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Which Supreme Court Cases Influenced Recent Supreme Court IP Decisions? A Citation Study

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WHICH SUPREME COURT CASES INFLUENCED RECENT SUPREME COURT IP DECISIONS? A CITATION STUDY

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TABLE OF CONTENTS

I. INTRODUCTION 1

II. PRIOR CITATION STUDIES & BASELINE EXPECTATIONS 5

A. The Mid-Scale Studies 6

B. The Post & Eisen Study 8

C. The Large-Scale Network Analysis Studies 10

D. Expectations for the Citations Among Supreme Court IP Opinions 15

III. METHODOLOGY 17

IV. RESULTS & DISCUSSION 19

A. Citations in All the Supreme Court's Recent IP Cases 19

Table 3: Supreme Court Non-IP Cases Cited Three or More Times in Supreme Court IP Cases, October Term 1994 – October Term 2016 24

B. Citations in the Supreme Court's Recent Patent Cases 24

C. Citations in the Supreme Court's Recent Copyright Cases 26

D. Citations in the Supreme Court's Recent Trademark Cases 27

E. The Citation Network Connecting the Supreme Court's Recent IP Cases 29

V. CONCLUSION 36

VI. APPENDICES 37

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A. Appendix A 37
B. Appendix B 38
C. Appendix C 39
D. Appendix D 42

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> It can signify an acknowledgment of priority or influence, a useful source of information, a focus of disagreement, an acknowledgment of controlling authority, or the prestige of the cited work or its author. All of these are forms of influence, in a broad sense . . . .[1]
>
> — *Judge Richard Posner, describing "uncertainty about the meaning to be ascribed to a citation"*

I. Introduction

The U.S. Supreme Court has, of late, been deciding more patent law cases. Given the special national jurisdiction of the U.S. Court of Appeals for the Federal Circuit—which hears, among other things, all appeals "arising under" U.S. patent laws[2]—that means the Supreme Court has been reviewing more Federal Circuit cases. As Court watchers note, the Federal Circuit's patent jurisprudence has not fared well. For example, Ronald Mann,[3] who covers "commercial law and intellectual property" for SCOTUSblog,[4] recapped the Court's May 2017 decision on the scope of the patent exhaustion doctrine this way:

> The court has been deciding a steady diet of patent cases for much of the last decade and has been rejecting the U.S. Court of Appeals for the Federal Circuit's rulings in those cases almost routinely; the Federal Circuit is now 0 for 5 in the current term, by far the worst record of any of the federal courts of appeals.[5]

In short, there are more Supreme Court patent cases reversing more Federal Circuit decisions. The Court's increasing interest in patent law, which John Duffy first brought to light graphically

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1 Richard A. Posner, *An Economic Analysis of the Use of Citations in the Law*, 2 AM. L. & ECON. REV. 381, 386 (2000).

2 28 U.S.C. § 1295 (2012).

3 *See Ronald Mann*, COLUMBIA LAW SCH., http://www.law.columbia.edu/faculty/ronald-mann (featuring Mann's faculty biography page).

4 *Ronald Mann*, SCOTUSBLOG, http://www.scotusblog.com/author/ronald-mann/.

5 Ronald Mann, *Opinion Analysis: Federal Circuit Loses Again, As Justices Categorically Reject Enforcement of Post-sale Patent Restrictions*, SCOTUSBLOG (May 30, 2017, 4:35 PM), http://www.scotusblog.com/2017/05/opinion-analysis-federal-circuit-loses-justices-categorically-reject-enforcement-post-sale-patent-restrictions/.

fifteen years ago,[6] has only intensified: In its October 2013 Term, when it heard six patent cases on appeal from the Federal Circuit, the Court reached a level of engagement with patent law it had not entertained since at least the 1940s.[7] Similarly, in its October 2016 Term, the Court heard five patent cases on appeal from the Federal Circuit.

What is happening? One way to engage the question, as a number of scholars have done, is to compare the different ways the Supreme Court and the Federal Circuit work through patent law questions in substantive terms, qualitatively and internally to patent doctrine.[8] That is vitally important work, and it will doubtless continue. A different way to engage the question is quantitatively, using such tools as citation counts and other metrics more familiar from network analysis.[9] This paper takes the second path. Specifically, I present measures of the Supreme Court's citation practices in its intellectual property (IP) law cases—patent, copyright, and trademark—from the October 1994 Term to the October 2016 Term.[10] These measures show that the strongest case-based influences on the Supreme Court's IP opinions, measured by citation rates, are its own prior decisions; no Federal Circuit case has any heft. Also, among its recent IP cases, the Court's citations to its own patent cases skew older than citations to copyright or trademark cases.

Before reviewing other citation studies and detailing this study's methodology, two contextual matters require discussion. First, it is fair to ask why my study begins with cases from the Supreme Court's October 1994 Term. The answer is pegged to Duffy's work. As he explained in a 2010 paper, that Term marks an inflection point in the Court's appetite for patent cases:

> [T]he 1994 Term was the beginning of a long-term trend. While the Court had decided only five patent cases in the first dozen Terms in which the Federal Circuit was in existence, its next five patent cases were decided in the four Terms after 1994 (1995–1998, inclusive). . . . In its next ten Terms (1999–2008, inclusive), the Justices would hear argument and issue opinions in eleven more Federal Circuit patent cases. Thus,

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[6] *See* John F. Duffy, *The* Festo *Decision and the Return of the Supreme Court to the Bar of Patents*, 2002 SUP. CT. REV. 273, 288, fig.1 (depicting the five-term rolling average of the number of Supreme Court patent cases per Term, from 1810 to 2000).

[7] *Id.* at 294 (describing "the Court's patent caseload during the 1940s" as "4.5 cases per term").

[8] *See*, *e.g.*, Robin Feldman, *Coming of Age for the Federal Circuit*, 18 GREEN BAG 2d 27 (2014); John M. Golden, *The Supreme Court as "Prime Percolator": A Prescription for Appellate Review of Questions in Patent Law*, 56 UCLA L. REV. 657 (2009); Timothy R. Holbrook, *The Federal Circuit's Acquiescence(?)*, 66 AM. U. L. REV. 1061 (2017); Peter Lee, *The Supreme Assimilation of Patent Law*, 114 MICH. L. REV. 1413 (2016).

[9] *See* Ryan Whalen, *Legal Networks: The Promises and Challenges of Legal Network Analysis*, 2016 MICH. ST. L. REV. 539 (2016) (reviewing the network analysis literature, including its use in law).

[10] By my count, there are 72 such decisions—46 in patent, 12 in copyright, and 14 in trademark. Tables listing the cases that form the basis of this study are set forth in Appendices A and B.

> unlike its anemic average . . . during the 1983–1994 Terms, the Court in the years since 1994 has averaged more than one patent case per Term . . . .[11]

That average continues to increase: In Figure 2 of Duffy's 2010 paper, the five-term rolling average of Supreme Court patent cases is just over 1.5 in the October 2008 Term.[12] Extending the count through the October 2016 Term—shown in Figure 1, below—puts the five-term rolling average of patent cases at four, a level not seen since the 1940s.[13] Nor is this simply a matter of greater interest in all IP cases generally, as shown by the smaller rolling average of both copyright and trademark cases combined during this same period.

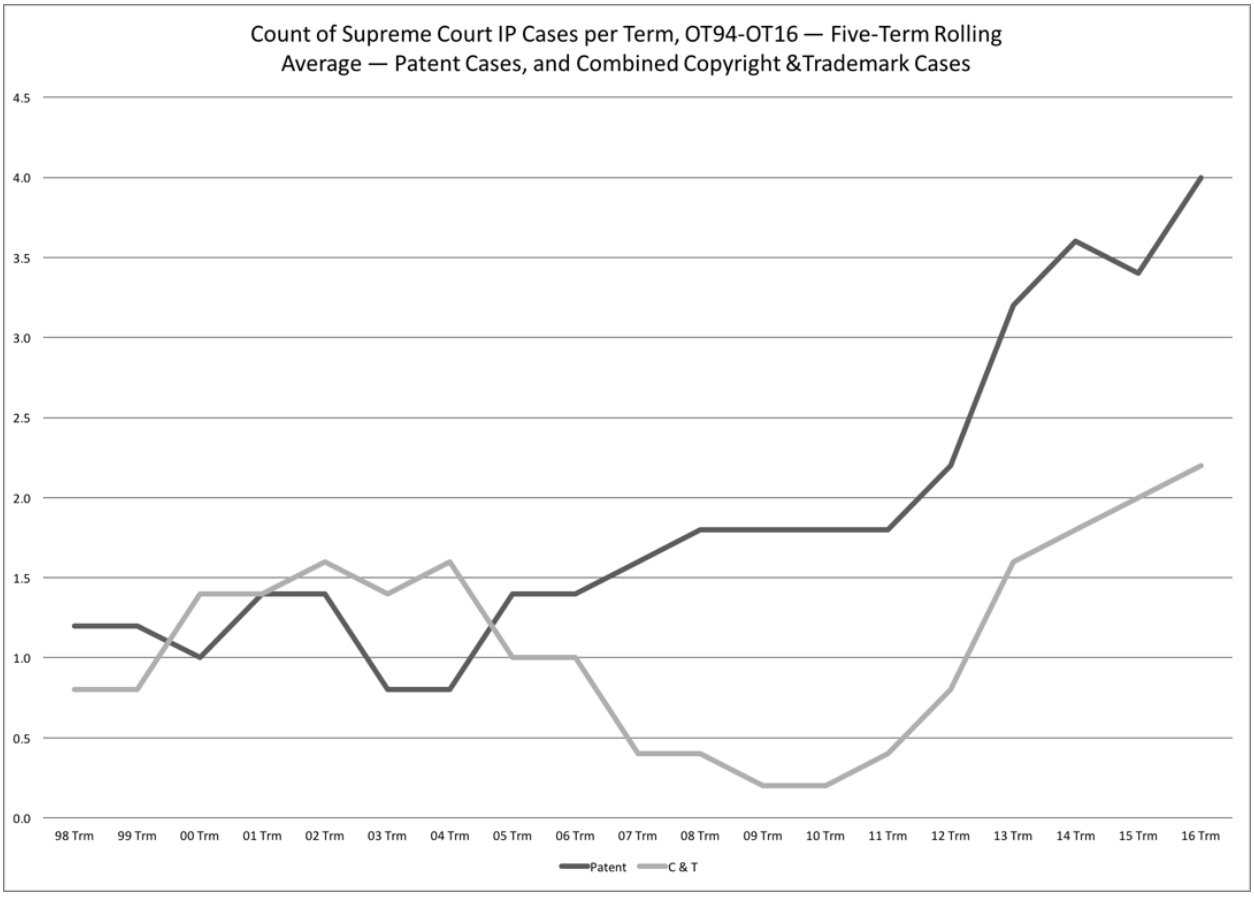

Figure 1 – Count of Supreme Court IP Cases per Term, OT94-OT16

[11] John F. Duffy, *The Federal Circuit in the Shadow of the Solicitor General*, 78 GEO. WASH. L. REV. 518, 523–24 (2010) (footnotes omitted).

[12] *Id.* at 521.

[13] *Id.* fig.1.

Second, it is important to appreciate that the Supreme Court's greater output of patent cases—or even of IP cases more broadly—occurs against a backdrop of declining output overall. In other words, the increase in patent cases does not reflect a rising tide that lifted all boats. Figure 2 graphs the annual count of cases with signed opinions after oral argument, from 1946 to 2016, as tallied in the Spaeth Supreme Court Database;[14] it is plain that the count has fallen by at least half since the mid-1980s.

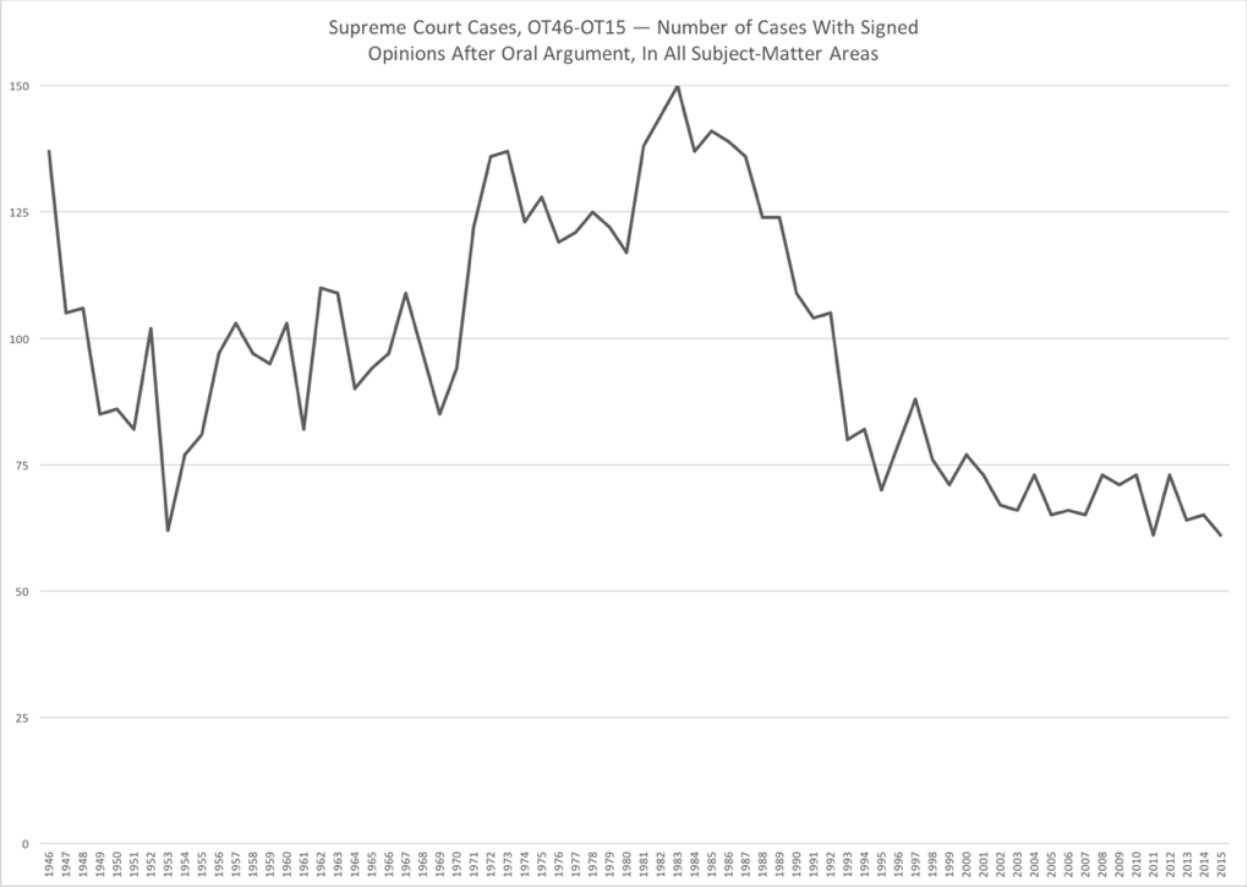

Figure 2 – Supreme Court Cases, OT46-OT15

The plan of this paper is straightforward. After canvassing previous citation studies of appellate courts to develop a set of baseline expectations for what a citation tally of recent Supreme Court IP opinions should reveal, I describe my methodology for identifying cases, counting citations,

[14] Harold J. Spaeth, Lee Epstein, Andrew D. Martin, Jeffrey A. Segal, Theodore J. Ruger & Sara C. Benesh, *2016 Supreme Court Database*, Version 2016 Release 01, http://supremecourtdatabase.org. The Supreme Court Database has provided the basis for a wealth of political science research on Supreme Court decision making. For a rich exploration of the core findings in the field, the interested reader should consult Chapters 2, 3, and 6 of LEE EPSTEIN, WILLIAM M. LANDES & RICHARD A. POSNER, THE BEHAVIOR OF FEDERAL JUDGES (2013).

and estimating cases' importance within the citation network. Next, I set forth my findings, considering all the IP cases together as well as by separate IP type. I conclude with some thoughts about directions for future research in light of the findings reported here.

II. Prior Citation Studies & Baseline Expectations

It is curious that, even as systematic citation indexing in U.S. law approaches its bicentenary,[15] "[c]itation to precedent in judicial opinions is a seriously understudied phenomenon."[16] *Studied*, in this context, means *examined both systematically and quantitatively*, for there are countless expository doctrinal studies that trace, in varied ways, how courts' reliance on one or more precedents ebbs and flows over time. Only a small handful of papers, by contrast, report systematic quantitative research on judicial citation practices. And though there are studies of judicial citations to such non-case authorities as restatements of the law, learned treatises, dictionaries, legislative history materials, or scholarly commentaries,[17] my focus here is on studies of judicial citations of precedents.[18]

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[15] *See* Fred R. Shapiro, *Origins of Bibliometrics, Citation Indexing, and Citation Analysis: The Neglected Legal Literature*, 43 J. AM. SOC'Y FOR INFO. SCI. 337, 338 (1992) (describing Simon Greenleaf's 1821 citation index as "list[ing] cases alphabetically, followed by brief notes on only those subsequent decisions [negatively] affecting the precedential authority of the cited decision").

[16] David G. Post & Michael B. Eisen, *How Long is the Coastline of the Law? Thoughts on the Fractal Nature of Legal Systems*, 29 J. LEGAL STUD. 545, 545 (2000).

[17] *See, e.g.*, James J. Brudney & Lawrence Baum, *Protean Statutory Interpretation in the Courts of Appeals*, 58 WM. & MARY L. REV. 681 (2017) (comparing dictionary and legislative history citation rates in the U.S. Supreme Court and U.S. Courts of Appeals); Joseph Scott Miller & James A. Hilsenteger, *The Proven Key: Roles and Rules for Dictionaries at the Patent Office and the Courts*, 54 AM. U. L. REV. 829, 913–16, tbls.5 & 6 (2005) (documenting, in Federal Circuit claim construction decisions, citation rates for different English language dictionaries and different technical dictionaries and treatises); Lee Petherbridge & David L. Schwartz, *An Empirical Assessment of the Supreme Court's Use of Legal Scholarship*, 106 NW. U. L. REV. 995 (2012). There are also data on recent U.S. and state supreme court citations to briefs from *amicus curiae*, which are akin to these non-case authorities. *See* Allison Orr Larsen, *The Trouble With* Amicus *Facts*, 100 VA. L. REV. 1757, 1777–80, 1818 (2014).

[18] At least five studies report citation rates for non-case material along with citation rates for prior precedent. *See* Lawrence M. Friedman et al., *State Supreme Courts: A Century of Style and Citation*, 33 STAN. L. REV. 773, 810–17 (1981); William H. Manz, *Citations in Supreme Court Opinions and Briefs: A Comparative Study*, 94 L. LIB. J. 267, 269–70, 273–74, 279–80 (2002); John Henry Merryman, *Toward a Theory of Citations: An Empirical Study of the Citation Practice of the California Supreme Court in 1950, 1960, and 1970*, 50 S. CAL. L. REV. 381, 388–91 & tbls.5A–5C (1977); John Henry Merryman, *The Authority of Authority: What the California Supreme Court Cited in 1950*, 6 STAN. L. REV. 613, 652–55 & tbl.2 (1954); Michael Whiteman, *Appellate Jurisprudence in the Internet Age*, 14 NW. J. TECH. & INTELL. PROP. 255, 281–83 (2017).

It is convenient to group these studies of citation to legal precedents into three clusters—earlier mid-scale studies, the transitional Post and Eisen study, and recent large-scale network analysis studies. Four key findings emerge from this literature. First, both state and federal supreme courts in the United States cite their own prior decisions far more often than the decisions of any other judicial body. Second, these same supreme courts cite their recent decisions more often than their older decisions. In other words, "the stock of knowledge capital created by . . . judicial activity, just like a stock of physical capital, both is durable and depreciates."[19] Third, when analyzed at a large scale, citations in judicial cases hew to basic citation patterns that are common in a variety of scholarly literatures. Fourth, network analysis tools can help identify, for a given set of cases at a given time, the precedents that the citations in those cases show to be core authorities.

A. The Mid-Scale Studies

The seminal work in this first group is Merryman's analysis of three selected years of the California Supreme Court's opinions—1950, 1960, and 1970. The study, which expanded upon the 1950-only review he had published twenty-three years earlier,[20] provides citation counts from all California Supreme Court opinions in each of those three years, tallying citations across the full range of cited authorities (California cases, federal cases, restatements, law reviews, etc.).[21] Merryman concisely described the two facets of the supreme court's consistent citation practice: "[t]he authority most frequently cited by the court in all three years was itself,"[22] and "the court strongly favors its more recent decisions."[23] Citations to California Courts of Appeal, though fewer in number, showed the same temporal patterns.[24]

Just a year before Merryman's paper, as part of a study with which Merryman was familiar,[25] Landes and Posner published citation data about judicial opinions in the context of a larger effort

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[19] Posner, *supra* note 1, at 388.

[20] *See generally* Merryman, *Authority of Authority*, *supra* note 18.

[21] *See* Merryman, *Toward a Theory*, *supra* note 18, at 388–91.

[22] *Id.* at 394 (reporting "2,160 citations to decisions of the California Supreme Court out of a total of 4,917 citations to authorities of all kinds, or 44% in 1950; 1,341 of 2,794, or 48%, in 1960; and 1,832 of 4,441, or 41%, in 1970").

[23] *Id.* (observing that "[t]he tendency to favor recent decisions is on the whole rather regular," which "produces something like a predictable decline in the 'citation power' of a decision"); *id.* at 395 ("suggest[ing] that there is a predictable property that might be called the 'citation half-life' of earlier California Supreme Court decisions").

[24] *Id.* at 396 (noting that "the more recent decisions are strongly favored, and the probability that decisions of any given period will be cited declines over time").

[25] *See id.* at 381 n.1 (describing the Landes & Posner study).

to explore "an economic approach to legal precedent."[26] Specifically, they "treat[ed] the body of legal precedents created by judicial decisions in prior periods as a capital stock that yields a flow of information services which depreciates over time as new conditions arise . . . ."[27] The bulk of the judicial opinions providing citation data in the study are sampled randomly from federal courts of appeals decisions, one group from "an approximately 18-month period beginning in January 1974 and ending in the summer of 1975" (totaling 658 decisions) and one group from 1960 (totaling 223 decisions).[28] Critically, for present purposes, the study also included citation data from "all of the decisions handed down by the [U.S.] Supreme Court during its 1974 term."[29] The citation pattern that the Supreme Court's 1974 Term cases reflect is the same as the pattern Merryman described for California's highest state court. Landes and Posner reported that the median age of Supreme Court cases cited in the 1974 opinions was thirteen years,[30] reflecting a preference to cite more recent cases. Moreover, the Supreme Court's 1974 Term cases cited 2,345 Supreme Court cases, compared to only 938 citations to cases from all other courts.[31] In short, just like the California Supreme Court, the U.S. Supreme Court most often cites itself, and it favors its more recent cases.[32]

Four years after Merryman, in the most sweeping of the mid-scale studies, Friedman et al. published data on citation patterns observed in "a sample of 5,900 cases from 16 state supreme courts . . . span[ning] a century of time, from 1870 to 1970."[33] The Friedman study presents a wealth of data about this century of state supreme court style, including opinion length, the

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[26] *See* William M. Landes & Richard A. Posner, *Legal Precedent: A Theoretical and Empirical Analysis*, 19 J. L. & ECON. 249, 250 (1976).

[27] *Id.*

[28] *Id.* at 252.

[29] *See id.* Though they tallied citations in concurring and dissenting opinions as well, Landes & Posner reported only the citation counts from Supreme Court majority opinions. *See id.* at 254 n.8.

[30] *Id.* at 255.

[31] *Id.* at 258 (Table 2, top row reporting "Total" tally, as explained in Note 1 of the table).

[32] A more recent study by Professor Manz confirms the Landes & Posner finding, using citation data from the U.S. Supreme Court's October Term 1996 cases. *See* Manz, *supra* note 18. Manz found, specifically, that "almost 70% of the cases cited in the Court's majority opinions during the 1996 Term were Supreme Court decisions." *Id.* at 269–70 & tbl.3. Importantly, Manz extended the findings of Merryman and Landes & Posner by demonstrating that one can find most—though by no means all—of the cited cases in the briefs filed by parties and *amici*: "[A]pproximately 73.5% of the case authority utilized by the Court appeared in one or more of the briefs." *Id.* at 271 & tbl.5.

[33] Friedman et al., *supra* note 18, at 774. The 16 states were sampled from five different regional clusters within the lower 48 states, and the cases were randomly sampled, in batches of 18 per target state, from each of 21 sampling years from 1870 to 1970 (in five-year steps—1870, 1875, etc.). *Id.* at 774–75. The actual sample was 5,904 cases, rather than 6,048 (*i.e.*, 16 x 18 x 21), "because Idaho and South Dakota did not become states until 1890." *Id.* at 775 n.3.

presence of concurrences and dissents, and rates of citation to cases and many other materials,[34] on the assumption that "[t]he reasoning of the judges . . . is an essential window into the legal culture of the judges"—providing "as good an indicator as we have of what counts as sound legal reasoning for any given era."[35] Taking all the surveyed states together, over the whole timespan considered, Friedman et al. found that "[t]he cases cited most often by [state supreme courts] are their own prior decisions . . . cit[ing] almost two home-grown precedents for every cite to an opinion written by a court of another state."[36] This confirms the pattern found in both the Merryman and the Landes and Posner studies. Given its longer time series spanning deeper into the past, however, the Friedman study further shows that "[t]he disparity emerged . . . only in the twentieth century, and has grown wide only in recent decades," referring to roughly 1940–1970[37]—the decades that both the Merryman and the Landes and Posner studies examined. By the 1960–1970 period, the difference is more pronounced, with state supreme courts citing an average of more than nine in-state cases per opinion while citing only about three out-of-state cases per opinion.[38]

B. The Post & Eisen Study

The mid-scale studies uncover the basic pattern we see in Supreme Court citation practice, a pattern that holds in both state supreme courts and in the U.S. Supreme Court: more frequent citation to a court's own cases,[39] and the more recent ones at that.[40] These studies cannot, however, uncover any fine-grained structure *within* the set of citations because they merely tally the citations without tracking the precise identities of the cited cases. Imagine, for example, a group of Supreme Court cases decided in year *Y*. In that group, are we as likely to see a citation to a given case decided in year *Y-5* as we are to see a citation to any other case decided that same year? (We *do* know, from the mid-scale studies, that we are more likely to see citations to cases decided in year *Y-5* than in year *Y-15* or *Y-25*.) Or, instead, do judicial citations to earlier cases stack up in much the same way that citations accumulate in scholarly literatures, where a small

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[34] *See id.* at 774.

[35] *Id.* at 773. *See also id.* at 794 ("It may be mere rationalization. But we can say, with some certainty, that the opinion and its reasoning show what judges *think* is legitimate argument and legitimate authority, justifying their behavior. And such thoughts are important.").

[36] *Id.* at 796; *see also id.* at 797 fig.A.

[37] *Id.* at 796–97. The Friedman data show regional variations as well, *see id.* at 802–04, but they are not germane to my analysis here.

[38] *Id.* at 797.

[39] *See, e.g.*, Manz, *supra* note 18, at 269 ("Any court with a significant stock of its own opinions shows a marked preference for citing them.").

[40] *See* Ryan C. Black & James F. Spriggs II, *The Citation and Depreciation of U.S. Supreme Court Precedent*, 10 J. EMPIRICAL LEGAL STUD. 325, 327 (2013) ("As the current literature stands, it is well established that older cases are generally less likely to be cited by courts.") (citations omitted).

number of pieces garner many citations and a large number of pieces garner few (or no) citations?[41] To learn more about the texture of the citation network that spans and connects judicial opinions, one must tally an opinion's citations tethered at both ends—the *outward* end, from the citing case, and the *inward* end, to the cited case.[42] It begins, in other words, with the difference between the following equally true statements: "A 2016 Supreme Court case cites, among others, a 1987 Supreme Court case," and "*Bosse v. Oklahoma*, 137 S. Ct. 1 (2016), cites, among others, *Booth v. Maryland*, 482 U.S. 496 (1987)." It develops as we gather information about the other cases to which *Bosse* outwardly cites, the other cases that cite inwardly to *Booth*, and so on.[43]

Post and Eisen move toward this approach in their 2000 study of broad citation networks in judicial opinions, recognizing "that the number of citations to precedent contained in a judicial opinion and the number of subsequent citations to an opinion . . . *help define the structure of* [our legal] system."[44] For the years 1930, 1950, 1970, and 1980, Post and Eisen analyzed the citations found in opinions from the New York Court of Appeals (New York's highest state court) and from the U.S. Court of Appeals for the Seventh Circuit.[45] Specifically, using case-specific Shepard's Citation Index data,[46] they plotted—for each court/year cohort of cases, and summing across years in a given court—both the number of cases containing a given number of

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[41] For a discussion on this issue, *see* Eugene Garfield, *The Evolution of the Science Citation Index*, 10 INT'L MICROBIOLOGY 65, 67 (2007) ("It is well known that there is a skewed distribution of citations in most fields: the 80/20 rule applies in that 20% of the articles may account for 80% of the citations."). Professor Garfield, a leading figure in the study of scholarly citation networks, was instrumental in creating the Science Citation Index. *See generally* EUGENE GARFIELD, CITATION INDEXING—ITS THEORY AND APPLICATION IN SCIENCE, TECHNOLOGY, AND HUMANITIES 6–18 (Robert M. Hayes & Joseph Becker, eds., 1979) (highlighting key moments in the development of citation indexing); Eugene Garfield, *From Citation Indexes to Informetrics: Is the Tail Now Wagging the Dog?*, 48 LIBRI 67, 67–80 (1998) (surveying citation-study methods and metrics).

[42] The terminology is conventional in network analysis. *See, e.g.*, James H. Fowler et al., *Network Analysis and the Law: Measuring the Legal Importance of Precedents at the U.S. Supreme Court*, 15 POL. ANALYSIS 324, 325 (2007) ("We refer to all the precedents a case cites as *outward citations* while all subsequent opinions that cite that case are *inward citations*.") (emphasis added).

[43] *See id.* ("The combination of nodes and links (both outward and inward) create a [judicial] precedent network of any number of cases—for example, within an issue area or among all existing cases.").

[44] *See* Post & Eisen, *supra* note 16, at 570 (emphasis added). Though they appear to have collected similarly fine-grained citation data, Landes et al. focused on the frequency with which particular federal appellate court judges' opinions had been cited. *See* William M. Landes et al., *Judicial Influence: A Citation Analysis of Federal Courts of Appeals Judges*, 27 J. LEGAL STUD. 271, 276–78 (1998). In other words, their counts focused on the inward, not the outward, end of the citations—the number of citations inward to, *e.g.*, Judge Richard Posner's opinions. *See id.* at 277.

[45] Post & Eisen, *supra* note 16, at 571 & tbl.1.

[46] *Id.* at 545 n.*.

outward citations[47] and the number of cases receiving a given number of inward citations.[48] The basic pattern is the same across the two courts over a span of fifty years: Many cases cite to/are cited by a small number of cases, and a small number of cases cite to/are cited by many cases. (With both axes on a logarithmic scale, as they are in all the study's graphs,[49] this displays as the familiar power-law line that slopes downward to the right.[50]) In this way, the Post and Eisen study indicates that the citation network in a given court's judicial opinions has a structure akin to the citation network within a given scholarly domain's published literature.

To explore the possibility more deeply, it would help to plot the counts of inward and outward citations within a larger, temporally continuous mass of cases and to find a way to map a citation network that highlights which of the case within it are the more important ones (for some value of the word "important"). The network analysis of judicial opinions has, happily, already taken these steps.

C. The Large-Scale Network Analysis Studies

Smith has posited that "[t]he legal citation network"—which he "call[s] the 'Web of Law'"—has an "overall topology, or mathematical structure . . . [that] closely resembles that of the World Wide Web."[51] Like Post and Eisen, Smith used Shepard's Citation Index data to track case-specific inward and outward citations.[52] Smith, however, reported analyses of far larger corpora of cases, totaling "more than four million in all."[53] This is a scope so different in degree as to be different in kind, in part because it shows that the power-law pattern in the Post and Eisen study—"relatively very few cases that are cited very frequently, and a large majority of rarely or never cited cases"[54]—is well-nigh universal in U.S. jurisdictions. The pattern holds, for example, when one plots the number of all federal cases cited *C* times[55] and the number of all state cases cited *C* times.[56] Notably, for present purposes, the pattern holds when one plots the number of U.S. Supreme Court cases cited a given number of times.[57] Smith explains:

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47 *Id.* at 572 fig.11 (N.Y. Ct. App.) & 575 fig.12 (7th Cir.).

48 *Id.* at 578 fig.13 (N.Y. Ct. App.) & 581 fig.14 (7th Cir.).

49 *See id.* at 572–83.

50 DAVID EASLEY & JON KLEINBERG, NETWORKS, CROWDS, AND MARKETS: REASONING ABOUT A HIGHLY CONNECTED WORLD §§ 18.1–18.2 (2010) (discussing popularity networks and power laws). To see myriad examples, simply do a Google Image search with the query "power law log."

51 Thomas A. Smith, *The Web of Law*, 44 SAN DIEGO L. REV. 309, 310–11 (2007).

52 *Id.* at 309 n.*, 312 n.12, 324–25.

53 *Id.* at 312–13.

54 *Id.* at 314.

55 *Id.* at 328 fig.6.

56 *Id.* at 328 fig.7.

57 *Id.* at 329 fig.8.

> [A] total of 2,839,156 "citing references" are divided among 107,874 Supreme Court cases that are cited at least once. (If Case A cites Case B one or several times, that counts as one citing reference.) If cases that receive more citing references are thought of as more authoritative, we can see that authority is concentrated in a relatively few opinions, and that most opinions have relatively little authority. Cases receiving one hundred citing references or more comprise only 9.7% of all cited cases. If one included the probably large, but difficult to collect, number of never cited Supreme Court cases, this figure would be even smaller. . . . Only a small percentage of Supreme Court cases thus exercise virtually all of its authority, at least as measured by citation frequency.[58]

Smith also suggests that, because real-world networks with a power-law pattern "tend to be organized in clusters," the network of judicial opinions may cluster as well—in "clusters of cases which are relatively tightly linked within themselves, but more sparsely linked to each other," and which "probably correlate highly with underlying legal semantics."[59] Contemporaneous studies of judicial opinions, using network analysis tools developed to study social networks, bear out Smith's suggestions.

Two network analysis studies of U.S. Supreme Court opinions, by Fowler et al. and by Fowler and Jeon,[60] published a year apart, proceed from the premise that "[a] citation analysis is an ideal way to tap 'case importance' . . . define[d] as the legal relevance of a case for the network of law at the Supreme Court."[61] Because we can treat "a citation to a precedent as a latent judgment by a judge regarding the relevance of the case for helping to resolve a legal dispute," it is "reasonable to determine how relevant a particular opinion is by considering how," in granular detail, "it is embedded in the broader network of opinions comprising the law."[62] The Fowler studies use mathematical tools developed to analyze social networks to map the case citation network within 26,681 signed or *per curiam* Supreme Court majority opinions decided from 1791 to 2005.[63]

For any network of nodes and links, one can pose the question, how can one quantify the centrality (or importance) to the network of the different nodes in the network?[64] "There are of

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[58] *Id.* at 330–31.

[59] *Id.* at 345.

[60] *See* Fowler et al., *supra* note 42; James H. Fowler & Sangick Jeon, *The Authority of Supreme Court Precedent*, 30 SOC. NETWORKS 16 (2008).

[61] Fowler et al., *supra* note 42, at 325.

[62] *Id.* at 326.

[63] *Id.* at 327. The second of the studies uses a larger set of cases, but the addition of these cases from the mid-1700s contributes only minimally to the resulting citation network. Fowler & Jeon, *supra* note 60, at 18 & n.2.

[64] "A large volume of research on networks has been devoted to the concept of *centrality*. This research addresses the question, 'Which are the most important or central vertices in a network?'" M.E.J. NEWMAN, NETWORKS: AN INTRODUCTION 168 (Oxford Univ. Press 2010).

course many possible definitions of importance, and correspondingly many centrality measures for networks."[65] The plots of inward and outward citation frequency found in the Post and Eisen study and in the Smith study are one way to quantify centrality, although only in a macro sense; some cases are clearly more important than others, but the plots do not identify the most frequently cited (or the most frequently citing) cases by name. The Fowler studies confirm the power-law pattern reported by Post and Eisen and by Smith, showing "that the vast majority of [Supreme Court] decisions are cited by only a few [Supreme Court] cases, but there are a few decisions that are widely cited. Similarly, most decisions contain only a few citations, but there are a few decisions that cite a large number of cases."[66]

Another way to quantify centrality, for each case/node in the network, is with a count of the links the case possesses. "The total number of links leading to and from each node is the 'degree,' where the *in degree* is the total number of inward citations and the *out degree* is the total number of outward citations."[67] It is "[p]erhaps the simplest centrality measure in a network," and doubtless "it can be very illuminating."[68] For example, in a body of scholarly literature, "[t]he number of citations a paper receives from other papers, which is simply its in-degree in the citation network, gives a crude measure of whether the paper has been influential or not and is widely used as a metric for judging the impact of scientific research."[69] And just so with a citation network that transits a set of judicial opinions: "At the most basic level one might use the number of inward citations, or *degree centrality*, to measure the importance of a given decision."[70]

As the Fowler studies emphasize, however, degree centrality is something of a second best, precisely because it treats every citing case's inward citation to a target case equally—even while the very citation network under examination can provide information that undercuts the premise. Fowler and Jeon explain:

> [T]his measure does not fully use information in the precedent network because it treats all inward citations in exactly the same way. Ideally, we should be able to use information we obtain about the importance of cited cases to improve our estimate of the importance of the cases that they cite. For example, suppose decision *i* is cited by a case that is considered to be very important and decision *j* is cited by a case that is not. This suggests that decision *i* may itself be more important than decision *j*.[71]

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65 *Id.* at 168–69.

66 Fowler & Jeon, *supra* note 60, at 18, 19 fig.2; *see also* Fowler et al., *supra* note 42, at 332 fig.3 (providing the same plots for the slightly different data set used in that study).

67 Fowler et al., *supra* note 42, at 328.

68 NEWMAN, *supra* note 64, at 169.

69 *Id.*

70 Fowler & Jeon, *supra* note 60, at 20.

71 *Id.* at 20; *see also* Fowler et al., *supra* note 42, at 329.

To take an example from the set of Supreme Court IP cases I analyze in detail below, consider *Dickinson v. Zurko*.[72] To date, the Supreme Court has cited *Zurko* in two subsequent IP cases—*Microsoft Corp. v. i4i Ltd. P'ship*[73] and *Kappos v. Hyatt*,[74] which were decided about ten months apart. We can score *Zurko* a degree centrality of two, with *i4i* and *Hyatt* each contributing one. At present, however, the Supreme Court has cited *i4i* in five subsequent IP cases,[75] but *Hyatt* in only one subsequent IP case.[76] The degree centrality metric does not use that information, although the greater importance of *i4i*, compared to *Hyatt*, is evident in the very citation network they share with *Zurko*. What metric does differentiate inward citations by the centrality of the cases from which they originate? There is more than one available.[77] The Fowler studies focus on a centrality metric Kleinberg developed to analyze Web pages to facilitate topic-based searches,[78] embodied in "a centrality algorithm called *hyperlink-induced topic search* or *HITS*."[79]

Fowler and Jeon explain the Kleinberg algorithm's capacity "to draw on both inward and outward citations for assessing importance,"[80] in a manner that is readily accessible even to one who cannot perform the underlying mathematical calculations. Specifically:

> A *hub* is a case that cites many other decisions, helping to define which legally relevant decisions are pertinent to a given precedent, while an *authority* is a case that is widely cited by other decisions. Most cases act as both hubs and authorities, and the degree to which cases fulfill these roles is mutually reinforcing within the precedent network. A case that is a *good hub* cites many *good authorities*, and a case that is a *good authority* is cited by many *good hubs*. . . . The resulting [numerical] hub and authority scores allow

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72 Dickinson v. Zurko, 527 U.S. 150 (1999).

73 Microsoft Corp. v. i4i Ltd P'ship, 564 U.S. 91, 96 (2011).

74 Kappos v. Hyatt, 566 U.S. 431, 435 (2012).

75 *See* SCA Hygiene Prods. Aktiebolag v. First Quality Baby Prods., LLC, 137 S. Ct. 954, 971 (2017) (Breyer, J., dissenting); Cuozzo Speed Techs. v. Lee, 136 S. Ct. 2131, 2144 (2016); Commil USA, LLC v. Cisco Sys. Inc., 135 S. Ct. 1920, 1929 (2015); Nautilus, Inc. v. Biosig Instruments, Inc., 134 S. Ct. 2120, 2130 n.10 (2014); Kappos v. Hyatt, 566 U.S. 431, 445 (2012). The Supreme Court has also, to date, cited *i4i* in three non-IP cases. *See* Lockhart v. United States, 136 S. Ct. 958, 972–73 (2016) (Kagan, J., dissenting); Marx v. Gen. Revenue Corp., 568 U.S. 371, 385 (2013); Freeman v. Quicken Loans, Inc., 566 U.S. 624, 635 (2012).

76 *See* B & B Hardware, Inc. v. Hargis Indus., Inc., 135 S. Ct. 1293, 1301 (2015). This is, at present, the only Supreme Court citation to *Hyatt* in a subsequent case of any kind.

77 *See* NEWMAN, *supra* note 64, at 169–81 (describing eigenvector, Katz, PageRank, and hubs & authorities centrality measures).

78 *See* Jon M. Kleinberg, *Authoritative Sources in a Hyperlinked Environment*, 46 J. OF THE ACM 604, 605 (1999) ("In particular, we focus on the use of links for analyzing the collection of pages relevant to a broad search topic, and for discovering the most 'authoritative' pages on such topics.").

79 NEWMAN, *supra* note 64, at 179.

80 Fowler & Jeon, *supra* note 60, at 20.

> us to identify the key precedents in the network—precedents that are influential (authorities) and precedents that are well founded in law (hubs).[81]

Using the authority or hub scores computed for each case/node in a citation network, one can rank order the included cases by importance.[82] Fowler and Jeon, for example, used the subject-matter categories tracked in the Spaeth Supreme Court Database to identify the top five cases by authority score, from 1953 to 2000, in four topical areas.[83] Those same cases are highlighted for importance in expert-opinion-based guides: Congressional Quarterly's 1997 *Guide to the United States Supreme Court*, the 1999 *Oxford Guide to Supreme Court Decisions*, and the 2005 Legal Information Institute list.[84] In short, "there is a strong correspondence between authority scores and expert opinion."[85]

Indeed, the Fowler studies critically scrutinize the validity of using authority and hub scores to measure centrality within a caselaw network. The authority score metric performs better than inward centrality, and at least as well as expert opinion. Fowler et al. compare the power of a case's authority score with that of other metrics, such as inward centrality, to predict the likelihood of citation to the case in subsequent U.S. Supreme Court, U.S. Courts of Appeals, and state court decisions. "Overall, inward relevance [i.e., authority score] fits the data better than the alternatives . . . ."[86] In fact, by using Kleinberg scores rather than degree centrality, one "get[s] a considerable amount of information out of the indirect network relationships, after controlling for the simple direct relationships that appear in the citation counts."[87] Fowler and Jeon present multiple mathematical models successfully using authority and hub scores to explain the variability in cases' appearance, or not, in the *Oxford Guide* and the Legal Information Institute list.[88] In addition, annualized graphs of individual case's authority scores

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[81] *Id.* (emphasis in original). *Accord* Kleinberg, *supra* note 78, at 611 ("Hubs and authorities exhibit what could be called a *mutually reinforcing relationship*: a good *hub* is a page that points to many good authorities; a good *authority* is a page that is pointed to by many good hubs.") (emphasis in original).

[82] Widely available software for conducting network analysis and creating data visualizations, such as the open-source application Gephi, https://gephi.org/, computes authority and hub scores as a matter of routine. I used Gephi to compute the authority scores and create the visualizations presented below.

[83] Fowler & Jeon, *supra* note 60, at 23 tbl.3.

[84] *Id.* at 20 (describing these sources), 23 tbl.3 note.

[85] *Id.* at 22.

[86] Fowler et al., *supra* note 42, at 338. With respect to subsequent citation by the Supreme Court, "inward relevance [i.e., authority score] and outward relevance [i.e., hub score] dominate all the other measures of case importance; that is, they lead to significantly larger changes in the predicted probability of the Court citing a case than the other measures do." *Id.* at 342.

[87] *Id.* at 343.

[88] Fowler & Jeon, *supra* note 60, at 22–24 & tbls.4 & 5. *See also id.* at 28 ("Authority scores yield rankings that conform closely to evaluations by legal experts, and even predict which cases they will identify as important in the future.").

do a stunningly effective job charting the way that overruling precedents rise up and displace the authority of the cases they overrule,[89] and the way that a case's importance can rise and fall as the issue-set of interest to the Court shifts over time.[90] The HITS-algorithm authority score serves, in short, as a valid measure of a case's importance within a citation network of judicial opinions.

D. Expectations for the Citations Among Supreme Court IP Opinions

We can use the results from the foregoing citation and network analysis studies to generate predictions about the patterns one should find among the citations to prior Supreme Court opinions within recent Supreme Court IP decisions. To wit, we should see the Supreme Court cite (1) itself more often than other courts, (2) its more recent cases more often than its older cases, and (3) a small group of cases repeatedly, and more often than the large mass of cases (which it may cite once or not at all). This pattern could well hold, moreover, both within any one IP type (patent, copyright, or trademark) and among all the IP cases considered together. Finally, the individual cases within the citation network that spans and connects the IP cases should show a range of authority scores (computed using the HITS algorithm) that enables one to rank the cases in descending order of importance to the network. Using a data visualization tool, one should also be able to depict the relationships among the cases as a function of those authority scores.

We can also generate a contrary prediction, albeit a weak one, for the citation pattern among the Supreme Court's recent patent cases. The prediction is a weak one because the basis for making it—the animating theory of the Federal Circuit as a specialized national intermediate appellate court for all cases arising under the U.S. patent laws, a theory set in motion about forty years ago[91]—has already been undercut by the Supreme Court's large and growing appetite for patent cases in recent years. From the perspective of the Federal Circuit's role in patent law at its inception, this Supreme Court activity should not be happening. Drawing attention to the Court's growing interest, Duffy explained in 2002:

> The Federal Circuit was created in part because of the Supreme Court's then decades-long neglect of the field, and it was *designed to become an expert court* with the jurisdiction and capability *to unify national patent law*. The creation of the Federal

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89 *Id.* at 25–26, 26 fig.7.

90 *Id.* at 26–27, 27 figs.8 & 9. *See also id.* at 28 ("[A]uthority scores conform to qualitative assessments about which issues and cases the Court prioritizes and how these change over time").

91 *See* Daniel J. Meador, *Origin of the Federal Circuit: A Personal Account*, 41 AM. U. L. REV. 581, 581 (1992) ("[P]resent[ing] an account of the origin of the Federal Circuit from the vantage point of one who observed and participated in the earliest stages of its creation."); Harold C. Petrowitz, *Federal Court Reform: The Federal Courts Improvement Act of 1982—And Beyond*, 32 AM. U. L. REV. 543, 550–51 (1983) (recounting the details of the USDOJ's 1978 report, *A Proposal to Improve the Federal Appellate System*, and its role in providing the foundation for what would become the Federal Circuit).

> Circuit seemed *to eliminate any need for further Supreme Court supervision*. . . . [I]n statutory cases the Supreme Court has long seen its primary function as resolving circuit conflicts. With the creation of the Federal Circuit, circuit splits became impossible (or, at best, extremely unlikely), and there consequently seemed to be no pressing need for Supreme Court review. *If a patent decision of the Federal Circuit were important enough to correct, Congress could always do so legislatively*. Moreover, continuing neglect by the Court might actually be desirable if a generalist court is more likely than a specialized institution to bungle the law in a highly technical field such as patent law.
>
> . . . .
>
> . . . There seemed to be a consensus that the creation of a specialized court would insulate patent law from generalist influence and would diminish the power and perhaps the ability of a generalist Supreme Court to continue effective review over the field. This has been a positive point to supporters of specialized courts, who view a generalist influence to be either unnecessary or even detrimental, and a negative to others who bemoan the loss of generalist influence over the path of the law. But it was assumed to be true by all.[92]

Assumed true by all or not, today's Supreme Court has put paid to the premise. The Federal Circuit's expertise, born of specialization, has not insulated patent law from Supreme Court review.

Even so, one might hazard the prediction that the Federal Circuit's unique appellate expertise in patent law—which the Supreme Court has acknowledged[93]—could influence the Supreme Court's citation practices in its recent patent decisions (even if that expertise does not shield patent cases from Supreme Court review). Specifically, given the Federal Circuit's specialized role and much larger body of recent patent law precedent, one could predict that the Supreme Court would, on questions of substantive patent law, cite Federal Circuit decisions with a frequency that more closely resembles its citations to its own prior cases: The Supreme Court would cite Federal Circuit cases noticeably more often, it would cite more recent Federal Circuit cases much more often than older cases, and a small number of Federal Circuit cases would garner the bulk of these repeated Supreme Court citations. In all these respects, the Supreme Court's citations in patent cases would—on this line of thinking—bear the unique stamp of

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[92] Duffy, *supra* note 6, at 276–78 (emphasis added) (footnote omitted). *See also id.* at 277 ("In the debate over the efficacy and desirability of specialized courts, a general assumption has been that *the Supreme Court would have little continuing influence over any area subject to the jurisdiction of the specialized court*.") (emphasis added).

[93] *See* Warner-Jenkinson Co. v. Hilton Davis Chem. Co., 520 U.S. 17, 40 (1997) ("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.").

Congress's creation of the Federal Circuit in 1982. (By way of preview, the data bear out virtually none of these patent-law-specific predictions.)

III. Methodology

The dataset here is a set of citations found within and corresponding to the set of seventy-two IP cases the Supreme Court has decided from October Term 1994 through October Term 2016, inclusive. The cases and their citations can also be stated as a network comprising case nodes and citation links interconnecting them. I identified the cases using computer searches of the Court's decisions during the relevant time period, with search terms such as "Patent Act," "Copyright Act," "Lanham Act" (for trademark and false advertising cases[94]), and "infring! /s (patent or copyright or trademark)." I also relied on my familiarity with the cases from teaching them (which I have done continuously, in one form or fashion, since 2001), as well as consulting lists of Supreme Court IP cases maintained by others.[95] The cases included in the study are listed in Appendixes A and B.

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[94] The federal trademark statute is colloquially known as the Lanham Act, 15 U.S.C. §§ 1051–1141n. It includes a prohibition on false advertising, 15 U.S.C. § 1125(a)(1)(B), as a form of unfair competition. I included such cases in my canvass, and there are three: *POM Wonderful LLC v. Coca-Cola Co.*, 134 S. Ct. 2228 (2014), *Lexmark Int'l v. Static Control Components, Inc.*, 134 S. Ct. 1377 (2014), and *College Sav. Bank v. Florida Prepaid Postsecondary Educ. Expense Bd.*, 527 U.S. 666 (1999).

[95] The principal on-line list I consulted is the pithy one helpfully maintained by Professor Ouellette. *See* Lisa Larrimore Ouellette, *Supreme Court Patent Cases*, Written Description, https://writtendescription.blogspot.com/p/patents-scotus.html (last accessed July 21, 2017). My final case list differs from hers, however, and that merits a few words.

Ouellette's list of Supreme Court patent cases extends back to 1952. For the period from October Term 1994 forward, she includes two cases on her list that I do not. The first, *FTC v. Actavis*, 133 S. Ct. 2223 (2013), is an antitrust case. The FTC initiated it in the Northern District of Georgia, and the appeal went to the 11th Circuit. *Id.* at 2229–30. The alleged antitrust violation is, admittedly, based on the collusive settlement of patent litigation between a name-brand drug maker and a generic firm that had sought FDA approval to enter the market. *Id.* at 2229. Patent law is material to the antitrust question at the core of the case, but the actual patent case itself, between the pharmaceutical firms, was not before the Court. The second case, *Illinois Tool Works Inc. v. Independent Ink, Inc.*, 547 U.S. 28 (2006), did start as an accused infringer's declaratory judgment action against a patentee, and the case did go the Federal Circuit on appeal. *Id.* at 32–33. The issue that the parties actually litigated, however, was an antitrust tying claim. One of the products in the alleged tie was patented, and the patent arguably gave rise to a presumption of market power. The Supreme Court granted review on that question of antitrust law, which it resolved (overruling its prior cases and eliminating the presumption). *Id.* at 31. Again, patent law is material to the antitrust question, but no actual patent dispute was before the court.

Professor Ouellette's list also omits two cases that I include. The first, *Nelson v. Adams USA, Inc.*, 529 U.S. 460 (2000), is a patent infringement case. "This litigation began when Ohio Cellular Products

I developed the citation list for each case by reading the entire opinion(s) in the case and recording each Supreme Court and U.S. Court of Appeals case cited one or more times therein, treating all portions of the cited opinion as on par with the others. I omitted the citations to the lower court opinions in the case, which are cited not for authority but for procedural notation or factual recitation. Importantly, I included all the relevant cited cases, whether they were cited for the first time in a majority opinion, a concurrence, or a dissent, for each citation is the authoring justice's freely chosen indication that the cited case is an influence in what that justice views as the proper grounds for the prudent disposition of the case.[96] For the same reason, I included all the relevant cited cases without respect to the stated reason, if any, for the citation, or the degree to which the citing case expressly analyzed or distinguished the cited case.[97]

For every cited case, using spreadsheets, I recorded its full identifying information, which allowed me to sort all citations both by year of decision and by age (in years separating the citing case from the cited case), and to sort Court of Appeals decisions by circuit of origin. For each cited Supreme Court case, I noted whether it was itself an IP case of the same type, or resolved issues material to IP of the same type, as the case citing it. Finally, I conducted the analyses

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Corporation (OCP) sued respondent Adams USA, Inc. (Adams), claiming patent infringement." *Id.* at 462. The appeal in the case, which turned on the liability for attorney fees of Nelson, OCP's president and sole shareholder, went to the Federal Circuit. *Id.* at 464–65. This patent litigation admittedly came to turn on the proper application of Federal Rule of Civil Procedure 15. All the same, it is a patent infringement case. Both Professor Ouellette's list and mine include, for example, *Florida Prepaid Postsecondary Educ. Expense Bd. v. College Sav. Bank*, 527 U.S. 627 (1999), a patent case that came to turn on the scope of Congress's power to abrogate the sovereign immunity of the states. I include *Nelson* for the same reason I include *Florida Prepaid*—they are both patent infringement cases. The second case, *Unitherm Food Sys., Inc. v. Swift-Eckrich, Inc.*, 546 U.S. 394 (2006), started as declaratory judgment action against a patentee and came to include an antitrust claim, *id.* at 397–98, much like *Illinois Tool Works*. And the case went through the Federal Circuit on appeal. *Id.* at 398–99. Unlike the tying claim in *Illinois Tool Works*, however, the gravamen of the antitrust claim in *Unitherm*—known as a *Walker Process* claim, for the case that recognized it, 382 U.S. 172 (1965)—is the enforcement of a patent that was procured from the Patent Office by fraud. *Unitherm*, 546 U.S. at 397 ("Unitherm . . . alleged that ConAgra had *violated* § 2 of the Sherman Act *by attempting to enforce a patent that was obtained by committing fraud on the Patent and Trademark Office*.") (emphasis added). In short, one cannot allege a *Walker Process* claim without alleging patent-infringement assertions too. Patent law is not only material to a *Walker Process* antitrust claim, it is inextricably at the core of the claim. As a result, I put *Unitherm* on the case list.

[96] The Landes & Posner study collected, but did not report, citations within concurring and dissenting opinions, as well as within majority opinions. Landes & Posner, *supra* note 26, at 254 n.8.

[97] *Cf.* Landes et al., *supra* note 43, at 273 ("We have not distinguished between favorable, critical, or distinguishing citations. It is not clear that we should. Critical citations . . . are also a gauge of influence since it is easier to ignore an unimportant decision than to spell out reasons for not following it.").

below using either the spreadsheet's (Excel's) functionality, or Gephi, an open-source application for network analysis and data visualization.

IV. Results & Discussion

The Supreme Court's recent IP decisions contain citations that, in the aggregate, conform to the patterns shown in prior citation studies of supreme courts generally. They cite their own prior cases far more often than those of other courts, and they cite recent cases more often than older cases. Some cases garnered more inward citations than others, though that phenomenon took place within the prior IP cases much more so than in the non-IP cases. The citation network among IP cases, when analyzed with the HITS algorithm, yielded authority scores that enable one to rank the Supreme Court's IP cases from most to least authoritative within the citation network. Patent cases dominate the ranking, in large part because patent cases dominate the Supreme Court's recent IP cases (comprising forty-six of the seventy-two cases (64 percent) that provide the foundation for this study).

A. Citations in All the Supreme Court's Recent IP Cases

The seventy-two recent Supreme Court IP cases, taken together, contain 1,155 citations to prior Supreme Court cases and 389 citations to prior Court of Appeals decisions, much as the prior citation studies would lead one to predict. Focusing on the Federal Circuit, the Supreme Court cited Federal Circuit[98] cases ninety-eight times in its recent *patent* cases (or 45 percent of the 216 total citations to all the Courts of Appeals in the Court's patent cases), twelve times in its recent *trademark* cases (or 14 percent of the 89 total citations to all the Courts of Appeals in the Court's trademark cases), and three times in its recent *copyright* cases (or 4 percent of the 84 total citations to all the Courts of Appeals in the Court's copyright cases). Among all 389 citations to any Court of Appeals case, no case is cited more than twice. Of the eleven cases cited twice, six

[98] The "Federal Circuit" category includes citations to the two predecessor courts that were combined to form the Federal Circuit—the Court of Customs & Patent Appeals, and the Court of Claims. *See* Federal Courts Improvement Act of 1982, Pub. L. No. 97-164, § 402, 96 Stat. 25 (codified as amended in scattered sections of 28 U.S.C.).

are Federal Circuit cases[99] and five are cases from the other Courts of Appeals.[100] Given the low rate at which the Supreme Court's recent IP cases cite Court of Appeals decisions, the remainder of this paper focuses on citations to prior Supreme Court cases.

The Court's recent IP cases cite more recent Supreme Court cases more often than they cite older Supreme Court cases, just as the citation studies predict. In the aggregate, across all 1,155 citations, the cited cases' median decisional year is 1980, and their median age when cited is thirty-one years. There is variation by IP type, however, and it shows up if one separates the recent IP cases' citations to Supreme Court cases that focus on the same IP type as the citing case from citations to cases that do *not* focus on that same IP type. The categories are set forth in Table 1, below. Among the Court's recent patent cases, the citations to the Court's prior patent cases skew noticeably older (median year 1942, median age sixty-five) than do the corresponding in-type citations for copyright (median year 1975, median age twenty-nine) or for trademark (median year 1985, median age twenty).[101]

	Cited Cases of the Citing Case's IP Type			
	All Types	Patent	Copyright	Trademark
Number of cited cases	438	326	66	46
Median decisional year	1950	1942	1975	1985
Median age when cited	55	65	29	20
	Cited Cases *Not* of the Citing Case's IP Type			
	All Types	Patent	Copyright	Trademark
Number of cited cases	717	343	138	236
Median decisional year	1985	1986	1987	1984
Median age when cited	24	25	23	25

Table 1: Median Year of Decision and Median Age of Cited Supreme Court Decisions, By Citing Case's IP Type

[99] Brooks Furniture Mfg. v. Dutailier Int'l, Inc., 393 F.3d 1378 (Fed. Cir. 2005), *abrogated by* Octane Fitness, LLC v. ICON Health & Fitness, Inc., 134 S. Ct. 1749, 1752–53 (2014); Phillips v. AWH Corp., 415 F.3d 1303 (Fed. Cir. 2005) (en banc); Midwest Indus. v. Karavan Trailers, Inc., 175 F.3d 1356 (Fed. Cir. 1999); State St. Bank & Tr. Co. v. Signature Fin. Grp., 149 F.3d 1368 (Fed. Cir. 1998), *sharply criticized in* Bilski v. Kappos, 561 U.S. 593 (2010); A.C. Aukerman Co. v. R.I. Chaides Constr. Co., 960 F.2d 1020 (Fed. Cir. 1992), *abrogated by* SCA Hygiene Prods. v. First Quality Baby Prods., 137 S. Ct. 954 (2017); Fregeau v. Mossinghoff, 776 F.2d 1034 (Fed. Cir. 1985).

[100] Vornado Air Circulation Sys., Inc. v. Duracraft Corp., 58 F.3d 1498 (10th Cir. 1995); Sebastian Int'l, Inc. v. Consumer Contacts (PtyPty) Ltd., 847 F.2d 1093 (3d Cir. 1988); Abercrombie & Fitch Co. v. Hunting World, Inc., 537 F.2d 4 (2d Cir. 1976) (Friendly, J.); United States v. Wong Kim Bo, 472 F.2d 720 (5th Cir. 1972); Thomson-Houston Elec. Co. v. Ohio Brass Co., 80 F. 712 (6th Cir. 1897) (Taft, J.).

[101] I do not report inferential statistics because my data comprise the relevant population, not merely a sample from some larger population (as a basis for making inferences). "By definition, any difference observed in a population is statistically significant." John R. Allison et al., *Our Divided Patent System*, 82 U. CHI. L. REV. 1073, 1092 n.57 (2015).

The distribution of cited Supreme Court cases, when grouped graphically by decisional year in successive ten-year spans, also confirms the predicted pattern: The Court cites its more recent cases more often. This is shown in Figure 3, below. Of course, the median ages in Table 1 indicate that, in a similar graph that separates citations by the citing case's IP type, the patent-case cites should differ.

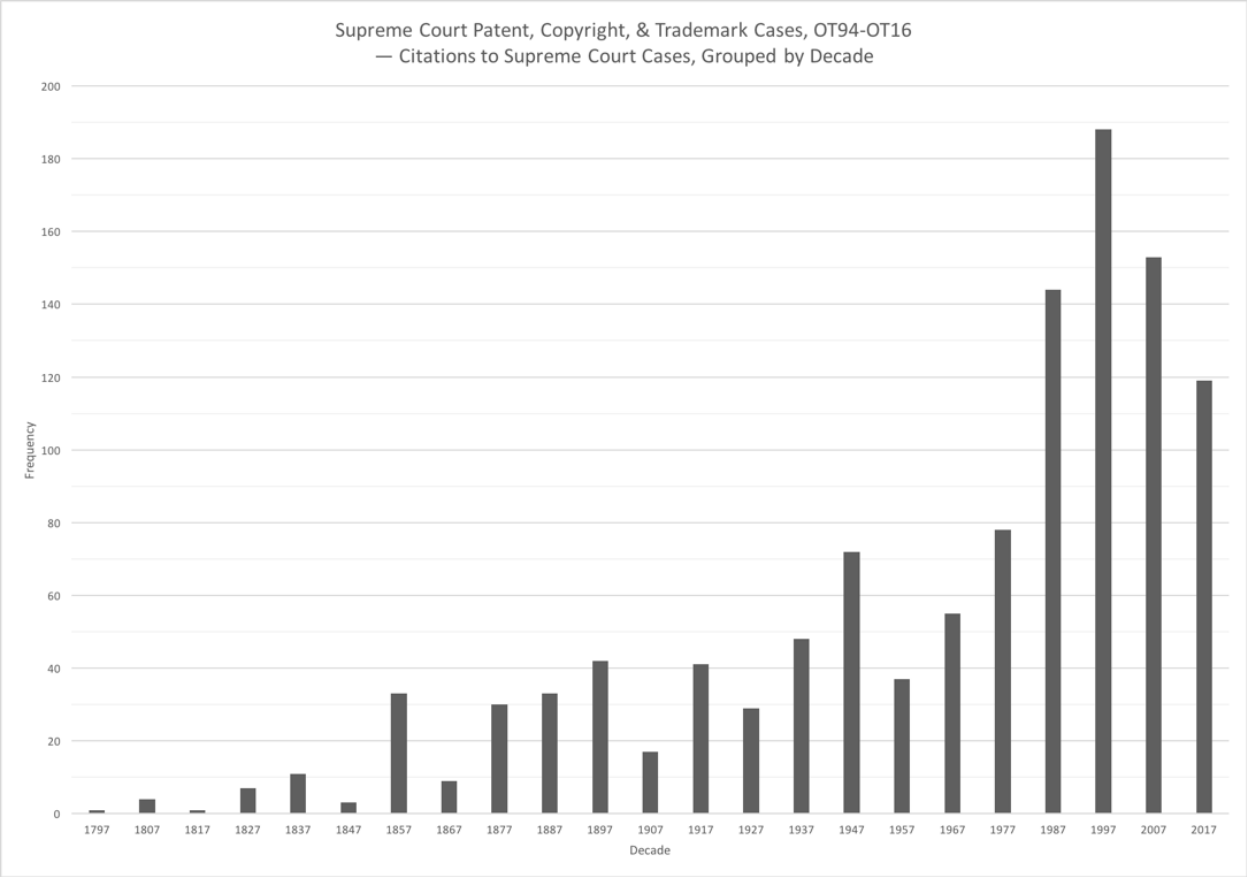

Figure 3 – IP Cases – Citations to Supreme Court Cases, Grouped by Decade

Indeed, they do, as Figure 4 shows. Specifically, the Court's recent patent cases cite to a considerable portion of Court cases from the later 1800s.

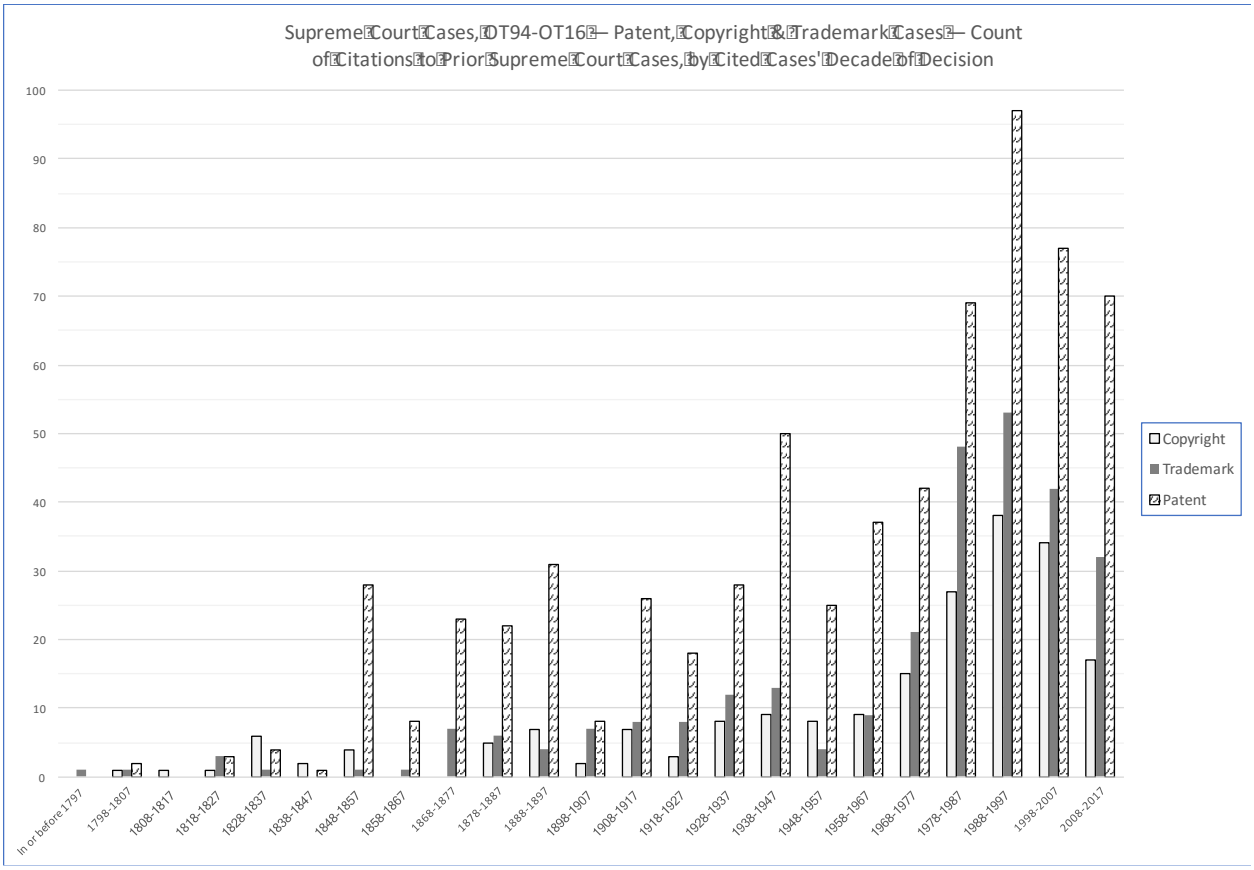

Figure 4 – IP Cases – Count of Citations Prior to Supreme Court Cases, by Cited Cases' Decade of Decision

What, then, of the tendency to cite a small number of cases more frequently, while citing most cases once, or never? That pattern obtains here as well. Taking all the Court's recent IP cases as a group, some prior IP cases garner more cites. Table 2 lists the twenty-eight Supreme Court IP cases that were cited by at least three recent cases of at least two IP types. The most frequently cited case, by a good bit, is the Supreme Court's 1989 decision in *Bonito Boats*,[102] cited in fourteen cases (19 percent).

[102] Bonito Boats, Inc. v. Thunder Craft Boats, Inc., 489 U.S. 141, 143–44 (1989) (holding that the Patent Act preempted a state design-protection law).

Cited Case Name	Year	Number of Citing Cases, by Type of Citing Case		
		Patent	Copyright	Trademark
Bonito Boats v. Thunder Craft Boats	1989	10	1	3
J.E.M. Ag Supply v. Pioneer Hi-Bred Int'l	2001	3	1	1
Kirtsaeng v. John Wiley & Sons I	2013	1	1	1
Sears, Roebuck & Co. v. Stiffel Co.	1964	1	1	1
Sony Corp. v. Universal City Studios	1984	2	6	—
Graham v. John Deere Co.	1966	5	2	—
Markman v. Westview Instruments, Inc.	1995	5	—	1
Mazer v. Stein	1954	2	4	—
Motion Picture Patents Co. v. Universal Film Mfg.	1917	5	1	—
Pfaff v. Wells Electronics, Inc.	1998	4	1	—
Warner-Jenkinson Co. v. Hilton Davis Chemical Co.	1997	4	—	1
Aro Mfg. v. Convertible Top Repl't Co. II	1964	4	1	—
Global-Tech Appliances, Inc. v. SEB S.A.	2011	3	—	1
Eldred v. Ashcroft	2003	—	3	1
Kewanee Oil Co. v. Bicron Corp.	1973	2	2	—
Fox Film Corp. v. Doyal	1932	1	3	—
Trade-Mark Cases	1879	—	1	3
MedImmune, Inc. v. Genentech, Inc.	2007	2	—	1
New York Times Co. v. Tasini	2001	1	2	—
TrafFix Devices, Inc. v. Marketing Displays, Inc.	2001	1	—	2
Campbell v. Acuff-Rose Music, Inc.	1994	1	2	—
Fogerty v. Fantasy, Inc.	1994	2	1	—
Cardinal Chemical Co. v. Morton Int'l	1993	2	—	1
Kellogg Co. v. National Biscuit Co.	1938	—	1	2
Henry v. A.B. Dick Co.	1912	2	1	—
Bobbs-Merrill Co. v. Straus	1908	1	2	—
Grant v. Raymond	1832	2	1	—
Pennock v. Dialogue	1829	2	1	—

Table 2: Supreme Court IP Cases Cited Three or More Times in Supreme Court IP Cases, October Term 1994 – October Term 2016

The Court's citations to non-IP cases, by contrast, show a much weaker degree of repetition. Only eight non-IP cases were cited by at least three recent cases of at least two IP types—less than a third as many as the repeatedly cited IP cases. Moreover, none of these eight non-IP cases was cited by more than four recent cases, whereas twelve of the twenty-eight cases in the repeatedly-cited-IP-case group (43 percent) were cited by more than four recent cases. The eight non-IP cases are listed in Table 3.

Cited Case Name	Year	Number of Citing Cases, by Type of Citing Case		
		Patent	Copyright	Trademark
Marbury v. Madison	1803	2	1	1
Russello v. United States	1983	1	1	1
John R. Sand & Gravel Co. v. United States	2008	2	2	—
Martin v. Franklin Capital Corp.	2005	2	1	—
TRW Inc. v. Andrews	2001	2	1	—
Lujan v. Defenders of Wildlife	1992	1	—	2
Abbott Laboratories v. Gardner	1967	2	1	—
New York Trust Co. v. Eisner	1921	2	1	—

Table 3: Supreme Court Non-IP Cases Cited Three or More Times in Supreme Court IP Cases, October Term 1994 – October Term 2016

B. Citations in the Supreme Court's Recent Patent Cases

As I noted earlier, patent cases dominate the set of recent Supreme Court IP cases, comprising forty-six of the seventy-two cases in the set (64 percent). The graph of cited cases, grouped by decisional year in decades in Figure 5, shows the bumper crop from the 1800s. Table 4, below, lists all cases cited by at least three recent patent cases; only one of them, *Franchise Tax Board*, has no plain connection to patent law.

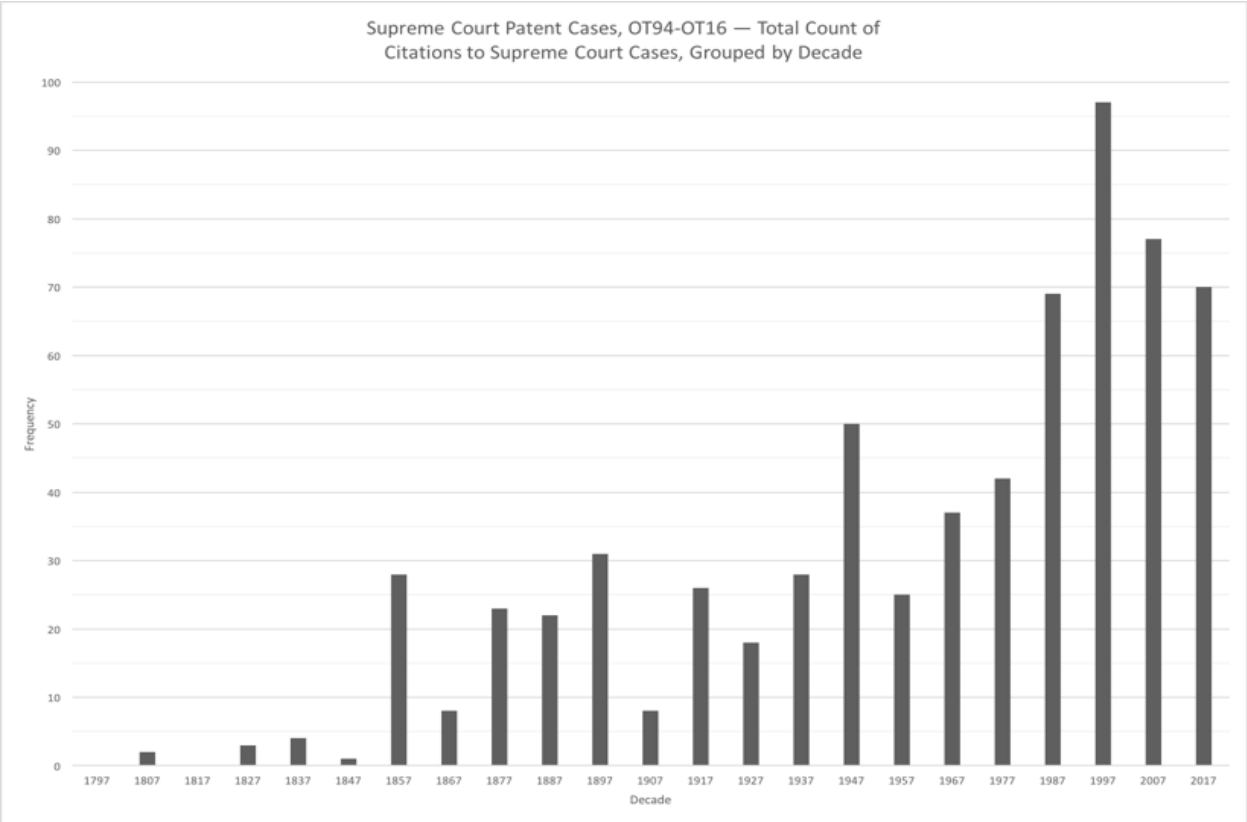

Figure 5 – Patent Cases – Total Count of Citations to Supreme Court Cases, Grouped by Decade

Cited Case Name	Year	Number of Citing Cases
Bonito Boats, Inc. v. Thunder Craft Boats, Inc.	1989	10
Diamond v. Chakrabarty	1980	6
Microsoft Corp. v. i4i Ltd.	2011	5
Bilski v. Kappos	2010	5
Markman v. Westview Instruments, Inc.	1996	5
Deepsouth Packing Co. v. Laitram Corp.	1972	5
Graham v. John Deere Co.	1966	5
Motion Picture Patents Co. v. Universal Film Mfg.	1917	5
O'Reilly v. Morse	1854	5
eBay Inc. v. MercExchange, LLC	2006	4
Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.	2002	4
Pfaff v. Wells Electronics, Inc.	1998	4
Warner-Jenkinson Co. v. Hilton Davis Chemical Co.	1997	4
Diamond v. Diehr	1981	4
Parker v. Flook	1978	4
Gottschalk v. Benson	1972	4
Aro Mfg. v. Convertible Top Replacement Co. II	1964	4
Aro Mfg. v. Convertible Top Replacement Co. I	1961	4
Funk Bros. Seed Co. v. Kalo Inoculant Co.	1948	4
United States v. Univis Lens Co.	1942	4
Winans v. Denmead	1854	4
Le Roy v. Tatham	1853	4
Octane Fitness, LLC v. Icon Health & Fitness, Inc.	2014	3
Global-Tech Appliances, Inc. v. SEB, S.A.	2011	3
Quanta Computer, Inc. v. LG Electronics, Inc.	2008	3
J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc.	2001	3
Christianson v. Colt Indus. Operating Corp.	1988	3
Franchise Tax Board v. Construction Laborers Vacation Tr. for S. Cal.*	1983	3
Lear, Inc. v. Adkins	1969	3
Great Atl. & Pac. Tea Co. v. Supermarket Equip. Corp.	1950	3
Graver Tank & Mfg. v. Linde Air Prods. Co. II	1950	3
The Telephone Cases	1888	3
Cochrane v. Deener	1877	3
Seymour v. Osborne	1870	3
Bloomer v. McQuewan	1853	3

Table 4: Supreme Court Cases Cited Three or More Times in Supreme Court Patent Cases, October Term 1994 – October Term 2016

*This is the only case in the group with no patent law issue genuinely in the case, even superficially. The Court has cited *Franchise Tax Board*, a federal question/removal case,[103] in twenty-nine subsequent cases (according to the Westlaw KeyCite database, through July 2017). None are copyright or trademark.

[103] *See* Paul E. Salamanca, *Another Look at* Skelly Oil *and* Franchise Tax Board, 80 ALB. L. REV. 53, 55 (2017) (concluding that "*Franchise Tax Board* stands for the proposition that, if and only if a state (or one

C. Citations in the Supreme Court's Recent Copyright Cases

Among the seventy-two recent Supreme Court IP cases, twelve (17 percent) are copyright cases. Figure 6 provides the graph of cited cases, grouped by decisional year in decades. Table 5, below, lists all cases cited by at least three of the recent copyright cases. Note that all nine of these often-cited Supreme Court cases are also, themselves, copyright cases.

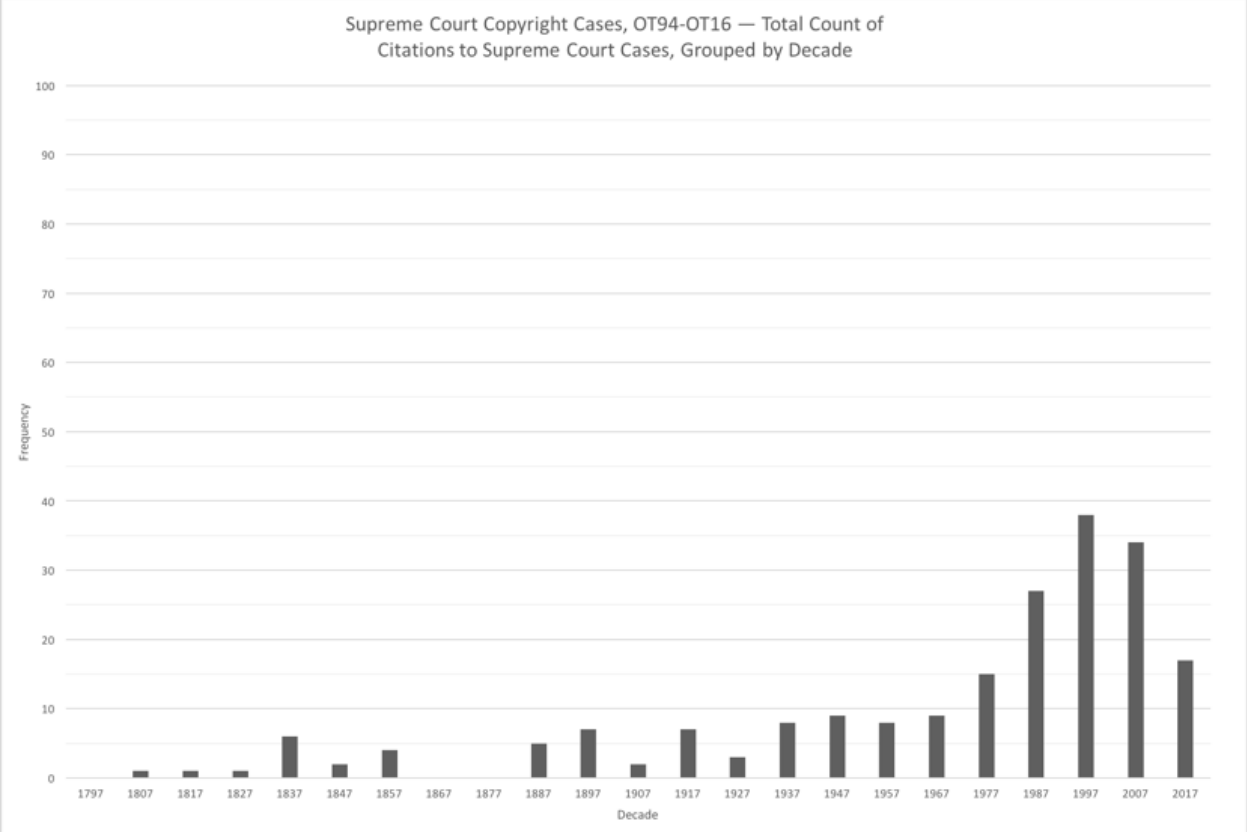

Figure 6 – Copyright Cases – Total Count of Citations to Supreme Court Cases, Grouped by Decade

of its instrumentalities) brings an action for declaratory relief under its own laws, in its own courts, and the party against whom it seeks such relief is sitting on (i.e., declining to bring) a coercive action that arises under the laws of the United States, that party may not remove the case to federal court").

Cited Case Name	Year	Number of Citing Cases
Sony Corp. v. Universal City Studios, Inc.	1984	6
Twentieth Century Music Corp. v. Aiken	1975	4
Mazer v. Stein	1954	4
Eldred v. Ashcroft	2003	3
Feist Publications, Inc. v. Rural Tel. Serv. Co.	1991	3
Stewart v. Abend	1990	3
Harper & Row, Publishers, Inc. v. Nation Enters.	1985	3
Fox Film Corp. v. Doyal	1932	3
Burrow-Giles Lithographic Co. v. Sarony	1884	3

Table 5: Supreme Court Cases Cited Three or More Times in Supreme Court Copyright Cases, October Term 1994 – October Term 2016

D. Citations in the Supreme Court's Recent Trademark Cases

Among the seventy-two recent Supreme Court IP cases, fourteen (19 percent) are trademark cases, broadly understood.[104] Figure 7 provides the graph of cited cases, grouped by decisional year in decades. Table 6, below, lists all cases cited by at least three of the recent trademark cases. Note that all of these often-cited Supreme Court cases are IP cases, and all but one of them—*Bonito Boats*—is a trademark case.

[104] *See supra* note 94 (explaining the Lanham Act's inclusion of false advertising claims).

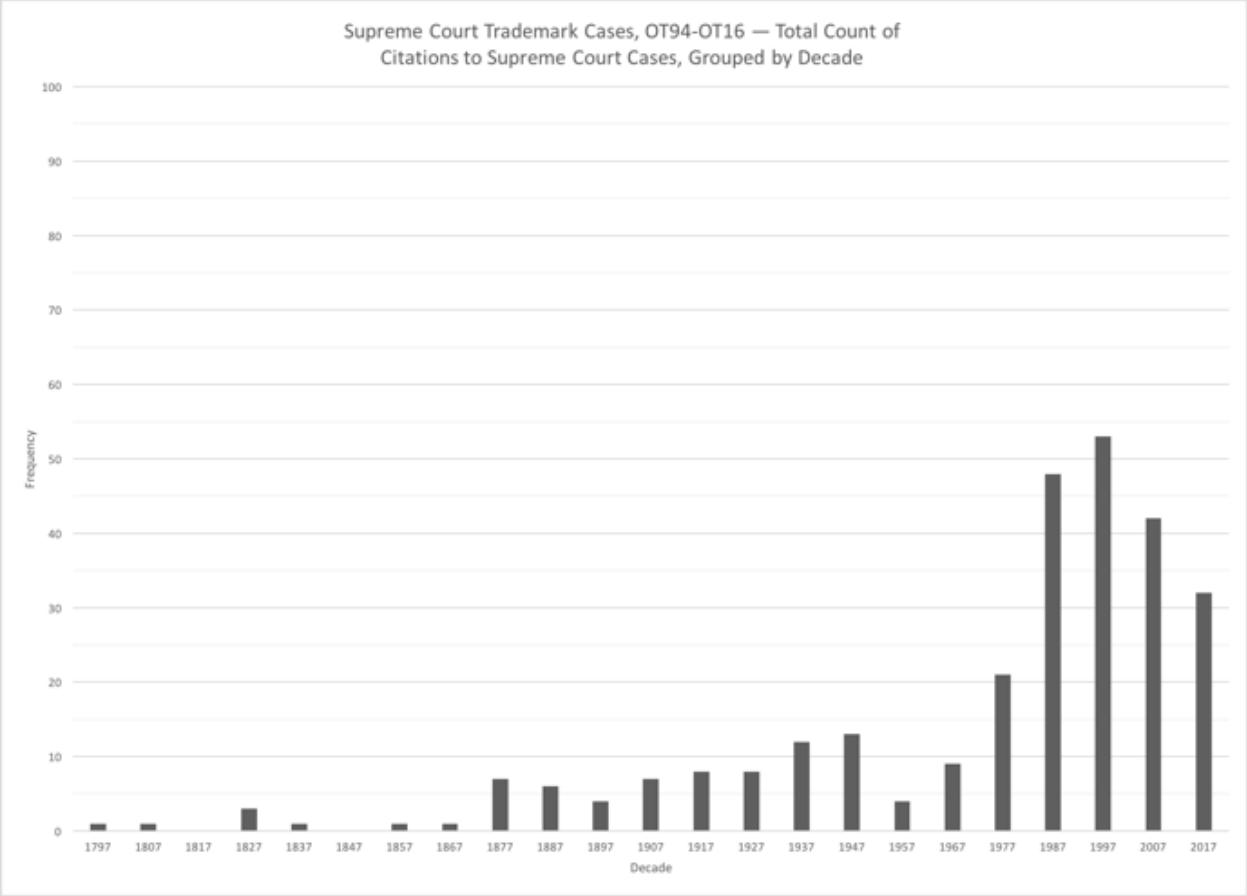

Figure 7 – Trademark Cases – Total Count of Citations to Supreme Court Cases, Grouped by Decade

Cited Case Name	Year	Number of Citing Cases
Two Pesos, Inc. v. Taco Cabana, Inc.	1992	6
Qualitex Co. v. Jacobson Prods. Co.	1995	4
Park 'N Fly, Inc. v. Dollar Park & Fly, Inc.	1985	4
Inwood Labs., Inc. v. Ives Labs., Inc.	1982	4
Wal-Mart Stores, Inc. v. Samara Bros., Inc.	2000	3
Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*	1989	3
Trade-Mark Cases	1879	3

Table 6: Supreme Court Cases Cited Three or More Times in Supreme Court Trademark Cases, October Term 1994 – October Term 2016

* This is the only case in the group with no trademark law issue in the case.

E. The Citation Network Connecting the Supreme Court's Recent IP Cases

The foregoing statistics demonstrate that, consistent with earlier citation studies, the Supreme Court's seventy-two IP cases, from October Term 1994 through October Term 2016, cite Supreme Court case more often than other cases, and cite more recent cases more often than older cases. In addition, the citations accrue to prior cases unevenly, with a few cases garnering several citations and most garnering only one (or none), and we can identify by name the cases cited by the greatest number of citing cases. These citation patterns hold both across all seventy-two IP cases and within each of the three IP types—the patent cases, the copyright cases, and the trademark cases. But these data, as useful as they are, do not make the most of the information embodied in the citation network. To do that, we must use network analysis tools of the type deployed in the Fowler studies, such as Kleinberg's HITS algorithm.[105]

To perform this network analysis, I first created a two-column list of all the citations from the recent Supreme Court IP cases to all Supreme Court IP cases cited three or more times. (The cited-case targets are thus listed in Tables 2 and 4–6, above.) I next added to the list any further citations from more recent cited cases to older cited cases, in order to ensure that the network fully specified the in-degree and out-degree among all the nodes already in the network by virtue of the first step. Consider, for example, *Bonito Boats*, the Supreme Court IP case with the most inward citations from the seventy-two cases at the foundation of the study. *Bonito Boats* itself cites outward to eight cases that were also cited three or more times in their own right by the seventy-two main cases: *Diamond v. Chakrabarty*, *Graham v. John Deere Co.*, *Inwoods Labs v. Ives Labs*, *Kellogg v. National Biscuit*, *Kewanee Oil v. Bicron*, *Lear v. Adkins*, *Pennock v. Dialogue*, and *Sears Roebuck v. Stiffel*. But, after the first step, the two-column list did not yet include *Bonito Boats*' citations to those eight other network cases, because *Bonito Boats*—decided in 1989—is not among the initial set of seventy-two recent Supreme Court IP cases. After the second step, however, the network included those eight links, and all similarly identified links. The resulting network of Supreme Court IP cases has 106 nodes and 383 links.

Using the Gephi program, I applied the Kleinberg algorithm to the network to obtain authority scores for all the cases in the network. Recall that HITS "hub and authority scores allow us to identify the key precedents in the network—precedents that are influential (authorities) and precedents that are well founded in law (hubs)."[106] Of the 106 cases, sixty-three had positive authority scores.[107] The top thirty-two cases, ranked by authority score and ending with the median, are listed below in Table 7. The prominence of the patentable subject matter doctrine in

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[105] *See supra* notes 60–90 and accompanying text.

[106] Fowler & Jeon, *supra* note 60, at 20.

[107] The other 43 cases all have an in degree of zero, being cited by no other case in the network. *See* Newman, *supra* note 64, at 181 ("In the hubs and authorities approach vertices not cited by any others have authority centrality zero (which is reasonable)[.]").

the Supreme Court's recent IP cases (*JEM Ag Supply*, *Lab Corp.*, *Bilski*, *Mayo*, *Myriad*, and *Alice Corp.*) is evident in the top four authority scores, from *Le Roy* to *Gottschalk*. Not until the fifth highest score is there a case with a different doctrinal emphasis—*Bonito Boats*, about Patent Act preemption of a conflicting state design-protection law.[108]

[108] *Bonito*'s high authority score is also intriguing in that the Supreme Court decision almost did not happen. The Court invited Charles Lipsey to defend the Florida high court decision striking down the statute "after being notified that the respondent had not authorized its counsel to participate in Supreme Court litigation in the case." Katherine Shaw, *Friends of the Court: Evaluating the Supreme Court's Amicus Invitations*, 101 CORNELL L. REV. 1533, 1567 n.177 (2016). In a unanimous decision, the Court affirmed that the Patent Act preempted the Florida law. *Bonito Boats, Inc.*, 489 U.S. at 144. "Amicus invitations of this sort—which generally arise when one party to a case declines either to participate at all, or to take a particular position, before the Court—come about once each Term "[T]hey originate with the Court, they direct the recipient of the invitation to take a particular position, and they are always paired with the right to present oral argument." Shaw, *supra* at 1535 (footnotes omitted).

Case Name	Authority Score	In Degree	Out Degree
Le Roy v. Tatham (1853)	0.2960	11	2
O'Reilly v. Morse (1854)	0.2952	11	1
Funk Bros. Seed Co. v. Kalo Inoculant Co. (1948)	0.2648	8	2
Gottschalk v. Benson (1972)	0.2561	7	5
Bonito Boats v. Thunder Craft Boats (1989)	0.2493	14	8
Graham v. John Deere Co. (1966)	0.2332	12	1
Parker v. Flook (1978)	0.2320	6	6
Cochrane v. Deener (1877)	0.2295	7	0
Diamond v. Chakrabarty (1980)	0.2159	8	9
Great A&P Tea Co. v. Supermarket Equip. (1950)	0.1875	9	0
Kewanee Oil v. Bicron (1974)	0.1833	6	3
Grant v. Raymond (1832)	0.1760	10	1
Pennock v. Dialogue (1829)	0.1664	9	0
Diamond v. Diehr (1981)	0.1637	4	9
The Telephone Cases (1888)	0.1475	5	2
Pfaff v. Wells (1998)	0.1473	5	4
Motion Pictr. Pats. v. Universal Film Mfg. (1917)	0.1369	9	4
Deepsouth Packing v. Laitram Corp. (1972)	0.1302	9	4
JEM Ag Supply v. Pioneer Hi-Bred Int'l (2001)	0.1275	5	3
eBay Inc. v. MercExchange, LLC (2006)	0.1189	4	3
Markman v. Westview Instruments, Inc. (1996)	0.1164	6	2
Sony Corp. v. Universal City Studios, Inc. (1984)	0.1114	12	10
Twentieth Century Music Corp. v. Aiken (1975)	0.1059	8	4
Mazer v. Stein (1954)	0.1036	8	3
Sears, Roebuck & Co. v. Stiffel (1964)	0.1020	9	4
Seymour v. Osborne (1871)	0.1010	4	1
Fox Film Corp. v. Doyal (1932)	0.1005	8	1
Festo Corp. v. Shoketsu Kinzoku Kogyo (2002)	0.0941	4	4
The Trade-Mark Cases (1879)	0.0864	8	0
Burrow-Giles Lithographic Co. v. Sarony (1884)	0.0833	7	0
Quanta Computer v. LG Electronics (2008)	0.0829	3	5
Kellogg Co. v. National Biscuit Co. (1938)	0.0820	7	0

Table 7: Supreme Court IP-Case-Citation-Network Top 32 Cases, Ranked By Kleinberg Authority Score

Indeed, patent cases so dominate the thirty-two cases ranked from the top to the median authority score that it is worthwhile to list separately the top ten copyright and trademark cases in the network. In the case of trademark cases, it is actually the top nine cases, however, because only nine trademark cases in the network have authority score greater than zero. Those cases are listed in Tables 8 and 9 below.

Case Name	Authority Score	In Degree	Out Degree
Sony Corp. v. Universal City Studios, Inc. (1984)	0.1114	12	10
Twentieth Century Music Corp. v. Aiken (1975)	0.1059	8	4
Mazer v. Stein (1954)	0.1036	8	3
Fox Film Corp. v. Doyal (1932)	0.1005	8	1
Burrow-Giles Lithographic Co. v. Sarony (1884)	0.0833	7	0
Harper & Row, Publ'rs. v. Nation Enters. (1985)	0.0813	6	4
Feist Publications, Inc. v. Rural Tel. Serv. (1991)	0.0629	5	4
Stewart v. Abend (1990)	0.0546	4	3
Campbell v. Acuff-Rose Music Inc. (1994)	0.0512	3	4
Eldred v. Ashcroft (2003)	0.0318	4	19

Table 8: Supreme Court IP-Case-Citation-Network Top Ten Copyright Cases, Ranked by Kleinberg Authority Score

Case Name	Authority Score	In Degree	Out Degree
Sears, Roebuck & Co. v. Stiffel (1964)	0.1020	9	4
The Trade-Mark Cases (1879)	0.0864	8	0
Kellogg Co. v. National Biscuit Co. (1938)	0.0820	7	0
Inwood Labs., Inc. v. Ives Labs., Inc. (1982)	0.0574	7	2
Two Pesos, Inc. v. Taco Cabana, Inc. (1992)	0.0250	6	3
Wal-Mart Stores v. Samara Bros., Inc. (2000)	0.0199	3	3
Qualitex Co. v. Jacobson Prods. Co. (1995)	0.0190	4	4
TrafFix Devices v. Marketing Displays (2001)	0.0111	3	6
Park 'N Fly, Inc. v. Dollar Park & Fly, Inc. (1985)	0.0105	5	0

Table 9: Supreme Court IP-Case-Citation-Network Top Ten Trademark Cases, Ranked by Kleinberg Authority Score

Finally, there is the matter of network visualization, depicting this IP-case citation network. "Visualization can be an extraordinarily useful tool in the analysis of network data, allowing one to see instantly [the] important structural features of a network that would otherwise be difficult to pick out of the raw data."[109] Gephi, the same application I used to compute authority scores, enables one to visualize the network using a variety of different mapping algorithms, the choice

[109] NEWMAN, *supra* note 64, at 8.

among which is largely a matter of aesthetic preference: "the information in [such] graph layouts is contained in the pattern of which nodes are connected to which other nodes. . . . Ultimately, any arrangement of nodes in space is equally valid as long as no ties are added or dropped."[110] The particular algorithm I used to create the visualizations presented here, known as ForceAtlas2,[111] provides "a force directed layout: it simulates a physical system in order to spatialize a network. Nodes repulse each other like charged particles, while edges attract their nodes, like springs. The forces create a movement that converges to a balanced state."[112] The network graph depicts that balanced state. In addition, using settings that Gephi provides, in the graphs I present here, node size, color saturation, and type size vary with authority score.

Figure 8, the graph below, includes the same top thirty-two cases, by authority score, that Table 7 lists. In other words, for Figure 8, I have filtered out the nodes with an authority score below the median. The force directed layout algorithm pulls more frequently linked cases to the center, and pushes less frequently linked cases to the periphery. Because the HITS algorithm treats different links differently, the presentation in Figure 8—which varies node size, type size, and color directly with authority score—provides an additional layer of information about the structure of the citation network. One can add a further layer by applying an additional algorithm for "community detection," *i.e.*, "divid[ing] the vertices" or nodes "so that the groups formed are tightly knit with many edges inside [the] groups and only a few edges between groups."[113] Gephi provides both a community detection algorithm and a convenient means for assigning a common color to the nodes in a given community. Applying this algorithm, known as Modularity,[114] to the nodes in Figure 8, the cases group into three clusters that are more thickly interlinked within than between the groups. Each group is assigned a different color, and the cite links connecting the nodes bear the color of the node to which they travel (e.g., *Stiffel*'s link to *Pennock* is purple and its link to *Kellogg* is red).

Appendix C provides the complete network graph with all 106 nodes and their links, as well as the same graph with its seven communities labeled. Appendix D provides the network graph comprising all sixty-three nodes that have an authority score greater than zero, as well as the same graph with its five communities labeled. Rather than further characterize my subjective sense of the relationships that these network graphs depict, I simply offer them for the reader's

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[110] STEPHEN P. BORGATTI ET AL., ANALYZING SOCIAL NETWORKS 105 (2013).

[111] For the reader interested in the particular settings, I set Scaling to 100, Gravity to 1, and turned on the "Prevent Overlaps" option.

[112] Mathieu Jacomy et al., *ForceAtlas2, a Continuous Graph Layout Algorithm for Handy Network Visualization Designed for the Gephi Software*, 9(6) PLOS ONE 2 (2014).

[113] NEWMAN, *supra* note 64, at 354. *See also id.* at 378 (observing that "'communities' are defined to be the natural groupings of vertices in networks," and that "we would like to be able to find them whatever their number").

[114] For the reader interested in the particular settings, I set Resolution to the default level of 1.0.

careful consideration—cognizant that, because "[i]ts very essence is to turn structural proximities into visual similarities," the mapping algorithm yields graphs in which "[t]he position of a node cannot be interpreted on its own, it has to be compared to the others."[115]

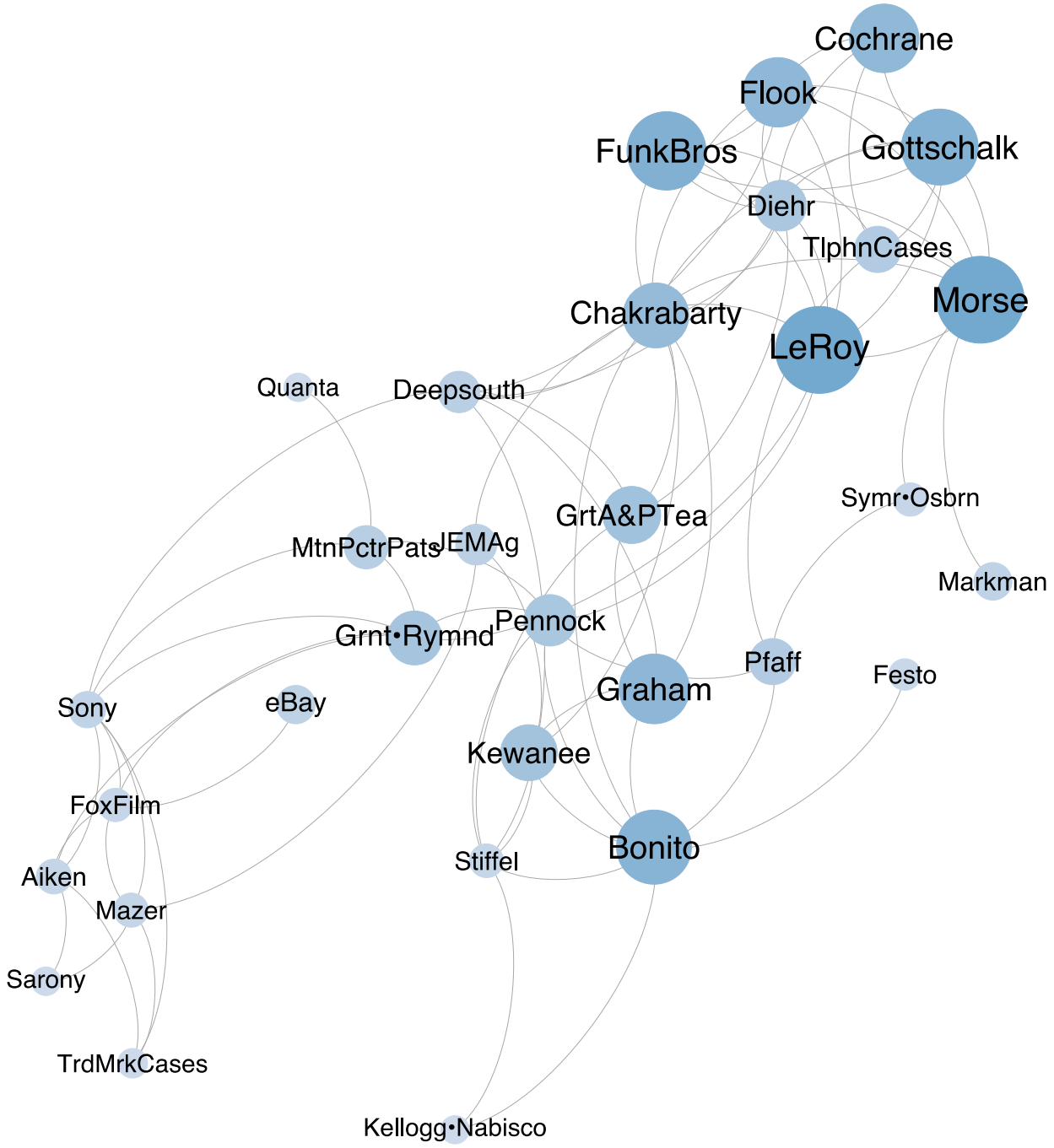


Figure 8

[115] Jacomy et al., *supra* note 111, at 2.

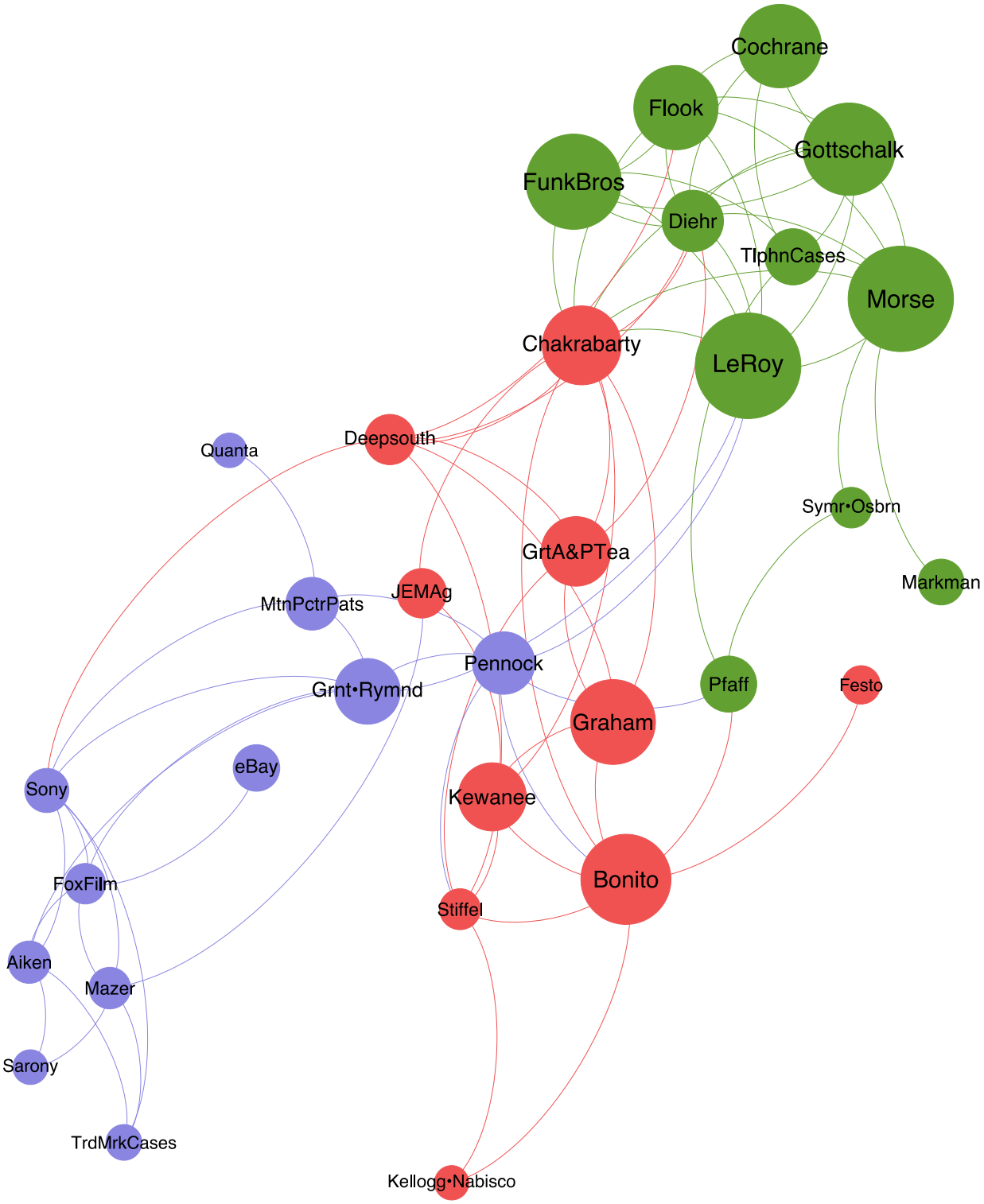

Cochrane
Flook
Gottschalk
FunkBros
Diehr
TlphnCases
Morse
Chakrabarty
LeRoy
Quanta
Deepsouth
Symr•Osbrn
GrtA&PTea
Markman
MtnPctrPats
JEMAg
Pennock
Grnt•Rymnd
Pfaff
Festo
Graham
eBay
Sony
Kewanee
Bonito
FoxFilm
Stiffel
Aiken
Mazer
Sarony
TrdMrkCases
Kellogg•Nabisco

Figure 9

V. Conclusion

The U.S. Supreme Court is unquestionably more active in IP cases now than it was a generation ago. Patent cases dominate the group, and citations to the Court's prior patent cases—including many from the latter 1800s and throughout the 1900s—dominate the citations. The Federal Circuit, whatever its supporters may have hoped for or its detractors may have feared, plays no appreciable role in the real warp and woof of the Supreme Court's contemporary patent jurisprudence, or its larger IP jurisprudence—at least, it does not do so in a way that the citation network permeating recent Supreme Court IP opinions reflects. The Federal Circuit is not unique in this regard, however; no Court of Appeals plays an appreciable role, so far as the citation network reveals.

The network analysis performed on the Court's seventy-two recent IP cases suggests that there is more to be learned about the citation network structuring the Court's IP jurisprudence over a longer span of time—back, for example, to the start of the Supreme Court's discretionary docket with the 1891 passage of the Evarts Act.[116] Given the fuzzy boundary between patent and antitrust cases,[117] it also seems important to extend the citation network to include antitrust cases alongside patent and other IP cases. One could even suppose that the connections among telecommunications, antitrust, and copyright are sufficiently numerous that telecommunications cases should be included too. Of course, other courts and other doctrinal areas are ripe for exploration as well. The findings reported here, which identify the key IP authorities in the Court's recent IP cases, establish the value in exploring quantitatively the citation network that spans and interconnects a set of doctrinally related cases.

[116] Act of March 3, 1891, ch. 517, § 6, 26 Stat. 826, 828 (providing the Supreme Court's certiorari jurisdiction over the newly established Circuit Courts of Appeals). *See* Duffy, *supra* note 6, at 291–96 (discussing the Supreme Court's engagement with passage law in the century spanning the passage of the Evarts Act in 1891 to the Federal Circuit's creation in 1982).

[117] *See supra* note 95.

VI. Appendices

A. Appendix A

Supreme Court Patent Cases				
October Term 1994 – October Term 2016				
Name	Volume	Rprtr	Page	Date
Sandoz Inc v. Amgen Inc	137	S. Ct.	1664	6/12/17
Impression Products, Inc v. Lexmark International, Inc	137	S. Ct.	1523	5/30/17
TC Heartland LLC v. Kraft Foods Group Brands LLC	137	S. Ct.	1514	5/22/17
SCA Hygiene Prods v. First Quality Baby Prods	137	S. Ct.	954	3/21/17
Life Technologies Corp. v. Promega Corp.	137	S. Ct.	734	2/22/17
Samsung Electronics Co. v. Apple Inc.	137	S. Ct.	429	12/6/2016
Cuozzo Speed Techs. v. Lee	136	S. Ct.	2131	6/20/2016
Halo Elecs., Inc. v. Pulse Elecs., Inc.	136	S. Ct.	1923	6/13/2016
Kimble v. Marvel Entertainment, LLC	135	S. Ct.	2401	6/22/2015
Commil USA, LLC v. Cisco Sys., Inc.	135	S. Ct.	1920	5/26/2015
Teva Pharms. USA, Inc. v. Sandoz, Inc.	135	S. Ct.	831	1/20/2015
Alice Corp. v. CLS Bank Int'l	134	S. Ct.	2347	6/19/2014
Limelight Networks, Inc. v. Akamai Techs., Inc.	134	S. Ct.	2111	6/2/2014
Nautilus, Inc. v. Biosig Instruments, Inc.	134	S. Ct.	2120	6/2/2014
Octane Fitness, LLC v. ICON Health Fitness, Inc.	134	S. Ct.	1749	4/29/2014
Highmark Inc. v. Allcare Health Mgmnt Sys.	134	S. Ct.	1744	4/29/2014
Medtronic, Inc. v. Mirowski Family Ventures, LLC	134	S. Ct.	843	1/22/2014
Association for Molecular Pathology v. Myriad Genetics	133	S. Ct.	2107	6/13/2013
Bowman v. Monsanto Co.	133	S. Ct.	1761	5/13/2013
Gunn v. Minton	568	U.S.	251	2/20/2013
Kappos v. Hyatt	566	U.S.	431	4/18/2012
Caraco Pharma. Labs. v. Novo Nordisk	566	U.S.	399	4/17/2012
Mayo Collaborative Srvs. v. Prometheus Labs.	566	U.S.	66	3/20/2012
Microsoft Corp. v. i4i Ltd.	564	U.S.	91	6/9/2011
Stanford University v. Roche Molecular Sys.	563	U.S.	776	6/6/2011
Global-Tech Appliances, Inc. v. SEB S.A.	563	U.S.	754	5/31/2011
Bilski v. Kappos	561	U.S.	593	6/28/2010
Carlsbad Tech., Inc. v. HIF Bio, Inc.	556	U.S.	635	5/4/2009
Quanta Computer, Inc. v. LG Elecs., Inc.	553	U.S.	617	6/9/2008
KSR Int'l Co. v. Teleflex Inc.	550	U.S.	398	4/30/2007
Microsoft Corp. v. AT&T	550	U.S.	437	4/30/2007
MedImmune, Inc. v. Genentech, Inc.	549	U.S.	118	1/9/2007
Lab. Corp. v. Metabolite Labs.	548	U.S.	124	6/22/2006
eBay Inc. v. MercExchange, LLC	547	U.S.	388	5/15/2006
Unitherm Food Sys. v. Swift-Eckrich, Inc.	546	U.S.	394	1/23/2006
Merck KGaA v. Integra Lifesciences I, Ltd.	545	U.S.	193	6/13/2005
Holmes Group, Inc. v. Vornado Air Circulation Sys.	535	U.S.	826	6/3/2002
Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.	535	U.S.	722	5/28/2002
J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int'l	534	U.S.	124	12/10/2001
Nelson v. Adams USA, Inc.	529	U.S.	460	4/25/2000
Florida Prepaid Postsecondary Edu. Exp. Bd. v. College	527	U.S.	627	6/23/1999
Dickinson v. Zurko	527	U.S.	150	6/10/1999
Pfaff v. Wells Elecs.	525	U.S.	55	11/10/1998
Warner-Jenkinson Co. v. Hilton Davis Chem.	520	U.S.	17	3/3/1997
Markman v. Westview Instruments, Inc.	517	U.S.	370	4/23/1996
Asgrow Seed Co. v. Winterboer	513	U.S.	179	1/18/1995

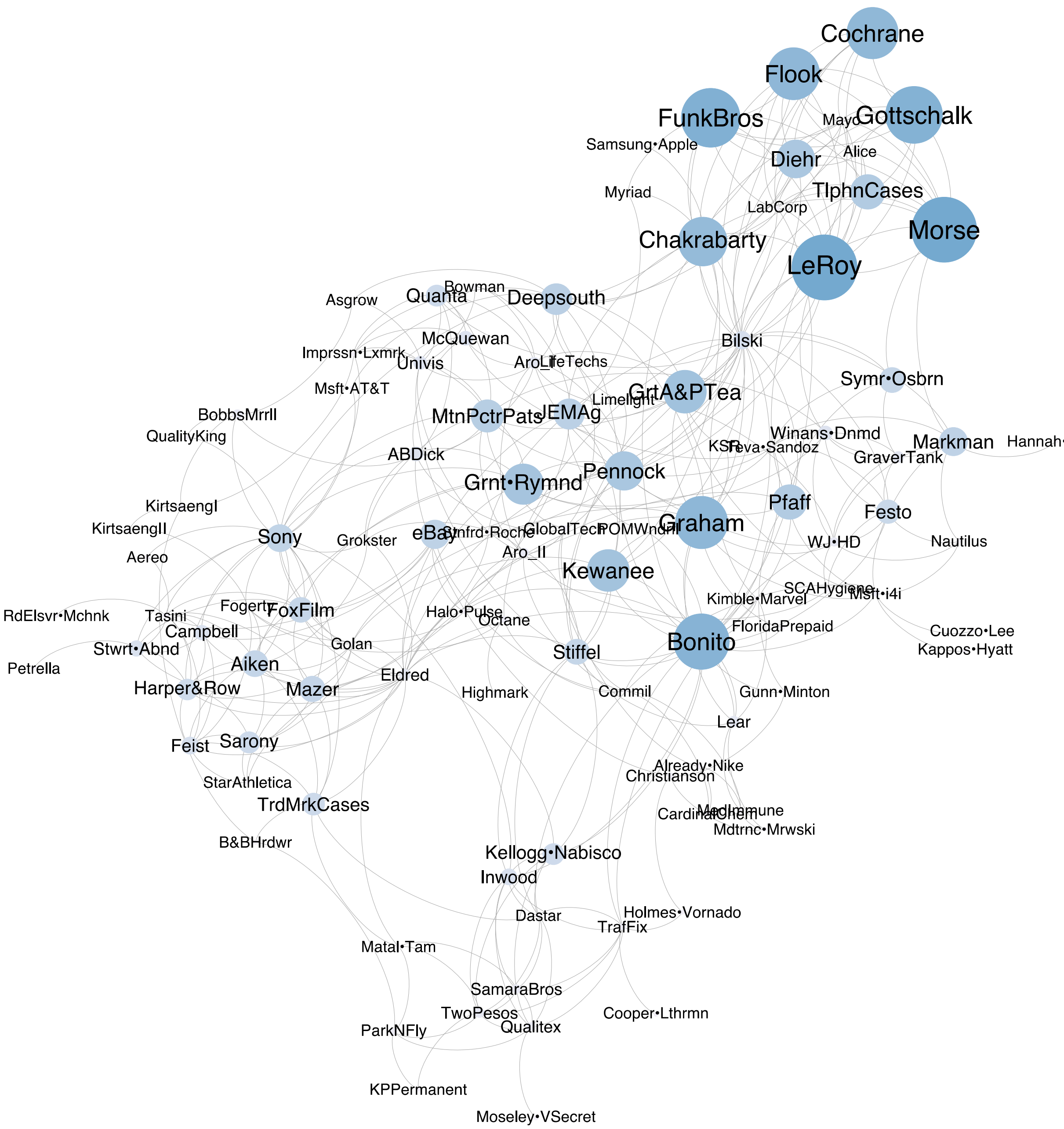
B. Appendix B

Supreme Court Copyright Cases				
October Term 1994 – October Term 2016				
Name	Volume	Rprtr	Page	Date
Star Athletica, LLC v. Varsity Brands, Inc.	137	S. Ct.	1002	3/22/2017
Kirtsaeng v. John Wiley & Sons, Inc.	136	S. Ct.	1979	6/16/2016
ABC, Inc. v. Aereo, Inc.	134	S. Ct.	2498	6/25/2014
Petrella v. MGM, Inc.	134	S. Ct.	1962	5/19/2014
Kirtsaeng v. John Wiley & Sons, Inc.	568	U.S.	519	3/19/2013
Golan v. Holder	565	U.S.	302	1/18/2012
Reed Elsevier, Inc. v. Muchnick	559	U.S.	154	3/2/2010
MGM Studios Inc. v. Grokster, Ltd.	545	U.S.	913	6/27/2005
Eldred v. Ashcroft	537	U.S.	186	1/15/2003
New York Times Co. v. Tasini	533	U.S.	483	6/25/2001
Feltner v. Columbia Pictures Television, Inc.	523	U.S.	340	3/31/1998
Quality King Distribs. v. L'Anza Res. Int'l	523	U.S.	135	3/9/1998

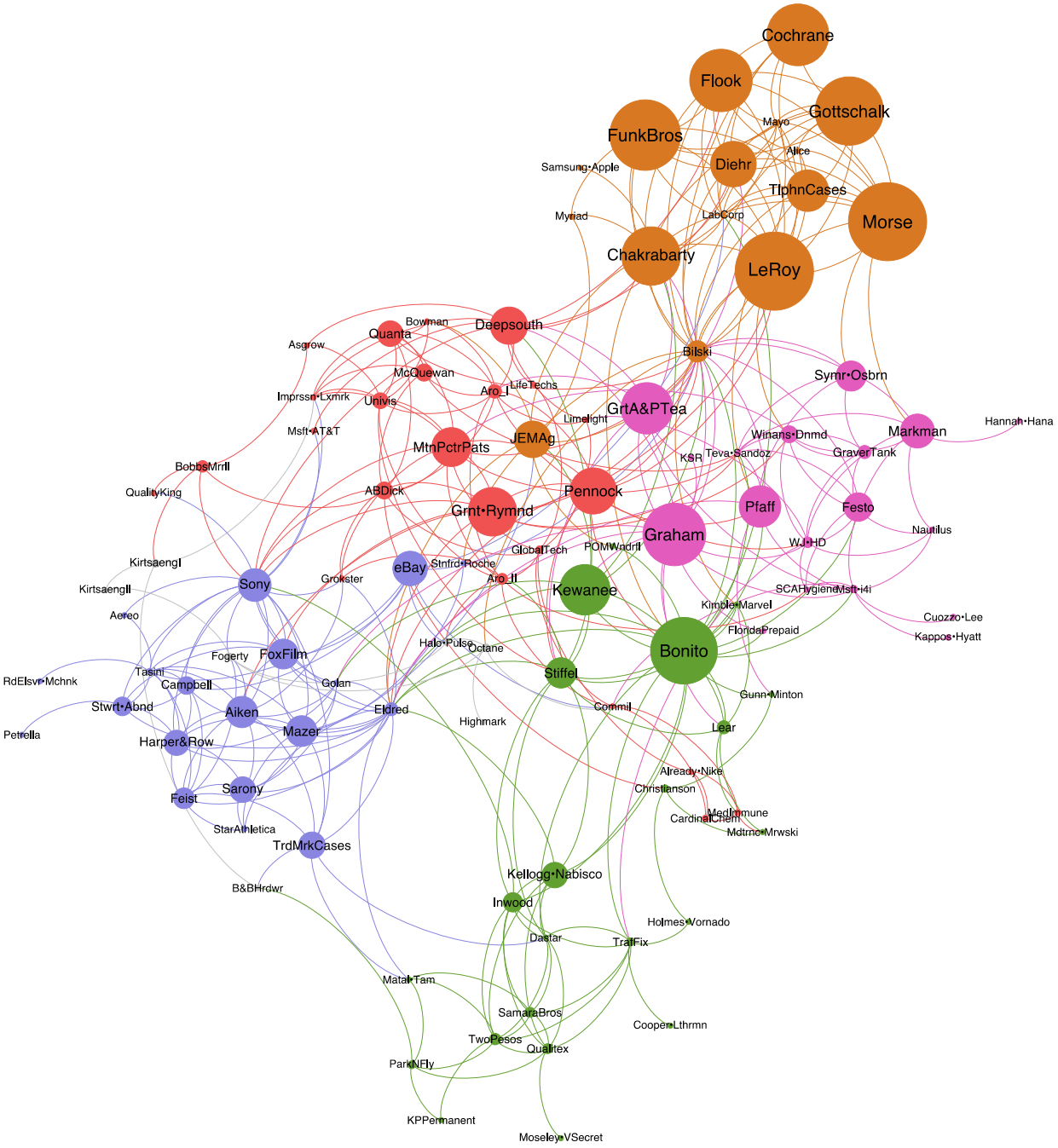
Supreme Court Trademark Cases				
October Term 1994 – October Term 2016				
Name	Volume	Rprtr	Page	Date
Matal v. Tam	137	S. Ct.	1744	6/19/2017
B&B Hardware, Inc. v. Hargis Indus., Inc.	135	S. Ct.	1293	3/24/2015
Hana Financial, Inc. v. Hana Bank	135	S. Ct.	907	1/21/2015
POM Wonderful LLC v. Coca-Cola Co.	134	S. Ct.	2228	6/12/2014
Lexmark Int'l v. Static Control Components, In	134	S. Ct.	1377	3/25/2014
Already, LLC v. Nike, Inc.	568	U.S.	85	1/9/2013
KP Permanent Make-Up, Inc. v. Lasting Impres	543	U.S.	111	12/8/2004
Dastar Corp. v. Twentieth Century Fox Film Co	539	U.S.	23	6/2/2003
Moseley v. V Secret Catalogue, Inc.	537	U.S.	418	3/4/2003
Cooper Indus. v. Leatherman Tool Grp.	532	U.S.	424	5/14/2001
TrafFix Devices, Inc. v. Marketing Displays, inc	532	U.S.	23	3/20/2001
Wal-Mart Stores v. Samara Bros., Inc.	529	U.S.	205	3/22/2000
College Savings Bank v. Florida Prepaid Posts	527	U.S.	666	6/23/1999
Qualitex Co. v. Jacobson Prods.	514	U.S.	159	3/28/1995

C. Appendix C

This figure shows the entire network of citations to IP cases, beginning with all the IP cases cited three or more times by any of the 72 recent Supreme Court IP cases, and adding links for all citations to earlier often-cited IP cases from later often-cited IP case on the list. For example, *Bonito Boats*, the Supreme Court IP case with most inward citations from the 72 October Term 1994 to October Term 2016 cases, cites outward to eight cases that were also cited three or more times by the October Term 1994 to October Term 2016 cases in their own right: *Diamond v. Chakrabarty*, *Graham v. John Deere Co.*, *Inwoods Labs v. Ives Labs*, *Kellogg v. National Biscuit*, *Kewanee Oil v. Bicron*, *Lear Inc. v. Adkins*, *Pennock v. Dialogue*, and *Sears Roebuck v. Stiffel*. The network includes those eight links, and all similarly identified links. The network has 106 nodes and 383 links. *Bonito Boats* has the highest in-degree (14), and *Eldred* has the highest out-degree (19). The figure on the following page shows the same network and applies a community detection algorithm to identify seven different clusters, in separate colors.

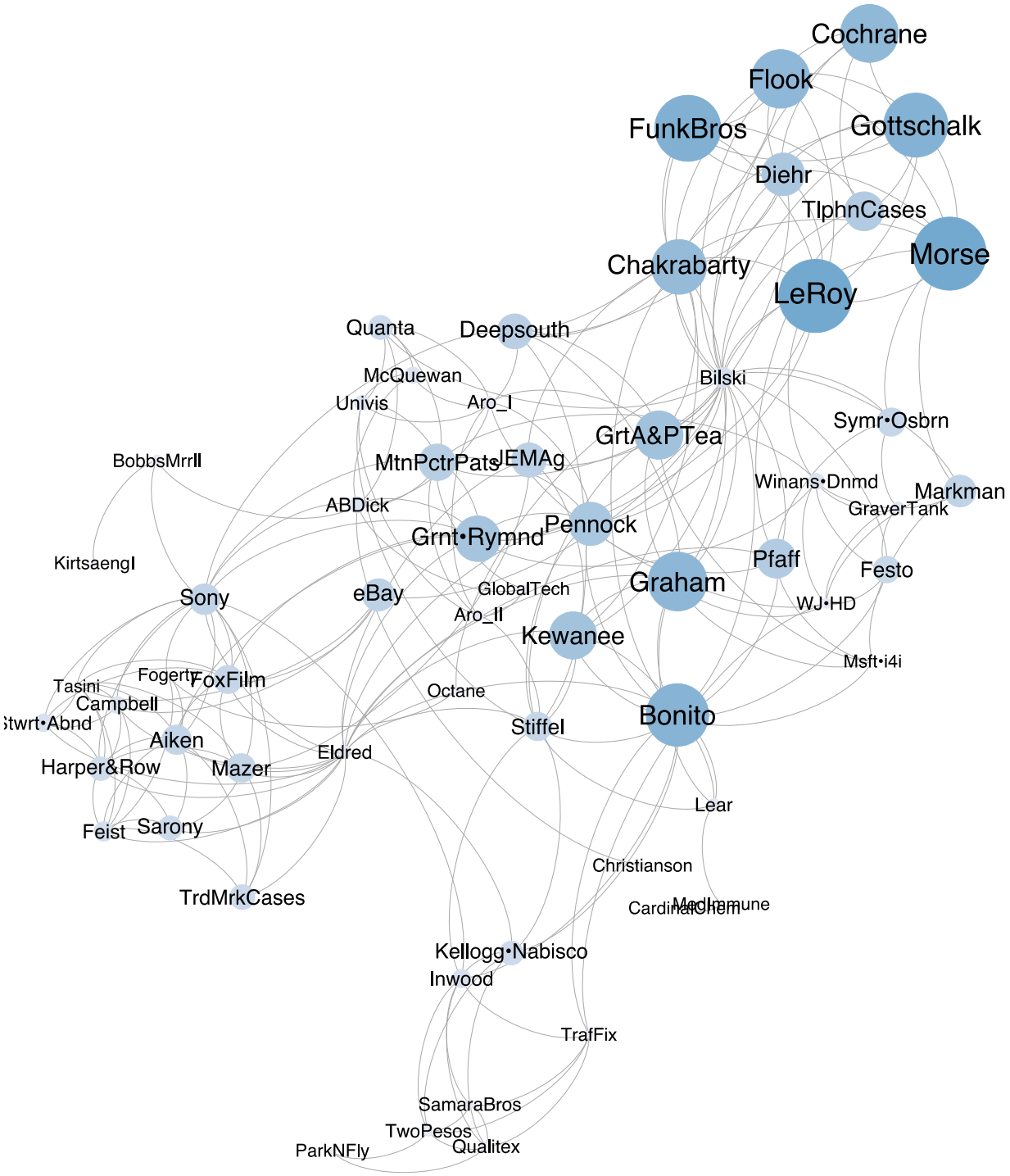


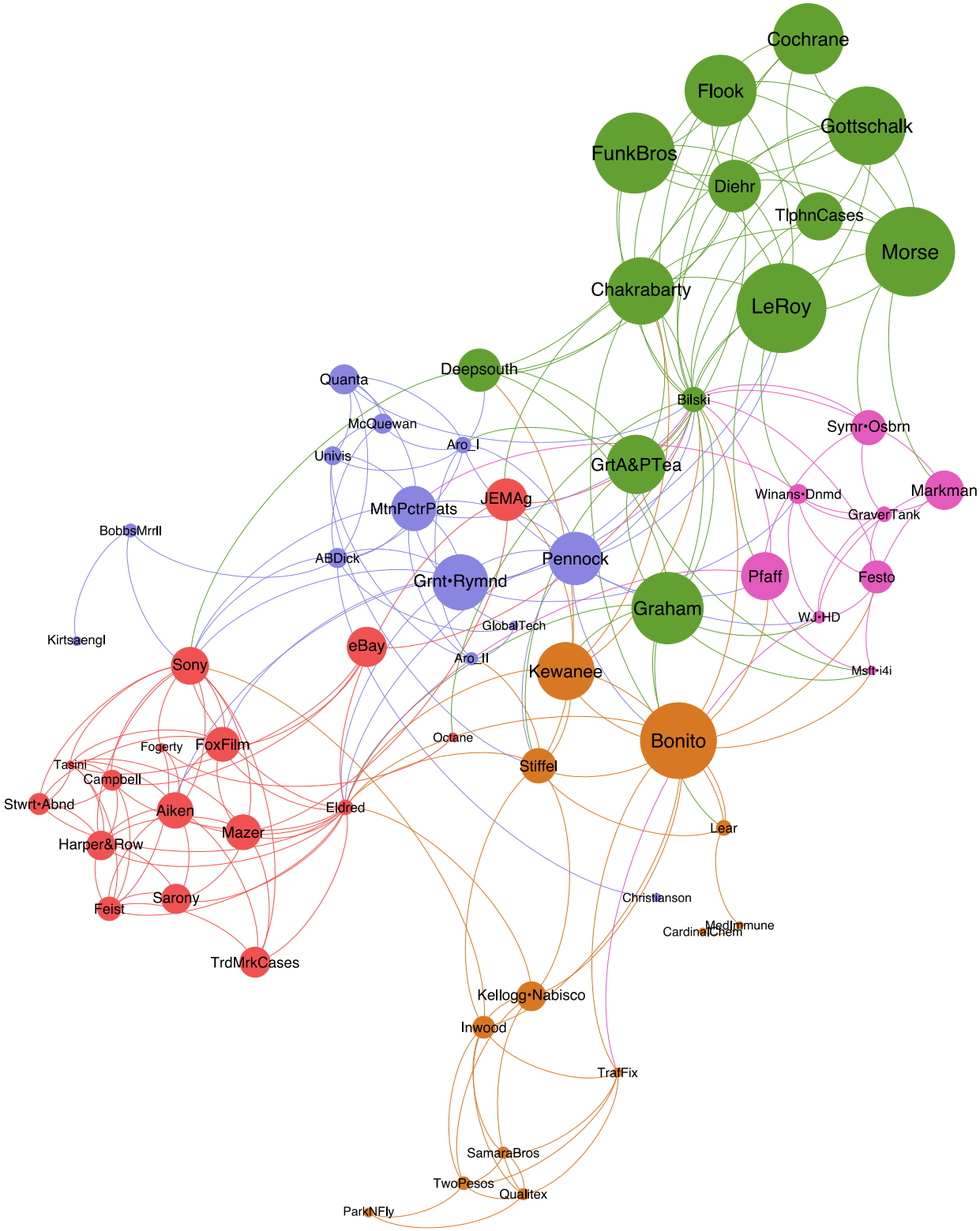
Cochrane
Flook
FunkBros
Gottschalk
Mayo
Samsung•Apple
Diehr
Alice
TlphnCases
Myriad
LabCorp
Morse
Chakrabarty
LeRoy
Asgrow
Quanta
Bowman
Deepsouth
McQuewan
Imprssn•Lxmrk
Univis
LifeTechs
Bilski
Msft•AT&T
Symr•Osbrn
GrtA&PTea
Limelight
MtnPctrPats
JEMAg
BobbsMrrll
QualityKing
Winans•Dnmd
Markman
Hannah
Teva•Sandoz
GraverTank
ABDick
Pennock
Grnt•Rymnd
Pfaff
KirtsaengI
Festo
KirtsaengII
Sony
Grokster
eBay
GlobalTech
Graham
WJ•HD
Nautilus
Aro_II
Aereo
Kewanee
SCAHygiene
Msft•i4i
Kimble•Marvel
RdElsvr•Mchnk
Tasini
FoxFilm
Halo•Pulse
Octane
FloridaPrepaid
Campbell
Cuozzo•Lee
Kappos•Hyatt
Stwrt•Abnd
Golan
Bonito
Stiffel
Petrella
Aiken
Harper&Row
Mazer
Eldred
Highmark
Commil
Gunn•Minton
Lear
Feist
Sarony
Already•Nike
Christianson
StarAthletica
TrdMrkCases
Mdtrnc•Mrwski
B&BHrdwr
Kellogg•Nabisco
Inwood
Dastar
Holmes•Vornado
TrafFix
Matal•Tam
SamaraBros
TwoPesos
Cooper•Lthrmn
Qualitex
ParkNFly
KPPermanent
Moseley•VSecret


Cochrane
Flook
Gottschalk
FunkBros
Mayo
Alice
Diehr
Samsung•Apple
TlphnCases
Morse
Myriad
LabCorp
Chakrabarty
LeRoy
Deepsouth
Bowman
Quanta
Asgrow
Bilski
McQuewan
Symr•Osbrn
Impressn•Lxmrk
Univis
Aro_I
LifeTechs
GrtA&PTea
Limelight
Markman
Hannah•Hana
Msft•AT&T
JEMAg
MtnPctrPats
Winans•Dnmd
GraverTank
KSR
Teva•Sandoz
BobbsMrrll
QualityKing
ABDick
Pennock
Pfaff
Festo
Grnt•Rymnd
Graham
Nautilus
GlobalTech
POMWadrll
WJ•HD
KirtsaengI
eBay
Stnfrd•Roche
Aro_II
Sony
Grokster
Kewanee
SCAHygiene
Msft•i4i
KirtsaengII
Kimble•Marvel
Aereo
Cuozzo•Lee
FloridaPrepaid
Kappos•Hyatt
Halo•Pulse
Octane
Bonito
Fogerty
FoxFilm
Tasini
Stiffel
RdElsvr•Mchnk
Campbell
Golan
Gunn•Minton
Stwrt•Abnd
Aiken
Eldred
Commil
Highmark
Lear
Petrella
Mazer
Harper&Row
Already•Nike
Christianson
Sarony
Feist
MedImmune
CardinalChem
Mdtrnc•Mrwski
StarAthletica
TrdMrkCases
Kellogg•Nabisco
B&BHrdwr
Inwood
Holmes•Vornado
Dastar
TrafFix
Matal•Tam
SamaraBros
Cooper•Lthrmn
TwoPesos
Qualitex
ParkNFly
KPPermanent
Moseley•VSecret

D. Appendix D

This figure shows all the nodes in the network that have a HITS algorithm authority score greater than zero. There are 63 such case nodes, from the 106 total nodes in the network. The figure on the following page shows the same network and applies a community detection algorithm to identify five different clusters, in separate colors.




Cochrane
Flook
Gottschalk
FunkBros
Diehr
TlphnCases
Morse
Chakrabarty
LeRoy
Deepsouth
Quanta
Bilski
McQuewan
Aro_I
Symr•Osbrn
Univis
GrtA&PTea
Markman
Winans•Dnmd
JEMAg
MtnPctrPats
GraverTank
BobbsMrrll
ABDick
Pennock
Grnt•Rymnd
Pfaff
Festo
Graham
WJ•HD
GlobalTech
Kirtsaengl
eBay
Aro_II
Kewanee
Msft•i4i
Sony
Bonito
Octane
Fogerty
FoxFilm
Tasini
Stiffel
Campbell
Stwrt•Abnd
Aiken
Eldred
Lear
Mazer
Harper&Row
Christianson
Sarony
Feist
MedImmune
CardinalChem
TrdMrkCases
Kellogg•Nabisco
Inwood
TrafFix
SamaraBros
TwoPesos
Qualitex
ParkNFly