinion is to pare back the effective scope of equivalents through a broadening of prosecution history estoppel. Because prosecution history estoppel is a matter of law that need not be given to a jury, to the extent that an accused infringer's case against the doctrine of equivalents is focused upon prosecution history estoppel, there is no jury issue present.[90] Here, for this

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[87] *Warner-Jenkinson*, 117 S. Ct. at 1053, 41 U.S.P.Q.2d (BNA) at 1875.

[88] *Id.*

[89] *Id.* The Court cites *Union Paper-Bag Machine Co. v. Murphy*, 97 U.S. 120, 125 (1878) ("[I]n determining the question of infringement, the court or jury, as the case may be, . . . are to 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"); and Winans v. Denmead, 15 How. 330, 344 (1854) ("'[It] is a question for the jury' whether the accused device was 'the same in kind, and effected by the employment of [the patentee's] mode of operation in substance.'").

The court in *Warner-Jenkinson* notes that "[i]ndeed, *Markman* cites with considerable favor, when discussing the role of judge and jury, the seminal *Winans* decision." 117 S. Ct. at 1053, 41 U.S.P.Q.2d (BNA) at 1875.

[90] *Id.* at 1053-54 n.8, 41 U.S.P.Q.2d (BNA) at 1875 n.8 ("Of course, the various legal limitations on the application of the doctrine of equivalents are to be determined by the court, either on a pretrial motion for partial summary judgment or on a motion for judgment as a matter of law at the close of the evidence and after the jury verdict. FED. R. CIV. P. 56; FED. R. CIV. P. 50. Thus, under the particular facts of a case, if prosecution history estoppel would apply or if a theory of equivalence would entirely vitiate a particular claim element, partial or complete judgment should be rendered by the court, as there would be no further *material* issue for the jury to resolve.").

type of case, the goal of those seeking to exclude jury consideration of equivalents has been achieved.

The Court also noted that while summary relief should be granted for some equivalents cases,[91] some courts have been reluctant to do so. The Court urged the Federal Circuit to find a way to remedy this situation.[92]

Even for those cases that still reach a jury, the Supreme Court encouraged the Federal Circuit to find creative ways to have focused jury verdicts on the specific issues involved:

> in cases that reach the jury, a special verdict and/or interrogatories on each claim element could be very useful in facilitating review, uniformity, and possibly postverdict judgments as a matter of law. We leave it to the Federal Circuit how best to implement procedural improvements to promote certainty, consistency, and reviewability to this area of the law.[93]

VI. *WARNER-JENKINSON'S* EFFECT ON OTHER DOCTRINAL PRECEDENT

This guidance from the Supreme Court in *Warner-Jenkinson* can be integrated with several case law doctrines and trends relating to prosecution history estoppel.[94]

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[91] *See id.* ("Where the evidence is such that no reasonable jury could determine two elements to be equivalent, district courts are obliged to grant partial or complete summary judgment. *See* FED. R. CIV. P. 56; Celotex Corp. v. Catrett, 477 U.S. 317, 322-323, 106 S. Ct. 2548, 2552-2553 (1986).").

[92] *See Warner-Jenkinson*, 117 S. Ct. at 1053-54 n.8, 41 U.S.P.Q.2d (BNA) at 1875 n.8 ("If there has been a reluctance to do so by some courts due to unfamiliarity with the subject matter, we are confident that the Federal Circuit can remedy the problem.").

[93] *Id.* (citations omitted).

[94] The following sections discuss invoking prosecution history estoppel. *See infra* Parts VI.A-G. The effect or scope of the estoppel is then discussed. *See infra* Part VI.H.

A. *Estoppels Based Upon Patentability*

In a classic case of prosecution history estoppel, the court in *Exhibit Supply Co. v. Ace Patents Corp.*[95] allowed an amendment to avoid prior art. The Court confirmed that where an amendment is made to overcome prior art, then, indeed, there is prosecution history estoppel. The Court pointed out that, in all Supreme Court examples given by the parties and by the Federal Circuit below,

> prosecution history estoppel was tied to amendments made to avoid the prior art, or otherwise to address a specific concern such as obviousness that arguably would have rendered the claimed subject matter unpatentable. Thus, in *Exhibit Supply Co. v. Ace Patents Corp.*, Chief Justice Stone distinguished inclusion of a limiting phrase in an original patent claim from the "very different" situation in which "the applicant, in order to meet objections in the Patent Office, *based on references to the prior art*, adopted the phrase as a substitute for the broader one" previously used. Similarly, in *Keystone Driller Co. v. Northwest Engineering Corp.*, estoppel was applied where the initial claims were "rejected on the prior art," and where the allegedly infringing equivalent element was outside of the revised claims and within the prior art that formed the basis for the rejection of the earlier claims.[96]

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[95] 315 U.S. 126, 52 U.S.P.Q. (BNA) 275 (1942).

[96] *Warner-Jenkinson*, 117 S. Ct. at 1049-50, 41 U.S.P.Q.2d (BNA) at 1872 (citations omitted). Footnote 5 follows this passage: "See also, Smith v. Magic City Kennel Club, Inc., 282 U.S. 784, 788 (1931) (estoppel applied to amended claim where the original 'claim was rejected on the prior patent to' another); Computing Scale Co. of America v. Automatic Scale Co., 204 U.S. 609, 618-620 (1907) (initial claims rejected based on lack of invention over prior patents); Hubbell v. United States, 179 U.S. 77, 83 (1900) (patentee estopped from excluding a claim element where element was added to overcome objections based on lack of novelty over prior patents); Sutter v. Robinson, 119 U.S. 530, 541 (1886) (estoppel applied where, during patent prosecution, the applicant 'was expressly required to state that [the device's] structural plan was old and not of his invention'); cf. Graham v. John Deere Co. of Kansas City, 383 U.S. 1, 33 (1966) (noting, in a validity determination, that 'claims that have been narrowed in order to

Not only did the fact patterns in these cases match up with narrowing over the prior art, the Court in these cases also explored the reasons for the amendment as part of its inquiry:

> It is telling that in each case this Court probed the reasoning behind the Patent Office's insistence upon a change in the claims. In each instance, a change was demanded because the claim as otherwise written was viewed as not describing a patentable invention at all typically because what it described was encompassed within the prior art. But . . . there are a variety of other reasons why the PTO may request a change in claim language. And if the PTO has been requesting changes in claim language without the intent to limit equivalents or, indeed, with the expectation that language it required would in many cases allow for a range of equivalents, we should be extremely reluctant to upset the basic assumptions of the PTO without substantial reason for doing so. Our prior cases have consistently applied prosecution history estoppel only where claims have been amended for a limited set of reasons, and we see no substantial cause for requiring a more rigid rule invoking an estoppel regardless of the reasons for a change.[97]

Beyond making amendments strictly to overcome the prior art, the Court did not preclude the application of prosecution history estoppel for other amendments: "Where the reason for the change was not related to avoiding the prior art, the change may introduce a new element, but it does not *necessarily* preclude infringement by equivalents of that element."[98] Therefore, amendments to the claims, that have nothing to do with the prior art, may be considered to invoke an estoppel.

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obtain the issuance of a patent by distinguishing the prior art cannot be sustained to cover that which was previously by limitation eliminated from the patent')." *Id.* at 1050 n.5, 41 U.S.P.Q.2d (BNA) at 1872 n.5.

[97] *Id.* at 1050, 41 U.S.P.Q.2d (BNA) at 1872 (citation and footnote omitted).

[98] *Id.* at 1050-51, 41 U.S.P.Q.2d (BNA) at 1872 (emphasis added).

For example, consider a narrowing amendment to overcome an "enablement" rejection under 35 U.S.C. section 112, paragraph 1. In *Litton Systems, Inc. v. Honeywell, Inc.*[99], one of the remand cases from the Supreme Court following *Warner-Jenkinson*, the patentee was faced with a series of obviousness rejections. The patentee argued that a specific feature of its invention, a Kaufman-type ion beam source, was not found in the art, and that the term "ion beam" used in the claims referred to a Kaufman-type ion beam source.[100] The examiner made an informal rejection under section 112, paragraph 2, that the patentee did not particularly point out and distinctly claim the subject matter that the patentee regards as his invention. The patentee responded by amending the claims to read that the "ion beam" was "produced or derived from a Kaufman-type ion beam source."[101] The patentee argued that this did not produce an estoppel, as it was responding to a section 112, second paragraph rejection, and cited *Warner-Jenkinson* for the proposition that amendments in response to section 112 rejections are not related to patentability.[102]

The Federal Circuit disagreed, finding that the amendment was "related to patentability" and therefore gave rise to a presumption of an estoppel.[103] First, the court noted that the rejection in this case, a section 112, second paragraph, rejection for what the applicant "regards as his invention," is one that is unlike other types of formal rejections:

> Although amendments made in response to indefiniteness and enablement rejections are generally not made "in response to the prior art," the amendment made in response to the section 112 rejection at issue here, a "regards as his invention" rejection, was related to patentability. Without evidence to the contrary, an examiner should presume that a claim recites what the applicant regards as his invention. Moreover, "some material submitted by [the] applicant, *other*

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[99] 140 F.3d 1449, 46 U.S.P.Q.2d (BNA) 1321 (Fed. Cir. 1998).

[100] *Id.* at 1458-60, 46 U.S.P.Q.2d (BNA) at 1327-29.

[101] *Id.* at 1460-61, 46 U.S.P.Q.2d (BNA) at 1329.

[102] *Id.* at 1461, 46 U.S.P.Q.2d (BNA) at 1329-30.

[103] *Id.*, 46 U.S.P.Q.2d (BNA) at 1330.

> *than his specification*" must warrant this type of section 112 rejection. Thus, an examiner generally makes a "regards as his invention" rejection only as to an applicant's position becomes clear over the course of prosecution. In other words, this rejection almost always follows some other rejection of the inventive material as set forth in the claim.[104]

Therefore, the court continued, it could not ignore the real basis for the section 112, second paragraph, rejection in this case:

> Consequently, this court cannot ignore the rejections which preceded this "regards as his invention" rejection. This particular "regards as his invention" rejection followed a series of obviousness rejections. In effect, the examiner threatened to reject again for obviousness unless the applicant restated its claim to match the scope of its narrow arguments for patentability. In this context, the section 112 rejection carried the same message as the prior obviousness rejection. An obviousness rejection is of course made in response to prior art. Consequently, this court determines that [the patentee] made its amendment for reasons related to patentability.[105]

The *Litton* decision shows that the Federal Circuit is willing to parse through the prosecution history, and determine the real reason behind the Patent Office's rejections, and the applicant's responses, to evaluate the reason for an amendment.

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[104] *Id.* (emphasis in original) (citations omitted).

[105] *Id.*

B. *Estoppel By Silence*

What if no reason for an amendment to a claim is apparent?

This is the situation in *Warner-Jenkinson*. The Court pointed to the specific factual situation at hand:

> [T]he patent examiner objected to the patent claim due to a perceived overlap with the [closely related prior art] Booth patent, which revealed . . . [a] process operating at a pH above 9.0. In response to this objection, the phrase "at a pH from approximately 6.0 to 9.0" was added to the claim. While it is undisputed that the upper limit of 9.0 was added in order to distinguish the Booth patent, the reason for adding the lower limit of 6.0 is unclear. The lower limit certainly did not serve to distinguish the Booth patent, which said nothing about pH levels below 6.0. Thus, while a lower limit of 6.0, by its mere inclusion, became a material *element* of the claim, that did not necessarily preclude the application of the doctrine of equivalents as to that element. Where the reason for the change was not related to avoiding the prior art, the change may introduce a new element, but it does not necessarily preclude infringement by equivalents of that element.[106]

No reasons were given by Hilton Davis for its narrowing of the claim *at the lower end* at pH 6.0. Why was this amendment made?[107] Did Hilton

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[106] *Warner-Jenkinson*, 117 S. Ct. at 1050-51, 41 U.S.P.Q.2d (BNA) at 1872 (emphasis in original) (footnote and citations omitted).

[107] If there was any single trigger for directing the result of *Warner-Jenkinson*, it may be found in the questioning of appellee's counsel by Justice Scalia concerning the need to look to the prosecution history to determine the scope of protection:

> JUSTICE SCALIA: Well, whatever the reason [for introducing the pH limitation of from 6 to 9] was, at least he says it has to be from 6 to 9. Now, your argument is, well, he had no reason for the 6.
>
> MR. SCHMIT: That's right.

Davis consider it necessary to establish an entire range as critical and/or superior to overcome prior art at the upper end in which case clearly there should be an estoppel created, notwithstanding any legal reasoning failure on the part of Hilton Davis? Was Hilton Davis merely interested in taking the claim and running, figuring that nobody would want to practice at the lower end? Was the patent largely defensive in nature, so that all Hilton Davis wanted was some claim to protect *its* embodiment under commercialization?

In cases where no reason is supplied for the amendment to the claim, a presumption that the claim amendment was made for "reasons of patentability" is introduced. As the Court explained in *Warner-Jenkinson*:

> We are left with the problem . . . of what to do in a case like the one at bar, where the record seems not to reveal the reason for including the lower pH limit of 6.0. In our view, holding that certain reasons for a claim amendment may avoid the application of prosecution history estoppel is not tantamount to holding that the absence of a reason for an amendment may similarly avoid such an estoppel.[108]

> JUSTICE SCALIA: He had a reason for the 9, no reason for the 6, and therefore we can disregard the 6. That requires whoever's conducting this to not only see what he said, but go further back into the history and see the reasons for what he said.
>
> MR. SCHMIT: That's entirely correct.
>
> JUSTICE SCALIA: I don't like history. I'm not inclined to. (Laughter.)
>
> JUSTICE SCALIA: I don't want to go any further back than I have to.

Warner-Jenkinson Oral Argument Transcript at 39-40.

[108] 117 S. Ct. at 1051, 41 U.S.P.Q.2d (BNA) at 1873.

The Court explained its policy reasons favoring industry over the patentee in a case where the patentee had failed to explain his motivations for narrowing:

> Mindful that claims do indeed serve both a definitional and a notice function, we think the better rule is to place the burden on the patent-holder to establish the reason for an amendment required during patent prosecution. The court then would decide whether that reason is sufficient to overcome prosecution history estoppel as a bar to application of the doctrine of equivalents to the element added by that amendment. Where no explanation is established, however, the court should presume that the PTO had a substantial reason related to patentability for including the limiting element added by amendment. In those circumstances, prosecution history estoppel would bar the application of the doctrine equivalents as to that element.[109]

In its conclusion, the state of prosecution history estoppel is explained as follows:

> Prosecution history estoppel continues to be available as a defense to infringement, but if the patent-holder demonstrates that an amendment required during prosecution had a purpose unrelated to patentability, a court must consider that purpose in order to decide whether an estoppel is precluded. Where the patent-holder is unable to establish such a purpose, a court should presume that the purpose behind the required amendment is such that prosecution history estoppel would apply.[110]

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[109] *Id.*

[110] *Id.* at 1054, 41 U.S.P.Q.2d (BNA) at 1876.

There are certain loose ends. Is the presumption rebuttable? Yes, says the Court. But under what terms? This is something that the Federal Circuit will have to determine for the future as it modifies its own test to accommodate the direction that has been provided in *Warner-Jenkinson*. The Court offers the following guidance:

> The presumption [of an estoppel], one subject to rebuttal if an appropriate reason for a required amendment is established, gives proper deference to the role of claims in defining an invention and providing public notice, and to the primacy of the PTO in ensuring that the claims allowed cover only subject matter that is properly patentable in a proffered patent application. Applied in this fashion, prosecution history estoppel places reasonable limits on the doctrine of equivalents, and further insulates the doctrine from any feared conflict with the Patent Act.[111]

Left open is the question of whether the reasons for a narrowed interpretation must be within the four corners of the patent prosecution or whether a milder test may be applied. The Supreme Court left this to the Federal Circuit on remand:

> Because [patentee Hilton Davis] has not proffered in this Court a reason for the addition of a lower pH limit, it is impossible to tell whether the reason for that addition could properly avoid an estoppel. Whether a reason in fact exists, but simply was not adequately developed, we cannot say. On remand, the Federal Circuit can consider whether reasons for that portion of the amendment were offered or not and whether further opportunity to establish such reasons would be proper.[112]

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[111] *Id.* at 1051, 41 U.S.P.Q.2d (BNA) at 1873.

[112] *Id.*

C. *Estoppel By Argument, Alone*

Recently the Federal Circuit is willing to find an estoppel when there has been no amendment to the claim, and the only basis for the estoppel is the patentee's arguments before the Patent Office.

Thus, under this precedent, mere argument can create an estoppel. As explained in *Litton*:

> This court has acknowledged that even arguments made during prosecution without amendments to claim language—if sufficient to evince a clear and unmistakable surrender of subject matter—may estop an applicant from recapturing that surrendered matter under the doctrine of equivalents. Estoppel by clear and unmistakable surrender without claim amendments may arise even when the arguments to the examiner were not necessary to distinguish prior art. This principle presupposes that the applicant has made the surrender unmistakable enough that the public may reasonably rely on it.[113]

Moreover, the arguments need not be made in a formally-denoted "reply" to an Official Action. That is, such arguments may be found in other papers filed with the Patent Office, such as an Information Disclosure Statement (IDS).[114] The Federal Circuit has opined that arguments to the Patent Office made outside the normal context of a reply to a rejection, may be considered a different form of estoppel, apart from prosecution history estoppel, and preclude a patentee from making inconsistent arguments later in litigation. Thus, in *Vehicular Technologies Corp. v. Titan Wheel International, Inc.*, the Court stated that:

> The available scope of protection of a patent under the doctrine of equivalents is not, however, limited solely by

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[113] *Litton*, 140 F.3d at 1458, 46 U.S.P.Q.2d (BNA) at 1327 (citations omitted).

[114] Ekchian v. Home Depot, Inc., 104 F.3d 1299, 1304, 41 U.S.P.Q.2d (BNA) 1364, 1368 (Fed. Cir. 1997) ("[A]rguments in an IDS can create an estoppel, and thus preclude a finding of infringement under the doctrine of equivalents.").

> prosecution history estoppel, the continuing vitality, rigors, and parameters of which the Supreme Court addressed in its *Warner-Jenkinson* decision. In addition, a separate body of case law confirms that a patentee may otherwise lose the right to assert coverage of allegedly equivalent structure or matter. The case law to which we refer establishes that, through statements made during prosecution of a patent application, it can become evident that an asserted equivalent is beyond coverage under the doctrine of equivalents.[115]

The court then provided what it considered examples of arguments belonging to this separate group:[116]

- *Gentry Gallery, Inc. v. Berkline Corp.*[117] (arguments made in Petition to Make Special limit the range of equivalents).
- *Tanabe Seiyaku Co. v. United States Int'l Trade Comm'n*[118] (statements made during prosecution demonstrated that ketone solvents other than acetone could not be asserted as equivalents).
- *Ekchian v. Home Depot, Inc.*[119] (grounding denial of asserted equivalent on statement made in information disclosure statement).

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[115] 141 F.3d 1084, 1090, 46 U.S.P.Q.2d (BNA) 1257, 1261 (Fed. Cir. 1998).

[116] *Id.*, 46 U.S.P.Q.2d (BNA) at 1261-62.

[117] 134 F.3d 1473 (Fed. Cir. 1998).

[118] 109 F.3d 726, 732, 41 U.S.P.Q.2d (BNA) 1976, 1981-82 (Fed.Cir.), cert. denied, 118 S. Ct. 624, 139 L. Ed. 2d 605 (1997).

[119] 104 F.3d 1299, 1304, 41 U.S.P.Q.2d (BNA) 1364, 1368 (Fed. Cir. 1997).

- *Maxwell v. J. Baker, Inc.*[120] (patentee barred from asserting as an equivalent subject matter that was unmistakably disclosed, but not claimed in patent application).

- *Applied Materials*[121] (written description demonstrated that a certain function must be performed by claimed process, and accused process that did not perform that function could not be asserted as an equivalent).

- *Texas Instruments Inc. v. United States Int'l Trade Comm'n*[122] (unmistakable assertions made by the applicant preclude assertion of equivalency).

However the arguments are classified, the effect is essentially the same—estoppel against the patentee can be invoked and may preclude a finding of infringement under the doctrine of equivalents (depending on the extent of the estoppel).

In *Warner-Jenkinson*, the Court was faced with the classic situation of an actual narrowing of the claims, and not the situation of an original claim limitation where arguments of criticality were keyed to a particular claim limitation. Otherwise, the propriety of invoking estoppel based on argument alone could be questioned based on dictum in *Warner-Jenkinson*, where the Court stated that "[o]ur prior cases have consistently applied prosecution history estoppel only where claims have been amended in a limited set of reasons . . . ."[123]

Arguments of patentability to obtain allowance, keyed to an admission of the narrow scope of the invention, is at the heart of prosecution history estoppel. It is certainly easier to focus upon an estoppel created by narrowing coupled with argument, but the case may be made that a focused argument pinpointing the criticality of a particular feature

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[120] 86 F.3d 1098, 1107, 39 U.S.P.Q.2d (BNA) 1001, 1006 (Fed. Cir. 1996), cert. denied, 117 S. Ct. 1244, 137 L. Ed. 2d 327 (1997).

[121] 98 F.3d at 1574, 40 U.S.P.Q.2d (BNA) at 1489-90.

[122] 988 F.2d 1165, 1174, 26 U.S.P.Q.2d (BNA) 1018, 1025 (Fed. Cir. 1993).

[123] *Warner-Jenkinson*, 117 S. Ct. at 1050, 41 U.S.P.Q.2d (BNA) at 1872.

vis-à-vis the prior art should, alone, be basis for estoppel—as has been held in the previously discussed panel opinions for the Federal Circuit.

D. *Limitations From Other Claims*

The Supreme Court did not directly touch the Federal Circuit line of cases that find estoppel for an *unamended* claim where a feature of that claim has been the subject of a narrowed amendment in a *second* claim in a *different* category—method versus apparatus.[124]

In *Hebert v. Lisle Corp.*, patentee Herbert's method claims in controversy contained a limitation that was in the original method claims.[125] But, the same limitation was also in previously sought apparatus claims, where the limitation was originally broader, reduced by amendment to a scope approved by the Examiner and then carried forward into Hebert's method claims.[126]

The court summarized the arguments as follows:

> Mr. Hebert's argument is that although he had previously placed limitations in the apparatus claims, these limitations were added in order to distinguish references cited against the claims while they were in apparatus form. Mr. Hebert states that since none of the references cited against the apparatus claims was applied to the method claims indeed no prior art was cited against the method claims the arguments and amendments he made while his claims were in apparatus form should not limit the range of equivalents available to the method claims. He asks us to endorse the legal correctness of this position. . . . [Accused infringer] "Lisle responds that since there is no way of knowing whether the examiner would have made the same prior art

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[124] It is too well settled to cite cases for the proposition that an unamended claim is subject to prosecution history estoppel where it replaces a broader claim, e.g., in a continuation, or where a subclaim remains after cancellation of a broader, generic claim.

[125] 99 F.3d 1109, 1118, 40 U.S.P.Q.2d (BNA) 1611, 1617 (Fed. Cir. 1996).

[126] *See id.*, 40 U.S.P.Q.2d (BNA) at 1617.

> rejections had the claims been initially presented in method form instead of in apparatus form, all of the amendments and arguments that were made must be viewed as creating an estoppel."[127]

The Federal Circuit found a trial necessary to resolve the issue:

> It is of course necessary to consider not only the amendments to the claims but the reason why they were made, but in so doing all aspects of the prosecution must be viewed as they would be viewed by persons of skill in the field of the invention. The method claims are not totally insulated from the previous prosecution of the apparatus claims, for it was not necessary for the examiner to repeat previous rejections if they had been satisfied. The issues raised by both sides' positions require development of the evidence, and determination with the benefit of the procedures of trial.[128]

Under *Warner-Jenkinson*, the argument, though perhaps tenuous, can be made that the patentee through silence introduced a limitation from parallel claims without any attempt to explain a purpose other than avoiding the prior art. The question then is whether summary judgment should have been granted in a case like *Hebert*.

E. *Amendments And Arguments In A Parent File*

It is quite common for a patent to issue on an unamended claim with little or no prosecution history in the patent file but with extensive argumentation, alone or with amendments, in one or more parent applications. The general rule is that argumentation and amendments in a

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[127] *Id.*

[128] *Id.* at 1118-19, 40 U.S.P.Q.2d (BNA) at 1617 (citations omitted).

parent should be considered both in the construction of the claim scope and in determining the presence and scope of prosecution history estoppel.[129]

In *Haynes International Inc. v. Jessop Steel Co.*, with respect to an unamended claim 5, prosecution history estoppel was keyed to the scope of claims and argumentation made in the parent:

> Haynes' . . . argument is that there is no estoppel because Cabot never amended original claim 5 during prosecution. We reject this argument because it exalts form over substance. It also conflicts with our precedent, which has consistently recognized a broad range of activities which can give rise to prosecution history estoppel. There is of course the classic example of prosecution history estoppel an amendment in response to a prior art rejection. But our precedent encompasses other conduct as well: statements contained in a disclosure document placed in the PTO file as well as representations made during the prosecution of the parent application; remarks made during prosecution of a claim not in suit as well as statements made after the examiner indicated the claims in suit were allowable; and arguments submitted to obtain the patent. Thus, an estoppel can be created even when the claim, which is the basis for the assertion of infringement under the doctrine of equivalents, was not amended during prosecution.[130]

In *Jonsson v. Stanley Works*,[131] the term "diffuse light" in the '912 patent in suit had a narrow interpretation in the parent '008 application,

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[129] Mark I Mktg. Corp. v. R.R. Donnelley & Sons Co., 66 F.3d 285, 291, 36 U.S.P.Q.2d (BNA) 1095, 1100 (Fed. Cir. 1995), *cert. denied*, 116 S. Ct. 917 (1996) (cited with approval, Wang Labs., Inc. v. Mitsubishi Elec. Am., Inc., 103 F.3d 1571, 1577, 41 U.S.P.Q.2d (BNA) 1263, 1269 (Fed. Cir. 1997)); *see also* Texas Instruments, Inc. v. United States Int'l Trade Comm'n, 988 F.2d 1165, 1173-75, 26 U.S.P.Q.2d (BNA) 1018, 1025-26 (Fed. Cir. 1993).

[130] 8 F.3d 1573, 1579, 28 U.S.P.Q.2d (BNA) 1652, 1657 (Fed. Cir. 1993) (citations omitted).

[131] 903 F.2d 812 14 U.S.P.Q.2d (BNA) 1863 (Fed. Cir. 1990).

which was first used in claim construction (as opposed to the creation of any estoppel):

> The '912 patent is the result of a continuation-in-part application from the original '008 application. . . . Hence, the prosecution history of the ['008 application] and the construction of the term "diffuse light" contained in that patent, is relevant to an understanding of "diffuse light" as that term is used in the '912 patent. Consequently, as to "diffuse light" in its interpretation of the '912 patent, the district court did not err in relying on "arguments and remarks" made during the prosecution of the ['008 application].[132]

In *Modine Manufacturing Co. v. United States International Trade Commission*,[133] changes from the parent to the "child" application were found to be a basis for limiting the scope of the "child": "The change in the description of the hydraulic diameter in the specification from grandparent to parent/child application, and the arguments to the patent examiner, highlighted the applicant's action in distinguishing the [ ] claims from the Cat condenser."[134]

F. *Reexamination: Post-Grant Estoppels*

The Court in *Warner-Jenkinson* did not deal with the issue of post-grant narrowing of claims. However, following the rationale of *Warner-Jenkinson*, it should be clear that if the patentee narrows his claims in a reexamination proceeding in the same manner as in an *ex parte* examination, an estoppel should be found. This is indeed the law of the Federal Circuit.[135]

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[132] *Id.* at 818, 14 U.S.P.Q.2d (BNA) at 1869.

[133] 75 F.3d 1545, 37 U.S.P.Q.2d (BNA) 1609 (Fed. Cir. 1996).

[134] *Id.* at 1556, 37 U.S.P.Q.2d (BNA) at 1616.

[135] *See* Cole v. Kimberly-Clark Corp., 102 F.3d 524, 532, 41 U.S.P.Q.2d (BNA) 1001, 1007 (Fed. Cir. 1996).

G. *Erroneous Narrowing Amendments*

Where the patentee creates an estoppel because he did not understand the facts, the fact that the argument was unnecessary does not neutralize the estoppel. Thus, the patent applicant who carelessly (or otherwise) argues criticality of a narrowed range is estopped from arguing later that he did not have to make the narrowing change:

> We do not suggest that, where a change is made to overcome an objection based on the prior art, a court is free to review the correctness of that objection when deciding whether to apply prosecution history estoppel. . . .[S]uch concerns are properly addressed on direct appeal from the denial of a patent, and will not be revisited in an infringement action.[136]

H. *Effect Of Invoking Prosecution History Estoppel—Recapture After Amendment*

Once it is determined that prosecution history estoppel should be invoked in a particular case, the next step is to determine what the effect of the estoppel should be. Should the patentee be barred from any equivalents with respect to the claim limitation that was added/amended during prosecution? Or should the patentee be permitted a degree of "recapture" of subject matter that was not necessary to distinguish the invention from the prior art?

1. Preliminary Matters In Determining The Effect Of The Estoppel—Viewpoint And "Surrendered Subject Matter"

First, the proper viewpoint from which to view what subject matter the patentee surrendered during prosecution history is that of a reasonable competitor.[137] Subjective intent of the patentee is not the standard.[138]

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[136] *Warner-Jenkinson*, 117 S. Ct. at 1050 n.7, 41 U.S.P.Q.2d (BNA) at 1873 n.7 (citing Smith v. Magic City Kennel Club, Inc., 282 U.S. 784, 789-790 (1931)).

[137] Insituform Techs., Inc. v. Cat Contracting, Inc., 99 F.3d 1098, 1107-08, 40 U.S.P.Q.2d (BNA) 1602, 1609 (Fed. Cir. 1996) (the scope of prosecution history estoppel objectively "depends on what a competitor, reading the prosecution history, would reasonably conclude was given up by the

In addition, prosecution history estoppel estops a patentee from asserting coverage of subject matter that was "surrendered" during prosecution.[139] What does it mean to "surrender subject matter"? When an applicant makes an amendment to a claim, it could be argued that the subject matter that is surrendered is the difference between the scope of the claim before amendment, and the scope of the claim after amendment. In *Exhibit Supply Co. v. Ace Patents Corp.*,[140] the Supreme Court stated that:

> [b]y the amendment, he recognized and emphasized the difference between the two phrases and proclaimed his abandonment of *all* that is embraced in that difference. The difference which he thus disclaimed must be regarded as

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applicant"); *see also* Prodyne Enter, Inc v. Julie Pomerantz, 743 F.2d 1581, 1583, 223 U.S.P.Q. (BNA) 477, 478 (Fed. Cir. 1984) ("Where the patentee was estopped from now broadening the description of a claim element limited during prosecution so as to encompass a structure which a competitor should reasonably be entitled to believe is not within the legal boundaries of the patent claims in suit."). Some panel decisions of the Federal Circuit indicate that the proper viewpoint from which to determine what subject matter was surrendered is that of one of ordinary skill in the art. *See, e.g.*, Litton Sys., Inc. v. Honeywell, Inc., 140 F.3d 1449, 1462, 46 U.S.P.Q.2d (BNA) 1321, 1330 (Fed. Cir. 1998). However, the *in banc* decision in *Cybor Corp. v. FAS Techs., Inc.* states that the viewpoint is that of the reasonable competitor. 138 F.3d 1448, 1456, 46 U.S.P.Q.2d (BNA) 1169, 1175 (Fed. Cir. 1998). The *in banc* decision is controlling.

[138] *Insituform Techs.*, 99 F.3d at 1107, 40 U.S.P.Q.2d (BNA) at 1609 ("[i]n examining the prosecution history in an estoppel analysis, we do not look to the subjective intent of the applicant and what the applicant subjectively believed or intended that he or she was giving up to the public") (footnote ommitted).

[139] *See, e.g., Litton*, 140 F.3d at 1455, 46 U.S.P.Q.2d (BNA) at 1325 ("[T]he Supreme Court adhered to the longstanding doctrine that an estoppel only bars recapture of that subject matter *actually surrendered* during prosecution." (emphasis added)); Hughes Aircraft Co. v. United States, 140 F.3d 1470, 1476, 46 U.S.P.Q.2d (BNA) 1285, 1290 (Fed. Cir. 1998) ("The Supreme Court has long recognized that the key to prosecution history estoppel is the *surrender or disclaimer* of subject matter by the patentee, which the patentee is then unable to reclaim through the doctrine of equivalence." (emphasis added)).

[140] 315 U.S. 126, 52 U.S.P.Q. (BNA) 275 (1942).

> material, and since the amendment operates as a disclaimer of that difference it must be strictly construed against him.[141]

In essence, this approach to surrendering subject matter means that the doctrine of equivalents would not apply to amended limitations. That is, if the accused infringing device did not have the amended/added limitation upon which prosecution history estoppel was invoked, then this would also negate any infringement under the doctrine of equivalents because the accused device would necessarily fall within subject matter that was surrendered. However, despite *Exhibit Supply*, the courts have not interpreted the concept of "surrendering subject matter" in such a fashion. Rather, based on the fact that the courts have left room for equivalents even when prosecution history estoppel applies, the courts are interpreting "surrender" to mean surrendering a specific element disclosed in the prior art.

More recently, in *Litton*[142] and *Hughes Aircraft*,[143] two of the cases remanded from the Supreme Court following *Warner-Jenkinson*, the defendants in each case argued that the following language from *Warner-Jenkinson* mandated a bar against applying the doctrine of equivalents to elements for which prosecution history applies:

> Where no explanation [for an amendment to the claim] is established . . . the court should presume that the PTO had a substantial reason related to patentability for including the limiting element added by amendment. In those circumstances, prosecution history estoppel would *bar* the application of the doctrine [of] equivalents as to that element.[144]

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[141] *Id.* at 136-37, 52 U.S.P.Q. (BNA) at 279-80 (citations omitted).

[142] *See* 140 F.3d at 1456, 46 U.S.P.Q.2d (BNA) at 1326.

[143] *See* 140 F.3d at 1476, 46 U.S.P.Q.2d (BNA) at 1289-1290.

[144] 117 S. Ct. at 1051, 41 U.S.P.Q.2d (BNA) at 1873 (emphasis added).

The Federal Circuit rejected the argument. In *Litton*, the Court stressed that the Supreme Court throughout its opinion in *Warner-Jenkinson* approved of the practice of amending claims with an understanding that the doctrine of equivalents would still apply to amended language.[145] In addition, the Federal Circuit pointed to "accumulated case law of the Supreme Court and this court" on the scope of prosecution history estoppel that contradicted the defendant's "reading of a single isolated sentence."[146] Thus, the Federal Circuit pointed to *Keystone Driller Co. v. Northwest Engineering Corp.*[147] and *Smith v. Magic City Kennel Club*,[148] stating that:

> In both cases, the Court inquired into the scope of the original claim and the prior art before estopping the patentee from asserting the equivalence of a particular feature of the accused device. If an amendment related to patentability automatically precluded all equivalents to the amended language, the Court's inquiry would have been irrelevant.[149]

To further support its conclusion, the Federal Circuit pointed to the Supreme Court's approval of "after-arising equivalents" and the Supreme Court's admonition that a "brighter line for determining whether a patentee is estopped under certain circumstances is not a sufficient reason for adopting such a rule."[150] Similarly, in *Hughes Aircraft*, the Federal Circuit rejected a complete bar of the application of the doctrine of equivalents as to elements upon which prosecution history estoppel has been invoked and in fact, cited *Exhibit Supply* as support.

Despite the Federal Circuit's pronouncements in *Litton* and *Hughes Aircraft*, the discussions on this issue are plainly not over yet. In *Litton*, two

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[145] 140 F.3d at 1457, 46 U.S.P.Q.2d (BNA) at 1326.

[146] *Id.*

[147] 294 U.S. 42, 24 U.S.P.Q. (BNA) 35 (1935).

[148] 282 U.S. 784, 8 U.S.P.Q. (BNA) 123 (1931).

[149] *Litton*, 140 F.3d at 1457, 46 U.S.P.Q.2d (BNA) at 1326.

[150] *Id.*, 46 U.S.P.Q.2d (BNA) at 1326-27 (citing *Warner-Jenkinson*, 117 S. Ct. at 1050 n.6, 1052-53, 41 U.S.P.Q.2d (BNA) at 1872 n.6, 1874).

judges vigorously dissented from the court's denial of a petition to rehear the case or suggestion to rehear the case *in banc*, and two judges noted that the decision was not the last in this area of the law.[151] One of the dissenters, Judge Gajarsa, asserted that the Supreme Court was clear in its language, and that "[t]he majority seeks to evade the clear holding of the Supreme Court through a tortured interpretation of the *Warner-Jenkinson* opinion."[152] In addition, Judge Gajarsa set forth the clear language in *Exhibit Supply* that seems to bar application of the doctrine to elements added or amended for a reason related to patentability.[153]

2. Effect Of An Estoppel

The Federal Circuit in *Litton* set forth a framework for deciding the effect of prosecution history estoppel, once it has been decided that prosecution history estoppel applies:

> When prosecution history estops a patentee, the court ascertains the scope of the estoppel in several ways. First, "a patentee is estopped from recovering through equivalency that which was deemed unpatentable in view of the prior art." In other words, when an applicant, in response to an examiner's prior art rejection, amends a claim by substituting one limitation for another, the applicant cannot later assert that the original limitation is an equivalent of the substituted limitation. Thus, the doctrine prevents the applicant from *completely* recapturing the subject matter rejected by the examiner.
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> In addition, when an applicant narrows a claim element in the face of an examiner's rejection based on the prior art, the

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[151] *See generally* Litton Sys., Inc. v. Honeywell, Inc., 145 F.3d 1472, 47 U.S.P.Q.2d (BNA) 1106 (Fed. Cir. 1998). In addition, one of the dissenters, Judge Clevenger, repeated his dissent (joined by Judge Gajarsa), in the denial to rehear *Hughes in banc*.

[152] *Id.* at 1476, 47 U.S.P.Q.2d (BNA) at 1110 (Gajarsa, J., dissenting from Order).

[153] *See id.* at 1478, 47 U.S.P.Q.2d (BNA) at 1111 (Gajarsa, J., dissenting from Order).

> doctrine estops the applicant from later asserting that the claim covers, through the doctrine of equivalents, features that the applicant amended his claim to avoid. A patentee is also estopped to assert equivalence to "trivial" variations of such prior art features. Depending on the facts of the case, an amendment may also limit the patentee to its literal claim scope.[154]

After finding that prosecution history estoppel was invoked, the majority of the Federal Circuit panel in *Litton* found that the estoppel in that case was an amendment that narrowed a claim element to avoid the prior art; more specifically, it narrowed the claim language from "ion beam source" to "Kaufman-type ion beam source."[155] The Court noted that the applicant on five (or six) occasions throughout prosecution cited and distinguished some eighty-three references based on the distinction that its invention was directed to a Kaufman-type ion beam source.[156] The Federal Circuit determined that "[o]n the unique facts of this case," it was reasonable to determine that the patentee surrendered the other ion beam sources disclosed in the eighty-three references before the examiner.[157] However, the district court had not determined whether the defendant's device was a trivial variation from the sources disclosed in the prior art, thus the court remanded the case for a determination on this ground.[158]

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[154] 140 F.3d at 1462, 46 U.S.P.Q.2d (BNA) at 1330 (quoting *Pall Corp. v. Micron Separations, Inc.*, 66 F.3d 1211, 1219 (Fed. Cir. 1995)).

[155] *See id.*, 46 U.S.P.Q.2d (BNA) at 1331.

[156] *See id.* at 1463, 46 U.S.P.Q.2d (BNA) at 1331.

[157] *Id.* ("[I]n this unique case, [the patentee] repeatedly referred expressly to the many references it presented to the examiner, distinguished each reference by number over and over, and then further insisted that its claims encompassed only processes with Kaufman-type sources. To confirm that its invention was different from these references, [the patentee] further amended its claim—in the face of its knowledge of all the ion beam sources disclosed in these references—in response to the examiner's rejection.").

[158] *See id.* at 1463-64, 46 U.S.P.Q.2d (BNA) at 1332.

Prophylactically, the patentee making an amendment greater than required to establish patentability, may find it useful to explain the reasons for the amendment.

VII. SPECIAL PROBLEMS FOR CERTAIN TYPES OF INVENTIONS

Unanswered questions remain after *Warner-Jenkinson* for two categories of invention that were not touched in this case, "pioneer" inventions and the chemical or biotech *product* invention.[159] Additionally, problems remain for "means" claiming.

A. *The "Pioneer" Invention*

The scope of equivalents for a "pioneer" patent must be assumed very broad, *if sought*, simply because of the absence of close prior art.[160]

Justice Nelson introduced the term "pioneer" into the judicial literature in 1856.[161] *McCormick v. Talcott*,[162] issued just one year after Justice Nelson's opinion, held that if the patentee is

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[159] While the *Warner-Jenkinson* case dealt with a chemical purification process, it does not implicate the far more important area of the interpretation of claims to a chemical (or biotech) *product*. Since *Warner-Jenkinson* involves a purification process with a variety of steps, it is more along the classical lines of a combination patent involving chemicals and mixing steps, as opposed to a classic combination of nuts and bolts in a mechanical case.

[160] For a thorough scholarly analysis of the subject, *see* Thomas, *supra* note 12, at 35.

[161] *See* Sickles v. Borden, 22 F. Cas. 67, 70 (C.C.S.D.N.Y. 1856) (No. 12,832) ("[A]fter a principle has been discovered, after a new set of ideas have been struck out by genius and thought . . . their embodiment in machinery, their adaptation to the working out of the practical results contemplated by the inventor, is very much the work of the skilful mechanic. Any one, after becoming acquainted with the ideas of an inventor, may work them out in a manner and by machinery very different from the arrangement preferred or used by the inventor; but his merit will be far less than that of the pioneer who has developed to the community all that is new and valuable in the invention. . . .").

[162] 61 U.S. (20 How.) 402 (1857).

> the original inventor of the . . . machine . . . , he will have a right to treat as infringers all who make [such machines] operating on the same principle, and performing the same functions by analogous means or equivalent combinations, even though the infringing machine may be an improvement of the original, and patentable as such. But if the invention claimed be itself but an improvement on a known machine by a mere change of form or combination of parts, the patentee cannot treat another as an infringer who has improved the original machine by use of a different form or combination performing the same functions. The inventor of the first improvement cannot invoke the doctrine of equivalents to suppress all other improvements which are not mere colorable invasions of the first.[163]

Then and today, where the patent owner is first in a field, he or she may obtain broad protection with a range of equivalents unfettered by prior art.[164] The *absence* of close prior art gives the patentee: (a) the freedom to craft enormously broad claims for the purpose of literal coverage; (b) a freedom from prosecution history estoppel (unless inadvertently introduced); and (c) freedom from case law that precludes an equivalents finding based upon the unpatentability of that prior art.[165]

As explained by the Court in *Hildreth v. Mastoras*,[166] the shorthand expression for considering the range of equivalents available to the patentee in view of the *absence* of relevant prior art is to describe the patent as "primary," "pioneer," or "generic."[167] With close prior art, the invention is

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[163] *Id.* at 405.

[164] *See* Wilson Sporting Goods v. David Geoffrey & Assoc., 904 F.2d 677, 14 U.S.P.Q.2d (BNA) 1942 (Fed. Cir. 1990).

[165] *Id.*

[166] 257 U.S. 27 (1921).

[167] *Id.* at 34-35; *see also* Continental Paper Bag Co. v. Eastern Paper Bag Co., 210 U.S. 405, 414 (1908) ("The range of equivalents depends upon the extent and nature of the invention. If the invention is broad or primary in its character, the range of equivalents will be correspondingly broad,

"secondary" or an "improvement." These labels, however, are just that. A close inspection of the case law shows that the court in each case looks to the scope and content of the prior art to determine the range of equivalents.

B. *Chemical And Biotech Inventions*

The *Warner Jenkinson* Court's opinion provides little, if any, guidance on determining equivalents in the case of a claim to a chemical compound. This was evident from the questioning of the respondent's counsel by Justice Breyer. He posed the fact pattern of two completely different chemical entities that were each useful to grow hair,[168] obviously borrowing from Judge Lourie's earlier example of a substitution of ibuprofen for aspirin.[169] Justice Breyer asked whether, with completely different chemical structures, there was equivalency under the "triple identity" test. The respondent's counsel answered "yes", but provided less than a satisfactory bright line for determining infringement.[170] Obviously, the answer in the case of a gross structural difference, e.g., ibuprofen for aspirin, is that the two are not legally equivalents. Yet, under the triple identity test, they may well be.

The Court alluded to its difficulty with the triple identity test for the Lourie and Breyer fact patterns: "[t]here seems to be substantial agreement that, while the triple identity test may be suitable for analyzing mechanical devices, it often provides a poor framework for analyzing other products or processes."[171]

The Court also mischaracterized the facts of *Graver Tank*, stating that "in . . . Graver Tank . . . we were discussing the known interchangeability between the chemical *compound claimed* in the patent and the compound

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under the liberal construction which the courts give to such inventions." (quoting Miller v. Eagle Mfg. Co., 151 U.S. 186, 207 (1894)); Westinghouse Electric & Mfg. Co. v. Formica Insulation Co., 266 U.S. 342, 351 (1924).

[168] *Warner-Jenkinson* Oral Argument Transcript at 39-40.

[169] *See infra* Part VII.B.1.

[170] *Warner-Jenkinson* Oral Argument Transcript at 40.

[171] *Warner-Jenkinson*, 117 S. Ct. at 1054, 41 U.S.P.Q.2d (BNA) at 1875.

substituted by the alleged infringer."[172] This is not at all the situation in *Graver Tank*, where the claim was not to a compound *per se*, but where the inorganic compound *in* the claim was but one element of the overall claim. Indeed, the "compound claimed" in *Graver Tank* was clearly an old compound, so that *Graver Tank* provides no guidance at all.

The Supreme Court guidance on the test for the doctrine of equivalents is unsuited to the realities of biotech and chemical entities: "[T]he particular linguistic framework used is less important than whether the test is probative of the essential inquiry: Does the accused product or process contain elements identical or equivalent to each claimed element of the patented invention?"[173] But, there is only one "element" in a chemical compound: the three-dimensional chemical compound, *per se*. It is an act of paper chemistry alone to dissect the various "R" groups of the chemical structure and look to equivalency of each. It is the compound *as a whole*, a single entity, that is claimed.

The more specific guidance offered by the Supreme Court is equally a non sequitur: "A focus on individual elements and a special vigilance against allowing the concept of equivalence to eliminate completely any such elements should reduce considerably the imprecision of whatever language is used."[174] Again, a chemical compound is an integral "thing," not a combination of elements. Yet again:

> An analysis of the role played by each element in the context of the specific patent claim will thus inform the inquiry as to whether a substitute element matches the function, way, and result of the claimed element, or whether the substitute element plays a role substantially different from the claimed element.[175]

Here, once again, no guidance is offered from the triple identity test.

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[172] *Id.* at 1052, 41 U.S.P.Q.2d (BNA) at 1874 (emphasis added).

[173] *Id.* at 1054, 41 U.S.P.Q.2d (BNA) at 1875.

[174] *Id.*

[175] *Id.*

There are often entirely different chemical compounds that perform the same results and otherwise meet the triple identity test of *Graver Tank*.

1. "Ibuprofen" As An Equivalent Of "Aspirin" And The Same With Hair Growth Agents

Both the Federal Circuit and the Supreme Court struggled with "equivalence" of distinctly different chemical moieties. They were not aided by the inability of counsel to teach the judges and justices during oral argument.

The dissent in *Hilton Davis* shows the difficulty of applying case law from the mechanical arts to the chemical field:

> New chemical compounds differ structurally from old compounds (that is what makes them new) and yet they may perform the same function (have the same use), provide the same result, and do so in the same way. The fact that they do so in the same way does not make them substantially the same in the way they are defined, *i.e.*, by structure. I emphasized this point in my concurring opinion in *Genentech, Inc. v. Wellcome Foundation*, 29 F.3d 1555, 31 USPQ2d 1161 (Fed. Cir. 1994), in which I pointed out that a protein containing 446 amino acids could not reasonably be held to infringe a claim to a material with 527 amino acids. The difference between the materials is enormous, irrespective of FWR. *One can also consider the example of the well-known analgesics aspirin and ibuprofen. These compounds have the same function (to provide analgesia, anti-inflammatory activity, and lower temperature), do so in the same way (by inhibiting prostaglandin synthesis), and give the same results (kill pain, relieve inflammation, and lower fever). Yet, they have different structures, which makes them different compounds, and no knowledgeable person would consider that a claim to aspirin would be infringed by the sale of ibuprofen.*[176]

[176] *Hilton Davis*, 62 F.3d 1512, 1546, 35 U.S.P.Q.2d (BNA) 1641, 1669 (Lourie, J., dissenting) (emphasis added).

The ibuprofen/aspirin analgesic couplet raised by Judge Lourie was brought out at oral argument in *Warner-Jenkinson*. Instead of using the analgesic example of Judge Lourie, Justice Breyer presented Hilton Davis' counsel a hypothetical in which he "ha[s] invented five chemicals, A, B, C, D, E, and you put them together and it grows hair . . . ."[177] Counsel was asked whether at "sometime in the future, 15 years from now, people discover a new chemical [X], [that] didn't even exist before [that] does the same [thing] as A * * * but they use X, and then I guess that's equivalent, and then I'm going to obviously say, then they invent Y, and then Z, and pretty soon instead of A, B, C, D and E, what we have are five totally new chemicals, [that] didn't exist before, but still grow[ ] hair in the same way, same function, same [result] now, is that supposed to be equivalent?"[178]

Counsel answered that "the same test" *should* be applied.[179] From this, Justice Breyer stated "the lawyers [for Warner-Jenkinson] are arguing, my goodness, we're supposed to advise clients, and we have no idea how to do it, because we read the patent [file] and we know with this doctrine people might discover all kinds of new chemicals in the future, and we just don't know how to do it, and so what we're groping for, is there then no limitation on this doctrine of equivalents?"[180] He questioned: "[H]ow do you prevent it from becoming so uncertain an element that it becomes impossible to advise the client?"[181]

2. Paucity Of Federal Circuit Infringement Holdings

Ironically, while the biotech and chemical industries often proclaim loudly that the doctrine of equivalents is important in their dealings with (or

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[177] *Warner-Jenkinson* Oral Argument Transcript at 39.

[178] *Id.* at 39-40.

[179] *Id.* at 40.

[180] *Id.* The argument was maintained that the same equivalents test would apply. But, an attempt was made by counsel to introduce the known equivalents test by referring to "the time the advice is being sought. Tomorrow, it may change, but at least as of the point in time that we're talking about right now, what does the person of ordinary skill in the art know about these equivalents? Is there an insubstantial difference?" *Id.*

[181] *Id.*

bashings of) foreign patent offices and courts, domestically there is a paucity of case law from the Federal Circuit supporting the doctrine of equivalents for new bio and chemical entities. A precedential Federal Circuit holding finding equivalence of a new chemical entity may be as scarce as a hen's tooth.

3. Is Equivalency Needed For Chemical Entities?

The question of whether a doctrine of equivalents is needed for new chemical entities where the core structure of the compound itself is changed is difficult to answer. The Federal Circuit seldom sees an equivalents case brought for a regulated chemical where there is a true substitution of a core portion of the compound.[182]

The answer may be different for variations outside the "core" of the compound. There are various modifications of the compound that can be made that are truly minor and predictable. For example, a compound which is an acid may be easily formulated in various salt and ester formulations. If the claim is to the compound, *per se*, and an accused infringer sells a salt or ester, there may not be literal infringement.[183]

Compounds with at least one asymmetric carbon atom are in fact racemates of individual isomers, where one of the isomers may have a much greater potency. Courts have not had difficulty finding infringement in this situation, as seen from the Darvon patent case.[184]

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[182] But, there is also a plausible answer quite independent from the doctrine of equivalents. A company is loathe to spend tens or hundreds of millions of dollars on regulatory approval of any compound that lacks literal protection *around the world* (including Japan and Europe), and as there are usually dozens of equally promising compounds that pass initial screening tests, the one that is chosen to go the route through full regulatory process will be one that has literal protection.

[183] But, the cautious patent attorney generally will include the salts and esters in the patent application, so that, as a general rule, there should be literal protection.

[184] *See* Eli Lilly & Co. v. Generix Drug Sales, Inc., 460 F.2d 1096, 174 U.S.P.Q. (BNA) 65 (5th Cir. 1972).

A more difficult question is the "pro" form, where a functional group of a drug is masked by addition of a protecting group that is dissolved *in situ* after the patient swallows the tablet, either in the stomach or the small intestine.[185] At that point, the masking group fades away, to yield the patented drug inside the patient's body. It is difficult to provide literal protection for all pro drug forms, yet if there is no doctrine of equivalents for such pro drug forms, then this may be an invitation to piracy of a drug patent.

4. Need For A New Test

Ibuprofen clearly is not the equivalent of aspirin, nor are totally different chemical hair growth structures equivalent. In one of the co-author's opinion, a test is needed to cover this fact pattern.

C. *A Word About "Means" Claiming*

Means claiming is governed by the sixth paragraph of 35 U.S.C. 112, which provides that "[a]n element in a claim for a combination may be expressed as a means . . . for performing a specified function without the recital of structure . . . and such claim shall be construed to cover the corresponding structure . . . described in the specification *and equivalents* thereof."[186]

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[185] *See Marion Merrell Dow, Inc. v. Baker Norton Pharm., Inc.*, 948 F. Supp. 1050, 1054 n.4, 41 U.S.P.Q.2d (BNA) 1127, 1134 n.4 (S.D.Fla. 1996) ("when a patent claims a compound . . ., the patent covers that compound regardless of whether it is made synthetically or is produced in the body after ingestion of a different compound.") (quoting *Zenith Labs., Inc. v. Bristol-Myers Squibb Co.*, 19 F.3d 1418 (Fed. Cir. 1994)), *appeal dismissed*, 152 F.3d 941 (unpublished table decision) (Fed. Cir. 1998).

[186] 35 U.S.C. § 112 (1994) (emphasis added); *see also Warner-Jenkinson*, 117 S. Ct. at 1048, 41 U.S.P.Q.2d (BNA) at 1870 ("Thus, under this new provision, an applicant can describe an element of his invention by the result accomplished or the function served, rather than describing the item or element to be used (*e.g.*, 'a means of connecting Part A to Part B,' rather than 'a two-penny nail'). Congress enacted §112, ¶ 6 in response to *Halliburton Oil Well Cementing Co. v. Walker*, which rejected claims that 'do not describe the invention but use 'conveniently functional language at the exact point of novelty,' 329 U.S. 1, 8, 67 S.Ct. 6, 9-10, 91 L.Ed. 3 (1946) (citation omitted). See *In re Donaldson Co.*, 16 F.3d 1189, 1194 (C.A.Fed.1994) [(en banc)] (Congress enacted predecessor of § 112, ¶ 6 in

The Court provided guidance on "means" equivalents:

> section 112, paragraph 6 now expressly allows so called "means" claims, with the proviso that application of the broad literal language of such claims must be limited to only those means that are "equivalent" to the actual means shown in the patent specification. This is an application of the doctrine of equivalents in a restrictive role, narrowing the application of broad literal claim elements. We recognized this type of role for the doctrine of equivalents in *Graver Tank* itself.[187]

The Court confirmed that there is no help in the "means" provision of the 1952 Patent Act for the interpretation of the doctrine of equivalents: "The [means] provision, however, is silent on the doctrine of equivalents as applied where there is no literal infringement."[188] The Court concluded that "the lengthy history of the doctrine of equivalents strongly supports adherence to our refusal in *Graver Tank* to find that the [statutory means provision of the] Patent Act conflicts with that doctrine."[189]

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response to *Halliburton*); *In re Fuetterer*, 50 C.C.P.A. 1453, 319 F.2d 259, 264, n.11 (1963) (same); see also, 2 D. CHISUM, PATENTS § 8.04[2], at 63-64 (1996) (discussing 1954 commentary of then-Chief Patent Examiner P.J. Federico).").

[187] *Warner-Jenkinson*, 117 S. Ct. at 1048, 41 U.S.P.Q.2d (BNA) at 1870-71 (citation omitted).

[188] *Id.*, 41 U.S.P.Q.2d (BNA) at 1871.

[189] *Id.* In-depth consideration of interpreting, and applying the doctrine of equivalents to, means elements is beyond the scope of this paper. For examples of post-*Warner-Jenkinson* cases addressing the interpretation and application of doctrine of equivalents in the area of means elements, see generally Vehicular Techs. Corp. v. Titan Wheel Int'l, Inc., 141 F.3d 1084, 46 U.S.P.Q.2d (BNA) 1752 (Fed. Cir. 1998) Chiuminatta Concrete Conc. v. Cardinal Indus., Inc., 145 F.3d 1303, 46 U.S.P.Q.2d (BNA) 1257 (Fed. Cir. 1998).

VIII. CHALLENGES BEYOND *WARNER-JENKINSON*

A. *Challenges For The Judiciary*

1. Crafting A Doctrine Of Equivalents

In the wake of *Warner-Jenkinson* a major challenge is to retool a positive doctrine of what *is* an equivalent.

a. *The false premise of a final solution*

The Court in *Warner-Jenkinson* thought that it had achieved the goal of providing reasonable certainty by its negatived equivalents, possibly rendering moot the need for further clarification of a *positive* definition for the doctrine of equivalents:

> The presumption [of implied estoppel] gives proper deference to the role of claims in defining an invention and providing public notice, and to the primacy of the PTO in ensuring that the claims allowed cover only subject matter that is properly patentable in a proffered patent application. Applied in this fashion, prosecution history estoppel places reasonable limits on the doctrine of equivalents, and further insulates the doctrine from any feared conflict with the Patent Act.[190]

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[190] 117 S. Ct. at 1051, 41 U.S.P.Q.2d (BNA) at 1873. Additionally, the court in *Warner-Jenkinson* stated:

> In our view, the particular linguistic framework used is less important than whether the test is probative of the essential inquiry: Does the accused product or process contain *elements* identical or equivalent to each claimed element of the patented invention? Different linguistic frameworks may be more suitable to different cases, depending on their particular facts. A focus on *individual elements* and a special vigilance against allowing the concept of equivalence to eliminate completely any such elements should reduce considerably the imprecision of whatever language is used. An analysis of the role played by *each element* in the context of the specific patent claim will thus inform

But, there will continue to be large numbers of patents with carefully drafted claims that are allowed on the first action and claim only one element of a combination (or the "all limitations" rule does not apply), so that neither the presumption nor the tightening of the *Pennwalt* "all elements" rule will provide help, particularly where the Examiner issues no rejection based upon prior art.[191]

b. *What is an equivalent?*

The Federal Circuit has been given remarkable latitude and encouragement by the Supreme Court to craft a refined test for the doctrine of equivalents. Since *Warner-Jenkinson* reversed the Federal Circuit on the question of an estoppel, everything said about the doctrine is dicta. While dicta from the Supreme Court is given an extra measure of deference, the Supreme Court candidly has shown that it has no solution and that the Federal Circuit should create a better definition for the doctrine, even though the Supreme Court had "endeavor[ed] to clarify the proper scope of the doctrine."[192]

After providing negative guidance on what's *not* an equivalent, or what's precluded by estoppel from being found to be an equivalent, the Court concluded by stating that:

> [a]ll that remains is to address the debate regarding the linguistic framework under which 'equivalence' is determined. . . . There seems to be substantial agreement that, while the triple identity test may be suitable for

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> the inquiry as to whether a substitute element matches the function, way, and result of the claimed element, or whether the substitute element plays a role substantially different from the claimed element.

Id. at 1054, 41 U.S.P.Q.2d (BNA) at 1875 (emphasis added).

[191] A possible solution is for the introduction of a tightened "reexamination" procedure. The current reexamination law, 35 U.S.C. §§ 302-307 (1994), has numerous weaknesses for third parties, which may well be alleviated through legislative reform.

[192] *Warner-Jenkinson*, 117 S. Ct. at 1045, 41 U.S.P.Q.2d (BNA) at 1868.

> analyzing mechanical devices, it often provides a poor framework for analyzing other products or processes. On the other hand, the insubstantial differences test offers little additional guidance as to what might render any given difference "insubstantial."[193]

Provided that the Federal Circuit follows the "all elements" rule for combination patents, the Court stated that it "s[aw] no purpose in going further and micro-managing the Federal Circuit's particular word-choice for analyzing equivalence."[194] It encouraged the Federal Circuit to experiment with a new definition.[195]

c. *Rethinking a century of earlier case law*

While it is clear the Federal Circuit now has the challenge of crafting a modification of the doctrine of equivalents, the answers today are unclear.[196] However, there is abundant case law in the roughly seventy-five year period between *Winans* and *Sanitary Refrigerator*, where the Supreme Court found numerous ways to find equivalents tailored to specific factual situations.[197]

It is curious that the Federal Circuit in *Hilton Davis*[198] chose to grasp onto a test of an "insubstantial difference", which immediately focuses attention on what the *difference* is between the accused embodiment and the

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[193] *Id.* at 1054, 41 U.S.P.Q.2d (BNA) at 1875.

[194] *Id.*, 41 U.S.P.Q.2d (BNA) at 1875-76.

[195] *Id.*, 41 U.S.P.Q.2d (BNA) at 1876.

[196] Consideration of where the Federal Circuit should take the doctrine is outside the scope of this paper. For the author's views prior to *Hilton Davis*, see Wegner, *Equitable Equivalents*, *supra* note 49.

[197] See id. at 15-16 as a starting point.

[198] *See* 62 F.3d at 1517-18, 35 U.S.P.Q.2d (BNA) at 1645 ("We expect that the Federal Circuit will refine the formulation of the test for equivalence in the orderly course of case-by-case determinations, and we leave such refinement to that court's sound judgment in this area of its special expertise.").

claimed invention. Rather, the Supreme Court had previously focused upon "substantial identity" between the two, which came from Justice Bushrod Washington's "general rule [that] where the machines are substantially the same, and operate in the same manner, to produce the same result, they must be in principle the same."[199] Justice Washington further explained that he "sa[id] *substantially*, in order to exclude all formal differences. . . ."[200]

Resort to this test, which is now 180 years old, would refocus the inquiry on the sameness of the accused infringement and the claimed invention as opposed to differences, and also be completely compatible with the triple identity test as a *subtest*, which is indeed as it was under Justice Washington's statement of the law.

With substantial identity as the key element the chemical patent questions of whether an "ibuprofen" is equivalent to "aspirin"[201] would necessarily be answered in the negative: There is no way to maintain that the structure of the two drugs has substantial identity, even if the triple identity test is met.

d. *Known equivalents*

On the one hand, it is true that one of the indicia favoring a finding of equivalents is known interchangeability.[202] On the other hand, it is a

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[199] Wegner, *Equitable Equivalents*, *supra* note 49, at 15-16 (quoting Gray v. James, 10 F. Cas. 1015, 1016 (C.C.D.Pa. 1817) (No. 5,718) (Washington, J., charging jury).

[200] *Id.* (emphasis in original)(quoting Gray v. James, 10 F. Cas. 1015, 1016 (C.C.D.Pa. 1817) (No. 5,718) (Washington, J., charging jury)).

[201] This hypothetical question was raised by Circuit Judge Lourie in his dissent from *Hilton Davis*. *See Hilton Davis*, 62 F.3d at 1546, 35 U.S.P.Q.2d (BNA) at 1669.

[202] *See Warner-Jenkinson*, 117 S. Ct. at 1052, 41 U.S.P.Q.2d (BNA) at 1874 ("The known interchangeability of substitutes for an element of a patent is one of the express objective factors noted by *Graver Tank* as bearing upon whether the accused device is substantially the same as the patented invention. Independent experimentation by the alleged infringer would not always reflect upon the objective question whether a person skilled in the art would have known of the interchangeability between two

misreading of *Warner-Jenkinson* to say that known interchangeability, particularly at the time of the invention, is a condition precedent to application of the doctrine of equivalents.

(1) Reaffirming the *Temco* line

Under *Temco Electric Motor Co. v. Apco Manufacturing Co.*[203] an equivalent need not have been *known* to a worker skilled in the art to be an

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elements, but in many cases it would likely be probative of such knowledge.").

[203] 275 U.S. 319, 327-28 (1928); *see also* United States v. Line Materials Co., 333 U.S. 287, 291-92, 76 U.S.P.Q. (BNA) 399, 401 (1948) ("Dominant claims [awarded] to Southern and subservient claims to Line . . . made it impossible for any manufacturer to use both patents . . . without some cross-licensing arrangement. Cf. Temco Electric Motor co. v. Apco Mfg. Co., 275 U.S. 319, 328.").

Temco is followed by A.B. Dick Co. v. Burroughs Corp., where the Federal Circuit stated:

> It is fundamental that one cannot avoid infringement merely by adding elements if each element recited in the claims is found in the accused device. See *Temco Elec. Motor Co. V. Apco Mfg. Co.*, 275 U.S. 319, 328, 48 S.Ct. 170, 173, 72 L.Ed. 298 (1928). For example, a pencil structurally infrining a patent claim would not become noninfringing when incorporated into a complex machine that limits or controls what the pencil can write. Neither would infringement be negated simply because the patentee failed to contemplate use of the pencil in that environment.

713 F.2d 700, 703, 218 U.S.P.Q. (BNA) 965, 967-68 (Fed. Cir. 1983).

See also Water Technologies Corp. v. Calco, Ltd., 850 F.2d 660, 669, 7 U.S.P.Q.2d (BNA) 1097, 1104 (Fed. Cir. 1988) ("it is elementary patent law that a patent may issue on an improvement which infringes another's patent."); Atlas Powder Co. v. E.I. DuPont de Nemours & Co., 750 F.2d 1569, 1580, 224 U.S.P.Q. (BNA) 409, 416-417 (Fed. Cir. 1984); Fields v. Conover, 443 F.2d 1386, 170 U.S.P.Q. (BNA) 276 (C.C.P.A. 1971) (public policy considerations that favor grant of improvement patent to junior inventor, while senior patent provides generic protection, in case involving generic disclosure of tetracycline intermediates by conover and specific improvements by Fields).

equivalent.[204] The Supreme Court in *Warner-Jenkinson sub silentio* reaffirms *Temco* by stating that "whether an accused element is equivalent to a claimed element, the proper time for evaluating equivalency and thus knowledge of interchangeability between elements is at the time of infringement, not at the time the patent was issued."[205]

Clearly, a determination that equivalency is to be judged at the time of the infringement means that, in many cases, the equivalency was known only after the patent has been granted.

(2) "Transistor" versus "vacuum tube"

The classic example comes from the transition from the era of the vacuum tube to the transistor.[206] There were countless patents that provided improved circuitry keyed to vacuum tube technology, with claims covering the combination of the inventive features in the context of a vacuum tube. If the patentee were limited to the wording of his claim, this would mean that for the thousands of electrical inventions of merit with claims keyed to a vacuum tube, all of the claims would go out the window with the advent of the transistor: Now, the wording of the claim is avoided simply by using the transistor with the inventive feature.

(3) The "infringing improver"

Historically, whether or not an infringer is able to convince the Patent Examiner that the infringing embodiment is *itself* patentable is of no moment in the underlying question of whether there is infringement of a senior patent.

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[204] *See* Wegner, *Equitable Equivalents*, *supra* note 49, at Part II.A (discussing Whitney v. Fort, 29 F. Cas. 1089 (1807) (No. 17,588) (Johnson, J.)).

[205] *Warner-Jenkinson*, 117 S. Ct. at 1053, 41 U.S.P.Q.2d (BNA) at 1874.

[206] This example is borrowed from Dr. Heinz Bardehle, who made this argument during the WIPO Committee of Experts meetings in Geneva on patent harmonization in the late 1980's.

Simplistically, one can argue: "You've got your patent. I've got mine." So what? The patent right consists entirely in the ability to exclude others, and not to practice one's own patent.[207]

The "infringing improver" does not escape liability for infringement.[208] A classic case involves Phillips' patentable catalyst that nevertheless was deemed an infringement of the basic Ziegler catalyst patent.[209] As pointed out in the *Ziegler* case:

> An improver cannot appropriate the basic patent of another, and an unlicensed improver is an infringer.
>
> Correlatively, the grant of a patent on an improvement of a patented article does not excuse infringement of the dominant patent. Therefore, one who appropriates the substance of a patented invention without the consent of the patentee does not escape infringement by improving upon or subtracting from the invention so long as the essential elements are retained.[210]

In *Schreiber*, the court confirmed that "[i]f Schreiber & Goldberg's [invention] be deemed an improvement, it is irrelevant to the question of infringement [of the patent in suit]."[211]

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[207] *See* Continental Paper Bag. Co. v. Eastern Paper Bag Co., 210 U.S. 405, 424, 177 U.S.P.Q. (BNA) 481, 495 (1908).

[208] *See* Ziegler v. Phillips Petroleum Co., 483 F.2d 858, 879, 177 U.S.P.Q. (BNA) 481, 495 (5th Cir. 1973) ("Without doubt, Phillips' catalyst is an improvement, but an improver does not escape infringing the dominant patent just by improving it. Here, the evidence is clear that Phillips is an *infringing improver*." (citations omitted) (emphasis added)).

[209] *See id.*

[210] *Id.* at 871, 177 U.S.P.Q. (BNA) at 489 (citations omitted).

[211] American Safety Table Co. v. Schreiber, 269 F.2d 255, 264, 122 U.S.P.Q. (BNA) 29, 37 (2d Cir. 1958) (citations, including *Temco*, omitted); *see also* Bryan v. Sid W. Richardson, Inc., 254 F.2d 191, 197, 117 U.S.P.Q. (BNA) 157, 162 (5th Cir. 1958) ("If it be assumed arguendo . . . that the accused device was a patentable improvement . . . , that would not excuse

(4) Rethinking *Hilton Davis* dictum

The *Hilton Davis* fact pattern and issues raised had little to do with the question of known interchangability as an limitation on the doctrine of equivalents, yet it speaks of "known interchangability" as an important indicator that an accused infringement is "substantially" changed and hence avoids infringement.[212]

Hilton Davis does not go so far as to say that evidence of "known interchangeability" is absolutely necessary to find equivalents. Yet, "[w]ithout such evidence [of known interchangeability], the patentee will need other objective technological evidence demonstrating that the substitute nevertheless represents a change that the ordinary artisan would have considered insubstantial at the time of infringement."[213]

There has been some support for the "known interchangeability" standard.[214] In *Zygo Corp. v. Wyko Corp.*, the existence of an accused infringer's improvement patent was given weight to find that the change was more than "insubstantial," and hence, the doctrine of equivalents did not apply.[215] The court reasoned that because the Examiner considered the infringement-improvement invention to be patentable, the infringement-improvement invention "is . . . presumed nonobvious in view of the [patent in suit] until proven otherwise."[216] The court concluded that "[t]he nonobviousness of the accused device, evidenced by the grant of a United States patent, is relevant to the issue of whether the change therein is

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infringement of the dominant patent.").

[212] *See Hilton Davis*, 62 F.3d at 1519, 35 U.S.P.Q.2d (BNA) at 1646.

[213] *Id.*

[214] *See* Roton Barrier, Inc. v. Stanley Works, 79 F.3d 1112, 1128, 37 U.S.P.Q.2d (BNA) 1816, 1828-1829 (Fed. Cir. 1996) (Nies, J., additional views).

[215] *See* 79 F.3d 1563, 1570, 38 U.S.P.Q.2d (BNA) 1281, 1286 (Fed. Cir. 1996).

[216] *Id.*

substantial."[217] Any stronger statement would be precisely contrary to earlier case law.[218]

Several panels have effectively repudiated the "known interchangeability" standard of an *en banc* opinion. In *Hoechst Celanese Corp. v. BP Chemicals Ltd.*, accused infringer BP's argument that its separate patent on the allegedly equivalent embodiment should kill the case for patent infringement was rejected:

> [T]he proposition [that an improvement patent avoids equivalency] is incorrect.
>
> The fact of separate patentability [of the accused embodiment] presents no legal or evidentiary presumption of noninfringement and, in this case, does not outweigh the substantial evidence supporting the jury verdict of infringement.[219]

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[217] *Id.* (citing "Roton Barrier, Inc. v. Stanley Works, 37 U.S.P.Q.2d (BNA) 1816 (Fed. Cir. 1996) (Nies, J., additional views); National Presto Indus., Inc. v. West Bend Co., 76 F.3d 1185, 1192 (Fed. Cir. 1996) ("The fact of separate patentability is relevant, and is entitled to due weight.")").

[218] *See, e.g.*, Foster Metal Prods., Inc. v. Jacoby-Bender, Inc., 255 F.2d 869, 872, 117 U.S.P.Q. (BNA) 373, 375 (1st Cir. 1958) (holding that the "issuance of the [improvement] patent . . . did not create a presumption that the structure described in the [improvement] patent was not an infringement of the earlier . . . patent" (citing Temco Electric Motor Co. v. Apco Mfg. Co., 275 U.S. 319 (1928)).

[219] 78 F.3d 1575, 1582, 38 U.S.P.Q.2d (BNA) 1127, 1132 (Fed. Cir. 1996) (citations omitted); *see also* Pall Corp. v. Micron Separations, Inc., 66 F.3d 1211, 1220, 36 U.S.P.Q.2d (BNA) 1225, 1231 (Fed. Cir. 1995) ("It is not controlling whether the inventor foresaw and described this potential equivalent at the time the patent application was filed. *See, e.g.*, Atlas Powder Co. v. E.I. du Pont De Nemours & Co., 750 F.2d 1569, 1581, 224 USPQ 409, 417 (Fed. Cir. 1984).").

In *National Presto Industries v. West Bend Co.*,[220] equivalency was sustained despite an improvement patent (not properly put into evidence):

> West Bend argues that its vegetable slicing device can not be equivalent to Presto's patented invention, as a matter of law, because West Bend obtained its own patent on its device. West Bend stresses that the patent examiner cited Presto's '286 patent as prior art, when granting a patent to West Bend.
>
> The grant of a separate patent on the accused device does not automatically avoid infringement, either literal or by equivalency. Improvements or modifications may indeed be separately patentable if the requirements of patentability are met, yet the device may or may not avoid infringement of the prior patent. Whether a modified device is within the scope of the prior patent, literally or by equivalency, depends on the particular facts. The fact of separate patentability is relevant, and is entitled to due weight. However, West Bend's statement that there can not be infringement as a matter of law is incorrect.[221]

2. Recapture

A rule against recapture precludes the patentee from ever arguing a scope of the patent that would extend to any previously presented but cancelled claim.

The Court in *Warner-Jenkinson* cited *Keystone Driller* as a case where "estoppel was applied where the initial claims were 'rejected on the prior art,' and where the allegedly infringing equivalent element was outside of

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[220] 76 F.3d 1185, 37 U.S.P.Q.2d (BNA) 1685 (Fed. Cir. 1996).

[221] *Id.* at 1191-92, 37 U.S.P.Q.2d (BNA) at 1689 (citations omitted).

the revised claims and within the prior art that formed the basis for the rejection of the earlier claims[.]"[222]

In fact, despite the Federal Circuit's reliance on *Keystone Driller* as supporting recapture,[223] it may be considered (along with *Exhibit Supply*[224]) a case against recapture, even if a narrowing amendment was unnecessary for distinguishing the prior art. As the Court itself said in *Keystone Driller*:

> We do not attribute the force of an estoppel to what was said by the claimant in seeking to avoid the prior art cited against his broad claims, but we do apply the principle that where such broad claims are denied and a narrower substituted, the patentee is estopped to read the granted claim as the

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[222] 117 S. Ct. at 1050, 41 U.S.P.Q.2d (BNA) at 1872 (citing Keystone Driller Co. v. Northwest Engineering Corp., 294 U.S. 42, 24 U.S.P.Q. (BNA) 35 (1935)). Footnote five of *Warner-Jenkinson* follows this passage and states:

> *See also* Smith v. Magic City Kennel Club, Inc., 282 U.S. 784, 788 (1931) (estoppel applied to amended claim where the original 'claim was rejected on the prior patent to' another); Computing Scale Co. of America v. Automatic Scale Co., 204 U.S. 609, 618-620 (1907) (initial claims rejected based on lack of invention over prior patents); Hubbell v. United States, 179 U.S. 77, 83 (1900) (patentee estopped from excluding a claim element where element was added to overcome objections based on lack of novelty over prior patents); Sutter v. Robinson, 119 U.S. 530, 541 (1886) (estoppel applied where, during patent prosecution, the applicant 'was expressly required to state that [the device's] structural plan was old and not of his invention'); cf. Graham v. John Deere Co. of Kansas City, 383 U.S. 1, 33 (1966) (noting, in a validity determination, that "claims that have been narrowed in order to obtain the issuance of a patent by distinguishing the prior art cannot be sustained to cover that which was previously by limitation eliminated from the patent.").

[223] *See* Litton Sys., Inc. v. Honeywell, Inc., 140 F.3d 1449, 1457, 46 U.S.P.Q.2d (BNA) 1321, 1326 (Fed. Cir. 1998).

[224] *See* Exhibit Supply Co. v. Ace Patents Corp., 315 U.S. 126, 52 U.S.P.Q. (BNA) 275 (1942).

> equivalent of those which were rejected. If the claim should be held to comprehend a pulley linked or fixed to the top of the ditcher stick or immovably fastened to the boom, we find such applications in the prior art, upon the basis of which claims worded so broadly as to embrace this method were rejected by the Patent Office and abandoned by the applicant.
>
> The claim in suit would not have been allowed without the limitations that the pivotal means was to be "carried" by the boom, and to "connect" the pulling member (the cable) with both the boom and the stick. In other words, we find no justification for enlarging the scope of what is described, but rather the requirement of strict limitation to that which is specified, namely, a pivotal means carried by the boom and connecting the pulling member with the boom and the stick. We think the court below was right in holding that the respondent's devices did not infringe.[225]

Should the scope of recapture be strictly limited to the previously claimed scope? Or, should there be a middle ground?

3. Unpatentable Equivalents

a. *Guidance from* Warner-Jenkinson

Whether or not the patentee has narrowed claims to avoid prior art, if an equivalent of a claimed invention is itself unpatentable, then the doctrine cannot be used to cover that equivalent. Quoting from *Graham v. Deere*, the Court in *Warner-Jenkinson* noted that "'claims that have been narrowed in order to obtain the issuance of a patent by distinguishing the prior art cannot be sustained to cover that which was previously by limitation eliminated from the patent.'"[226]

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[225] 294 U.S. at 48-49, 24 U.S.P.Q. (BNA) at 37 (footnote omitted).

[226] 117 S. Ct. at 1050 n.5, 41 U.S.P.Q.2d (BNA) at 1872 n.5 (quoting Graham v. John Deere Co. of Kansas City, 383 U.S. 1, 33 (1966)). In the text of *Warner-Jenkinson*, immediately preceding the cited footnote, the Court noted that "in Keystone Driller Co. v. Northwest Engineering Corp., 294 U.S. 42 (1935), estoppel was applied . . . where the allegedly infringing

b. *Confirmation of* Wilson Sporting Goods

Then and today, where the patent owner is first in a field, he or she may obtain broad protection with a range of equivalents unfettered by prior art, but where the invention is a close improvement, the existence of prior art relevant to the invention prohibits a broad interpretation much beyond the literal scope. This principle is reflected today in *Wilson Sporting Goods*[227] and its progeny.

c. *Aberrant Federal Circuit panel opinions*

At least one Federal Circuit panel opinion is at odds with *Wilson Sporting Goods*. In *National Presto*,[228] the court stated that "[w]hen the patentee has made a prima facie case of infringement under the doctrine of equivalents, the burden of coming forward with evidence to show that the accused device is in the prior art is upon the accused infringer, not the trial judge."[229] Certainly, there is no burden on the trial judge to prove anything. Rather, the burden is on the patentee to establish that the accused infringing embodiment he failed to literally cover before the Examiner is patentable.

Yet, *National Presto* conflicts with other panel opinions such as *Sofamor Danek Group, Inc. v. DePuy-Motech, Inc.*, that states that "a patentee may not assert a range of equivalents that captures art already in the public domain."[230]

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equivalent element was . . . within the prior art that formed the basis for the rejection of the earlier claims[.]" *Id.* at 1050, 41 U.S.P.Q.2d (BNA) at 1872.

[227] Wilson Sporting Goods Co. v. David Geoffrey & Assoc., 904 F.2d 677, 14 U.S.P.Q.2d (BNA) 1942 (Fed. Cir. 1990).

[228] National Presto Indus., Inc. v. West Bend Co., 76 F.3d 1185, 1192, 37 U.S.P.Q.2d (BNA) 1685, 1689 (Fed. Cir. 1996).

[229] *Id.* at 1192, 37 U.S.P.Q.2d (BNA) at 1689.

[230] Sofamor Danek Group, Inc. v. DePuy-Motech, Inc., 74 F.3d 1216, 1222, 37 U.S.P.Q.2d (BNA) 1529, 1533 (Fed. Cir. 1996) (citing *Wilson Sporting Goods*, 904 F.2d at 683, 14 U.S.P.Q.2d (BNA) at 1947; *see also* Athletic Alternatives, Inc. v. Prince Mfg., Inc., 73 F.3d 1573, 1582, 37 U.S.P.Q.2d

d. *Relationship to estoppels*

Even if *Keystone Driller* is interpreted as permitting the independent application of the doctrine of equivalents up to the original scope of the former claims, this does not necessarily end the matter. Consider the following hypothetical situation:

> A composition includes the hypothetical material, "Wolfroxy", which is known in the prior art at a percentage of 12% Wolfroxy, but which the applicant has discovered *after filing* provides unexpected results within the range of 6-10% Wolfroxy, and where the original claims are:
>
> > 1. A composition of matter having up to about 13.0% Wolfroxy.
> >
> > 2. The composition of matter of claim 1, having up to about 8.0% Wolfroxy.
>
> After rejection under 35 U.S.C. § 102 based upon the prior art composition with 12% Wolfroxy, the applicant rewrites claim 2 in independent form as the sole claim of what becomes the patent:
>
> A composition of matter having up to about 8.0% Wolfroxy.

Assuming that there is an argument that unexpected results are achieved with the patented composition to create an estoppel, to what extent should there be a limited scope of equivalents to at least cover the compositions with up to 10% Wolfroxy. In that regard, with Federal Circuit has permitted a certain degree of recapture. However, difficulties to the

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(BNA) 1365, 1373 (Fed. Cir. 1996) (the doctrine of equivalents "cannot be used to protect subject matter in, or obvious in light of, the prior art, Wilson Sporting Goods Co. v. David Geoffrey & Assocs., 904 F.2d 677, 684 (Fed.Cir. 1990) . . . .")).

recapture rule are presented in light of the clear statements in *Warner-Jenkinson*, and other Supreme Court decisions such as *Exhibit Supply*.[231]

4. The Public's Interest, Including Notice

In *Warner-Jenkinson*, the Court espoused the importance of protecting the public's interest, including that the claims provide notice to the public of the patentee's scope of invention.[232] Post *Warner-Jenkinson*, the Federal Circuit has also stressed the public's interests, and the importance of the notice function of claims.[233] In *Sage Products, Inc. v. Devon Industries, Inc.*,[234] the Federal Circuit provided an extensive policy argument relating to claiming inventions narrowly before the Patent Office, and later attempting to reach devices using the doctrine of equivalents. The Federal Circuit stated:

> [F]or a patentee who has claimed an invention narrowly, there may not be infringement under the doctrine of equivalents in many cases, even though the patentee might have been able to claim more broadly. If it were otherwise, then claims would be reduced to functional abstracts, devoid of meaningful structural limitations on which the public could rely.[235]

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[231] *See* Exhibit Supply Co. v. Ace Patents Corp., 315 U.S. 126, 52 U.S.P.Q. (BNA) 275 (1942).

[232] 117 S. Ct. at 1051, 41 U.S.P.Q.2d (BNA) at 1873 ("[C]laims do indeed serve both a definitional and a notice function.").

[233] *See, e.g.*, Sage Prods., Inc. v. Devon Indus., Inc., 126 F.3d 1420, 1424-25, 44 U.S.P.Q.2d (BNA) 1103, 1106-07 (Fed. Cir. 1998); Dawn Equip. Co. v. Kentucky Farms Inc., 140 F.3d 1009, 1023, 46 U.S.P.Q.2d (BNA) 1109, 1119 (Fed. Cir. 1998) (Michel, J., additional views)).

[234] *See* 126 F.3d at 1424-25, 44 U.S.P.Q.2d (BNA) at 1106-07.

[235] *Id.*, 44 U.S.P.Q.2d (BNA) at 1107 ("The doctrine of equivalents cannot be used to erase 'meaningful structural and functional limitations of the claim on which the public is entitled to rely in avoiding infringement.'" (citing *Conopco, Inc. v. May Dep't Stores Co.*, 46 F.3d 1556, 1562, 32 U.S.P.Q.2d 1225, 1228 (Fed. Cir. 1994)) (internal citations omitted).

The Court was quite willing to limit the patentee strictly to its claimed invention where it had decided to claim the invention narrowly before the Patent Office:

> The claim at issue defines a relatively simple structural device. A skilled patent drafter would foresee the limiting potential of the "over said slot" limitation.[*] No subtlety of language or complexity of the technology, nor any subsequent change in the state of the art, such as later-developed technology, obfuscated the significance of this limitation at the time of its incorporation into the claim. If Sage desired broad patent protection for any container that performed a function similar to its claimed container, it could have sought claims with fewer structural encumbrances. Had Sage done so, then the Patent and Trademark Office (PTO) could have fulfilled its statutory role in helping to ensure that exclusive rights issue only to those who have, in fact, contributed something new, useful, and unobvious. Instead, Sage left the PTO with manifestly limited claims that it now seeks to expand through the doctrine of equivalents.[236]

The Court went on to make clear that the public's interest in such a case was paramount over the patentee's interest:

> [A]s between the patentee who had a clear opportunity to negotiate broader claims but did not do so, and the public at large, it is the patentee who must bear the cost of its failure

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[236] *Id.* at 1425, 44 U.S.P.Q.2d (BNA) at 1107 (citation omitted). Footnote denoted "*" reads as follows:

> This court does not imply that Sage's representation before the Patent and Trademark Office was inadequate. To the contrary, it appears that the claim precisely defines the structure elaborated in the written description and drawings. The public record reflects a manifest intention to claim this structure and no more. Whether actual or constructive, that intention now binds Sage."

Id.

to seek protection for this foreseeable alteration of its claimed structure.

This court recognizes that such reasoning places a premium on forethought in patent drafting. Indeed this premium may lead to higher costs of patent prosecution. However, the alternative rule—allowing broad play for the doctrine of equivalents to encompass foreseeable variations, not just of a claim element, but of a patent claim—also leads to higher costs. Society at large would bear these latter costs in the form of virtual foreclosure of competitive activity within the penumbra of each issued patent claim. Because the doctrine of equivalents blurs the line of demarcation between infringing and non-infringing activity, it creates a zone of uncertainty, into which competitors tread only at their peril. Given a choice of imposing the higher costs of careful prosecution on patentees, or imposing the costs of foreclosed business activity on the public at large, this court believes the costs are properly imposed on the group best positioned to determine whether or not a particular invention warrants investment at a higher level, that is, the patentees.[237]

5. Disclosed But Unclaimed Subject Matter

Another line of case law has emerged in *Maxwell v. J. Baker, Inc.*[238] that apparently denies a finding of equivalents where the equivalent is disclosed but not claimed in the patent, even in the absence of prosecution history estoppel.

a. *Dictum in* Warner-Jenkinson

While *Warner-Jenkinson* did not specifically have the fact pattern of *Maxwell*, the accused infringer argued that the doctrine should be *limited* to the fact pattern of *Maxwell*.

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[237] *Id.*, 44 U.S.P.Q.2d (BNA) at 1107-08 (citation omitted).

[238] *See* 86 F.3d 1098, 1106-07, 39 U.S.P.Q.2d (BNA) 1001, 1005-06 (Fed. Cir. 1996).

The Court observed that "petitioner proposes that in order to minimize conflict with the notice function of patent claims, the doctrine of equivalents should be limited to equivalents that are disclosed within the patent itself."[239] And, a "milder version of this argument . . . is that the doctrine should be limited to equivalents that were known at the time the patent was issued . . . ."[240] Here, in dictum as to the *Maxwell* case, the Court "reject[ed] the milder version of petitioner's argument and rejected the more severe proposition that equivalents must not only be known, but must also be actually disclosed in the patent in order for such equivalents to infringe upon the patent."[241]

b. *Policy issues*

It is one thing to permit a patentee to gain coverage of an equivalent that was unforeseen by the patentee when he filed his application. It is another matter to permit coverage where the patentee had full knowledge of a range of embodiments, *disclosed* all the embodiments, yet *claimed* less than all of them. Should the patent owner be held to a higher standard for the application of the doctrine of equivalents in such a case?

Nevertheless it is still difficult for a patentee to describe every possible embodiment, even every disclosed embodiment, with the limitations of the English language.

c. *Former rule for literal infringement*

Maxwell finds antecedence in cases where a finding of *literal* infringement is precluded by the failure of an applicant to claim the accused but disclosed embodiment. The rule is stated in *Miller v. Bridgeport Brass Co.*, that "the claim of a specific device or combination, and an omission to claim other devices or combinations apparent on the face of the patent, are, in law, a dedication to the public of that which is not claimed."[242]

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[239] *Warner-Jenkinson*, 117 S. Ct. at 1052, 41 U.S.P.Q.2d (BNA) at 1874.

[240] *Id.*

[241] *Id.* at 1053, 41 U.S.P.Q.2d (BNA) at 1874.

[242] 104 U.S. 350, 352 (1881).

d. *Judge Rich and the* Gibbs *case*

It may be one thing to say that the failure to claim a particular invention that is *disclosed* but not claimed is a forfeiture of *literal coverage* of that invention. Indeed, that was the case more than twenty-five years ago until *In re Gibbs*,[243] when that line of cases was overruled.

In *Gibbs*, reference is made to "the bromide that what is disclosed and not claimed in a patent is dedicated to the public."[244] There is indeed support in WALKER ON PATENTS[245] for the dedication rule.[246] Yet, WALKER was simply wrong. As pointed out by Judge Rich:

> We have observed that this oft-repeated statement frequently occurs in the context of a discussion of *infringement* and what it is that the patent *covers*, being the equivalent of a statement that patent *protection* is determined solely by the claims, rather than the disclosure. One example is what Judge Learned Hand said in . . . *Picard v. United Aircraft Corp.*, 2 Cir., 128 F.2d 632, 637. The solicitor copied a misquotation from Deller's Walker on Patents, 2d Ed., 674. What Judge Hand said was:
>
> *As a general principle* a patentee dedicates or surrenders all that he discloses except so far as the claims reserve it.
>
> By "dedication" in such a context it is meant that subject matter not claimed is not subject to the monopoly or property right of the particular patent under discussion. A modicum of thought will demonstrate, as can be seen from the cases we are discussing herein, that the public does not necessarily get free use of an invention merely because *in a*

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[243] 437 F.2d 486, 168 U.S.P.Q. (BNA) 578 (C.C.P.A. 1971).

[244] *Id.* at 493, 168 U.S.P.Q. (BNA) at 584.

[245] 2 DELLER'S WALKER ON PATENTS, § 138 (2d ed. 1964).

[246] *See id.* at 493 n.6, 168 U.S.P.Q. (BNA) at 584 n.6.

> *particular patent* it is disclosed and not claimed. It may be and often is claimed in another patent.[247]

While it is undoubtedly true that if "Invention A" and "Invention B" are both disclosed but only "Invention A" is claimed, then in the end there is a dedication of "Invention B", but *not necessarily the equivalents of "Invention A"*.

e. *The* Maxwell *case*

In *Maxwell*, the Court held that where an invention is disclosed in a patent application but not claimed, it cannot be considered an *equivalent* for purposes of patent infringement.[248] This goes a step beyond *Miller*, and into uncharted territory. The Federal Circuit thus agreed with the patentee's "asserti[on] that [the patentee had] dedicated to the public the [embodiment] by disclosing that alternate system in the specification, but failing to claim it."[249]

The policy justification for the *Maxwell* holding was explained by the court:

> A patentee may not narrowly claim his invention and then, in the course of an infringement suit, argue that the doctrine of equivalents should permit a finding of infringement because the specification discloses the equivalents. Such a result would merely encourage a patent applicant to present a broad disclosure in the specification of the application and file narrow claims, avoiding examination of broader claims that the applicant could have filed consistent with the specification.[250]

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[247] *Id.*

[248] *See* 86 F.3d at 1107, 39 U.S.P.Q.2d (BNA) at 1006.

[249] *Id.* at 1106, 39 U.S.P.Q.2d (BNA) at 1006.

[250] *Id.* at 1107, 39 U.S.P.Q.2d (BNA) at 1006.

The court acknowledged that it is creating a new rule by blocking a finding of infringement *as an equivalent* under case law that previously had blocked a finding of literal infringement where the claim failed to literally cover an accused embodiment disclosed in the specification.[251]

In essence, the court in *Maxwell* stated that if an accused embodiment is *disclosed* in the patent specification but not within a claim, then the doctrine of equivalents is precluded. That would be not only new legal ground for the Federal Circuit, but seemingly inconsistent with the Supreme Court finding that an equivalent *disclosed* in the *Graver Tank* patent was an equivalent of a narrow claim that did not cover that embodiment. *Graver Tank* is distinguished on the basis that the patentee *had* at one time had claims providing literal coverage.[252]

f. *Cutting back on* Maxwell—YBM Magnex

In *YBM Magnex, Inc v. International Trade Commission*[253] the Federal Circuit rejected the International Trade Commission's holding that *Maxwell* stands for the proposition that all subject matter disclosed, but not claimed, was dedicated to the public. The Federal Circuit noted that the facts of *Maxwell* "are not the routine facts of an equivalency determination."[254] As described by the court in *YBM*:

> Maxwell disclosed two distinct alternative ways in which pairs of shoes are attached for sale, and claimed only one of them. Both embodiments were fully described in the patent. The court in its opinion observed that by this action Maxwell avoided examination of the unclaimed alternative, which was distinct from the claimed alternative. In view of the distinctness of the two embodiments, both of which were fully described in the specification, the Federal Circuit

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[251] *See id.*

[252] *See id.* at 1107-08, 39 U.S.P.Q.2d (BNA) at 1006-07.

[253] 145 F.3d 1317, 1321, 46 U.S.P.Q.2d (BNA) 1843, 1846-47 (Fed. Cir. 1998).

[254] *Id.* at 1320, 46 U.S.P.Q.2d (BNA) at 1846.

> denied Maxwell the opportunity to enforce the unclaimed embodiment as an equivalent of the one that was claimed.[255]

The court stated that viewing *Maxwell* as standing for the broad proposition that all which is disclosed but not claimed would be dedicated, would conflict with Supreme Court precedent, including *Graver Tank* and *Warner-Jenkinson*.[256] Thus, the court stated the following concerning *Graver Tank*:

> In *Graver Tank*, for example, the asserted equivalent, manganese silicate, had itself been disclosed in the specification; the district court had relied on this disclosure as supporting equivalency, not negating it:
>
> Accordingly, it is concluded that the patent itself fully discloses that welding compositions composed chiefly of manganese silicate and prepared according to the teachings of the patent are equivalent to those in which the alkaline earth metals are the principal constituents.
>
> The Supreme Court sustained this conclusion against the Court's dissenters, who urged that "what is not specifically claimed is dedicated to the public. This specific issue was presented and resolved in *Graver Tank*, the explicit dissents illuminating that this point of law had been considered and rejected by the Court.[257]

The court also noted that *Warner-Jenkinson*, where the Court rejected as too severe the proposition that equivalents must be actually disclosed in the patent in order for the equivalents to infringe the patent, was a recognition that equivalents may be disclosed in the patent.[258] Further, the court cited

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[255] *Id.*

[256] *Id.*

[257] *Id.* at 1320-21, 46 U.S.P.Q.2d (BNA) at 1846.

[258] *Id.* at 1321, 46 U.S.P.Q.2d (BNA) at 1846.

to certain Federal Circuit precedent that conflicted with the Commission's reading of *Maxwell*.[259]

In sum, the court essentially held that *Maxwell* only applied to its unique fact situation, and found that any statements suggesting a broader application were not binding authority.[260]

g. *Resolving* YBM Magnex *and* Maxwell

While *YBM* appears to provide some assurance that *Maxwell* will not be applied by the court for all cases, difficulties in application still remain. *YBM* suggests that the dedication rule of *Maxwell* only applies when there are distinct alternative embodiments, and the claims of the patent are not directed to all of the embodiments disclosed. However, what constitutes such a distinct alternative embodiment? Does it mean that unless the patent expressly designates an arrangement as being an alternative, perhaps with separate headings and associated figures, that the dedication rule should not apply? Is a separate example a different embodiment? What about general variation sentences often found near the end of the written description, that provide some alternatives for certain features of the invention? Only future cases can resolve the ambiguity that remains.

h. *Problems with a wooden doctrine*

(1) Difficulties in claim drafting

One can sympathize with the public interest in denying an equivalents finding against someone practicing a disclosed invention that the patentee could have and *should have* claimed. But, the other side of the coin is that equivalents of a claimed invention are frequently disclosed but not specifically claimed and are manifestly equivalent under any test.

For example, there are many organic acids that are found in the pharmaceutical field. Literally thousands of patents to organic acids have been granted, some of which have claims that are limited to the acids, per se. Yet, even where the patent is limited to acids, the specification states

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[259] *See id.*, 46 U.S.P.Q.2d (BNA) at 1846-47.

[260] *See id.* at 1321-22, 46 U.S.P.Q.2d (BNA) at 1847.

that the sodium salt is a preferred form of the acid, even though the salt is not specifically claimed. In addition, consider, for example, the case where a group of compounds are disclosed and claimed as compounds, per se, and there is a disclosure of "pro" derivatives, stereoisomeric forms, and also simple ester derivatives. Under the rationale of the "surrender" line of cases, if these simple derivatives are disclosed but not *claimed* then they would also be "surrendered", even though they are the most obvious equivalents imaginable. It does appear that *YBM* provides some relief in such cases, as the salt or simple derivatives are usually not set forth as distinct alternative embodiments.

(2) Guidance from Justice Ginsburg

Although *Warner-Jenkinson* did not deal with the fact pattern of a "surrender" as in the *Maxwell* case, the Court did recognize the need for fairness for patentees. A strict "surrender" doctrine would cause great harm to patentees.

If anything, the patentee who inadvertently fails to claim some element disclosed in a patent should not be unduly punished. This comports with the balance that the Court sets between the rights of patentees and the public. The balanced view is perhaps best set in the concurring opinion of Justice Ginsburg in *Warner-Jenkinson* who advises that the new test, "if applied woodenly, might in some instances unfairly discount the expectations of a patentee who had no notice at the time of patent prosecution that such a presumption would apply."[261]

She warns against rules that would push intellectual property owners away from the patent system:

> [A] patentee [victimized by such wooden application of the rule] would have had little incentive to insist that the reasons for all modifications be memorialized in the file wrapper as they were made. Years after the fact, the patentee may find

[261] 117 S. Ct. at 1055, 41 U.S.P.Q.2d (BNA) at 1876 (Ginsburg, J., concurring).

it difficult to establish an evidentiary basis that would overcome the new presumption . . . .[262]

6. Estoppel Through Interview Silence

A further issue is raised in *Warner-Jenkinson*: Is an applicant who makes a particular argument at an oral interview estopped from raising that issue at a much later date, where he has failed to reduce his arguments to writings found in the prosecution history?

Warner-Jenkinson breaks no new ground in finding that a patent applicant is estopped through failure to record the results of an interview. Interview estoppel was established in *Litton Systems, Inc. v. Whirlpool Corp.*,[263] where the patentee later said that there was an interview and argument made for support for particular claim language in the original application, but where there was no written record confirming this.

Finding interview estoppel, the court noted that "[t]he applicant *must* provide [after the interview], however, a written record of the substance of any such meeting or discussion for inclusion in the application file wrapper . . . ."[264] In support of this position, the court in *Litton Systems* quoted from Rule 133(b) that provides that "[i]n every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant."[265]

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[262] *Id.*

[263] 728 F.2d 1423, 221 U.S.P.Q. (BNA) 97 (Fed. Cir. 1984); *see also* Pennwalt Corp. v. Akzona, Inc., 740 F.2d 1573, 222 U.S.P.Q. (BNA) 833 (Fed. Cir. 1984); *cf.* State Industries, Inc. v. A.O. Smith Corp., 751 F.2d 1226, 224 U.S.P.Q. (BNA) 418 (Fed. Cir. 1985).

[264] *Litton Sys.*, 728 F.2d at 1439, 221 U.S.P.Q. (BNA) at 106 (emphasis in original).

[265] *Id.*, 221 U.S.P.Q. (BNA) at 106-07 (quoting 37 C.F.R § 1.133(b)). The quoted portion of 37 C.F.R § 1.133(b) is the first sentence. Additionally, the second sentence states that "[a]n interview does not remove the necessity for response to Office actions as specified in [37 C.F.R.] §§ 1.111, 1.135." 37 C.F.R. § 1.133(b) (1998).

The requirement for recordation of interviews in the *Manual of Patent Examining Procedure* was a further basis for the finding of interview estoppel.[266]

Concluding that interview estoppel should apply, the Court said that "Litton . . . simply filed a perfunctory paper which . . . said virtually nothing.

In addition, 37 C.F.R § 1.2 states that "[a]ll business with the Patent and Trademark Office should be transacted in writing." 37 C.F.R. § 1.2 (1998). This means that an interview must be detailed in writing.

Under 37 C.F.R § 1.111(c), there is a requirement that for any amendment or other written request for reconsideration, whether preceded by an interview or not, "the applicant . . . must clearly point out the patentable novelty which he or she thinks the claims present in view of the state of the art disclosed by the references cited or the objections made" and "must also show how the amendments avoid such references or objections." 37 C.F.R. § 1.111(c) (1998).

[266] *See Litton Sys.*, 728 F.2d at 1439, 221 U.S.P.Q. (BNA) at 107.

> The MPEP, commonly relied upon as a guide to patent attorneys and patent examiners on procedural matters, details procedures to be followed during and after an interview. The MPEP has no binding force on us, but is entitled to notice so far as it is an official interpretation of statutes or regulations with which it is not in conflict. At the time Litton prosecuted the '859 patent application, the MPEP, expressly incorporating 37 C.F.R. § 1.133, stated that '[t]he substance of an interview must always be made [by the applicant] of record in the application, particularly where agreement between attorney and the Examiner is reached.' MPEP § 713.04 (3d ed. rev. 1970), reprinted in A. Deller, Walker on Patents, ch. XVI, app. at 383 (2d ed. 1972). (The language in the current edition of the MPEP is more direct: 'A complete written statement as to the substance of any face-to-face or telephone interview with regard to an application must be made of record in the application, whether or not an agreement with the examiner was reached . . . . It is the responsibility of the applicant . . . to make the substance of an interview of record in the application file, . . . ,' MPEP § 713.04 (4th ed. rev. 1982).

Id.

As a result of Litton's own failure to document the results of its interview with the patent examiners, Litton is now estopped from showing that the prosecution record is not true . . . ."[267]

Although the general point made in *Warner-Jenkinson* is keyed to estoppel through silence to establish the basis for an amendment, the specific factual setting of the case comes out of the sequence of an interview, followed by sketchy written remarks, the same setting as *Litton Systems*.

The Federal Circuit must now consider to what extent it should tighten up its overview of interview summary procedures of the PTO.

B. *Congressional Mandate To Change*

The Court in *Warner-Jenkinson* recognized that Congress can modify the doctrine of equivalents if it so chooses, even to the point of its abolition.[268] The Court made it clear that the doctrine of equivalents is fraught with problems. It invited Congressional consideration.

In refraining from a sharp limitation to the doctrine, the Court also, at least implicitly, suggested that the PTO could prospectively issue guidelines: "To change so substantially the rules of the game now could very well subvert the various balances the PTO sought to strike when issuing the numerous patents which have not yet expired and which would be affected by our decision."[269]

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[267] *Id.* The Court additionally noted that "[b]ecause Litton's ultimate goal . . . was to secure a patent, and because a patent was issued as a direct and immediate result of Litton's actions, we see no reason not to extend traditional estoppel doctrine here." *Id.*

[268] 117 S. Ct. at 1048, 41 U.S.P.Q.2d (BNA) at 1871. ("Congress can legislate the doctrine of equivalents out of existence any time it chooses. The various policy arguments now made by both sides are thus best addressed to Congress, not this Court.").

[269] *Id.* at 1050 n.6, 41 U.S.P.Q.2d (BNA) at 1872 n.6.

1. Patent Reexamination To Create Estoppels

It is already the case that an amendment or argument made in reexamination[270] can create a prosecution history estoppel.[271] Yet, the reexamination law today leaves much to be desired in terms of opportunities for challengers of patents.

Current legislation would, if enacted, strengthen reexamination from the standpoint of third parties by enhancing *inter partes* participation and providing the third party with a right of appeal.[272] This would likely cause a more argumentative interaction between the patent applicant and the Examiner during reexamination: While the patentee surely would not want to create estoppels during the course of reexamination, at the same time he is on the horns of a dilemma: argue strongly, and create estoppels; argue weakly, and risk losing the patent altogether.[273]

2. Reissue As A Meaningful Alternative

It is proposed that reissue be made a meaningful alternative to the doctrine of equivalents. A modest proposal was given to Congress as part of testimony on the current patent reform proposals that included a shift of "intervening rights" in a reissue from the grant date to the filing date.[274] This

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[270] *See* 35 U.S.C. §§ 302-307 (1998).

[271] *See* Cole v. Kimberly-Clark, 102 F.3d 524, 532, 41 U.S.P.Q.2d (BNA) 1001, 1007 (Fed. Cir. 1996).

[272] As of this writing, bills such as H.R. 400 have included comprehensive reexamination reform providing, *inter alia*, full inter partes participation by a third party requester as well as a right of appeal if the Examiner upholds the patent. *See* H.R. 400, 105th Cong. (1997).

[273] There are, unfortunately, middle ground approaches that have not been fully developed. To the extent that there is no contemporaneous record of interviews, the patentee may have his cake allowance and eat it too a milder statement of reasons for patentability in the written interview summary than would be the case in a strictly written set of arguments.

[274] The most recent proposal from one of the authors was in testimony before the United States House of Representatives Committee on the Judiciary, Subcommittee on Courts as Intellectual Property, Hearing on the "21st Century Patent System Improvement Act", H.R. 400, February 26,

would permit the patentee launching a new product (and presumably then free from infringing competition) to fearlessly seek reissue, knowing that during the often long and torturous path of a reissue, competitors could not enter the market and create intervening rights.[275] The proposed legislation would permit broadening of claims not only in reissue but also in reexamination.[276]

To be sure, the proposal does not provide a full loaf for patentees, as there is nothing in this proposal that would extend the period for filing for a *broadening* reissue to more than the current two years from patent grant.[277] However, to the extent that a very broad claim, even of questionable validity, can be obtained in an original patent grant, there would never be a time cap for what effectively would be a broadening reissue or reexamination vis-à-vis the more realistic subgeneric claims.

1997. A written statement presented to accompany this testimony included a "discussion draft" of the proposed leglislation and a background paper citing Allan M. Soobert, *Analyzing Infringement by Equivalents: A Proposal to Focus the Scope of International Patent Protection*, 22 RUTGERS COMPUTER & TECH. L.J. 189, 232 n.169 (1996); N. Thane Bauz, *Reanimating U.S. Patent Reexamination: Recommendations for Change Based Upon a Comparative Study of German Law*, 27 CREIGHTON L. REV. 945, 955 (1994).

The first publication of this proposal is found in Wegner, *Equitable Equivalents*, *supra* note 49, at 34-35. The most comprehensive treatment of this proposal is found in Allan G. Altera, Note, *Expanding the Reissue Procedure: A Way To Do Business*, 1 J.INTELL. PROP. L. 185 (1993).

[275] *See* Adelman, *En Banc on Claim Construction and Equivalents*, *supra* note 68, at 704-05 (Professor Adelman states that "[t]he better approach [vis a vis equivalents] is to leave the correction of errors to reissue where the protection of the equitable doctrine of intervening rights is available to protect those who relied on the language of the original claims.").

[276] Because reexamination is a faster and less cumbersome procedure than reissue, permitting reexamination would simplify procedures.

[277] There is one proposal circulating within bar circles that would provide a four year period for broadening, but this is keyed to the *filing date* of the original patent. This is hardly a bonus for patentees who normally take about two years, or more, to gain a patent grant. Since the current law gives two years from grant for a broadening reissue under 35 U.S.C. § 251 (1997), the proposal is not worth much consideration.

Whether the proposal should be expanded to provide a longer term for a broadened reissue or reexamination is a difficult question to answer, given divergent viewpoints. The patentee always would like the luxury of having more time to broaden, while industry also demands a certainty in claim scope that is frustrated when the door is left open to late term broadenings.

C. *PTO Reforms*

The Commissioner is obligated to more closely scrutinize the interview process, particularly telephone interviews that in recent times have been viewed all too often as a panacea for production problems.[278] The PTO leadership has been sympathetic to the need for written reasons for an interview.[279]

A particularly thorny problem is the need for a contemporaneous statement of results of an interview. If, for example, the Examiner and the applicant agree that "black" is "black" and there is no contemporaneous summary, but then several months later the applicant responds in writing by saying "black" is "white," there is often no basis for the Examiner to contradict this argument. If the patent has been granted or if the file is on the road to allowance in a different building, the Examiner may not even

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[278] Historically, Patent Examiners viewed telephone interviews with great reluctance, and many refused to entertain this once radical idea. Examiners did not receive an "action" credit for a telephone interview, whereas the give and take of an amendment and a written rejection *did* give "action" credit at one time the most important bean-counter number for an Examiner. While "action" credit was still important by the end of the 1960's, the Brenner Administration of the late 1960's stressed total "disposals" of cases the sum of all patents and abandonments an Examiner accrued in the course of a fiscal year.

[279] The Hon. Nancy Linck, Solicitor, stressed the need for written records of interviews at her presentation on *Warner-Jenkinson* to a joint meeting of the Bar Association of the District of Columbia P.T.C. Section and the Dean Dinwoodey Center, George Washington University Law School (Mar. 14, 1997).

physically see the file, or, if he does, may not give it more than a cursory glance.[280]

The PTO owes it to applicants to inform them of the benefit they gain by pointing out *why* they make an amendment to the claims. Under *Warner-Jenkinson*, the amendment of a claim for purely formal purposes may be construed as an estoppel, where the patent applicant fails to explain his reason for amendment.

1. Stricter And More Even Examination

The PTO could do most to help patentees and third parties alike by having a more rigorous and even-handed claim scope determination. Claims that are far too broad represent an invitation to sue at any time, while very narrow claims deprive the patentee of his rights to meaningful protection of his invention.

2. Reasons For Amendment

Beyond the amendment that is the result of a written response to an Examiner's prior art rejection, where the ground for amendment is clear, there are several situations where claims are amended and there may not be a reason on the record for the amendment.

a. *Preliminary amendments*

It is frequently the case that a patent attorney will clean up his file before a first Official Office Action, including amendments to the claims that may or may not be filed concurrently with an Information Disclosure Statement.[281] Amendments to the claims often are totally independent of the prior art such as provided in the Information Disclosure Statement, or the prior art may very well be to distinguish prior art in that paper.

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[280] At this stage, post-allowance, the Examiner's "bean" has been counted. Anything done at this stage would be to do something for nothing and, if the Examiner *does* recall what was said and wants to contradict the applicant's paper, there is no effective vehicle to do so.

[281] 37 C.F.R. §§ 1.97, 1.98 (1998).

To the extent that the amendment is purely formal in nature and not to avoid prior art, then this fact must be made clear on the record to avoid the presumption under *Warner-Jenkinson.*

b. *Interview amendments*

Interviews are frequently followed by an amendment to the claim to put the application into condition for allowance. Yet, all too often, the written reasons for the amendment are skimpy to nonexistent. Even though the amendment may have been made for purely formal reasons, the absence of reasons supplied by the applicant may create an estoppel under *Warner-Jenkinson.*

A more rigorous system should be devised for interview recordation.[282]

c. *Examiner's amendments*

On occasion, an amendment is written by the Examiner, himself.[283] Thus, in the "Examiner's Amendment,"[284] the Examiner may supply *his* reason for the amendment, but often it is nothing more than that the applicant's counsel has given permission for the amendment. Here, the patent applicant should file a paper to comment on the reasons for the amendment, if there should not be prosecution history estoppel applied at a later date.

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[282] *See supra* note 279, the Solicitor—speaking for herself—posed the question whether taping interviews should be encouraged (or even permitted) as one way to have a complete record of the interview.

[283] Of course, any change of a substantive nature must be approved by the patent applicant.

[284] The term dates back at least as far as the author's experience as a Patent Examiner that started in 1965. An Examiner's Amendment is a paper prepared entirely by the Examiner that often includes an amendment of the claims.

D. *Prospective Reforms*

The Court recognizes that whatever reforms may be introduced, whether congressional or administrative, due respect should be paid to the rights of those who have procured patents prior to such reforms. This is emphasized in the concurrence of Justice Ginsburg in *Warner-Jenkinson.*[285] The Federal Circuit has already paid heed to this advice in the 1997 *Hilton Davis* case.[286]

IX. FOUR REMANDS FROM THE SUPREME COURT

The Federal Circuit was given remands in four equivalents cases, including *Warner-Jenkinson* that is now restyled as *Hilton Davis.*[287]

A. *The* In Banc *1997* Hilton Davis *Opinion*

Because it is an *in banc* pronouncement of the Federal Circuit, its brief remand to the trial court in the 1997 *Hilton Davis* opinion[288] constitutes an important early treatment of equivalents following *Warner-Jenkinson,* and therefore, deserves special attention. This most likely marks the end of the *Warner-Jenkinson* saga insofar as any importance in developing case law.[289]

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[285] 117 S. Ct. at 1055, 41 U.S.P.Q.2d (BNA) at 1876 (Ginsburg, J., concurring).

[286] Hilton Davis Chem. Co. v. Warner-Jenkinson Co., 114 F.3d 1161, 1163, 43 U.S.P.Q.2d (BNA) 1152, 1154 (Fed. Cir. 1997) (hereinafter *Hilton Davis II*).

[287] *See supra* note 2 and accompanying text.

[288] *Hilton Davis II*, 114 f.3d at 1163, 43 U.S.P.Q.2d (BNA) at 1154.

[289] While the case conceivably could return on appeal to the court at some future point, by then the law should be more settled with the intervening Federal Circuit precedent.

1. Determination Of Equivalents

In *Warner-Jenkinson*, the Court reversed the judgment of the Federal Circuit and remanded the case stating:

> Because the Court of Appeals for the Federal Circuit did not consider all of the requirements as described by us today, particularly as related to prosecution history estoppel and the preservation of some meaning for each element in a claim, we reverse and remand for further proceedings consistent with this opinion.[290]

The Federal Circuit, on remand, first was faced with the application of prosecution history estoppel to the claim which was amended during prosecution by placing a lower pH limit of "approximately 6.0" on the purification process.[291] Because the prosecution history in the PTO did not reveal the reason for including the limitation, a presumption applied which the Supreme Court created in the interest of placing "reasonable limits on the doctrine of equivalents."[292] That presumption is

> when a claim is amended, but the prosecution history does not reveal the reason for the change, it should be presumed that there was 'a substantial reason related to patentability for including the limiting element added by amendment.' In that event, prosecution history estoppel would bar the application of the doctrine of equivalents as to that element (or claim limitation).[293]

The Federal Circuit was clear in stating that the presumption is not absolute, but "may be rebutted by the patentee by establishing that the reason for the amendment made during prosecution 'had a purpose

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[290] 117 S. Ct. at 1054, 41 U.S.P.Q.2d (BNA) at 1876.

[291] *See Hilton Davis II*, 114 F.3d at 1162-63, 43 U.S.P.Q.2d (BNA) at 1153.

[292] *Id.* at 1163, 43 U.S.P.Q.2d (BNA) at 1153.

[293] *Id.* (citations omitted).

unrelated to patentability.'"[294] At that point, the court would then decide, based on the particular facts of the case, "whether that reason [was] sufficient to overcome prosecution history estoppel as a bar to application of the doctrine of equivalents to the element added by that amendment."[295]

The court, in attempting to provide guidance in this area, stated that

> [b]ecause of this presumption, we expect that the PTO and applicants will henceforth usually include in the prosecution history express statements of their reasons for requiring or making claim changes or interpretive assertions. Express recitations may not exist, however, in applications prosecuted prior to the Supreme Court's decision. Thus, we conclude that where the prosecution history is silent or unclear the district court should give a patentee the opportunity to establish the reason, if any, for a claim change. We hesitate to specify the procedures that the district court can employ to answer the question posed by the newly created presumption of prosecution history estoppel. The better course is to allow the district court to use its discretion to decide whether hearings are necessary or whether the issue can adequately be determined on a written record. If the district court determines that a reason not related to patentability prompted an amendment, the court must then decide if that reason is sufficient to overcome estoppel. In conducting the inquiry, the Supreme Court has cautioned the courts to consider carefully the importance of public notice and reliance on the prosecution history, as well as the need for fairness to the patentee.[296]

Thus, the Federal Circuit remanded the case for a determination of "whether Hilton Davis can rebut the presumption by showing the reason for the amendment of the claim to place a lower pH limit of approximately 6.0 on the ultrafiltration process and whether that reason is sufficient to

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[294] *Id.* (citation omitted).

[295] *Id.*, 43 U.S.P.Q.2d (BNA) at 1153-54 (citations omitted).

[296] *Id.*, 43 U.S.P.Q.2d (BNA) at 1154 (citations omitted).

overcome the estoppel bar to the application of the doctrine of equivalents."[297]

2. Possible "Grandfathering"

Obviously picking up on the comments of Justice Ginsburg in her concurring opinion, the court suggested a possible leniency for patentees who obtained their rights prior to *Warner-Jenkinson*:

> Warner-Jenkinson suggests [in a motion] that [the Federal Circuit] can resolve this case without remand to the district court because of Hilton Davis' record "admissions" allegedly made during argument before this court and the Supreme Court to the effect that there was no reason for the claim amendment made to establish the low end of the pH scale. If these statements were truly factual admissions, then Hilton Davis should be held to those admissions, even though an intervening change in the law has made them more relevant. However, it is not clear to us that Hilton Davis' statements were factual admissions at all. Rather, they may simply have been representations that the record, as developed prior to submission of this case, did not reflect any reason for the change, or representations that the administrative record of the PTO proceedings did not expressly recite any reason for the amendments. Such statements merely characterize the state of the record, not the state of facts. *Given the change in law, it would be unfair at this stage of the case to apply Hilton Davis' statements against it or estop it from augmenting the record to show the reason for the claim amendment based on other facts that may be available.*[298]

3. Future Of The "All Elements" Rule

The *Hilton Davis* remand also includes a special section devoted to the Supreme Court's "expressed concern that consideration had not

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[297] *Id.*

[298] *Id.* at 1164, 43 U.S.P.Q.2d (BNA) at 1155 (emphasis added).

adequately been given to the 'preservation of some meaning for each element in a claim."[299] The Federal Circuit, quoting *Warner-Jenkinson*, stated:

> Each element contained in a patent claim is deemed material to defining the scope of the patented invention, and thus the doctrine of equivalents must be applied to individual elements of the claim, not to the invention as a whole. It is important to ensure that the application of the doctrine, even as to an individual element, is not allowed such broad play as to effectively eliminate that element in its entirety. So long as the doctrine of equivalents does not encroach beyond the limits just described, or beyond related limits . . . we are confident that the doctrine will not vitiate the central functions of the patent claims themselves.[300]

The Federal Circuit, in light of its reconsideration of the pH equivalence issue, held that there was substantial evidence in the record to support the jury's verdict of equivalence.[301] The court then stated:

> [t]he '746 patent claim recites a pH range "from approximately 6.0 to 9.0." Warner-Jenkinson performed the process using a pH of 5.0. Although there is nothing in the written description part of the specification to indicate that the invention extends beyond the specific range given in the claim, there is substantial record evidence to prove that one of ordinary skill in the art would know that performing ultrafiltration at a pH of 5.0 will allow the membrane to perform substantially the same function in substantially the same way to reach substantially the same result as performing ultrafiltration at 6.0. In this regard, Dr. Cook, one of the inventors, testified that the process would work to separate the dye from the impurities at pH values as low as 2.0 (albeit with foaming). Moreover, Warner-Jenkinson's expert testified that the Hilton Davis process would operate

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[299] *Id.* at 1163, 43 U.S.P.Q.2d (BNA) at 1154.

[300] *Id.* at 1163-64, 43 U.S.P.Q.2d (BNA) at 1154 (citations omitted).

> at a pH of 5.0. The jury's finding that the accused process with a pH of 5.0 is equivalent to the claimed process with a lower limit of approximately 6.0 does not therefore vitiate the claim limitation. Accordingly, assuming prosecution history estoppel does not preclude such a finding, we reaffirm our prior decision that a pH of 5.0 is equivalent to a pH of "approximately 6.0" in the context of the claimed process.[302]

B. *A Final 1998* Hughes Aircraft *Opinion?*

The Federal Circuit issued its remand decision in *Hughes Aircraft Co. v. United States*,[303] in April of 1998. Initially, the Federal Circuit made it clear that, despite the government's argument that the Supreme Court effectively vacated both *Hughes VII*[304] and *Hughes XIII*,[305] "the scope of [its] review on remand [was] limited to determining whether *Hughes VII* satisfies the legal analysis required by *Warner-Jenkinson*."[306]

In addressing *Hughes VII*, the court rejected the government's argument that the Federal Circuit in *Hughes VII* did not follow the "All Elements" rule, based on the statement in *Hughes VII* that the trial court erred in not "apply[ing] the doctrine of equivalents to the claimed invention as a whole."[307] The Federal Circuit explained that the court in *Hughes VII* found that all the elements were met in the accused device, and that certain elements highlighted by the government were equivalently met in the accused device.[308] The court based it decision, in part, on the fact that the

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[302] *Id.*, 43 U.S.P.Q.2d (BNA) at 1154-55 (footnote omitted).

[303] 140 F.3d 1470, 46 U.S.P.Q.2d (BNA) 1285 (Fed. Cir. 1998).

[304] 717 F.2d 1351, 219 U.S.P.Q. (BNA) 473 (Fed. Cir. 1983).

[305] 86 F.3d 1566, 39 U.S.P.Q.2d (BNA) 1065 (Fed. Cir. 1996).

[306] *Hughes Aircraft*, 140 F.3d at 1474, 46 U.S.P.Q.2d (BNA) at 1287-88.

[307] *Id.*, 46 U.S.P.Q.2d (BNA) at 1288 (quoting *Hughes VII*, 717 F.2d at 1364, 219 U.S.P.Q. (BNA) at 482).

[308] *Id.* at 1474-75, 46 U.S.P.Q.2d (BNA) at 1288.

accused device used advanced technology that was not available at the time of the invention, stating that "[t]his is a case in which a 'subsequent change in the state of the art, such as later-developed technology, obfuscated the significance of [the] limitation at the time of its incorporation into the claim.'"[309]

In addition, the court addressed the government's argument that *Warner-Jenkinson* proclaims an absolute bar must apply to elements that are added/amended during prosecution for reasons related to patentability.[310] The court stated that:

> We reject the government's contention that *Warner-Jenkinson* requires such a wooden approach to prosecution history estoppel. The Supreme Court has long recognized that the key to prosecution history estoppel is the surrender or disclaimer of subject matter by the patentee, which the patentee is then unable to reclaim through the doctrine of equivalents.[311]

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[309] *Id.* at 1475, 46 U.S.P.Q.2d (BNA) at 1289 (quoting Sage Prods., Inc. v. Devon Indus., Inc., 126 F.3d 1420, 1425, 44 U.S.P.Q.2d (BNA) 1103, 1107 (Fed. Cir. 1997)).

[310] *Id.* at 1475-76, 46 U.S.P.Q.2d (BNA) at 1289-90.

[311] *Id.* at 1476, 46 U.S.P.Q.2d (BNA) at 1290 (citing Exhibit Supply Co. v. Ace Patents Corp., 315 U.S. 126, 136, 62 S.Ct. 513, 518-19, 86 L.Ed. 736 (1942) ("By the amendment he recognized and emphasized the difference between the two phrases and proclaimed his abandonment of all that is embraced in that difference. The difference which he thus disclaimed must be regarded as material, and since the amendment operates as a disclaimer of that difference, it must be strictly construed against him." (citations omitted)); *see also* Sutter v. Robinson, 119 U.S. 530, 541, 7 S.Ct. 376, 381-82, 30 L.Ed. 492 (1886) ("He is not at liberty now to insist upon a construction of his patent which will include what he was expressly required to abandon and disavow as a condition of the grant."). The citation to *Exhibit Supply* is curious, considering that it actually suggests that an absolute bar should apply.

The Federal Circuit then found that while prosecution history estoppel was invoked, the extent of prosecution history estoppel did not preclude the finding of equivalents in this case:

> Because [Hughes'] amendments to the claim language were made to overcome a prior art rejection, they do serve to narrow the range of equivalents; however, they do not preclude all equivalents available to Hughes. Because the accused device does not fall within the range of subject matter surrendered, prosecution history estoppel does not preclude infringement under the doctrine of equivalents.[312]

While the Federal Circuit declined an invitation to rehear the *Hughes*[313] case *in banc*, one dissenter from this decision, Judge Clevenger, suggested that the Supreme Court should ultimately decide the issue of whether prosecution history estoppel should create an absolute bar as to that element:

> If the United States has misread the Supreme Court, the Court may let the panel's decision stand with a swift denial of the certiorari petition. If the United States is correct, the Supreme Court could grant the petition and might even correct our error per curiam. Cases involving the doctrine of equivalents continue to flow through the federal courts. The question posed by the United States in this case is of utmost importance to patent law. A swift answer to the question is needed. Therefore, it perhaps is wise of my colleagues to decline to spend the many months we would consume in rehearing this case, in favor of clearing the path for the Solicitor General to make his way to the best source for the answer to his question.[314]

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[312] *Id.* at 1477, 46 U.S.P.Q.2d (BNA) at 1290.

[313] 148 F.3d 1384, 1385 (Fed. Cir. 1998).

[314] *Id.* at 1386 (Clevenger, J., dissenting).

C. *The* Litton Systems *Case*

The remand in *Litton* was decided on the same day as the remand decision of *Hughes*. The decision on remand has already been discussed.[315]

D. Festo *Rebriefed*

Shoketsu Kinzoku Kogyo Kabushiki Co., Ltd v. Festo Corp.[316] has been rebriefed, argued orally, and is awaiting decision. The panel for oral argument was comprised of Judges Rich, Michel and Newman. Unlike the *in banc* court or any of the other panels, the *Festo* panel comprises the two senior patent attorney judges on the court with a collective fifty-five years on the bench.[317]

XI. Equivalents In A Global Village

It will be a challenge to provide clear, certain claim boundaries, as required by industry, if the court maintains a broad doctrine of equivalents along the difficult to apply "insubstantial" change test.

Compounding matters is the leadership position that the American patent system plays in the international community. As we move into an ever smaller and more highly integrated commercial global village, the American judiciary and Congress is challenged to craft a more precise and understandable doctrine of equivalents. Failing this task, it is inevitable that the world will move toward a global standard of literal infringement with diminished opportunities for the doctrine of equivalents.[318] It may be anticipated that the United States may move toward a middle ground with

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[315] *See supra* Part VI.A. The authors' views regarding *Litton* in this paper are strictly their own. For the sake of full disclosure, the authors acknowledge the involvement in this case of Foley & Lardner.

[316] 117 S. Ct. 1240 (1997).

[317] Circuit Judges Rich and Newman.

[318] *See generally* Harold C. Wegner, Patent Harmonization 188-97 (London: Sweet & Maxwell 1993).

Japan, which has the most moderate application of the doctrine of equivalents of any of the major countries of the world.[319]

Prudent applicants will focus increasing resources on fewer cases, to make certain that literal coverage of commercial embodiments is obtained.

[319] To be sure, the Osaka High Court affirmed an equivalents finding in *Genentech v. Sumitomo*, yet this was a rare victory for a patentee under the doctrine of equivalents. More significantly, however, is the fact that the Japanese judiciary has more strictly honored the *literal* scope of protection than in previous years, moving closer to the international standard. *See* Genentech, Inc. v. Sumitomo Seiyaku, Judgment of the Osaka High Court, Hanrei jiho No. 1586, Mar. 29, 1996.

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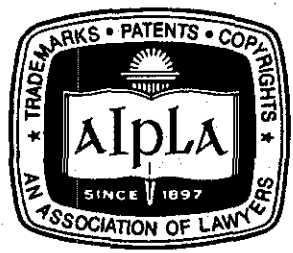

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