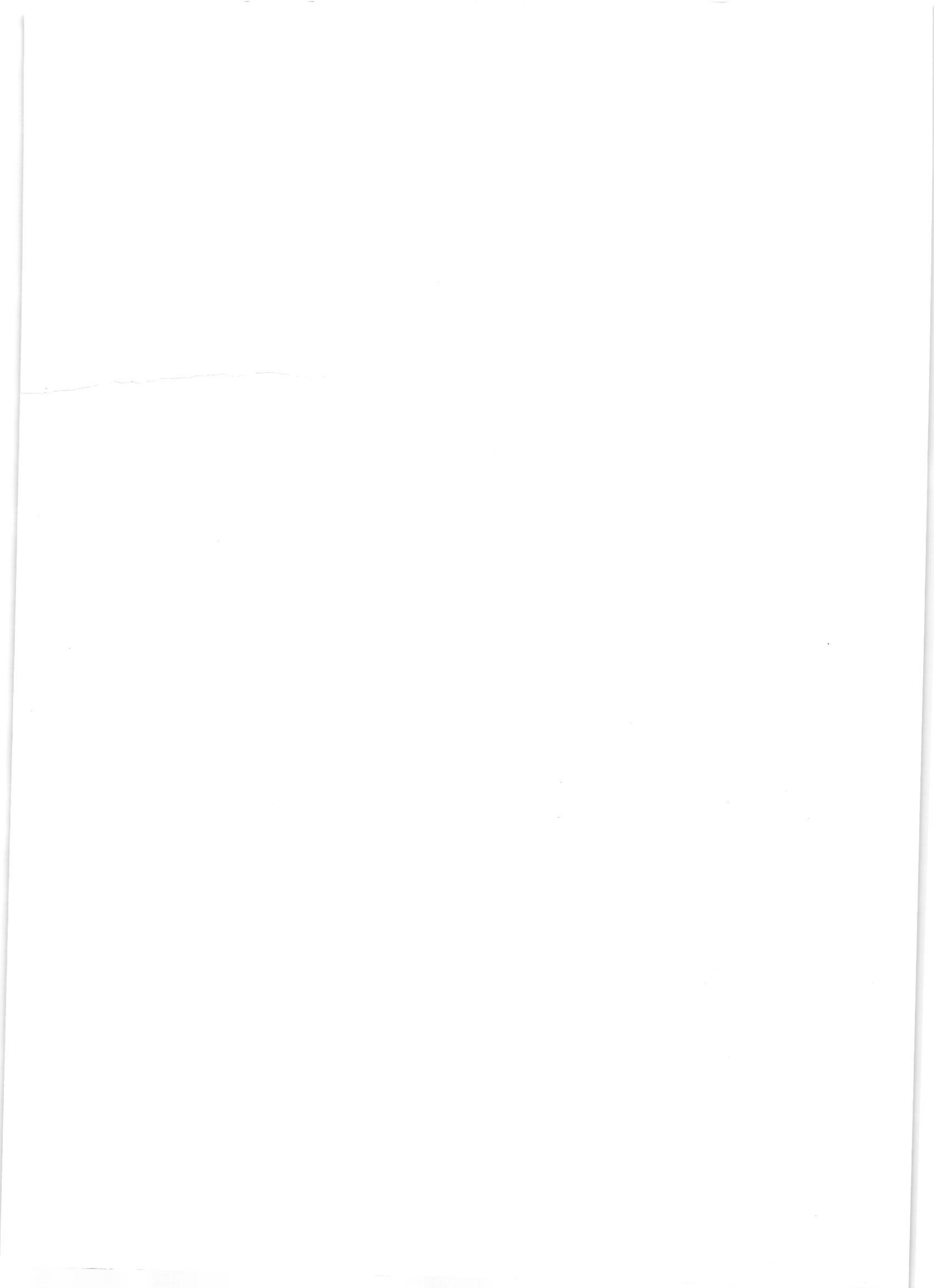


**Innovation and Incentives**

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with Stephen M. Maurer

Intellectual property (IP) law is not a single subject. It embraces a half dozen protection regimes including patents, copyright, and trade secrets, as well as sui generis laws like the Europeans' Database Directive of 1996, and special statutes for plants. For the most part, formal protections cover different types of innovation, although this principle has been breached in the case of computer software, to which patents and copyright both apply. Trade secrecy applies to any subject matter that can be kept secret.

Legal scholars draw clear distinctions among the branches of IP law, whereas economists tend to focus on the policy levers they all share—length, breadth, the required inventive step, and exemptions—without tying their analysis to any specific body of law. The legal approach is messier. This chapter provides a quick overview of IP as lawyers conceive it, and motivates the stylized economic models found later in the book. Except as noted, we focus on American law. Most countries follow broadly similar rules, especially after the comprehensive worldwide TRIPS treaty was enacted in 1994. TRIPS is discussed in chapter 11.

After laws are enacted by the U.S. Congress, they are codified into a set of books, the *United States Code*, where they are organized by topics. The U.S. patent law is in volume 35, referred to as 35 USC, and copyright is in volume 17. Sometimes we will refer to a particular law by the name of the original legislation (e.g., "Semiconductor Chip Protection Act") and sometimes by the code section (e.g., "17 USC §901").

Both patent law and copyright law incorporate many amendments that have accumulated over the years by acts of Congress. Both have also been clarified and changed by court decisions. We refer to important court opinions in footnotes, in case the reader wants more detail. Readers who want to do their own legal research should consult section 3.8.

Most intellectual property statutes and court cases are federal. The U.S. Constitution grants the right to create patents and copyrights to Congress, and the states cannot create conflicting rights. For example, states cannot trump Congress's decision to leave certain knowledge unprotected by creating their own intellectual property laws. States also cannot increase protection beyond that provided by Congress.<sup>1</sup>

At the administrative level, patents are the only form of intellectual property screened by a government agency before the right is granted. The U.S. Patent & Trademark Office (PTO) decides whether applicants have met the legal and factual standards required for a patent.

### 3.1 Patents

A patent gives its owner the right to sue for infringement if anyone tries to make, use, sell, offer, import, or offer to import the invention into the country issuing the patent (35 USC §154). It thus grants a legal monopoly. In addition to infringement, there is also a concept of contributory infringement. This lets patent holders sue to stop third parties from knowingly selling inputs that are "especially adapted" for use in patented combinations or processes (§271(c)).

Patents are the gold standard of intellectual property protection. With other forms of protection, if a third party duplicates the protected innovation independently, he or she can use it. The absence of this independent-invention defense makes patent law uniquely powerful.

**Covered Subject Matter** To be patentable, an invention must meet four basic requirements: patentable subject matter, utility, novelty, and non-obviousness. The first two requirements focus on technology. An invention satisfies the patentable-subject-matter requirement if it is (1) a machine, (2) a manufactured product, (3) a composition made from two or more substances, or (4) a process for manufacturing objects. In practice, the PTO and courts almost always stretch these categories to encom-

1. *Sears, Roebuck & Co. v. Stiffel Co.*, 376 U.S. 225 (1964); *Compco Corp. v. Day-Brite Lighting, Inc.*, 376 U.S. 234 (1964); *Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141 (1989). An apparent exception involves trade secrets, which are created by State law. However, for these purposes, trade secrecy is not a form of intellectual property protection; federal policy lets inventors can keep their work secret if they want to (*Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470 (1974)).



pass new technologies. For example, in 1980 the U.S. Supreme Court narrowly upheld a patent on a genetically engineered bacterium that eats oil slicks, thus ruling that life forms can be patented.<sup>2</sup> This decision opened the door to a broad range of other life forms. Famous biological products that were later patented included a reproducible cell line, the Moore line, and the Harvard Medical School oncomouse, both used in cancer research. The cell line was controversial not because of its patentability, but rather because of who owned it. The eponymous patient, John Moore, claimed that he himself should own it, since the cell line originated in his body.<sup>3</sup> The oncomouse, being a mammal, was a particularly charming life form, which helped to revive the moral debate about whether life forms should be patentable.<sup>4</sup> The oncomouse has also been patented in Europe, Japan, and Australia, but not in Canada.

These subject matters are controversial mainly for philosophical reasons. Since this is an economics book, we will put aside the moral and philosophical issues and stick to incentives. Would the incentives to develop and use the Moore line be different if John Moore had a blocking right in the cell line, while the researchers had a blocking right in their development of it? Is there anything fundamentally different about bacteria and mice from, for example, computer software? To the extent that they are different in germane ways, is patent law set up to accommodate those differences? Those are the types of issues that the rest of the book will equip us to address.

Another furor over subject matter arose in 1998 when the Court of Appeals for the Federal Circuit clarified the status of business-method patents. It upheld a patent for a method of calculating and managing the net value of mutual funds, using strong affirmative language that any "method" that "produces a useful, concrete and tangible result" was patentable even if not dependent on a particular device.<sup>5</sup>

2. *Diamond v. Chakrabarty*, 447 U.S. 303 (1980).

3. *Moore v. Regents of the University of California*, 793 P.2d 479, 271 Cal. Rptr. 146 (1990). The cell line was developed by researchers at UCLA and assigned to the University of California. The court rejected the theory that Moore should own the cell line, while acknowledging complications due to a physician's obligation to disclose his or her intentions.

4. You can visit the mouse at [www.hms.harvard.edu/news/images/onco\\_mouse.jpg](http://www.hms.harvard.edu/news/images/onco_mouse.jpg).

5. *State St. Bank & Trust Co. v. Signature Fin. Group, Inc.* 149 F.3d 1368 (Fed. Cir. 1998).

Business-method patents have been particularly criticized for issuing on trivial or well-known methods. U.S. patent 5,794,207 describes a method for conducting a Dutch (descending-bid) auction. This selling technique has been in use for centuries. Since the Dutch auction was well known, why did it merit a patent? A legal response may be that the use or implementation of the Dutch auction meets the requirements of patent law. However, an economic inquiry would ask whether the requirements of patent law make sense. Is the patent necessary to elicit this implementation? If not, doesn't the patent on a well-known method hurt consumers rather than help them, as well as being an affront to common sense? How should the requirements of novelty and nonobviousness be interpreted to avoid mistakes? We return to business methods below, and to the more general questions in chapters 4 and 5.

The second requirement for patentability is utility—that is, an invention must offer some positive benefit to society (§101). Historically, this requirement was usually invoked against devices that either did not work (e.g., perpetual-motion machines) or were against public policy (e.g., gambling devices). Today, the rule is mainly used to deny patents to drugs that have not been shown to be safe and effective or to chemical compounds whose only known use involves research and experimentation. It has also been used to rein in the patenting of gene sequences, where utility is interpreted to mean that the function of the DNA fragment must be known.<sup>6</sup> A related requirement (§112) is that the invention must be “enabling” and, according to the Supreme Court, “reduced to practice.”<sup>7</sup>

The remaining two requirements withhold protection from inventions that produce only trivial or nonexistent advances over existing knowledge. Novelty asks whether the patent's teaching has been previously used or described in a single publication (§101). Similarly, non-obviousness asks whether the invention differs from the “prior art” in ways that would not have been obvious to somebody who had “ordinary skill” in the technology. During the 1940s, the U.S. Supreme Court set a very restrictive standard by declaring that inventions could only be

6. *Ex Parte Deuel* 27 USPQ2d 1360 (Bd. Pat. App. & Inf. 1993).

7. The Supreme Court ruled in *Reed v. Cutter* 1 Story 590 (1841) that “an imperfect and incomplete invention . . . not actually reduced to practice and embodied in some distinct machinery, apparatus, manufacture, or composition of matter, is not, and indeed cannot be, patentable under our patent acts.”

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patented if they evidenced a “flash of creative genius.”<sup>8</sup> Congress overruled this interpretation by statute in 1952. Today, even trivial inventions qualify, but even current standards ignore the costs of invention.<sup>9</sup>

**Duration** All statutory intellectual property rights eventually expire. The maximum duration of a patent is twenty years from the date of filing, although patent life can be truncated earlier by a failure to pay maintenance fees (called renewal fees in Europe).<sup>10</sup> The property right that lasts twenty years is in the knowledge needed to make and use the protected object, as opposed to the object itself. The patent holder’s right to control individual objects that embody the invention expires as soon as he or she sells them. This doctrine is called the first-sale rule.

**Breadth** As a formal legal matter, infringement must be established with respect to one of the several “claims” in the patent document. Claims are chosen by the applicant and patent examiner as minimal combinations of elements that qualify for protection, and any missing element saves the offending product from infringement. To infringe, the accused product must embody every element of at least one claim.

The patent monopoly would be meaningless if limited exactly to the original invention. In that case, even trivial changes would allow competitors to appropriate the patent’s insights without paying royalties. Although breadth is not a legal term of art, patent law implicitly creates such a concept in the “doctrine of equivalents,”<sup>11</sup> by which the patent claim is deemed to cover any product that “does the same work in substantially the same way to accomplish substantially the same result.” As we will see in chapter 4, economists have defined breadth in ways that do not always track legal concepts and court decisions.

**Exemptions and Defenses** If the rightholder asserts rights that do not meet the foregoing requirements, a defense to infringement might be that the patent is invalid. Beyond this, there are five basic groups of defenses.

8. *Cuno Engineering Corp. v. Automatic Devices Corp.*, 314 U.S. 1 (1941).

9. *Graham v. John Deere Co.*, 383 U.S. 1 (1966).

10. 35 USC §154(c). Prior to 1994, the maximum patent life was seventeen years after the date of issue. Congress changed the rule in accordance with the TRIPS treaty discussed in chapter 11.

11. *Graver Tank & MFG Co. v. Linde Air Products Co.* 339 U.S. 605, 70 S. Ct. 854, 94 L.Ed. 1097 (1950). *Autogiro Co. of America v. United States*, 181 Ct. Cl. 55, 384 F.2d 391 (Ct. Cl. 1967).

The first group of defenses make sure that patent monopolies only go to inventors who make full and timely disclosures. For example, the originality requirement (§116) says that applicants cannot receive a patent on someone else's invention. Similarly, the abandonment, on-sale bar, and first-use rules, in §102, force inventors to file their applications (if at all) within one year after they start to exploit the invention. Finally, the enablement requirement states that the patent application must describe the invention clearly enough so that somebody "with ordinary skill in the art can make and use it without undue experimentation."<sup>12</sup> Despite this requirement, most patents are obscure and hard to read. Empirical studies show that corporations rarely bother to monitor—much less learn from—newly issued patents.

The second group of defenses applies when patent holders "misuse" their patents. The misuse defense is often used in conjunction with an alleged antitrust violation. However, courts also apply the misuse concept to practices that extend the patent holder's rights beyond the "careful balance between monopoly and free usage" set by Congress.<sup>13</sup> Trying to interpret this language is a lawyer's and economist's nightmare, but examples may include patent licenses that require the licensee to pay royalties for unpatented products; licenses that require royalty payments after the patent expires; and licenses that require the licensee to grant back intellectual property rights to any improvements.<sup>14</sup> At least in theory, a misuse defense is not permanent. Instead, patent holders can change their conduct and wait for the effects to dissipate.

12. Scarce inputs (e.g., microorganisms) needed to practice the invention must also be made public (*In re Wands*, 858 F.2d 731 (Fed. Cir. 1988)). There are several repositories where patented microorganisms are stored.

13. *Brulotte v. Thys*, 379 U.S. 29 (1964).

14. See, for example, *Zenith Radio Corp. v. Hazeltine Rsch., Inc.* 395 U.S. 100 (1969) (contract requiring licensee to pay royalties based on total sales regardless of whether patent was actually used constitutes "misuse"); *Brulotte v. Thys*, 379 U.S. 29 (1964) (contract requiring licensee to pay royalties after expiration of the patent constitutes "misuse"); *Morton Salt Co. v. G.S. Suppiger Co.*, 314 U.S. 488 (1942) (contract requiring licensee to purchase unpatented salt tablets for use in patented machine constitutes "misuse"); *Transparent-Wrap Mach. Corp. v. Stokes & Smith*, 329 U.S. 637 (1947) (license-back provision is not per se illegal, but may be unacceptably anticompetitive depending on the circumstances). A license agreement can provide for perpetual royalties if the licensed technology contains both patented and trade-secret information. This is because trade-secret protection can theoretically last forever (*Aronson v. Quick Point Pencil*, 440 U.S. 257 (1979)).

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monopolies only. For example, the patent holder cannot receive a royalty on sale of their applications without the invention. Finally, the application must be "with ordinary experimentation."<sup>12</sup> It is hard to read. It is hard to monitor—

patent holders are often found in conjunction with the misuse of rights beyond the scope of what is permitted by Congress.<sup>13</sup> The patent holder's nightmare, the licensee to pay royalty payments to the licensee to grant rights.<sup>14</sup> At least in some cases, patent holders can sue.

The invention must be novel (see 35 U.S.C. § 101). There are many exceptions.

*Grain Processing, Inc.*, 395 U.S. 873 (1969) (reduced on total sales of "patent misuse"); *Brulotte v. Thys*, 379 U.S. 29 (1964) (royalties after expiration of patent); *Suppiger Co. v. U.S. Patent & Trademark Office*, 359 F.2d 831 (9th Cir. 1966) (unpatented salt); *Transparent-Wrap*, 307 F.2d 831 (9th Cir. 1962) (back provision is depending on the amount of royalties if the patent is not issued). This is *Aronson v. Quick*

The third group of defenses consist of judge-made exemptions in cases where the infringer's conduct is socially beneficial. The repair exemption lets customers maintain patented machinery.<sup>15</sup> In the past there has also been a restricted research exemption, allowing researchers to use patented inventions for noncommercial research or experimentation. Even for commercial research, the extent to which innovators should control the innovations that build on their contributions is a deep policy question; see chapter 5. In the case of research tools, some ability to collect royalties is obviously necessary, or there would be no incentive to create them (Eisenberg 1989). According to nineteenth-century case law, the research exemption only applied "for amusement, to satisfy idle curiosity, or for strictly philosophical inquiry." The main users of this exemption have been universities. In the growing climate of commercialization of university research (see chapters 1 and 8), the boundary between commerce and philosophical inquiry has become blurred, and the research exemption has largely been abolished.<sup>16</sup>

The fourth group of defenses is designed to keep patent owners from playing fast and loose with the federal court system and PTO. For example, the doctrines of laches and estoppel prevent patent holders from deferring enforcement or making misleading assurances that encourage infringers to run up more damages. Similarly, the statute of limitations (§286) requires patent owners to bring suit (if at all) within six years. Patent applicants must also meet minimal standards of honesty vis-à-vis the PTO. For example, file-wrapper estoppel prevents patent holders from reinterpreting ambiguous patents in ways that contradict previous statements to the PTO. Similarly, the duty of candor requires applicants to volunteer information about facts (e.g., prior art) that might make their patents unenforceable. Applicants who actively mislead examiners are also subject to a fraudulent procurement defense. Many scholars complain that the last two defenses have been counterproductive, since they encourage patent applicants to avoid research that might uncover inconvenient facts. In theory, the PTO could fix the problem by

15. *FMC Corp. v. Up-Rights, Inc.*, 21 F.3d 1073 (Fed. Cir. 1994).

16. In 2002, the Court of Appeals for the Federal Circuit ruled that the research exemption did not depend on whether a particular institution "is engaged in an endeavor for commercial gain, so long as the act is in furtherance of the alleged infringer's legitimate business" (*Madey v. Duke*, 307 F.3d 1351 (Fed. Cir. 2002)). In this case, the court found that Duke's legitimate business was education and research, which apparently disqualifies universities whether or not they reserve the right to earn revenues from research.

requiring inventors to conduct reasonable searches before they apply for a patent.

Finally, it sometimes happens that two inventors apply for, and even receive, separate patents for the same invention. When the telephone was invented, an independent inventor, Elisha Gray, arrived at the patent office with his application a mere two hours after Alexander Graham Bell filed his application on February 14, 1876. As related by Flatow (1992), if Gray had believed in the commercial value of his device, he could have written an application earlier and preempted Bell. But even after Gray lost the race to the patent office, the commercial value was unclear and his attorneys advised him not to pursue a priority dispute. Suppose, however, that he had done so; how would (or should) the priority dispute have been resolved? This is an area where U.S. law differs from that of most of the rest of the world. In the United States, priority is given to the first inventor, and elsewhere to the first inventor to file an application.<sup>17</sup>

Under most patent laws, governments can suspend rights during times of national need. During World War I, the U.S. military browbeat airplane companies into cross-licensing each other and suspended all radio patents. The United States also seized 5,000 German chemical patents, including aspirin, and licensed them to American manufacturers.<sup>18</sup> This right to nullify or modify patent rights when necessary for the public interest is also preserved in the TRIPS agreement discussed in chapter 11.

**Relief** The rights conferred by intellectual property are only valuable if exclusive use of the intellectual property can be enforced. The main tools that courts use to punish infringers are money damages, paid by the infringer to the rightholder, and injunctions, which are court orders against further infringement.

17. As we have mentioned, it is only patent law that works against independent inventors, and it is not obvious that the rule against independent invention is the optimal one; see Maurer and Scotchmer 2002. The difference between the first-to-file and first-to-invent rules is particularly important in cases of cumulative invention; see Scotchmer and Green 1990. The first-to-file rule can encourage inventors to choose patents over trade secrecy.

18. After the war, Germany's patents were used to establish a Chemical Foundation to advance science and industry. In 1932, the foundation earned almost \$9 million in royalties.

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Courts have used two calculations for money damages, investigated further in chapter 7. The concept currently in favor is "lost profit," the idea being restoration.<sup>19</sup> Where the invention has been widely licensed, restoration means paying the standard royalty rate. The calculation is harder if the rightholder had no intention of licensing, or if licenses were intended but no licensing contracts had been made. In the latter case, courts must try to construct a "reasonable royalty" that willing parties would have agreed to in the course of a hypothetical negotiation.<sup>20</sup> In theory, courts can increase damages up to three times the actual injury if the infringer acted intentionally or in bad faith.<sup>21</sup> In practice, potential infringers can usually immunize themselves by obtaining competent legal advice before they use the invention.<sup>22</sup>

Patent holders can also obtain court orders against infringement before or after trial (§283). Courts grant preliminary injunctions where there is (1) a strong probability of success on the merits, and (2) a likelihood of "irreparable injury" if no injunction is granted.<sup>23</sup> In theory, courts will not grant a preliminary injunction if the defendant is likely to suffer "disproportionate hardship."<sup>24</sup> When preliminary injunctions are granted in high fixed-cost industries, such as semiconductors, they create a danger of bankruptcy. Observers claim that plaintiffs who obtain preliminary injunctions frequently extract much larger settlements than they would ever receive in damages. Fear of injunctions has produced

19. 35 USC §284; see also *SmithKline Diagnostics, Inc. v. Helena Labs. Corp.*, 926 F.2d 1161, 1163 (Fed. Cir. 1991).

20. See *Georgia-Pacific Corp. v. United States Plywood Corp.*, 318 F.Supp. 1116 (S.D.N.Y. 1970). *Georgia-Pacific* tried to make the analysis more predictable by recommending ten "factors" (e.g., remaining patent life; the invention's advantages over rival technologies) that courts should consider before arriving at an estimate. Despite this, analyses of reasonable royalties remain inconsistent from case to case.

21. 35 USC §284; see also *Roberts v. Sears, Roebuck & Co.*, 723 F.2d 1324 (7th Cir. 1983).

22. *SRI International, Inc. v. Advanced Technology Labs., Inc.*, 127 F.3d 1462 (Fed. Cir. 1997); *Kalman v. Berlyn Corp.*, 914 F.2d 1473 (Fed. Cir. 1990).

23. *GenDerm Corp. v. Ferndale Labs., Inc.*, 32 USPQ 1567 (E.D. Mich. 1994). The concept of "irreparable injury" does not seem useful to many economists, since most harms can be compensated by enough cash. Courts usually issue injunctions when either the patent holder is about to go out of business, or damages are likely to be late, uncertain, or difficult to prove.

24. *PPG Indus., Inc. v. Guardian Indus. Corp.*, 75 F.3d 1558 (Fed. Cir. 1996) (preliminary injunction withheld where plaintiff would not lose significant revenues and defendant's business would be shut down).

socially wasteful arms races in which companies acquire massive patent portfolios for the sole purpose of deterring each other (Hall and Ziedonis 2001).<sup>25</sup>

Patent holders who win at trial can obtain permanent injunctions.<sup>26</sup> Courts are usually willing to grant this relief because it encourages licensing talks and also makes future damages estimates unnecessary. Nevertheless, courts sometimes refuse to issue an injunction where there are broader public interests at stake.<sup>27</sup>

**Quality of Patents** In the beginning of the U.S. patent system, Thomas Jefferson examined patent applications in his role as secretary of state. When his duties regarding foreign policy became more onerous, the examination system lapsed into a registration system. Patents were issued to anyone who could pay the \$35 application fee (Ryan 1998, 32). Critics complained that the system produced low-quality patents that encroached on the public domain, encouraged baseless litigation, and defrauded investors. In the 1830s, Congress created the PTO to screen patents before they issue. Today, quality is controlled by professional examiners. Examiners are always scientists or engineers; they may also be attorneys. Among other things, examiners are supposed to search the literature to make sure that the invention is actually new, examine the application to make sure it meets the legal requirements for patentability, and ask the applicant to answer questions or amend the application to surrender overbroad claims.

Many scholars have criticized the examination system based on the suspicion that examination has been captured by industry, that examiners are rewarded for approving as many applications as possible, and that examiners have a poor track record of finding relevant prior art. On the other hand, there is a question as to how much examination is optimal. (See, e.g., Merges 1999 and Lemley 2001.)

25. Even then, deterrence can break down if one side—usually called a “troll”—does not operate an active business. Trolls do not care whether they are enjoined or not.

26. *Kearns v. Chrysler Corp.*, 32 F.3d 1541 (Fed. Cir. 1994).

27. *Datascope Corp. v. Kontron, Inc.*, 786 F.2d 398 (Fed. Cir. 1986) (refusing to grant permanent injunction in medical-device case where practicing physicians preferred to use infringing product); see also *Jenn Air v. Modern Maid Co.*, 499 F.Supp. 320 (D. Del. 1980) (courts may withhold preliminary injunctions where infringing product relates to health care, environment, or other critical public interests).

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In the 1990s, the PTO and courts expanded patentable subject matter to include computer software,<sup>28</sup> which then became controversial largely because of what were perceived as “low-quality patents” (Barton 2000; Lemley 2001; Hall 2003). “Low quality” refers to the PTO’s failure to screen out applications that do not meet the requirements for patentability, especially as to prior art. Since patents on computer software emerged rather precipitously (software had previously been protected by copyright), most of the prior art was not in the main database consulted by patent examiners, which is prior patents. Instead the prior art was largely to be found in industry practice, in existing computer programs, and to some extent in academic publications. All of these are harder to search than prior patents.

In principle, a rival inventor or other member of the public can file a protest if he believes that the PTO is about to issue a defective patent. Because PTO proceedings tend to be invisible, this rarely happens. After the patent issues, reexamination can be requested by any member of the public at any point in the life of the patent. This is an area where the United States and Europe differ. The analogous proceeding in Europe is an “opposition” to the patent, which must be filed in the European Patent Office (a consolidated patent office discussed in chapter 11) within nine months after issuance. The opposition is a more adversarial proceeding than reexamination in the United States. In the United States close to half of reexaminations are initiated by the patentees themselves, whereas in Europe this almost never happens (Graham et al. 2003). European oppositions are more frequent and more often result in modification or revocation of the patent.<sup>29</sup>

28. During the 1970s, the U.S. Supreme Court suggested that computer software was a “mathematical algorithm” that could not be patented (*Gottschalk v. Benson*, 409 U.S. 63 (1972)). However, lower-court decisions have pointed out that a computer running software is akin to a physical machine. Today, most software can be patented if it produces a “tangible, useful result” (*In re Alappat*, 33 F.3d 1526 (Fed. Cir. 1994)).

29. Merges (1999) estimates from 1995 data that about 7 percent of European patents trigger opposition proceedings, and only about 0.3 percent of U.S. patents trigger reexaminations. Graham et al. (2002) show a slightly greater discrepancy, 8 percent and 0.2 percent. The latter also find that the opposition and reexamination rates are substantially lower than average in the semiconductor, software, and computing industries, and higher in biomedicine. Both these studies find that patents are much more likely to be revoked in an opposition proceeding (between 35 percent and 50 percent) than in a reexamination proceeding (roughly 10 percent).

### 3.2 Copyright

Copyright gives rightholders the exclusive right to copy, reproduce, distribute, adapt, perform, or display their works. The right is much narrower than a patent, because copyright only protects expression.<sup>30</sup> For example, you cannot copy *Gone with the Wind*, but you can write a book about a Southern belle, her roguish lover, and the Burning of Atlanta. More precisely, copyright does not protect ideas, procedures, discoveries, or methods of operation (17 USC §102(b)).

**Covered Subject Matter** Copyright law protects “original works of authorship fixed in any tangible medium of expression” (§102(a)). Examples include literature, music, drama, dance, pantomime, graphics, sculpture, movies, sound recordings, and architecture. Copyright also extends to anthologies and other compilations (§103(a)). Unlike patent law, copyrighted works do not have to meet the so-called novelty standard.<sup>31</sup> They must, however, show minimal creativity. This means that simple databases (e.g., telephone directories) cannot be copyrighted under U.S. law.<sup>32</sup>

**Breadth and Duration** In general, copyright breadth is set by the doctrine of “comprehensive nonliteral similarity.” This prevents an infringer from avoiding liability by making mechanical changes to a short story, such as changing the names of the characters, or arbitrary changes to software code, such as renaming the variables or reordering the pieces.<sup>33</sup> Congress has also expanded breadth to include so-called derivative works that exploit preexisting publications. The concept includes, inter alia, sequels and translations (§103(a)).

Copyright makes up for its narrow breadth by having an exceptionally long duration. Protection starts when a work is published and continues until seventy years after the author’s death (§302). Like patent holders, copyright owners cannot assert rights in particular physical copies after the first sale, although this too is changing as vendors have started to license the use of copies rather than sell them (see chapter 6).

30. *Whelan Assocs., Inc. v. Jaslow Dental Lab., Inc.*, 799 F.2d 1222 (3rd Cir. 1986).

31. *E. Mischan & Sons, Inc. v. Maycana, Inc.*, 662 F.Supp. 1339, 1340–43 (S.D.N.Y. 1987).

32. *Feist Publications, Inc. v. Rural Telephone Service Co., Inc.*, 499 U.S. 340 (1991).

33. See, for example, *Castle Rock Enter. v. Carol Pub. Group, Inc.*, 150 F.3d 132, 140 (2d Cir. 1998).

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**Exemptions and Defenses** Courts have recognized a “fair-use” defense to a charge of copyright infringement since the 1840s, and it is codified in the Copyright Act of 1976. This doctrine extends to comment, criticism, news reporting, scholarship, research, parody, library photocopying, and reverse engineering. Fair use is a common defense against infringement. For example, in the 1990s someone wrote a takeoff called *The Wind Done Gone*, written from the perspective of a slave, using the characters developed in *Gone with the Wind*. The heirs of the author of *Gone with the Wind* sued for infringement. The defense was fair use, and after various legal wranglings, the case settled.

Congress has told judges to consider four factors in deciding whether a use is fair or infringing: (1) the purpose and character of the defendant’s use, (2) the nature of the copyrighted work, (3) the amount and substantiality of the materials copied, and (4) the effect of the copying on the plaintiff’s potential market (§107). (Congress did not tell judges the objective, but only what to consider.)

In addition to defining fair use, Congress has also created exemptions for certain types of socially useful conduct. Typical examples include library patrons’ right to make limited photocopies, computer users’ right to archive software, and cable TV providers’ right to retransmit commercial broadcasts (§111(f)). The right to rebroadcast is only available where the cable TV provider agrees to pay royalties under a compulsory license.

Defendants can also assert a defense if the copyright holder fails to satisfy certain formalities. These used to include placing a printed notice on copyrighted works and depositing copies in the U.S. Library of Congress. Most formalities were abolished after the U.S. joined the Berne Convention in 1989 (see chapter 11). However, copyright owners must still register their works with the government before filing suit for infringement (§412).

Finally, copyright shares various defenses with patent law. Examples include abandonment,<sup>34</sup> misuse,<sup>35</sup> and unclean hands.<sup>36</sup>

34. *Pacific & S. Co. v. Duncan*, 572 F.Supp. 1186 (N.D. Ga. 1983).

35. *Lasercomb America, Inc. v. Reynolds*, 911 F.2d 970 (4th Cir. 1990) (software contract that prohibited purchaser from creating a competing product was an unacceptable restraint of trade).

36. See, for instance, *Rosemont Enters., Inc. v. Random House, Inc.*, 366 F.2d 303 (2d Cir. 1966) (litigant who purchased rights to infringing book in order to suppress a new biography was guilty of “unclean hands”).

**Relief** Copyright holders can seek actual damages based on the higher of their own lost profits or the infringer's earnings (§504). Alternatively, copyright owners can seek statutory damages of up to \$30,000 for each infringement, or \$150,000 if the infringement is willful. Statutory damages allow owners to enforce their copyrights where damages would be minimal or hard to prove. Courts can also issue preliminary and permanent injunctions to prevent future copying. (The publisher of *The Wind Done Gone* was initially enjoined by a district court from distributing copies, but the preliminary injunction was overturned by a higher court before the case settled.)

Finally, copyright infringers are subject to criminal penalties. The maximum for first-time offenders is \$25,000 in fines and one year in jail. Until fairly recently, these penalties were limited to infringement done for "commercial advantage or private financial gain." Congress changed the rule in 1996 after ideologically motivated hackers began to distribute stolen software over the Internet free of charge.<sup>37</sup> Today, criminal penalties are available against anyone who reproduces or distributes more than \$1,000 worth of copyrighted works within a single 180-day period (§102(a)). Copyright owners can also ask the court to impound or destroy infringing items.

**Variations** Copyright has less of a one-size-fits-all character than patents do. Congress has periodically created industry-specific statutes featuring one-of-a-kind breadth, duration, and/or defenses. Examples of this sui generis approach include statutes protecting analog sound recordings, semiconductor chips, and boat hulls. Unlike normal copyright, protection under the last two statutes expires after ten years.<sup>38</sup> The Semiconductor Chip Protection Act also has a special, fair-use-type exemption that permits reverse engineering for the purpose of developing an improved chip, but not for the purpose of cloning the original chip. The Boat Hull Protection Act contains a similar exemption for "teaching."

Congress has also experimented with legislation that sets royalty rates and forces companies to adopt technical safeguards against unauthorized copying. For example, the Audio Home Recording Act (1992) requires any company that manufactures, distributes, or imports digital

37. *U.S. v. LaMacchia*, 871 F.Supp. 535 (D. Mass. 1994).

38. 17 USC §904(b) (Semiconductor Chip Protection Act); 17 USC §1305(a) (Boat Hull Protection Act).

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### 3.3 Trade Secret

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recorders to pay a 2 percent royalty on each unit (3 percent for tape manufacturers). Industry members are supposed to split the proceeds through voluntary agreements and must defer to the Librarian of Congress if they cannot agree (§1007). (The Librarian of Congress plays a similar role under various copyright statutes.) The act also supports technical protections by requiring manufacturers to install a Serial Copy Management System (SCMS) in each unit shipped. SCMS examines each piece of music to see whether it contains a copyright notice; if so, it attaches a digital notice telling other SCMS machines not to make further copies. This keeps consumers from making copies of copies.<sup>39</sup>

Finally, under the Digital Millennium Copyright Act (1998), §1002(c), copyright owners can collect damages from manufacturers who fail to pay royalties or sell circumvention technologies. This is discussed in chapter 7.

### 3.3 Trade Secrets

Trade-secret law protects individuals and businesses against the “misappropriation of trade secrets by improper means.” It is state courts, not Congress or federal courts, that created the law of trade secrecy as an extension of traditional contract and tort principles. To rationalize the resulting inconsistencies, thirty-four state legislatures have passed some version of the Uniform Trade Secrets Act (UTSA), designed to summarize, and in some cases change, judge-made case law. In general, our discussion follows UTSA.

**Covered Technologies** A trade secret can include any information that (1) derives economic value from not being readily known to, or ascertainable by, others, (2) whose owner has taken reasonable steps to keep it secret, and (3) is not publicly available. Unlike patents, a trade secret does not have to be novel or even relate to a particular technology.<sup>40</sup>

39. 17 USC §1002(a)(2). The statute does not even try to describe the complicated SCMS system. Details can be found in *Recording Indus. Assn. of America, Inc. v. Diamond Multimedia Systems, Inc.* 29 F.Supp. 2d 624 (C.D. Cal. 1998).

40. *Sinclair v. Aquarius Electronics, Inc.* 42 Cal.App.3d 216, 184 USPQ 682 (1974) (trade secrets need not be patentable); *Choisser Rsch. Corp. v. Electronic Vision Corp.*, 173 USPQ 234 (Cal. Super. 1972) (trade secrets include “slight advances”).

Almost any information, including financial data and customer lists, qualifies.

**Duration and Breadth** In principle, a company can keep anything secret, potentially forever. Some secrets, such as the formula for Coca-Cola, have demonstrated remarkable longevity, even if not yet infinite. In practice, most secrets leak out after a few years. This is particularly true of product designs, which usually become obvious once a device is displayed, advertised, or sold to consumers.

**Defenses and Exemptions** Trade-secret law recognizes three broad groups of defenses to a charge of misappropriating a trade secret. First, defendants can claim that the information they took was not a trade secret and/or that the owner did not take reasonable steps to protect it. In practice, this usually means showing that the owner failed to adopt normal precautions like nondisclosure agreements, physical security, and computer passwords.

Second, the defendant may argue that he or she received the secret by means that were not improper. If Claude receives the secret from Blair who stole it from Alan, but Claude does not know that it was stolen, then Claude is not liable and cannot be enjoined from using the secret. Improper means of receiving the secret include criminal conduct (e.g., theft, bribery, espionage, fraud, or electronic surveillance), torts, and other noncriminal acts like breaching contracts, violating confidential relationships, or persuading others to do so.

Finally, courts sometimes refuse to enforce trade-secret claims on public-policy grounds. For example, competitors can reverse engineer products to find out how they work,<sup>41</sup> although they can waive this right by contract.<sup>42</sup> Courts also invoke public policy to limit the enforcement of trade secrets against former employees. This usually means that agreements to protect the secret cannot unreasonably restrict the employee's right to earn a living. Instead, restrictions must be limited as to both time and geography.

41. *Acuson Corp. v. Aloka Co.*, 209 Cal.App.3d 425, 10 USPQ2d 1814 (1989); *Futurecraft v. Clary Corp.*, 205 Cal.App.2d 279 (1962).

42. Manufacturers can also discourage reverse engineering by using technical measures. Common examples include encasing key electronic components in epoxy, shipping software without human-readable "source code," and retaining physical control over leased equipment in the field.

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**Relief** Trade-secret owners are entitled to damages for past injury. These are usually based on the higher of the owner's lost profits or defendant's earnings as a result of his or her misappropriation.<sup>43</sup> Punitive damages are also available.<sup>44</sup>

Trade-secret owners can also seek preliminary and permanent injunctions against future use of the secret. Generally speaking, such injunctions must terminate as soon as the secret becomes public. However, courts sometimes allow the injunction to continue for a "limited, reasonable period" if stealing the secret gave the defendant a head start in using the technology.<sup>45</sup>

**Effects on Commerce** Unlike all other forms of intellectual property, trade-secret law allows owners to suppress knowledge. Nevertheless, the law encourages the sharing and sale of secrets. For example, owners can share the secret with potential buyers under a nondisclosure agreement.

### 3.4 Miscellaneous Rights

**Design Patents** Traditional patents must show utility—that is, they have to produce tangible results in the physical world. In 1842, Congress created a second statute to protect purely decorative products. This design-patent statute covers any product that is new, original, nonobvious, and ornamental (35 USC §171). Design patents expire after fourteen years (§173).

**Unfair Competition** Federal courts sometimes use the doctrine of unfair competition to block copying that would destroy the incentives for producing a given product in the first place.<sup>46</sup> The main strength of this approach is that—unlike most forms of intellectual property—it invites judges to apply economic reasoning.

**Plant-Protection Statutes** The Plant Patent Act (1930), 35 USC §163, extends patent protection to anyone who discovers and asexually

43. See, for example, *Morlife, Inc. v. Perry*, 56 Cal.App.4th 1514 (1997).

44. See, for instance, *Robert L. Cloud & Associates, Inc. v. Mikesell*, 69 Cal.App.4th 1141 (1999). UTSA limits punitive awards to two times actual damages.

45. See, for example, *USM Corp. v. Mason Fastener Corp.*, 467 N.E.2d 1271 (1984).

46. *International News Service v. Associated Press*, 248 U.S. 215 (1918); *National Basketball Assn. v. Motorola, Inc.*, 105 F.3d 841 (2d Cir. 1997).

reproduces new types of plants. Similarly, the Plant Variety Protection Act (1970), §2321 et seq., gives breeders the exclusive right to sell, market, or offer sexually reproduced plants for a period of twenty years. The act also contains a broad exemption for private, noncommercial use (§2541).

**Database Rights** Databases are becoming increasingly central to both science and commerce, especially in the Internet age. Almost every query to an Internet website retrieves data from a database. U.S. copyright law does not protect databases that are deemed “noncreative.”<sup>47</sup> However, the European Union has adopted a sui generis copyright law for databases<sup>48</sup> and has pressed the United States to follow suit. Although for a time it seemed likely that Congress would pass some type of database legislation, the debate has quieted as of this writing. One policy question is whether protection should require creativity, since the costliness of assembling a database may not depend on its creative content. On the other hand, there are many informal ways to protect databases—for example, by restricting how much information a user can download, or by updating the database at regular intervals. In practice, there is little or no evidence that lack of protection has impeded the creation of new databases.

### 3.5 The Problem of Disclosure

Chapter 2 stressed the public-goods nature of knowledge. To get the full benefits from new knowledge, the knowledge must be used. Knowledge has two main uses: to end users, usually through new products, and as a foundation for future discoveries. That is, knowledge can be used for consumption or research.

In the case of patents, where independent invention is not a defense to infringement, the patented technology must be disclosed so that rivals and courts know what is protected. Disclosure also ensures that the knowledge enters the public domain when the patent expires. Lawyers refer to the knowledge that is thus provided as the “teaching” of the patent. While patents are in force, patent holders have an almost absolute

47. *Feist Publications, Inc. v. Rural Telephone Service Co., Inc.*, 499 U.S. 340 (1991).

48. Council Directive No. 96/9/EC, O.J.L 77/20 (1996). For a discussion of the issues here, see Maurer and Scotchmer 1999.

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right to control uses of the knowledge they have created. In contrast, for traditional copyrighted works, there has been no need for a disclosure requirement, since written expression is self-disclosing.

The patent holders' rights to control the new knowledge they disclose is hard to enforce. The underpowered airplane designed and patented by the Wright brothers (U.S. patent 821,393) could only fly because they had figured out that propellers work on an airfoil principle, like wings. Using the data they had derived for the wing in wind-tunnel experiments, they were then able to optimize the shape and position of the propeller (Wainfan 2003). If the Wright brothers had claimed all uses of the knowledge in their patent, and if the PTO had granted the claim, they would have had an easier time enforcing their patent against other patent holders and airplane designers. However, it is hard to protect a physical principle such as the knowledge that a propeller works as an airfoil, even if claimed. The airfoil principle is at work in every propeller, and propellers had long been in use, even if the physical principle that makes them work was not well understood.

A design invention such as how to position a propeller on an airplane is also difficult to protect as a trade secret. Nevertheless, inventors generally prefer to avoid disclosure, because it is difficult to protect all of the knowledge disclosed in a patent. Trade secrecy is especially attractive if the inventor thinks that the trade secret would never leak out and never be rediscovered independently by someone else. However, choosing trade secrecy undermines the well-thought-out objectives of the patent system. The invention will not become public in the timely manner contemplated by the designers of the patent statute, and the knowledge may not be used to further the research of rivals in the meantime.

Many innovations can be protected alternatively as trade secrets or by patents. However, computer software has the distinction of having three types of protection available: trade secrecy, patents, and copyright. The system seems incoherent in that the three types of protection demand different disclosures. The most anomalous of these is copyright. When programmers register their code at the copyright office, they are allowed to suppress large amounts of it—that is, the intellectual property right provides for secrecy rather than disclosure. In contrast, patents require disclosure, although typically not of code. The disclosure would typically concern structural aspects of the program, but even there, critics complain that the disclosure is insufficient. And, of course, if programmers rely on trade secrecy, distributing the program in compiled form, they disclose nothing. They may be vulnerable to reverse engineering, which

is possible from the compiled program, but that is costly and unreliable for complicated programs.<sup>49</sup>

Congress has occasionally recognized that sharing knowledge should be an explicit policy goal. The Semiconductor Chip Protection Act of 1984, which creates a *sui generis* form of protection for computer chips, grants a right to reverse engineer the circuitry on chips to get at the embodied knowledge, but prohibits the use of that knowledge for cloning. The knowledge can be used to make improved chips, with the required improvement left for interpretation by the courts. As we will see in chapter 5, these provisions operate very much like the economists' interpretation of breadth.

### 3.6 Breadth and the Required Inventive Step

In anticipation of the models and incentive issues to be investigated in chapters 4 and 5, we draw attention to two particularly important policy levers of intellectual property law, which we will call the required inventive step, and the breadth of the right. The required inventive step governs which innovations are protectable, and the breadth governs how different another product must be to avoid infringement. In chapter 5 we will sort out their respective economic roles. Many discussions of patent incentives conflate these two policy levers into one lever, assuming that an innovation that has a large enough inventive step to be protected will automatically escape infringement, and an invention that escapes infringement has a large enough inventive step to be patentable. This is incorrect as a matter of law, at least for patents, and has economic implications.<sup>50</sup>

In patent law, the required inventive step and the breadth follow from the requirements of novelty and nonobviousness, as interpreted in

49. For general and comprehensive discussions of how computer software is protected, see Samuelson et al. 1994 and Menell 2002. For the role of reverse engineering, see Samuelson and Scotchmer 2002.

50. When first studying these issues, Scotchmer and Green (1990) assumed that the two criteria—noninfringement and patentability—coincide. Subsequent inquiries, such as Green and Scotchmer 1995, and especially Scotchmer 1996 and Denicolò 2002, make a clear distinction between these two policy instruments. Scotchmer (1996) argues that in the donut of case B in figure 3.1, where a new product is infringing, the owner of B is better off if the new product is not patentable because that increases B's bargaining power in the licensing negotiation. See Lemley 1997 for a discussion of how patents and copyrights differ as to blocking possibilities.

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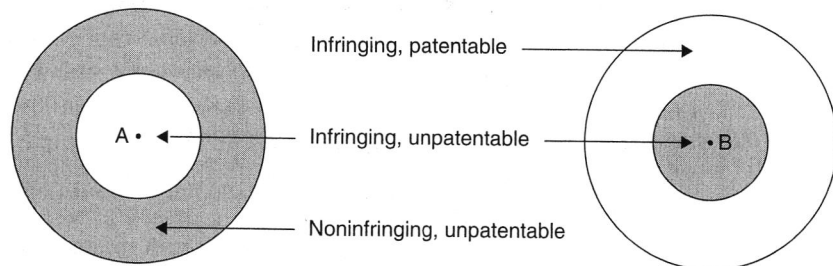
case law. The required inventive step must be such that the innovation is not obvious to one skilled in the art. The breadth is governed by the doctrine of equivalents.

In copyright law, particularly as it relates to the traditional subject matter of literary works, paintings, and other art, almost any work is protectable—the requirement of inventive step is not onerous. However, the property right is also narrow. Copyright protects against copying, and, aside from the fact that the copyright protects against mechanical changes, there is no notion of equivalents that extends the breadth beyond the expression.

Comparing patent law to copyright (to the extent that they can be compared, since they cover different subject matters), patent law imposes a more serious requirement as to inventive step, grants more breadth, and is shorter than copyright.

Figure 3.1 shows two different patents, for products A and B, each understood to be at the center of a product space. Each point in the surrounding territory represents a different substitute product. The inner sphere around product A encloses the substitute products that are infringing due to supposed “equivalence”—it represents the patent’s breadth. The outer sphere encloses the substitute products that have become “prior art” due to their similarity to A and that do not embody an inventive step necessary to receive a patent. The donut represents products that are noninfringing but also unpatentable, which will presumably be supplied by a competitive fringe, constraining the profit earned by the owner of product A.

For product B, the spheres are reversed. The inner circle encloses the substitute products that are barred from patentability by prior art,



**Figure 3.1**  
 Patent A: Narrow; large required inventive step  
 Patent B: Broad; small required inventive step

whereas the outer circle encloses the products that are infringing. In example B, there will be products that are infringing but patentable, which means that so-called blocking patents may occur. A patent received by another innovator will be blocked by the owner of B, since it infringes the patent on B. A license is required to market it.

To illustrate these ideas, consider the laser. As described by the inventor Charles Townes (1999), there were two related technologies, the maser and the laser, which use the same principle to create coherent electromagnetic waves, microwaves in the case of the maser or light waves in the case of the laser. Coherence means that all the photons have the same direction and frequency, and is the property that concentrates energy. Laser technology grew out of the maser technology but presented different technical difficulties.

The patent on the maser was deliberately written broadly enough to include all similar means of creating coherent electromagnetic waves, including light waves. Townes did the work leading to the maser at Columbia University and assigned the patent to the Research Corporation, described chapter 1. After doing additional work, he obtained a patent on the laser and assigned it to Bell Labs. The Research Corporation later sued Bell Labs for infringement, when they used the laser without a license on the maser. The case was eventually settled, granting royalties from Bell Labs to the Research Corporation. The settlement was based on the assumption that the Research Corporation and Bell Labs had blocking patents on the laser. The laser infringed the maser patent, but was itself a patented invention, since it solved technical difficulties not described in the maser patent. In figure 3.1, the patented technology B would be the maser, and the laser would fall in the donut.

Which of the two patents in figure 3.1 implies a better incentive system? We have not equipped ourselves to answer that question, because we have said nothing about the costs of innovation or the welfare of consumers or the degree to which the innovator enables follow-on discoveries (but see chapter 5). However, even in this very simple model, it is possible to contemplate what we might mean by the “strength” or “protectiveness” of the patent.

A rightholder mainly gets protection by preventing rivals from marketing close substitutes. The right of rivals to market close substitutes is governed by breadth. However, the required inventive step also matters. For substitutes that are infringing, the patent holder will typically be better off if they are not patentable. He or she then controls the pricing

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of infringing substitutes and does not have to negotiate with another patent holder who has a blocking patent. For substitutes that are non-infringing, the patent holder will typically be better off if the substitute is supplied by another patent holder than if it is supplied by competitors, since prices will generally be higher if the market is controlled by two oligopolists. Thus, the arrangement that is best for the rightholder is a very broad patent so that close substitutes are infringing, and an inventive-step requirement that is coextensive with breadth. The patent holder's best position is when all infringing substitutes are unpatentable, and when all noninfringing substitutes are patentable.

How do these observations apply to business-method patents? The question should be posed from the society's perspective, not from the patent holder's perspective, and we are not yet ready to consider the question in its entirety. In the case of the Dutch-auction patent described earlier, critics pointed out the absurdity of allowing the patentee to restrict use of a well-known idea. It is presumably a mistake to give patents on technologies that the applicant did not invent, since the patents serve no incentive purpose. On the other hand, what if the patent is narrow? Narrow patents are not very harmful to competition, regardless of the required inventive step. Even if all the rival implementations are patented, the market for using Dutch auctions will be competitive if the patents are very narrow.<sup>51</sup>

This is not to argue that a low bar to patentability (low inventive step) is always harmless. In the Dutch auction, the patented products would be substitutes. In another famous example, that of semiconductor chips, the patented technologies are typically complements. Every innovator in the industry must obtain licenses from hundreds of previous rightholders. Merely as a matter of transaction costs, if nothing else, the need to license all these pieces may deter innovation. The transactions not only are expensive but take time and create uncertainty. This problem of many patented complements goes by various names,

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51. Another example concerns insulating sleeves for paper cups that protect users from burning their fingers. Barton (2003) describes how minor changes in the pattern of dimples stamped into the sleeves have received patent protection. Indeed, it may be an affront to common sense that such insulating sleeves are patentable. However, it is hard to find the threat to competition if the sleeves are mutually noninfringing. Similarly, there has been a proliferation of patents on paper clips throughout the twentieth century, continuing to the present (Petroski 1996). Does anyone feel unduly burdened by the high price of paper clips? Competition is saved by the fact that they are noninfringing.



including patent thickets and the anticommons.<sup>52</sup> We discuss it further in chapters 5 and 6.

### 3.7 Intellectual Property and Antitrust

For most practical purposes, U.S. antitrust law is found in sections 1 and 2 of the Sherman Act. Section 1 prohibits two or more competitors from forming “contracts, combinations or conspiracies in restraint of trade” (15 USC §1). Since 1911, courts have interpreted section 1 according to the “rule of reason.” Section 2 applies to unilateral acts instead of conspiracies, and prohibits firms from acquiring or keeping a monopoly by improper means.

The main implication of section 1 is that business arrangements must promote competition, usually by creating technical efficiencies, more than they restrict it.<sup>53</sup> This is the rule-of-reason analysis. However, courts have also held that certain practices are clearly destructive and should always be illegal under section 1. These “per se” violations include horizontal price-fixing agreements, vertical agreements to set minimum prices, and geographic allocation of markets.

Section 2 does not make monopoly illegal but outlaws “wrongful acts” to maintain monopolies.<sup>54</sup> A section 2 violation can arise from attempted monopolization that falls short of its goal. A monopoly created by intellectual property is not illegal in itself. However, patents may offer tempting opportunities to engage in wrongful acts.

Courts have had a hard time reconciling the Sherman Act’s hostility to cartels with the legal monopolies created by intellectual property. Nevertheless, firms cannot use their intellectual property any way they want to. As a judge has remarked, “That is no more correct than the proposition that use of one’s personal property, such as a baseball bat, cannot give rise to tort liability.”<sup>55</sup> The basic point is that sections 1 and 2 both require wrongful acts. Courts have been trying to define the dif-

52. The term *anticommons* is a play on words and refers to the “tragedy of the commons,” which is usually taught in freshman economics. In the tragedy of the commons, peasants in early modern Britain overgrazed shared pastures (“the commons”) because the absence of private ownership eliminated incentives to conserve. The “anticommons” hypothesis holds that property rights can also destroy assets by promoting friction and deadlock.

53. *Standard Oil Co. v. United States*, 221 U.S. 1, 31 S.Ct. 502 (1911).

54. *United States v. Aluminum Co. of America*, 148 F.2d 416 (2d Cir. 1945).

55. *United States v. Microsoft Corp.*, 253 F.3d 34, 63 (D.C. Cir. 2001).

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sections 1 and competitors from "infringement of trade" according to section 1 instead of common-law monopoly by

arrangements that reduce overall efficiencies, and analysis. However, anticompetitive and "unfair" violations of section 1 are elements to set

aside "wrongful" acts that can arise from

A monopoly. However, patents are not in themselves anticompetitive.

Under the Act's hostility to intellectual property,

in any way they are more correct than the rule in a baseball bat, sections 1 and 2 define the dif-

ference between the "tragedy of the commons." In the tragedy of the commons, shared pastures are overgrazed because unregulated incentives to overgraze rights can also

be corrected (1911).

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ference between normal and wrongful uses of intellectual property since the 1920s.

As we will discuss more fully in chapter 6, licensing is generally considered a pro-competitive practice. First, it allows rightholders to share their intellectual property with others. Second, licenses are often needed to resolve so-called blocking patents—cases where several patent holders can keep a particular product or technology from being used. However, licensing also creates opportunity for wrongful acts, usually as a section 1 violation. Since intellectual property rights are designed to create legal monopolies, some restraints are legal. For example, courts have repeatedly held that intellectual property owners can refuse to license anyone at all.<sup>56</sup> Similarly, intellectual property owners can require the licensee to charge a particular price, restrict output, stay within a particular geographic territory, or limit use of the license to a particular field of use.<sup>57</sup> Courts generally also uphold nonexclusive licensing (that is, licensing to several licensees simultaneously), and even exclusive licensing, between companies that are not normally rivals (see chapter 6).

The analysis is harder in cases involving an exclusive license between competitors. According to the rule of reason, such agreements can be beneficial if they promote competition by encouraging the licensee to invest in the technology, realizing economies of scale, or allowing the licensor and licensee to integrate complementary R&D, production, or marketing efforts. On the other hand, these factors may not be enough if the exclusive license significantly reduces competition in a market.

56. *Image Technical Services, Inc. v. Eastman Kodak*, 125 F.3d 1195 (9th Cir. 1997); accord, U.S. Department of Justice and Federal Trade Commission, *Antitrust Guidelines for the Licensing of Intellectual Property* (April 6, 1995) (antitrust law does not require an IP owner to set up competition in its own technology). *Image Technical Services* leaves open the possibility that section 2 might require a monopolist to offer nonexclusive licenses where would-be entrants cannot otherwise compete.

57. *United States v. General Elec. Co.*, 272 U.S. 476 (1926) (price restrictions upheld); *General Talking Pictures Corp. v. Western Elec. Co.*, 304 U.S. 175 (1938) (field-of-use restrictions upheld); *United States v. E.I. DuPont de Nemours & Co.*, 188 F.Supp. 41 (D. Del. 1953) (output restrictions upheld); *Miller v. Institutform, Inc. v. Institutform of North America, Inc.*, 605 F.Supp. 1125 (M.D. Tenn. 1978) (territory restrictions upheld). The U.S. Department of Justice has traditionally argued that patent holders should not be allowed to restrict the prices charged by licensees. An evenly divided Supreme Court declined to change the rule in *United States v. Huck Mfg. Co.*, 382 U.S. 197 (1965).

Finally, some licenses are inherently suspect. Examples include provisions that keep the licensee from using or developing other technologies, licenses that fix prices between firms that would otherwise compete with one another, and licenses that fix the price at which licensees can resell patented goods.<sup>58</sup>

In addition to licensing, parties frequently trade intellectual property rights through cross-licenses and patent pools. In general, courts try to balance the "dominant purpose" of the patent pool against its "likely effect on competition."<sup>59</sup> Courts usually approve arrangements that remove blocking patents so that firms can bring technologies to market. Conversely, they are suspicious of pools that encourage participants to reduce R&D expenditures, or limit competition between different technologies. In general, pool members are free to exclude competitors. However, courts sometimes make an exception where pool members have substantial market power and nonmembers cannot compete effectively.

So-called sham licenses present a recurring danger. Suppose A, B, and C compete in the same market. According to section 1, they cannot agree to fix prices or divide the market into geographic territories. What would happen, though, if they disguised their transaction as a series of licenses with D? A, B, and C could then separately agree to restrictions that required them to maintain minimum prices, divide geographic markets, or otherwise coordinate their actions. Such an agreement has potential to be collusive and is illegal.<sup>60</sup>

Finally, intellectual property owners can run afoul of the antitrust laws under section 2 without entering into licenses or agreements at all. Courts agree that merely applying for intellectual property rights or suing to enforce them is never by itself illegal, since federal intellectual property law expressly authorizes these acts. However, section 2 may be triggered if a firm performs other acts that have a "dangerous probability"

58. *United States v. Univis Lens Co.*, 316 U.S. 241 (1942); *Ethyl Gasoline Corp. v. United States*, 309 U.S. 436 (1940).

59. *Standard Oil Co. v. United States*, 283 U.S. 163 (1931).

60. *United States v. U.S. Gypsum Co.*, 333 U.S. 364, 400 (1948). Sham agreements are also a problem for intellectual property litigation. Courts usually encourage parties to settle their differences through cross-licensing. Such agreements may be unlawful if they are part of a broader scheme to exclude competitors. See, for example, *United States v. Singer Manuf. Co.*, 374 U.S. 174 (1963).

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of acquiring or maintaining a monopoly. Finding instances of such a thing is clearly tricky, since the patent itself grants market power. Examples of acts that have been deemed illegal include purchasing patent portfolios in order to exclude competitors from a particular technology;<sup>61</sup> requiring purchasers to buy unpatented goods or services in order to obtain a patented product;<sup>62</sup> requiring would-be licensees to purchase multiple patents in a package;<sup>63</sup> or requiring parties to do all of their business with the patent holder.<sup>64</sup> Section 2 also prevents firms from obtaining intellectual property—and the market power it confers—by fraud. Examples include misleading the PTO about one's eligibility for a patent, trying to enforce a patent after learning that it is invalid, and conducting "sham" litigation against competitors.<sup>65</sup>

It is apparent from the historical hints in this chapter that intellectual property evolves along with technology, and indeed it must do so in order to be effective. In fact, the importance of intellectual property in the industrial landscape has varied widely. Antimonopoly judges have been the least supportive of intellectual property. For example, during the 1880s, the U.S. Supreme Court complained that Congress was trying to "grant a monopoly for every trifling device." Similarly, New Deal justices went out of their way to restrict patents during the 1930s and 1940s. Since then, the pendulum has swung back. In 1952, Congress passed a new patent statute that overruled several New Deal decisions. More recently, the PTO has expanded the subject matter of patents, such as to semiconductor chips, computer software, and business methods. Many commentators think that intellectual property protection was much strengthened in the 1990s.

61. *SCM Corp. v. Xerox Corp.*, 463 F.Supp. 983, 1007 (D.Conn. 1978); but see *Image Technical Services, Inc. v. Eastman Kodak Co.*, 125 F.3d 1195 (9th Cir. 1997).

62. *Morton Salt Co. v. G.S. Suppiger Co.*, 314 U.S. 488 (1942).

63. *Zenith Radio Corp. v. Hazeltine Rsch., Inc.*, 395 U.S. 100 (1969). However, parties can "voluntarily" bundle IP rights for mutual convenience. The distinction between "voluntary" and "mandatory" bundling tends to confuse economists, who see all contracts as voluntary.

64. *Tampa Elec. Co. v. Nashville Coal Co.*, 365 U.S. 320 (1961).

65. See, for example, *Walker Process Equip. v. Food Machinery & Chem. Corp.*, 382 U.S. 172 (1965) (fraudulently procured patent); *Handgards, Inc. v. Ethicon*, 601 F.2d 986 (9th Cir. 1979) (baseless litigation after owner discovered that patent was invalid); *Argus Chemical Corp. v. Fibre Glass-Evercoat, Inc.*, 812 F.2d 1381 (Fed. Cir. 1987) (fraud on the PTO).

### 3.8 Technical Note: Doing Legal Research

This chapter provides enough legal background to understand the current book and, in most cases, the professional economics literature. That said, some readers may want to learn more about particular issues. Fortunately, almost all research universities host large, well-stocked law libraries. Furthermore, publishers have produced streamlined tools that make finding the law easier than almost any other kind of library research. This section lists the major resources.

**Primary Sources** Finding statutes is easy if you already have a formal citation like 35 USC §163. For example, federal statutes are collected in a series of volumes called *United States Code*. If not, most statute books are also indexed by subject matter (“copyright”) and popular name (“Digital Millennium Copyright Act”). Court opinions are collected in bound volumes called “Reporters.” Among U.S. federal courts, the main case reporters are *The Supreme Court Reporter*, *Federal Reporter* (U.S. Court of Appeals decisions), and *Federal Reporter Supplement* (U.S. District Court decisions). Some intellectual property cases are also found in the *United States Patent Quarterly* (USPQ), which contains an extensive index of patent, trademark, copyright, and other intellectual property cases. Additional case reporters exist for each of the fifty states. Case reporters are almost always published in chronological order and have no obvious structure. If the citation is already known, they are easy to use. If only the name of a party is known, it may be necessary to consult a digest or search through an online service.

**Secondary Sources** Economists can usually rely on what legal scholars have written instead of reading case law or statutes for themselves. For important subjects, multivolume treatises are often the best place to start. Some leading examples include treatises by Milgrim (trade secrets), Chisum (patents), Nimmer (copyright), and Areeda (antitrust). Even if it does not provide the answer directly, a good treatise usually provides plenty of leads for further research. The problem may also have been discussed in a law review. These can be searched through online indexes and full-text services like LEXIS. A good law review article will mention every possible case or statute that bears on the problem.

Many commercial publishers offer digests that collect and sort the main points of each published case under headings like “Patent Law” or “Copyright.” The largest and oldest digests are produced by the West

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Publishing Company. These provide a more or less complete guide to all of the case reporters mentioned above. Cases that happen to mention a particular statute are also digested in USC (supra) and other annotated codes.

**Electronic Services** Almost all of the primary and secondary sources already listed can be searched through the online services LEXIS/NEXIS<sup>66</sup> or WESTLAW. Both services offer Boolean, full-text searches of case law, statutes, law reviews, and treatises. Furthermore, WESTLAW allows readers to search its copyrighted “key note” index. In addition to offering LEXIS/NEXIS and WESTLAW, some vendors provide smaller but still useful collections on CD-ROM. Boolean searches can be a frustrating way to learn about a general concept like “copyright” or “restitution.” Here, traditional paper resources like digests and treatises are still the best option. Boolean searches are ideal for finding cases that involve certain rare situations. Examples include finding all patent cases that interpret particular words in a statute; that mention a particular technology or brand name; or that involve a particular company, court, judge, or law firm.

Finally, the PTO maintains a searchable online database that contains most patents. You can access the database by visiting [www.uspto.gov](http://www.uspto.gov). There is no comparable service for copyrights, which do not need to be registered.

#### References and Further Reading

Allison, J. R., and M. A. Lemley. 2002. “The Growing Complexity of the United States Patent System.” *Boston University Law Review* 82:77–145.

Anton, J. J., and D. A. Yao. 1994. “Expropriation and Inventions: Appropriable Rents in the Absence of Property Rights.” *American Economic Review* 84:190–209.

Areeda, P. E., and H. Hovenkamp. 1985. *Economics and Federal Antitrust Law*. St. Paul, MN: West.

Barton, J. 2000. “Intellectual Property Rights: Reforming the Patent System.” *Science* 287:1933–1934.

Barton, J. 2003. “Nonobviousness.” *IDEA: The Journal of Law and Technology* 43:475–508.

66. LEXIS/NEXIS is typically available to law school personnel and—on occasion—other university patrons. LEXIS/NEXIS also offers free access to selected online files—including recent federal cases—at [www.lexisone.com](http://www.lexisone.com).

- Chisum, D. S. 2001. *Chisum on Patents: A Treatise on the Law of Patentability, Validity, and Infringement*. San Francisco: Bancroft-Whitney.
- Cowan, R., and P. A. David. 1999. "The Explicit Economics of Knowledge Codification and Tacitness." Working Paper 99-027. Stanford, CA: Department of Economics, Stanford University.
- Denicolò, V. 2002. "Two-Stage Patent Races and Patent Policy." *RAND Journal of Economics* 31:488–501.
- Eisenberg, R. 1989. "Patents and the Progress of Science: Exclusive Rights and Experimental Use." *University of Chicago Law Review* 56:1017–1055.
- Flatow, I. 1992. *They All Laughted . . . From Light Bulbs to Lasers: The Fascinating Stories Behind the Great Inventions that Have Changed Our Lives*. New York: HarperCollins.
- Graham, S., B. H. Hall, D. Harhoff, and D. Mowery. 2003. "Patent Quality Control: A Comparison of U.S. Patent Reexaminations and European Patent Oppositions." In W. Cohen, ed., *Intellectual Property in the Knowledge-Based Economy*. Washington, DC: National Academies Press.
- Green, J., and S. Scotchmer. 1995. "On the Division of Profit in Sequential Innovation." *RAND Journal of Economics* 26:20–33.
- Hall, B. H. 2003. "Business Method Patents, Innovation and Policy." Working Paper 9717. Cambridge, MA: National Bureau of Economic Research.
- Hall, B. H., and R. H. Ziedonis. 2001. "The Patent Paradox Revisited: An Empirical Study of Patenting in the U.S. Semiconductor Industry, 1979–1995." *The RAND Journal of Economics* 32:101–128.
- Lemley, M. A. 1997. "The Economics of Improvement in Intellectual Property Law." *Texas Law Review* 75:989–1083.
- Lemley, M. A. 2001. "Rational Ignorance at the Patent Office." *Northwestern University Law Review* 95:1495–1532.
- Maurer, S. M. 2003. "New Institutions for Doing Science: From Databases to Open Source Biology." Paper presented at the conference "European Policy for Intellectual Property." Maastricht, the Netherlands: Maastricht Economic Research Institute on Information and Technology. Available at [www.merit.unimaas.nl/epip/papers/maurer\\_paper.pdf](http://www.merit.unimaas.nl/epip/papers/maurer_paper.pdf).
- Maurer, S. M., and S. Scotchmer. 1999, May 14. "Database Protection: Is It Broken and Should We Fix It?" *Science* 284:1129–1130.
- Maurer, S. M., and S. Scotchmer. 2002. "The Independent Invention Defense in Intellectual Property." *Economica* 69:535–547.
- Menell, P. 1989. "An Analysis of the Scope of Copyright Protection for Application Programs." *Stanford Law Review* 41:1045–1104.
- Menell, P. 2002. "Can Our Current Conception of Copyright Law Survive the Internet Age? Envisioning Copyright Law's Digital Future." *New York Law School Law Review* 46:63–199.

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Merges, R. 1994. "Intellectual Property Rights and Bargaining Breakdown: The Case of Blocking Patents." *Tennessee Law Review* 62:75-106.

Merges, R. 1997. *Patent Law and Policy*. Charlottesville, VA: Michie.

Merges, R. 1999. "As Many as Six Impossible Patents Before Breakfast: Property Rights for Business Concepts and Patent System Reform." *Berkeley High Technology Law Journal* 14:577-615.

Merges, R., P. Menell, M. A. Lemley, and T. Jorde. 1997. *Intellectual Property in the New Technological Age*. New York: Aspen.

Milgrim, R. M. 2001. *Milgrim on Trade Secrets*. San Francisco: Bancroft-Whitney.

Miller, A. R., and M. H. Davis. 1990. *Intellectual Property: Patents, Trademarks, and Copyright*. St. Paul, MN: West.

Nimmer, M. B., and D. Nimmer. 2001. *Nimmer on Copyright*. San Francisco: Matthew Bender.

Petroski, H. 1996. *Invention by Design: How Engineers Get from Thought to Thing*. Cambridge, MA: Harvard University Press.

Poyago-Theotoky, J., J. Beath, and D. S. Siegel. 2002. "Universities and Fundamental Research: Reflections on the Growth of University-Industry Partnerships." *Oxford Review of Economic Policy* 18:10-12.

Ryan, M. P. 1998. *Knowledge Diplomacy*. Washington, DC: Brookings Institution Press.

Samuelson, P., R. David, M. Kapor, and J. H. Reichman. 1994. "A Manifesto Concerning the Legal Protection of Computer Programs." *Columbia Law Review* 94:2308-2431.

Samuelson, P., and S. Scotchmer. 2002. "The Law and Economics of Reverse Engineering." *Yale Law Journal* 111:1575-1663.

Scotchmer, S. 1996. "Protecting Early Innovators: Should Second-Generation Products Be Patentable?" *RAND Journal of Economics* 27:322-331.

Scotchmer, S., and J. Green. 1990. "Novelty and Disclosure in Patent Law." *The RAND Journal of Economics* 21:131-146.

Townes, C. H. 1999. *How the Laser Happened: Adventures of a Scientist*. Oxford: Oxford University Press.

Wainfan, B. 2003, December. "Wright Flyer Aerodynamics." *Flight Journal* 8:58-61.

Walsh, J. P., A. Arora, and W. M. Cohen. 2003. "Research Tool Patenting and Licensing and Biomedical Innovation." Paper presented at the conference "European Policy for Intellectual Property." Maastricht, the Netherlands: Maastricht Economic Research Institute on Information and Technology. Available at [www.merit.unimaas.nl/epip/papers/walsh\\_paper.pdf](http://www.merit.unimaas.nl/epip/papers/walsh_paper.pdf).