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## Reverse Engineering and the Rise of Electronic Vigilantism: Intellectual Property Implications of "Lock-Out" Programs

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REVERSE ENGINEERING  
AND THE RISE OF ELECTRONIC  
VIGILANTISM: INTELLECTUAL  
PROPERTY IMPLICATIONS OF  
“LOCK-OUT” PROGRAMS

JULIE E. COHEN\*

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Nearly twenty years ago, Congress officially extended copyright protection to computer programs.<sup>1</sup> Five years later, the Supreme Court

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<sup>1</sup> Pub. L. No. 94-553, 90 Stat. 2541 (1976) (codified as amended at 17 U.S.C. ‘‘ 101, 102 & 117 (1988 & Supp. 1994)).

issued a decision that definitively established computer programs' eligibility for patent protection.<sup>2</sup> The two developments had very different trajectories; the debate over patent protection was long, hard-fought, and occasionally acrimonious,<sup>3</sup> while the extension of copyright protection was accomplished by committee and consensus, almost as an afterthought.<sup>4</sup> The developments were similar in one respect, however. Both Congress and the Supreme Court treated computer programs as autonomous intellectual products, intended for use on a stand-alone basis in the same manner as a copyrighted book or a patented industrial apparatus.<sup>5</sup> Today, in contrast, it is evident that the value of a computer program to its users depends heavily on its compatibility, or *interoperability*, with a particular computer system and with other programs.<sup>6</sup> Whether interoperability-related issues should affect copyright and patent treatment of computer programs, and if so, how, are among the decade's most hotly debated legal questions.<sup>7</sup>

For creators of computer programs, achieving interoperability with particular computers and operating systems is necessary for commercial survival.<sup>8</sup> Interoperability has also become a watchword for consumers who seek applications programs that will operate on their

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<sup>2</sup> *Diamond v. Diehr*, 450 U.S. 175 (1981).

<sup>3</sup> For an exhaustive chronicle of this debate, see Pamela Samuelson, *Benson Revisited: The Case Against Patent Protection for Algorithms and Other Computer-Related Inventions*, 39 EMORY L.J. 1025, 1032-99 (1990) [hereinafter Samuelson, *Benson Revisited*].

<sup>4</sup> See H.R. REP. No. 94-1476, 94th Cong., 2d Sess. 51 (1976), reprinted in 1976 U.S.C.C.A.N. 5659, 5664 ("[C]omputer programs, for example could be regarded as an extension of copyrightable subject matter Congress had already intended to protect, and were thus considered copyrightable from the outset without the need of new legislation."); FINAL REPORT OF THE NAT'L COMM'N ON NEW TECHNOLOGICAL USES OF COPYRIGHTED WORKS 12, 15-16 (1978) [hereinafter CONTU, FINAL REPORT].

<sup>5</sup> See 17 U.S.C. § 101 (1988) (defining "computer program" as "a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result"); *Diehr*, 450 U.S. at 185-87 (describing program invention as a process in which "a mathematical formula" and "a digital computer" are used).

<sup>6</sup> See Dennis S. Karjala, *Copyright Protection of Computer Documents, Reverse Engineering, and Professor Miller*, 19 U. DAYTON L. REV. 975, 990 (1994) [hereinafter Karjala, *Computer Documents*]; Dennis S. Karjala, *Copyright, Computer Software, and the New Protectionism*, 28 JURIMETRICS J. 33, 63-64 (1987) [hereinafter Karjala, *New Protectionism*]; Timothy S. Teter, Note, *Merger and the Machines: An Analysis of the Pro-Compatibility Trend in Computer Software Copyright Cases*, 45 STAN. L. REV. 1061, 1063-66 (1993).

<sup>7</sup> The first court before which issues of compatibility were raised termed the defendant's desire to achieve compatibility "a commercial and competitive objective" irrelevant to the intellectual property analysis. *Apple Computer, Inc. v. Franklin Computer Corp.*, 714 F.2d 1240, 1253 (3d Cir. 1983). That conclusion is discussed and rejected *infra* part III.B.

<sup>8</sup> See, e.g., Peter S. Menell, *Tailoring Legal Protection for Computer Software*, 39 STAN. L. REV. 1329, 1357-58, 1361-63 (1987) [hereinafter Menell, *Tailoring Legal Protection*].

existing computer systems, or who may base selection of new systems on the applications programs available. Manufacturers of computer systems and operating systems have responded in a variety of different ways to program developers' demands for access to interoperability-related information. Some have made program interface specifications and protocols freely available to applications developers.<sup>9</sup> Others have licensed the rights to create compatible programs to third parties, although some withhold complete technical information on interoperability requirements from their licensees.<sup>10</sup> Still others, chiefly manufacturers of specialized computers designed to serve industry specific customer bases, have attempted to keep their systems completely proprietary.<sup>11</sup> As a result of the frequent unavailability of interoperability-related information through ordinary market channels, "reverse engineering" of interface specifications for proprietary and quasi-proprietary systems has become common. In particular, many third-party software developers have come to rely on a method of reverse engineering known as "disassembly" or "decompilation," which parses the binary object code in which computer programs are distributed into higher-level, human-readable commands.<sup>12</sup>

The rise of reverse engineering by third-party software developers in turn has led some computer manufacturers to seek technological protection against unwanted competitors.<sup>13</sup> Within the video game industry, several system manufacturers have developed specialized "lock-out" programs that limit access to their hardware to program disks or cartridges that contain the "key."<sup>14</sup> Lock-out programs are

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<sup>9</sup> Apple Computer and Microsoft Corporation fall within this category. Both companies also compete with third-party developers to create applications programs compatible with their respective operating systems. However, third-party developers have raised recurrent concerns about whether the shared information is complete. *See, e.g.,* Kathy Rebello et al., *Is Microsoft Too Powerful?*, BUS. WK., Mar. 1, 1993, at 82.

<sup>10</sup> *See* Sega Enters. Ltd. v. Accolade, Inc., 977 F.2d 1510,1514 (9th Cir. 1992), *as amended*, 1993 U.S. App. LEXIS 78 (9th Cir. 1993); Atari Games Corp. v. Nintendo of Am., Inc., 30 U.S.P.Q. 2d (BNA) 1401, 1403 (N.D. Cal. 1993); *infra* text accompanying notes 26-27.

<sup>11</sup> *See, e.g.,* MAI Sys. Corp. v. Peak Computer, Inc., 991 F.2d 511 (9th Cir. 1993) (relating to a dispute over access to a completely proprietary system).

<sup>12</sup> The process of reverse engineering through decompilation is described in detail in Andrew Johnson-Laird, *Software Reverse Engineering in the Real World*, 19 U. DAYTON L. REV. 843 (1994).

<sup>13</sup> For a discussion of this technological one-upmanship, see Marshall Leaffer, *Engineering Competitive Policy and Copyright Misuse*, 19 U. DAYTON L. REV. 1087, 1096-97 (1994).

<sup>14</sup> *See* Sega, 977 F.2d at 1515; Atari Games Corp. v. Nintendo of Am., Inc., 975 F.2d 832, 836 (Fed. Cir. 1992).

designed to exclude all “unauthorized” programs, and to make reverse engineering more difficult.<sup>15</sup> However, lock-out programs, like other computer programs, also can be reverse engineered. Lock-out programs therefore complicate, but do not defeat, third-party research and development efforts. Ultimately, neither technological nor market solutions have enabled computer manufacturers to prevent determined competitors from creating and marketing compatible programs. As a result, computer manufacturers and software developers have sought recourse under the copyright and patent laws. They have argued that both the reverse engineering process and the subsequent creation of compatible programs that include “keys” to their systems infringe their intellectual property rights.

Reverse engineering of interface specifications and use of the information gained through reverse engineering to create a compatible program raise novel questions in the overlapping realms of copyright law, patent law, and public policy. Over the past few years, there has been an abundance of scholarship dealing with the appropriate scope of copyright and patent protection for computer programs.<sup>16</sup> This Article approaches those problems from a slightly different perspective, focusing on the discrete problem of lock-out programs. The choice of lock-out as a paradigm for exploring the interoperability question and the contours of copyright and patent protection of computer programs

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<sup>15</sup> See, e.g., Johnson-Laird, *supra* note 12, at 853-56 (describing the problems that confront those seeking to reverse engineer a lock-out program).

<sup>16</sup> Regarding copyright protection, see, for example, Anthony L. Clapes et al., *Silicon Epics and Binary Bards: Determining the Proper Scope of Copyright Protection for Computer Programs*, 34 UCLA L. REV. 1493 (1987); Karjala, *Computer Documents*, *supra* note 6; Karjala, *New Protectionism*, *supra* note 6; Peter S. Menell, *An Analysis of the Scope of Copyright Protection for Application Programs*, 41 STAN. L. REV. 1045 (1989) [hereinafter Menell, *Application Programs*]; Menell, *Tailoring Legal Protection*, *supra* note 8; Arthur R. Miller, *Copyright Protection for Computer Programs, Databases, and Computer-Generated Works. Is Anything New Since CONTU?*, 106 HARV. L. REV. 977 (1993); David A. Rice, *Sega and Beyond: A Beacon for Fair Use Analysis . . . At Least As Far As It Goes*, 19 U. DAYTON L. REV. 1131 (1994) [hereinafter Rice, *Sega and Beyond*]; Pamela Samuelson, *Computer Programs, User Interfaces, and Section 102(b) of the Copyright Act of 1976: A Critique of Lotus v. Paperback*, 6 HIGH TECH. L.J. 209 (1992) [hereinafter Samuelson, *Critique of Paperback*]; Pamela Samuelson, *Creating a New Kind of Intellectual Property: Applying the Lessons of the Chip Law to Computer Programs*, 70 MINN. L. REV. 471 (1985) [hereinafter Samuelson, *Chip Law*]; Pamela Samuelson, *CONTU Revisited: The Case Against Copyright Protection for Computer Programs in Machine-Readable Form*, 1984 DUKE L.J. 663 [hereinafter Samuelson, *CONTU Revisited*]. Regarding patent protection, see, for example, Donald S. Chisum, *The Patentability of Algorithms*, 47 U. PITT. L. REV. 959 (1986); A. Samuel Oddi, *An Uneasier Case for Copyright Than for Patent Protection of Computer Programs*, 72 NEB. L. REV. 351 (1993); Samuelson, *Benson Revisited*, *supra* note 3; Richard H. Stem, *Tales From the Algorithm War. Benson to Iwahashi, It's Deja Vu All Over Again*, 18 AIPLA Q.J. 371 (1991).

is informed by two considerations. First, for purposes of the interoperability inquiry, lock-out programs represent an extreme; they are discrete, self-contained modules that are highly innovative in design, yet that serve no purpose other than to regulate access to a computer or computer operating system. Copyright and patent analyses of the lock-out problem highlight a fundamental tension between intellectual property rights and considerations of public access, and so afford a useful vehicle for examining the scope of copyright and patent protection for computer programs generally. Second, lock-out may well become a defining technology of the coming "Information Age." Pundits have prophesied a "set-top box" in every home that affords a gateway to an "information superhighway" where goods and services may be purchased and information accessed.<sup>17</sup> Whether or not the manufacturer of the set-top box will be able to exclude unauthorized purveyors of goods, services, and information will significantly affect both the structure of the emerging market in information services and the nature of individual participation in that market.<sup>18</sup>

The purpose of this Article is twofold. First, I argue that neither the copyright laws nor the patent laws preclude duplication of protected program features, including "lock" and "key" features, to whatever extent necessary to achieve full compatibility with an unpatented computer system. Second, and more generally, I address inconsistencies and conceptual flaws in the current understanding of copyright and patent protection for computer programs that emerge during the first inquiry, and propose doctrinal modifications to resolve them. Although computer programs have been protected by both copyright and patent regimes for years, the precise contours of the protection these regimes afford remain unsettled. For that reason, some scholars, computer lawyers, and computer industry professionals have urged the adoption of *sui generi* protection for computer programs,<sup>19</sup> but the question of *sui generis* protection may have become

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<sup>17</sup> See, e.g., *Screen Test*, THE ECONOMIST, Sept. 17, 1994, at 17.

<sup>18</sup> Among the leading contenders for development of a viable set-top box are none other than the video game giants Sega and Nintendo, whose attempts to enforce lock-out protection for their video game consoles are discussed below. See, e.g., George Gilder, *Telecosm: The Bandwidth Tidal Wave*, FORBES, Dec. 5, 1994, at 162 ("If the personal computer cannot handle these [data] streams, [TCI chief executive] John Malone's set-top boxes, Sega or Nintendo game machines or [Microsoft chief executive] Bill Gates' new communications technology will."); Ken Yamaha, *Standards Time. New Set-Top-Box Technology Key to Interactive TV*, COMPUTER RESELLER NEWS, Dec. 5, 1994, at 55.

<sup>19</sup> See, e.g., Menell, *Tailoring Legal Protection*, *supra* note 8, at 1371-72; Samuelson, *CONTU Revisited*, *supra* note 16, at 762-69; Samuelson, *Benson Revisited*, *supra* note 3, at 1148-53; Pamela Samuelson et al., *A Manifesto Concerning the Legal Protection of Computer Programs*, 94 COLUM. L. REV. 2308, 2342-64 (1994) [hereinafter Samuelson et al., *Manifesto*].

largely irrelevant. The United States has convinced many other countries to follow its lead in “tending both copyright and patent protection to computer programs and is unlikely to change course.”<sup>20</sup> For better or worse, it seems we are stuck with the existing modes of intellectual property protection for computer programs. However, this Article argues that certain adjustments to the copyright and patent doctrines governing the protection of computer programs are necessary if the intellectual property laws are to continue to serve both their new and their traditional functions.

Part I of this Article describes the facts and outcomes of two recent cases: *Sega Enterprises Ltd. v. Accolade, Inc.*<sup>21</sup> and *Atari Games Corp. v. Nintendo of America, Inc.*,<sup>22</sup> both of which involved attempts to enforce intellectual property rights in lock-out programs. The remainder of the Article takes those cases as a starting point for discussion of the interoperability question and what it reveals about the scope and structure of copyright and patent protection for computer programs. Parts II and III explore the copyright implications of reverse engineering interface specifications and lock-out programs and of using the information gained thereby to create and market a compatible program. Part II focuses on the copyright issues resulting from intermediate copying during the reverse engineering process. Part III considers whether the reverse engineer may create a program that duplicates the “key” to the “lock” and other functional features of interoperability-related routines. Part IV addresses issues bearing on the validity of a lock-out patent. Finally, Part V considers whether, in light of the analyses in Parts II, III, and IV, attempts to enforce patents and copyrights against competitors who crack the code for a lockout program constitute patent or copyright misuse. The Article concludes with some general reflections on the efficacy and viability of the copyright and patent models for intellectual property protection of computer programs.

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<sup>20</sup> See, e.g., Samuelson et al., *Manifesto*, *supra* note 19, at 2313 & nn.7-8 (summarizing recent international developments).

<sup>21</sup> 785 F. Supp. 1392 (N.D. Cal.), *aff'd in part and rev'd in part*, 977 F.2d 1510 (9th Cir. 1992), *as amended*, 1993 U.S. App. LEXIS 78 (9th Cir. 1993).

<sup>22</sup> 18 U.S.P.Q.2d (BNA) 1935 (N.D. Cal. 1991) (granting preliminary injunction), *aff'd*, 975 F.2d 832 (Fed. Cir. 1992), *after remand*, 30 U.S.P.Q.2d (BNA) 1401 (N.D. Cal. 1993); 30 U.S.P.Q.2d (BNA) 1420 (N.D. Cal. 1993).



I. THE *SEGA* AND *ATARI* CASES

Both *Sega* and Atari involved attempts to gain access to, and to create interoperability with, video game consoles developed by industry giants. Sega Enterprises Ltd. manufactures the Sega Genesis, a video entertainment console system that accepts video game cartridges.<sup>23</sup> Nintendo of America, Inc. distributes the Nintendo Entertainment System (“NES”), a similar device.<sup>24</sup> Both companies are leaders in the home video entertainment market.<sup>25</sup> Both license the rights to create games compatible with their consoles to independent developers of video game programs, but only under agreements that withhold from the licensees the actual information needed to achieve interoperability. Instead, the agreements require that the licensor (Sega or Nintendo) be the exclusive manufacturer of the games developed by the licensee. The licensor supplies the missing information during the manufacturing process, and then resells the completed games to the licensee for commercial distribution.<sup>26</sup> Neither Sega nor Nintendo holds a U.S. patent on its console.<sup>27</sup>

A. *SEGA V. ACCOLADE*

Both factually and legally, *Sega* is the simpler case. Accolade, an independent developer of home computer game software for a variety of computer systems, wanted to expand its product line to include games compatible with the Genesis console, but was unwilling to cede control over manufacturing the games to Sega.<sup>28</sup> To discover the requirements for interoperability with the Genesis console, Accolade's engineers “reverse engineered” the microcode contained in several Sega video game cartridges by using a process known as “decompilation” to translate the binary object code into human-readable form.<sup>29</sup>

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<sup>23</sup> *Sega*, 977 F.2d at 1514.

<sup>24</sup> *Atari*, 975 F.2d at 835-36.

<sup>25</sup> In 1994, they each controlled approximately 50% of the U.S. home video game market. See, e.g., Merrill Goozner, *Rivals Nose in on Nintendo*, CHI. TRIB., June 12, 1994, ' 7 at 1.

<sup>26</sup> *Sega*, 977 F.2d at 1514; *Atari*, 30 U.S.P.Q.2d (BNA) at 1403.

<sup>27</sup> *Sega*, 977 F.2d at 1526; *Atari*, 30 U.S.P.Q.2d (BNA) at 1401-02.

<sup>28</sup> *Sega*, 977 F.2d at 1514.

<sup>29</sup> *Id.* at 1514-15. Initially, computer programs are written in human-readable form known as source code. In order to be functional, however, a computer program must be translated from source code into machine-readable form, or object code. See Johnson-Laird, *supra* note 12, at 856-59. Object code cannot be translated back into source code, but can be translated into a lower-level human-readable form, known as assembly language, by decompilation. See *id.* at 872-79, 896-97.

Ultimately, the engineers successfully identified the interface specifications for the Genesis console and released Accolade's first Genesis-compatible game.<sup>30</sup> In the process, however, they had made numerous copies of Sega's copyrighted microcode.

While Accolade's reverse engineering efforts were in progress, Sega began manufacturing its consoles to include a trademark security system ("TMSS"),<sup>31</sup> a lock-out device that operated by searching each game cartridge inserted into the console for four bytes of data present at a particular location in all Sega-produced game programs.<sup>32</sup> If the console did not find the "TMSS initialization code" at the necessary location in the game program, it would not allow the game to operate.<sup>33</sup> When Sega introduced the Genesis III console, the first to include the TMSS, at a consumer electronics show, Accolade observed that its reverse engineered games would not operate on the Genesis III.<sup>34</sup> Further study of the decompiled Sega programs revealed a small segment of code, containing approximately twenty-five bytes of data, which Accolade's engineers had determined to be unnecessary for interoperability with the original Genesis console, and so had omitted from their summary of specifications for a Genesis-compatible game. After studying the segment, which contained the TMSS initialization code, Accolade "added the code to its development manual in the form of a standard header file to be used in all games."<sup>35</sup> Shortly thereafter, Accolade released several games for use with the Genesis III.

Sega filed suit for copyright infringement against Accolade in the Northern District of California.<sup>36</sup> The district court granted Sega's

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<sup>30</sup> *Sega*, 977 F.2d at 1515.

<sup>31</sup> According to Sega, the TMSS was adopted solely as a response to software pirates who had discovered a way to produce copies of Sega's video game cartridges without the initial screen display of Sega's trademark. The TMSS was designed both to "lock out" unauthorized cartridges and to "lock in" an initial screen display of Sega's trademark, thereby protecting Sega's ability to prosecute pirates for trademark infringement. *Id.*

<sup>32</sup> *Id.*

<sup>33</sup> *Id.*

<sup>34</sup> *Id.*

<sup>35</sup> *Id.* at 1516. Unbeknownst to Accolade, the "standard header file" that rendered its games compatible with Sega's new console also triggered a screen display that stated "PRODUCED BY OR UNDER LICENSE FROM SEGA ENTERPRISES LTD." *Id.* at 1515.

<sup>36</sup> Sega also asserted claims for trademark infringement and false designation of origin in violation of the Lanham Act, 15 U.S.C. §§ 1114(l)(a), 1125(a) (1988). Arguing that the TMSS enabled Sega to falsely pass off Accolade's games as its own, Accolade counterclaimed for false designation of origin. The district court found accolade, not Sega, responsible for the misleading screen display of the Sega trademark message. *Sega Enters, Ltd. v. Accolade Inc.*, 785 F. Supp. 1392, 1400 (N.D. Cal.) *aff'd in part and rev'd in part*, 977, F.2d 1510 (9th Cir. 1992), as amended 1993 U.S. App. LEXIS 78 (9th Cir. 1993).

motion for a preliminary injunction. It found that Accolade had infringed Sega's copyrights in its video game programs by making unauthorized copies and translations of Sega's microcode during the reverse engineering process.<sup>37</sup> The court further ruled that Accolade's conduct could not be considered a fair use, because its motive in reverse engineering Sega's games was commercial and had resulted in the creation of a competing product.<sup>38</sup> Accordingly, the court barred Accolade from further disassembly or use of Sega's video game programs and from selling its reverse engineered games.<sup>39</sup>

The Ninth Circuit reversed.<sup>40</sup> The court agreed with the district court that Accolade's creation of copies and translations during the reverse engineering process constituted infringement under the literal terms of the Copyright Act.<sup>41</sup> However, it held that decompilation of computer object code is a fair use privileged by the Act when there is no other way to gain access to the functional requirements for interoperability, which are not protected by copyright.<sup>42</sup> Writing for the court, Judge Reinhardt emphasized the uniquely opaque nature of computer programs that are distributed for public use in object code form, readable only by machine.<sup>43</sup> The court concluded that to deem Accolade's decompilation unfair would be to grant Sega a de facto monopoly over access to the Genesis III, although it held no patent on the console.<sup>44</sup>

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<sup>37</sup> *Sega*, 785 F. Supp. at 1396-97. Section 106 of the Copyright Act reserves to the copyright owner the exclusive right to make or authorize copies or derivative works. 17 U.S.C. ' 106(l), (3).

<sup>38</sup> *Sega*, 785 F. Supp. at 1398. Section 107 of the Copyright Act, 17 U.S.C. ' 107, provides that otherwise infringing conduct may be considered a fair use of the copyrighted material, depending on the circumstances of the use. *See infra* note 81.

<sup>39</sup> *Id.* at 1402.

<sup>40</sup> *Sega Enters. Ltd. v. Accolade, Inc.*, 977 F.2d 1510 (9th Cir. 1992), *as amended*, 1993 U.S. App. LEXIS 78 (9th Cir. 1993).

<sup>41</sup> *Id.* at 1518-20.

<sup>42</sup> *Id.* at 1523-28. The court relied on section 102(b) of the Act, which provides that copyright protection does not extend "to any idea, procedure, process, system, method of operation, concept, principle, or discovery." 17 U.S.C. ' 102(b).

<sup>43</sup> *Id.* at 1525-26.

<sup>44</sup> *Id.* at 1526-27. The Ninth Circuit also rejected the district court's resolution of the trademark issues. It held that Sega, not Accolade, bore primary responsibility for the confusing Sega trademark message display because Sega had intended the TMSS to produce a misleading screen display in some circumstances. *Id.* at 1528-30.

B. *ATARI V. NINTENDO*

The basic fact pattern in *Atari* was similar to that in *Sega*. To ensure that only video games developed by Nintendo or its authorized licensees would operate on the NES, Nintendo developed a “security system” for the NES.<sup>45</sup> The system consists of two microprocessors: a “master” chip in the console and a “slave” chip in the video game cartridge, each containing Nintendo's copyrighted 10NES program.<sup>46</sup> When the cartridge is inserted into the console, the two 10NES programs generate and exchange a series of values based on an initial, randomly selected number. The master program then compares the results. If the final digits of the two series are equal, the console is unlocked and the operator may proceed to play the game.<sup>47</sup> If they are not equal, the console remains in a reset mode and the game will not operate.<sup>48</sup>

In its efforts to reverse engineer the NES security system, Atari analyzed the output of the 10NES program and also chemically “peeled” the security system chip to examine the 10NES microcode embedded in it.<sup>49</sup> When these initial efforts failed, Atari decided to become a Nintendo licensee.<sup>50</sup> Unhappy with Nintendo's restrictive license terms, however, Atari continued its reverse engineering efforts. Ultimately, Atari's engineers produced the Rabbit program, a program that was “functionally indistinguishable” from the 10NES program.<sup>51</sup> Atari then began marketing its own games for the NES.

*Atari* differed from *Sega* in two crucial respects. First, Nintendo had applied for and received a U.S. patent on the NES security system.<sup>52</sup> Atari's reverse engineering, therefore, raised questions of patent infringement as well as copyright infringement. Second, as part of its reverse engineering process, Atari committed fraud on the Copyright Office. Although Atari's engineers were able to decipher much

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<sup>45</sup> *Atari Games Corp. v. Nintendo of Am., Inc.*, 975 F.2d 832, 836 (Fed. Cir. 1992).

<sup>46</sup> *Id.*

<sup>47</sup> *Atari Games Corp. v. Nintendo of Am., Inc.*, 30 U.S.P.Q.2d (BNA) 1401, 1403 (N.D. Cal. 1993).

<sup>48</sup> *Id.* at 1410-11.

<sup>49</sup> *Atari Games Corp. v. Nintendo of Am., Inc.*, 18 U.S.P.Q.2d (BNA) 1935, 1936 (N.D. Cal. 1991). “Peeling” is a process by which successive layers of the circuitry embedded in a microchip are removed and studied. Because successful peeling reveals, at most, an object coded version of the program under study, it cannot substitute for decompilation. *See Johnson-Laird, supra* note 12, at 863-64.

<sup>50</sup> *Atari*, 18 U.S.P.Q.2d (BNA) at 1936.

<sup>51</sup> *Id.* at 1937.

<sup>52</sup> U.S. Patent No. 4,799,635 (1989).

of the code embedded in the NES “slave” microprocessor, they failed to produce a complete translation of the program.<sup>53</sup> Atari's attorneys then applied to the Copyright Office for a copy of the 10NES program, stating that they needed the code because Atari was a defendant in infringement litigation involving the program.<sup>54</sup> Since no lawsuit had yet been filed, that was an outright misrepresentation.<sup>55</sup>

When Atari began producing unauthorized NES-compatible games, Nintendo filed suit for copyright and patent infringement.<sup>56</sup> In support of its motion for a preliminary injunction, it argued that both Atari's final product and its intermediate copying of the 10NES program during the reverse engineering process infringed the 10NES copyright.<sup>57</sup> In response, Atari argued that it had copied, and taken, only functional elements unprotected by copyright.<sup>58</sup> The district court sided with Nintendo. It ruled that even if the doctrine of merger excused some similarities between the Rabbit and 10NES programs, Atari had taken more than necessary to achieve interoperability.<sup>59</sup> The court also found that Nintendo was likely to succeed on its intermediate copying argument.<sup>60</sup>

The Court of Appeals for the Federal Circuit affirmed the preliminary injunction.<sup>61</sup> Regarding intermediate copying, it held that Atari's procurement of an unauthorized copy of the 10NES program

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<sup>53</sup> *Atari*, 18 U.S.P.Q.2d (BNA) at 1936.

<sup>54</sup> *Atari Games Corp. v. Nintendo of Am., Inc.*, 975 F.2d 832, 836 (Fed. Cir. 1992).

<sup>55</sup> *Id.*

<sup>56</sup> *Atari Games Corp. v. Nintendo of Am., Inc.*, 897 F.2d 1572, 1574-75 (Fed. Cir. 1990). First, Nintendo sent letters to Atari's retailers threatening suit if sales of the unauthorized games continued, and Atari sued Nintendo for antitrust violations and unfair competition. Nintendo's subsequent copyright and patent infringement lawsuit was consolidated with Atari's. *Id.* at 1575. Atari requested, and the district court granted, a preliminary injunction barring Nintendo from suing retailers of Atari's NES-compatible games. However, the Court of Appeals for the Federal Circuit reversed, ruling that Atari had not adduced sufficient facts on the issue of Nintendo's allegedly anticompetitive conduct. *Id.* at 1577-78. Atari's antitrust counterclaims and its related copyright and patent misuse defenses were subsequently severed for separate trial following trial of Nintendo's infringement claims. *See* Rex Bossert, *Nintendo Is Victorious in Patent Claim Against Foe*, S.F. DAILY J., July 30, 1993, at 1, 7.

<sup>57</sup> *Atari*, 18 U.S.P.Q.2d (BNA) at 1938.

<sup>58</sup> *Id.*

<sup>59</sup> *Id.* at 1938-39. Under the doctrine of merger, “[w]hen there is essentially only one way to express an idea, the idea and its expression are inseparable and copyright is no bar to copying that expression.” *Concrete Mach. Co. v. Classic Lawn Ornaments, Inc.*, 843 F.2d 600, 606 (1st Cir. 1988); *see also* *Herbert Rosenthal Jewelry Corp. v. Kalpakian*, 446 F.2d 738, 742 (9th Cir. 1971) (holding that protecting expression that is inseparable from an idea would confer an impermissible monopoly on the idea).

<sup>60</sup> *Atari*, 18 U.S.P.Q.2d (BNA) at 1939.

<sup>61</sup> *Atari Games Corp. v. Nintendo of Am., Inc.*, 975 F.2d 832 (Fed. Cir. 1992).

from the Copyright Office constituted infringement.<sup>62</sup> It further held that Atari's misconduct in obtaining the copy precluded any attempt by Atari to invoke the fair use defense to shield its other reverse engineering efforts.<sup>63</sup> Regarding Atari's final product, the Federal Circuit agreed with the district court that Nintendo had made a sufficient preliminary showing of substantial similarity between the Rabbit and the 10NES by establishing that Atari's Rabbit program "incorporate[d] elements of the 10NES program unnecessary for the chip's performance."<sup>64</sup>

On remand, the district court granted summary judgment for Nintendo on its copyright infringement claims. Examination of the 10NES and Rabbit programs revealed, and Atari did not dispute, that Atari had duplicated some 10NES functions that were unnecessary to achieve interoperability with the version of the NES then on the market.<sup>65</sup> Atari argued that it needed to create a program "functionally indistinguishable" from the 10NES to preclude any attempt by Nintendo to lock Atari's game cartridges out of future versions of the NES.<sup>66</sup> The district court declined to extend the Sega rule to cover copying intended to achieve future interoperability "absent further guidance from the Ninth Circuit or Congress."<sup>67</sup> The court ruled, in essence, that those functional attributes of the 10NES unnecessary for current interoperability were expressive elements of the program's structure, and so entitled to copyright protection.<sup>68</sup>

The court also granted Nintendo partial summary judgment on its patent infringement claims. Although Atari had written a different program to generate the results required by the 10NES, the court ruled that Atari's Rabbit program infringed the 10NES patent under

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<sup>62</sup> *Id.* at 841-42.

<sup>63</sup> *Id.* at 843. In a lengthy dictum, however, the court opined that absent fraud, reverse engineering based on copies of the copyrighted work would constitute a fair use. *Id.* at 843-44. Ninth Circuit's opinion in *Sega* was released two months later.

<sup>64</sup> *Id.* at 845.

<sup>65</sup> *Atari Games Corp. v. Nintendo of Am., Inc.*, 30 U.S.P.Q.2d (BNA) 1420,1423 (N.D. Cal. 1993).

<sup>66</sup> *See id.*; *Atari Games Corp. v. Nintendo of Am., Inc.*, 30 U.S.P.Q.2d (BNA) 1401,1406-08 (N.D. Cal. 1993). A future lock-out could be accomplished by reprogramming the master 10NES chip (in the console) to search for a different subset of functions in the slave 10NES chip, unless the Rabbit chip also performed those functions. *See id.* at 1406-07; *infra* text accompanying note 279.

<sup>67</sup> *Atari*, 30 U.S.P.Q.2d (BNA) at 1408.

<sup>68</sup> *Id.* at 1407 n.14; *Atari*, 30 U.S.P.Q. 2d (BNA) at 1423. However, the court ruled that Nintendo was not entitled to claim copyright protection for the signal stream generated by the 10NES program. *Atari*, 30 U.S.P.Q. 2d (BNA) at 1403-06.

the doctrine of equivalents.<sup>69</sup> However, Atari had raised several challenges to the validity of Nintendo's patent. Among other things, Atari argued that the use of a lock-out system in conjunction with a reset pin for disabling the console was obvious (or anticipated) in light of a previously issued patent for an electronic security system, not cited to or discovered by the examiner who approved the 10NES patent, and a home computer system designed by the inventor of that patent that included a reset pin and that was on the market when the 10NES system was developed.<sup>70</sup> The district court found Atari's arguments sufficient to defeat summary judgment for Nintendo on the obviousness issues.<sup>71</sup> In July 1993, however, an eight-member jury rejected Atari's position.<sup>72</sup>

Success on its copyright and patent infringement claims would not necessarily have guaranteed Nintendo victory in the litigation because Atari's misuse defenses and antitrust counterclaims still remained to be tried.<sup>73</sup> Had Atari prevailed at the second trial, Nintendo would have been barred from enforcing its infringement judgment.<sup>74</sup> Eight months after the conclusion of the infringement trial, however, Atari and Nintendo settled the case.<sup>75</sup> How the district court would have resolved the misuse and antitrust issues thus remains a matter for speculation.

## II. THE DECOMPILATION DEBATE: FAIR USE OR FOUL PLAY?

As *Sega* and *Atari* illustrate, any debate over permissible uses of knowledge gained through decompilation becomes purely academic if decompilation is not itself permissible. This part evaluates the *Sega* court's resolution of that question.<sup>76</sup> Although many commentators

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<sup>69</sup> *Id.* at 1414-15. *See infra* note 310.

<sup>70</sup> *Id.* at 1416-19. *See* 35 U.S.C. H 102, 103 (establishing requirements of novelty and nonobviousness for patentability).

<sup>71</sup> *Id.* at 1418-19.

<sup>72</sup> Bossert, *supra* note 56, at 1.

<sup>73</sup> *See supra* note 56.

<sup>74</sup> *See infra* part V.A.3.

<sup>75</sup> *See Nintendo, Atari Games Reach Settlement*, L.A. TIMES, Mar. 25, 1994, at D2; *Atari and Nintendo End Court Battle, Begin Media Battle Fracas*, COMPUTER LAW., May 1994, at 28.

<sup>76</sup> Accolade also argued that section 117 of the Copyright Act, which allows copying of a computer program as an essential step in the utilization of the program, permits decompilation. *Sega Enters. Ltd. v. Accolade, Inc.*, 977 F.2d 1510, 1520 (9th Cir. 1992), *as amended*, 1993 U.S. App. LEXIS 78 (9th Cir. 1993). The Ninth Circuit rejected that argument, in my view correctly, on the ground that section 117 encompasses only the right to load a copy of a program into a computer in order to use it. *Id.*; *see* 17 U.S.C. § 117(l); CONTU, FINAL REPORT, *supra* note 4, at 13. Nonetheless, at least one commentator has suggested that section 117 might be interpreted to allow decompilation. Charles R. McManis, *Intellectual Property Protection and Reverse Engineering of Computer Programs in the United States and the European Community*, 8 HIGH TECH. L.J. 25, 94-95 (1993) (discussing *Vault Corp. v. Quaid Software, Ltd.*, 847 F.2d 255 (5th Cir. 1988)). Discussion of that position is beyond the scope of this Article.

have praised the *Sega* decision as forward-thinking,<sup>77</sup> the fair use analysis adopted by the *Sega* court also has drawn some high-powered criticism. Most notably, in his recent comprehensive review of computer copyright law, Professor Arthur Miller assails the Ninth Circuit's application of the fair use doctrine as misguided and "singularly ill-suited to vindicating the public interest."<sup>78</sup> Even a recent student note by an unabashed fan of thin copyright protection for software interface specifications finds the court's analysis "strained."<sup>79</sup> This reception doubtless would come as no surprise to the *Sega* court, which acknowledged that the result it reached—allowing "wholesale copying" by a competitor intent on producing a competing product—"may seem incongruous at first blush."<sup>80</sup> Are the critics' reactions warranted? Careful consideration of the nature of computer programs and the patterns of innovation and dissemination of new developments within the computer industry suggests that they are not. *Sega* is faithful to both the letter and the spirit of the copyright laws.

In determining whether Accolade's copying was a fair use, the *Sega* court engaged in a lengthy analysis of the four factors enumerated in the fair use provision, section 107 of the Copyright Act.<sup>81</sup> The

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<sup>77</sup> See, e.g., Karjala, *Computer Documents*, *supra* note 6, at 993-94, 1015-16; McManis, *supra* note 76, at 55-74; Rice, *Sega and Beyond*, *supra* note 16; Pamela Samuelson, *Fair Use for Computer Programs and Other Copyrightable Works in Digital Form: The Implications of Sony, Galoob, and Sega*, 1 J. INTELL. PROP. L. 49, 86-102 (1993); S. Carran Daughtrey, Note, *Reverse Engineering of Software for Interoperability and Analysis*, 47 VAND. L. REV. 145, 172-81 (1994). Even prior to *Sega*, many copyright scholars had advocated a fair use solution to the decompilation problem. See Donald S. Chisum et al., *LaST Frontier Conference Report on Copyright Protection of Computer Software*, 30 JURIMETRICS J. 15, 24-25 (1989) [hereinafter Chisum et al., *LaST Frontier Conference Report*]; Jessica Litman, *Copyright and Information Policy*, LAW & CONTEMP. PROBS., Spring 1992, at 185, 196-201; J.H. Reichman, *Computer Programs As Applied Scientific Know-How: Implications of Copyright Protection for Commercialized University Research*, 42 VAND. L. REV. 639, 694 n.288, 702 n.324 (1989). In *Sega*, eleven professors of copyright law submitted a brief amicus curiae in support of Accolade. See *Brief Amicus Curiae of Eleven Copyright Law Professors in Sega Enterprises, Ltd. v. Accolade, Inc.*, 33 JURIMETRICS J. 147 (1992).

<sup>78</sup> Miller, *supra* note 16, at 1020. Professor Miller was a signatory to an amicus brief filed by the Computer and Business Equipment Manufacturers Association (ACBEMA®) on behalf of *Sega*.

<sup>79</sup> Teter, *supra* note 6, at 1087.

<sup>80</sup> *Sega Enters. Ltd. v. Accolade, Inc.*, 977 F.2d 1510, 1527 (9th Cir. 1992), as amended, 1993 U.S. App. LEXIS 78 (9th Cir. 1993).

<sup>81</sup> See *id.* at 1522-27. Section 107 of the Copyright Act lists four nonexclusive factors for courts to consider in determining whether a particular use of a copyrighted work is fair:

- (1) the purpose and character of the use, including whether use is of a commercial nature or is for nonprofit educational purposes;
- (2) the nature of the copyrighted work;
- (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and
- (4) the effect of the use upon the potential market for or value of the copyrighted work.

17 U.S.C. § 107.



application of these factors to computer programs raises several novel questions, and brings other unresolved issues concerning the scope of the fair use doctrine into sharp focus. Ultimately, the answers to these questions turn on, and require decisions about, the purpose and role of fair use in the overall scheme of copyright protection. This part analyzes the individual statutory fair use factors as they relate to lock-out, and then considers the implications of the decompilation debate, and the *Sega* court's resolution of it, for an overarching vision of fair use.

#### A. CHARACTERIZING COMPUTER PROGRAMS

Conceptually, the *Sega* court's analysis began and ended with the second statutory factor: the nature of the copyrighted work. The court observed that when computer programs are distributed in object code form, the only means of access to their unprotected functional features, even for trained programmers, necessarily involves preparing human-readable copies or derivative works.<sup>82</sup> Accordingly, core principles of copyright law would seem to require that reverse engineers be allowed to keep records of their progress; otherwise, “the owner of the copyright gains a *de facto* monopoly over the functional aspects of his work—aspects that were expressly denied copyright protection by Congress.”<sup>83</sup>

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<sup>82</sup> *Sega*, 977 F.2d at 1525-26. This unique characteristic of computer programs has been documented by many scholars, including a number who are familiar with the technical aspects of computer programming. See, e.g., Gary R. Ignatin, Comment, *Let the Hackers Hack: Allowing the Reverse Engineering of Copyrighted Computer Programs to Achieve Compatibility*, 140 U. PA. L. REV. 1999,2001 n.6 (1992); Johnson-Laird, *supra* note 12, at 890-95; see also Karjala, *New Protectionism*, *supra* note 6, at 37; Menell, *Tailoring Legal Protection*, *supra* note 8, at 1347 n.75. That humans cannot decipher object code unaided is not seriously disputed. The district court in *Sega* focused on this issue, but missed the point. It concluded that since reverse engineers can decipher object code by hand, without resort to an electronic decompiler, Accolade's time-saving decision to use a decompiler precluded a finding of fair use. See *Sega Enters. Ltd. v. Accolade, Inc.*, 785 F. Supp. 1392,1399 (N.D. Cal.), *aff'd in part and rev'd in part*, 977 F.2d 1510 (9th Cir. 1992), *as amended*, 1993 U.S. App. LEXIS 78 (9th Cir. 1993). The Ninth Circuit recognized that what is relevant for purposes of copyright is not the means of decompilation used, but the fact that decompilation is not possible *at all* without making some fixed record of one's progress. *Sega*, 977 F.2d at 1525-27.

<sup>83</sup> *Sega*, 977 F.2d at 1526; see 17 U.S.C. ' 102(b).

1. “One of These Things Is Not Like the Others”: Computer Programs as Literary Works

Professor Miller's objection to the *Sega* court's analysis of the second statutory factor is that computer programs are “literary works” under the Copyright Act and therefore should be treated no differently from other literary works for fair use purposes.<sup>84</sup> That is, intermediate copying of a computer program's creative content—an inevitable consequence of decompilation because protected and unprotected portions cannot be distinguished until they have been translated into human-readable form—should be prohibited, because such copying would not be allowed for other literary works. The assumption implicit in this argument—that intermediate copying of a traditional literary work's creative content can never be a fair use—is addressed below in the discussion of the first statutory factor.<sup>85</sup> As to the second statutory factor, the objection that computer programs are classified as literary works, while accurate as a statement of positive law,<sup>86</sup> is so broad as to be virtually meaningless as a guide for courts struggling to apply section 107 in the computer software context. To the extent that generalizations about the nature of “literary works” are possible, however, what they reveal is that the statutory classification of computer programs as literary works confuses more often than it clarifies.

First, the classification of computer programs as “literary works” is staggeringly uninformative. As defined by the Copyright Act, “literary works” include all works “expressed in words, numbers, or other verbal or numerical symbols or indicia”<sup>87</sup>—in other words, not only novels and essays, but also textbooks, reference works, directories, greeting cards, and everything in between. The proportion of creative, protectable expression in these works varies enormously.<sup>88</sup> Thus, to state that a computer program is, legislatively speaking, a “literary work” proves nothing about the scope of the protection courts should afford it. The copyright protection for which the work is eligible is a function of the work's relative proportions of creative and noncreative content.

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<sup>84</sup> Miller, *supra* note 16, at 1022.

<sup>85</sup> See *infra* text accompanying notes 147-55.

<sup>86</sup> See 17 U.S.C. § 101.

<sup>87</sup> 17 U.S.C. § 101.

<sup>88</sup> See, e.g., *Feist Publications, Inc. v. Rural Tel. Serv. Co., Inc.*, 499 U.S. 340, 349 (1991) (holding that the copyright in a factual compilation is thin); Karjala, *Computer Documents*, *supra* note 6, at 1005-06; Rice, *Sega and Beyond*, *supra* note 16, at 1169-70.

Assuming for the moment that computer programs are properly viewed as literary works,<sup>89</sup> then to which types of literary work should computer programs be compared? Professor Miller acknowledges that “the scope of protection given to different types of literary works may vary.”<sup>90</sup> Yet he consistently compares computer programs to works of literature such as “Steinbeck's *[The] Grapes of Wrath*, Hemingway's *The Sun Also Rises*, or Miller's *Death of a Salesman*” without once explaining why they should not instead (or also) be compared to the *Physician's Desk Reference* or the *Pacific Bell Yellow Pages*.<sup>91</sup> The parallels between computer programs and literary classics are far from obvious. A computer program is, first and foremost, a series of instructions to the computer to execute a given task.<sup>92</sup> The instructions themselves may be written or arranged with more or less creativity, but that is not their primary significance. In this respect, a successful program is more analogous to a well-designed, easy-to-use directory of information, or to a cookbook, than to a novel or a play. Given this defining characteristic of computer programs, there is no logical basis for Professor Miller's conclusion that the scope of protection afforded computer programs under *Sega* differs from that afforded other literary works not only in scope, but in kind.<sup>93</sup> Traditional literary works exist on a continuum of protection; if computer programs are best characterized as literary works, it certainly would be reasonable to conclude that computer programs constitute a new endpoint on that continuum.

A far more reasonable conclusion, however, is that computer programs do not lie on the literary works continuum at all. Even among highly utilitarian literary works, the barriers to access created by distribution of computer programs in object code form have no analogue.<sup>94</sup> Thus, it is by no means obvious that computer programs can

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<sup>89</sup> In my opinion, they are not. See *infra* text accompanying notes 94-105.

<sup>90</sup> Miller, *supra* note 16, at 1022.

<sup>91</sup> *Id.* at 1020. Thus, Professor Miller argues that a proposal that intermediate copying be considered fair use would not be taken seriously if the copyrighted works were Steinbeck's *Y*, Hemingway's *Y*, or Miller's *Y*. *Id.* But of course, they are not; they are computer programs, and there is a world of difference.

<sup>92</sup> See Karjala, *New Protectionism*, *supra* note 6, at 38; Samuelson, *CONTU Revisited*, *supra* note 16, at 672-82. Indeed, the definition of “computer program” in the Copyright Act recognizes as much. See 17 U.S.C. § 101 (defining “computer program” as “a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result”).

<sup>93</sup> See Miller, *supra* note 16, at 989, 1021.

<sup>94</sup> Professor Miller implies that copying the program in the course of decompilation is no different, and therefore no less infringing, than unauthorized copying of a book in the course of translating it. *Id.* at 1029. Miller's argument ignores the fact that translation from one language to another need not entail the preparation of written, printed, or otherwise recorded copies. To access the ideas or functional principles contained in Vaclav Havel's essays or a cookbook published in Braille, one need only find a person fluent in the language to read the work aloud. No physical copies of either work, or portions of them, need be made. In contrast, to access the ideas contained in the “text” of the 10NES program or MS-DOS 5.0 requires pencil and paper. See *supra* note 82.

or should be compared with literary works rather than with some other category of copyrightable works or viewed as *sui generis* in many critical respects.<sup>95</sup> As Professor Miller's commentary illustrates, treating computer programs as literary works too easily complicates the task of determining the scope of software copyright by importing into the analysis preconceptions of marginal relevance. The *Sega* court, in contrast, treated computer programs simply as "utilitarian works," and so avoided that pitfall.<sup>96</sup> Arguably, one of the lessons of *Sega* is that the classification of computer programs as literary works is inappropriate and breeds confusion.

The rationale for the statutory classification of computer programs as literary works, which originated in the Copyright Act of 1976, is unclear. Apparently, neither Congress nor CONTU<sup>97</sup> deemed it worthy of discussion.<sup>98</sup> It appears that both Congress and CONTU simply concluded that because they are written or typed (as opposed to sculpted, drawn, or rendered in musical notes), computer programs are more similar to literary works than to works in the other categories of copyrightable works listed in section 102(a) of the Act. Both legally and factually, that conclusion is dubious.

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<sup>95</sup> Because comparison and analogy are the essence of legal reasoning, it would be futile to suggest dispensing with them entirely where computer programs are concerned. However, as the *Sega* court recognized, reconciling existing legal categories with new technologies requires great care to avoid the temptation of trying to force 'the proverbial square peg in[ ]tol a round hole.' *Sega Enters. Ltd. v. Accolade, Inc.*, 977 F.2d 1510, 1527 (9th Cir. 1992) (quoting *Computer Assocs. Int'l, Inc. v. Altai, Inc.*, 982 F.2d 693, 712 (2d Cir. 1992)), as amended, 1993 U.S. App. LEXIS 78 (9th Cir. 1993).

<sup>96</sup> Although this Article argues that the statutory classification of computer programs should be changed, the *Sega* court's approach did not do violence to the current language. As explained above at text accompanying notes 91-92, the broadly defined category of literary works includes works that are distinctly utilitarian. See, e.g., *Feist Publications, Inc. v. Rural Tel. Serv. Co., Inc.*, 499 U.S. 340 (1991) (telephone white pages); *Baker v. Selden*, 101 U.S. 99 (1879) (blank accounting forms); *Sega*, 977 F.2d at 1524 (citing *Feist* and *Baker*).

<sup>97</sup> The National Commission on New Technological Uses of Copyrighted Works (ACONTU) was established by Congress in 1974 to study, among other things, the applicability of copyright to computer programs. See Act of Dec. 31, 1974, Pub. L. No. 93-573, 88 Stat. 1873 (codified as amended at 17 U.S.C. § 104 (1988)).

<sup>98</sup> See H.R. REP. NO. 1476, 94th Cong., 2d Sess. 54 (1976), reprinted in 1976 U.S.C.A.N. 5659, 5667; CONTU, FINAL REPORT, *supra* note 4. Significantly, Congress did state that "[t]he term 'literary works' does not connote any criterion of literary merit or qualitative value: it includes catalogs, directories, and similar factual, reference, or instructional works and compilations of data." H.R. REP. NO. 1476 at 54.

As a matter of copyright law, denominating computer programs “writings” tells us nothing about how to categorize them, because constitutionally every work protected by the copyright laws is a “writing.”<sup>99</sup> As a practical matter, a rule that all works expressed in “numerical symbols or indicia” are “literary works” also encompasses audiovisual and musical works created and expressed digitally.<sup>100</sup> In terms of use, computer programs also exhibit similarities to works in several of the other statutory categories. To the extent that computer programs constitute a script for the computer to follow, they may be argued to resemble “dramatic works” that are “performed” by the computer.<sup>101</sup> In other ways, computer programs are analogous to “pictorial, graphic . . . or sculptural works.”<sup>102</sup> in that they constitute a map or set of blueprints for accomplishing a task.<sup>103</sup>

Compassion to other statutory categories is more than an exercise in semantics. Each change in the statutory reference point conjures up a slightly different body of precedent and different variations on the basic approach to identifying what the copyright in the work protects.<sup>104</sup> The difficulty of selecting the statutory category of protected works to which computer programs are most analogous, and of finding a good fit in any category, suggests that computer programs may be most appropriately regarded as *sui generis* forms of creative expression.

That conclusion is not new; the unique nature of computer programs has long been a rallying cry for advocates of a wholly *sui generis* system of intellectual property protection.<sup>105</sup> My intent here is more modest; at minimum, sections 101 and 102(a) of the Copyright Act should be amended to ensure that computer programs are properly viewed as unique—a ninth category of copyrightable works. As the debate over the *Sega* decision illustrates, the epistemological consequences of the current classification of computer programs are not

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<sup>99</sup> U.S. CONST. art. I, ' 8, cl. 8 (authorizing Congress A[t]o promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries).

<sup>100</sup> See 17 U.S.C. ' 101.

<sup>101</sup> 17 U.S.C. ' 102(a)(3).

<sup>102</sup> See 17 U.S.C. ' 101, 102(a)(5).

<sup>103</sup> See Samuelson, *CONTU Revisited*, *supra* note 16, at 727-36.

<sup>104</sup> See Karjala, *Computer Documents*, *supra* note 6, at 986 (discussing “separability” test for pictorial, graphic and sculptural works); Samuelson, *CONTU Revisited*, *supra* note 16, at 727-36 (analyzing computer programs as utilitarian/sculptural works).

<sup>105</sup> See, e.g., Menell, *Tailoring Legal Protection*, *supra* note 8, at 1364-71; Samuelson, *CONTU Revisited*, *supra* note 16, at 762-69; Samuelson, *Chip Law*, *supra* note 16, at 530; Samuelson et al., *Manifest*, *supra* note 19, at 2315-56.

trivial. Part III demonstrates that those consequences become even more significant during evaluation of the alleged copier's final product for substantial similarity to the copyrighted work. By signaling courts to abandon preconceptions about "literary works" and to adopt a more flexible, open-minded approach to computer copyright cases, an amendment acknowledging *sui generis* status would encourage more thoughtful decisionmaking regarding the scope of copyright protection available.

## 2. Defining "Publication" in the Context of Machine-Readable Works

For fair use purposes, the nature of the copied work is determined in part by whether it was published or unpublished when the copying occurred.<sup>106</sup> Traditionally, courts have accorded unpublished works much greater protection and have been less willing to treat copying of such works as fair use.<sup>107</sup> In an effort to turn the characteristics of object code to its advantage, Sega argued that its program should be considered unpublished because they were distributed for public use only in object code form. The Ninth Circuit summarily rejected that argument,<sup>108</sup> but it deserves more than summary treatment. Whether and when computer programs distributed in object code form become published works for purposes of copyright is a question of great significance in assessing the level of protection that the Copyright Act affords them. Once again, the search for answers suggests that a traditional copyright concept developed in the context of artistic and literary works—here, publication—in unhelpful when analyzing computer programs.

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<sup>106</sup> See, e.g., *Harper & Row Publishers, Inc. v Nations Enters.*, 471 U.S. 539, 564 (1985); *Salinger v. Random House, Inc.*, 811 F.2d 90, 950986 (2d Cir.), cert. denied, 484 U.S. 890 (1987). In professor Weinreb's view, publication status should properly be considered a separate, fifth fair use factor. Lloyd L. Weinreb, Comment, *Fair's Fair: A Comment on the Fair Use Doctrine*, 103 HARV. L. REV. 1137, 1156 n. 74 (1990). That view has some merit.

<sup>107</sup> After the Supreme Court's decision in *Harper & Row*, Congress amended section 107 to specify that a work's publication status is relevant, but not necessarily dispositive, in fair use decisions. See 17 U.S.C. § 107 (Supp. 1992). Judge Pierre Leval, in contrast, has argued against the publication factor and in favor of judging all uses of copyrighted material according to one criterion: whether the use of the material is in some way transformative. Pierre N. Leval, *Toward A Fair Use Standard*, 103 HARV. L. REV. 1105, 1111-16 (1990). Judge Leval's approach to fair use is discussed at greater length *infra* at text accompanying notes 217-219.

<sup>108</sup> *Sega Enters. Ltd. v. Accolade, Inc.*, 977 F.2d 1510, 1526 (9th Cir. 1992), as amended, 1993 U.S. App. LEXIS 78 (9th Cir. 1993). The court relied on its recent, equally summary, decision on this point in *Lewis Galoob Toys, Inc. v. Nintendo of Am., Inc.*, 964 F.2d 965, 970 (9th Cir. 1992), *aff'g* 780 F. Supp. 1293 (N.D. Cal. 1991).

The rationale for concluding that Sega's program was a published work was that once a program is distributed for public use it is published for purposes of copyright.<sup>109</sup> At first glance, classification of computer programs distributed for public use in object code form as "published" works is entirely consistent with the treatment of other machine-readable works under the Act. For example, musical works on record, compact disc, or cassette are deemed published when sold, even though the works cannot be played without stereo equipment.<sup>110</sup> However, musical works distributed in machine-readable form and computer programs differ in one significant respect. Playing a machine-readable musical work discloses its substance, while using a computer program need not. Because computer programs are functional rather than artistic works, they may be distributed to and used by the public without disclosing the manner in which they are written or the methods by which they operate. Conversely, computer programs in human-readable form cannot perform the functions they describe; thus, there would be no consumer market for them.

Professor Miller suggests that Congress was aware of the peculiar problem posed by computer programs when it amended the fair use statute in 1992 to state that the fact that a work is unpublished will not automatically preclude a finding of fair use.<sup>111</sup> The bill's sponsor, Senator Simon, noted that the amendment was "not intended to provide new fair use access" through decompilation, nor to "broaden the fair use of unpublished computer programs."<sup>112</sup> These statements are less significant than Professor Miller makes them seem. As is its wont when considering section 107, Congress took a cautious approach to assessing the current state of the law. It stated only that it did not intend to "alter" fair use access to unpublished works; it did not attempt to state the current rule or dictate what it should be.<sup>113</sup> Moreover, nowhere did Senator Simon, or anyone else, suggest that

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<sup>109</sup> *Sega*, 977 F.2d at 1526 n.9 (citing *Lewis Galoob Toys*, 780 F. Supp. at 1293).

<sup>110</sup> See 17 U.S.C. § 101 (defining publication to include the distribution of copies or phonorecords of a work). For this reason alone, Professor Litman concludes that the question whether computer programs distributed in object code form are published is easily resolved. See Litman, *supra* note 77, at 200-01.

<sup>111</sup> Miller, *supra* note 16, at 1017 n.187.

<sup>112</sup> See 137 CONG. REC. S5648 (daily ed. May 9, 1991); 137 CONG. REC. S13,925 (daily ed. Sept. 27, 1991) (statements of Sen. Simon), *quoted in* Miller, *supra* note 16, at 1017 n.187.

<sup>113</sup> See H.R. REP. No. 836, 102d Cong., 2d Sess. 9-10 (1992), *reprinted in* 1992 U.S.C.C.A.N. 2553; *see also* H.R. REP. No. 1476, 94th Cong., 2d Sess. 66, *reprinted in* 1976 U.S.C.C.A.N. 5659, 5680 ([T]here is no disposition to freeze the doctrine in the statute, especially during a period of rapid technological change.... [T]he courts must be free to adapt the doctrine to particular situations on a case-by-case basis.®).

publicly distributed object-coded computer programs are “unpublished.”<sup>114</sup> Thus, the legislative history simply returns us to the initial problem.

A rule that public distribution in any form constitutes publication makes sense given the rationale for heightened protection for unpublished works. The unpublished work doctrine protects the author's right of creative control.<sup>115</sup> Allowing the author to determine when a work is ready for release also protects the public, by assuring sufficient time to polish the work to the author's standards.<sup>116</sup> A commercial (or not-for-profit) distribution of the work signifies a decision that the work has met the author's standards and is ready for release. The greater protection accorded to unpublished works also allows the author to reap the first commercial benefits from distribution of the work (or to elect to forgo those profits for not-for-profit distribution).<sup>117</sup> All of these rationales seem to apply with equal force to computer programs. It might be argued that computer programs are different from most other copyrighted works that are distributed to the public, in that versions released to customers often are subject to continuing upgrades and other revisions, both as the “author” deems necessary and in response to customer complaints and requests. However, the mere fact that the programmer may have an ongoing relationship with the program after its release should not call into question the program's “published” status. Many textbooks, casebooks, and treatises also are updated on an ongoing basis, without thereby losing their unquestioned status as published works. And the rationale for considering such works published applies even so, because the author's initial decision to release the work, and any economic benefit gained thereby, cannot be changed by later events.

Finally, a “public distribution equals publication” rule also is consistent with other aspects of the copyright treatment of computer programs. The bare fact that the copyright afforded a program extends to

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<sup>114</sup> Upon introducing the bill Senator Simon indicated only that it was not intended to provide access to certain unpublished scientific works such as *computer source codes*. 136 CONG. REC. S3550 (daily ed. Mar. 29, 1990) (statement of Sen. Simon) (emphasis added).

<sup>115</sup> *Harper & Row Publishers, Inc. v. Nation Enters.*, 471 U.S. 539, 551-52, 555 (1985); William W. Fisher 111, *Reconstructing the Fair Use Doctrine*, 101 HARV. L. REV. 1659, 1675 (1988).

<sup>116</sup> Fisher, *supra* note 115, at 1674-75.

<sup>117</sup> *Harper & Row*, 471 U.S. at 555.



the object code mandates that public distribution of a program in object code form be considered a publication of the program.<sup>118</sup> Any other rule would, in effect, confer heightened protection on object code—an incorrect result, given that copyright protection only extends to the zeros and ones of object code because they are derived from the human expression contained in the original source code.<sup>119</sup> The Copyright Act should not be used to bootstrap de facto trade secret protection for publicly distributed works.

Still unaddressed by the foregoing discussion, however, is what “public distribution” means. Both *Sega* and the case on which it relied, *Lewis Galoob Toys, Inc. v. Nintendo of America, Inc.*,<sup>120</sup> involved programs distributed to retail customers.<sup>121</sup> As a result, neither court considered the variety of other ways in which computer programs are distributed and the application of section 107 to those programs.<sup>122</sup> Whether the limited decompilation privilege established in *Sega* applies to programs not distributed directly to the general public is a more difficult question. It is conceivable, for example, that a program with limited distribution to a small number of licensees, subject to contractual restrictions on disclosure, could be considered unpublished. Referring back to the purposes of the unpublished work doctrine, however, the reasons that programs available for retail purchase should be considered published works apply with equal force to programs distributed on a more limited basis. By definition, any distribution to customers or distributors, however small, still reflects the author's choice and the author's decision that the program is suitable for release. Extending the *Lewis Galoob Toys* ruling to any distribution of a copyrighted computer program thus would preserve both the author's right of control and the public's interest. By the same token, that reasoning would not apply to releases known as “beta test copies,” which are distributed on a trial basis with the understanding that they are unfinished, prerelease products.<sup>123</sup>

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<sup>118</sup> See *Apple Computer, Inc. v. Formula Int'l Inc.*, 725 F.2d 521, 524-25 (9th Cir. 1984); *Apple Computer, Inc. v. Franklin Computer Corp.*, 714 F.2d 1240, 1246-48 (3d Cir. 1983), *cert. dismissed*, 464 U.S. 1033 (1984).

<sup>119</sup> See CONTU, FINAL REPORT, *supra* note 4, at 21-22.

<sup>120</sup> 964 F.2d 965 (9th Cir. 1992).

<sup>121</sup> Distributors of such programs have attempted to characterize these transactions as licenses rather than outright sales, by imposing so-called shrink-wrap licenses.® The prevailing view has been that such licenses are unenforceable, but that may be changing. See Mark A. Lemley, *Intellectual Property and Shrinkwrap Licenses*, 68 S. CAL. L. REV. 1239 (1995).

<sup>122</sup> In this respect, the *Sega* decision is much narrower than its critics acknowledge.

<sup>123</sup> Professor Rice concurs in this conclusion. Rice, *Sega and Beyond*, *supra* note 16, at 1200.

As a practical matter, however, limited distribution programs typically are licensed rather than sold,<sup>124</sup> and the price of licensing a proprietary program usually includes an agreement not to reverse engineer the program. A question that courts and litigants eventually must confront is whether a contractual restriction on reverse engineering is valid. Contracts that alter the existing balance of common law property rights are commonplace, and license agreements for proprietary computer programs that alter the balance of rights established by the Copyright Act follow in that tradition. Copyright's debt to common law property rights and the theories of ownership in which they are rooted is significant.<sup>125</sup> However, modern-day copyright is substantially a creature of public policy. Arguably, to the extent that private contracts frustrate that policy—for example, by divesting licensees of a right of access to unprotectable information—they are unenforceable.<sup>126</sup> The courts have yet to resolve this question. Their answer will determine whether the reverse engineering privilege established in *Sega* applies to all computer programs, or only to some.

#### B. COMMERCIAL ACTORS AND ENABLING USES: REFINING THE “COMMERCIAL PURPOSE” TEST

The first statutory fair use factor is the purpose and character of the use, “including whether such use is of a commercial nature or is for nonprofit educational purposes.”<sup>127</sup> Accolade is a commercial actor, and its ultimate purpose in copying *Sega*'s code was unquestionably commercial. For the district court in *Sega*, the fair use analysis began and ended there.<sup>128</sup> The Ninth Circuit rejected the district court's bright-line approach to the purpose and character test in favor

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<sup>124</sup> See, e.g., *MAI Sys. Corp. v. Peak Computer, Inc.*, 991 F.2d 511 (9th Cir. 1993) (involving licensing of proprietary operating system software).

<sup>125</sup> See Wendy J. Gordon, *An Inquiry Into the Merits of Copyright: The Challenges of Consistency, Consent, and Encouragement Theory*, 41 STAN. L. REV. 1343, 1354-77, 1446-68 (1989) [hereinafter Gordon, *The Merits of Copyright*].

<sup>126</sup> See, e.g., Lemley, *supra* note 121, at 1279-83; McManis, *supra* note 76, at 88-99; David A. Rice, *Public Goods, Private Contract and Public Policy: Federal Preemption of Software License Prohibitions Against Reverse Engineering*, 53 U. PITT. L. REV. 543 (1992); Rice, *Sega and Beyond*, *supra* note 16, at 1195-1201; Pamela Samuelson, *Comparing U.S. and E.C. Copyright Protection for Computer Programs: Are They More Different Than They Seem?*, 13 J.L. & COMMERCE 279, 288 (1994).

<sup>127</sup> 17 U.S.C. § 107(l).

<sup>128</sup> *Sega Enters. Ltd. v. Accolade, Inc.*, 785 F. Supp. 1392, 1398 (N.D. Cal.), *affid in part and rev'd in part*, 977 F.2d 1510 (9th Cir. 1992), as amended, 1993 U.S. App. LEXIS 78 (9th Cir. 1993).

of a detailed, fact-specific analysis.<sup>129</sup> Ultimately, the court concluded that this statutory factor weighed in Accolade's favor, because Accolade had copied Sega's microcode solely in order to study its unprotected elements.<sup>130</sup>

The Ninth Circuit's more circumspect approach to the purpose and character inquiry has since been squarely vindicated. In *Campbell v. Acuff-Rose Music, Inc.*,<sup>131</sup> its first fair use opinion in nine years, the Supreme Court warned against "elevating commerciality to hard presumptive significance," and cited *Sega* with approval.<sup>132</sup> The Court's substantive analysis of the purpose and character test also tends to support the Ninth Circuit's conclusion that Accolade's purpose in decompiling Sega's copyrighted code was "legitimate [and] essentially non-exploitative."<sup>133</sup> Together, *Acuff-Rose* and *Sega* suggest a conception of the first statutory fair use factor that is less rigid than the simplistic commercial/noncommercial distinction and far better suited to identifying permissible uses of copyrighted material within the predominantly commercial field of computer programming.

The district court in *Sega* based its approach to the purpose and character inquiry on the Supreme Court's opinions in *Sony Corp. v. Universal City Studios, Inc.*<sup>134</sup> and *Harper & Row Publishers, Inc. v. Nation Enterprises*.<sup>135</sup> In *Sony*, the first of the two decisions, the Court remarked that "every commercial use of copyrighted material is presumptively an unfair exploitation of the monopoly privilege that belongs to the owner of the copyright."<sup>136</sup> This statement is noteworthy for two reasons. First, because *Sony* did not involve a commercial use of copyrighted material, the Court's remark was dictum. Second, the Court cited no authority whatsoever for the sweeping proposition that every commercial use is presumptively unfair. Indeed, section

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<sup>129</sup> See *Sega*, 977 F.2d at 1522 ("[The district court's] analysis is far too simple and ignores a number of important considerations. We must consider other aspects of 'the purpose and character of the use' as well.").

<sup>130</sup> *Id.* at 1522-23.

<sup>131</sup> 114 S. Ct. 1164 (1994).

<sup>132</sup> *Id.* at 1174 (citing, *inter alia*, *Sega*, 977 F.2d at 1522).

<sup>133</sup> *Sega*, 977 F.2d at 1523.

<sup>134</sup> 464 U.S. 417 (1984).

<sup>135</sup> 471 U.S. 539 (1985).

<sup>136</sup> 464 U.S. at 451.

107 itself is to the contrary; several of the activities listed in its preamble as examples of fair use—news reporting, comment, and criticism—are generally viewed as commercial endeavors.<sup>137</sup> The following year, in *Harper & Row*, which did involve a commercial use of copyrighted material, the Court invoked the *Sony* dictum to support its finding that the challenged use was unfair.<sup>138</sup> Invented out of whole cloth in *Sony* and then cited and reinforced in *Harper & Row*, the Court's sweeping generalization about an entire class of uses became a lodestar of virtually every fair use decision handed down by the lower courts over the next decade, *Sega* included.<sup>139</sup>

Copyright scholars were nearly unanimous in criticizing the commercial/noncommercial distinction as both simplistic and inherently ambiguous.<sup>140</sup> *Acuff-Rose* signals the Court's response to a decade's worth of criticism: a full-blown retreat. Writing for the Court, Justice Souter went to great lengths to characterize his analysis of the first fair use factor as entirely consistent with *Sony* and *Harper & Row*.<sup>141</sup> However, the *Acuff-Rose* opinion owes far more to the dissents in those cases and to the scholarly criticism that followed them. In noting the commercial nature of news reporting, criticism, and other fair

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<sup>137</sup> 17 U.S.C. § 107; *Harper & Row*, 471 U.S. at 592 (Brennan, J., dissenting) (“Many uses § 107 lists as paradigmatic examples of fair use, including criticism, comment, and news reporting, are generally conducted for profit in this country, a fact of which Congress was obviously aware when it enacted § 107.” (emphasis omitted)).

<sup>138</sup> 471 U.S. at 562. The Court further observed, delphically, that “[t]he crux of the profit/nonprofit distinction is not whether the sole motive of the use is monetary gain but whether the user stands to profit from exploitation of the copyrighted material without paying the customary price.” *Id.* Self-evidently, of course, “the customary price” (whatever it may be) will not be paid if a use is deemed fair; nonpayment is a consequence of fair use, not its determinant. Cf. Fisher, *supra* note 115, at 1674 n.66 (observing that “the existence of a customary price cannot determine whether the use violates the Act”). *But see* American Geophysical Union v. Texaco, Inc., 37 F.3d 881 (2d Cir. 1994) (“[I]t is not unsound to conclude that the right to seek payment for a particular use tends to become legally cognizable under the fourth fair use factor when the means for paying for such a use is made easier.”) *Id.* at 898. In any event, the existence of a “customary price” has more to do with the fourth fair use factor, the effect on the market for the copyrighted work, than with the purpose and character of the use made of the work.

<sup>139</sup> Some courts unquestioningly invoked the “presumption” of unfairness. *See, e.g.*, *United Tel. Co. of Missouri v. Johnson Publishing Co., Inc.*, 855 F.2d 604, 609 (8th Cir. 1988); *Telerate Sys., Inc. v. Caro*, 689 F. Supp. 221, 229 (S.D.N.Y. 1988); *Original Appalachian Artworks, Inc. v. Topps Chewing Gum, Inc.*, 642 F. Supp. 1031, 1034-35 (N.D. Ga. 1986). Others devised elaborate rationales to “rebut” it. *See, e.g.*, *Hustler Magazine, Inc. v. Moral Majority, Inc.*, 796 F.2d 1148, 1152 (9th Cir. 1986).

<sup>140</sup> *See, e.g.*, Fisher, *supra* note 115, at 1673-74; Leval, *supra* note 107, at 1111-16; William F. Patry & Shira Perlmutter, *Fair Use Misconstrued: Profit, Presumptions, and Parody*, 11 CARDOZO ARTS & ENT. L.J. 667, 676-87 (1993). Among other things, these commentators observe that “commercial” may be defined in several different ways.

<sup>141</sup> *Campbell v. Acuff-Rose Music, Inc.*, 114 S. Ct. 1164, 1174 (1994). Justice Souter noted that “*Sony* itself emphasized the need for a ‘sensitive balancing of interests.’” *Id.*

uses enumerated in section 107, Justice Souter relied on Justice Brennan's dissent in *Harper & Row*.<sup>142</sup> Following Justice Brennan's lead, he expressly acknowledged that whether a use is, broadly speaking, "commercial" in nature is not the sole determinant of its purpose and character. The new standard the Court set forth for evaluating purpose and character derives from the writings of Judge Pierre Leval, one of the fair use doctrine's most thoughtful critics. The Court observed that the statutory distinction between "commercial" and "noncommercial" uses is, to a considerable degree, intended as shorthand for uses that do or do not promote the purposes of copyright. Borrowing Judge Leval's terminology, it reasoned that "the more transformative the new work, the less will be the significance of other factors, like commercialism, that may weigh against a finding of fair use."<sup>143</sup>

*Acuff-Rose's* treatment of the first statutory factor signals a sea change in the jurisprudence of fair use. However, the copying in *Sega* raises issues that *Acuff-Rose* did not address. First, there is a far more complex relationship between commercial activity and innovation in the realm of creative expression than most courts have yet acknowledged. For some types of copyrightable works, including computer programs, creativity and commercial endeavor are inextricably intertwined. Developing computer programs is expensive. Research and development efforts may require significant investments of equipment, personnel, and time. Those costs can only increase when product development must be expedited to beat a close competitor to the market. As a result, many of the most creative computer programming innovations come from the corporate sector.<sup>144</sup> In recent years, research consortia, "technology transfer" programs, and other joint ventures sponsored by corporate investors have become the preferred

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<sup>142</sup> *Id.*

<sup>143</sup> *Id.* at 1171 (citing Leval, *supra* note 107, at 1111). This is true to the intent of copyright protection, but does not go far enough. See *infra* text accompanying notes 156-58.

<sup>144</sup> See, e.g., Tom Foremski, *Eye on the Future*, S.F. EXAMINER, Mar. 13, 1994, at C5 (discussing the Xerox Palo Alto Research Center's development of graphical user interface technology). As federal and state research budgets decline, that trend may be expected to continue. As one industry commentator recently noted: "Innovative new products don't usually come out of government research projects. Just look at the most successful companies in the PC business. If we had waited for a government-funded think tank to come up with the idea for the first personal computer, we would still be waiting." Ed Foster, *Clinton High-Tech Plan Walks Dangerous Protectionist Line*, INFO WORLD, Mar. 8, 1993, at 41.

methods of innovation.<sup>145</sup> In this environment, the commercial purpose and character test is more than inapt. Applied without an understanding of the unique constraints inherent in a form of creative expression that requires a research and development budget, the test threatens to remove the protection of fair use from an entire class of copyrightable works, and so undermine incentives for further innovation. In short, the first statutory factor cannot be applied to all types of copyrightable works in the same way. In *Sega*, the Ninth Circuit implicitly acknowledged this.<sup>146</sup> With respect to the first statutory fair use factor, the first lesson of *Sega* is that a fair use analysis must take into account the mechanisms by which new works of a particular type are ordinarily created.

Second, the “particular use” challenged by *Sega* was an intermediate, not an ultimate, one—copying as an essential but preliminary step to developing a competing but hopefully noninfringing product.<sup>147</sup> While *Accolade's* ultimate purpose was unquestionably commercial, its intermediate purpose was to gain knowledge and understanding of certain functional principles.<sup>148</sup> The case thus required the court to answer a novel question: To which of *Accolade's* purposes does the first statutory factor refer—or, can the intermediate step of copying solely to gain understanding be viewed as a fair use? Doctrinally speaking, it is in this respect that *Sega* was a case of first impression. While other cases had considered whether intermediate copying is an infringement, no previous case had considered the fair use defense in the context of intermediate copying.<sup>149</sup> The Ninth Circuit concluded, largely without discussion, that *Accolade's* immediate purpose was dispositive, rather than its ultimate, unquestionably commercial one.<sup>150</sup> Professor Miller, in contrast, focuses entirely on *Accolade's* long-term commercial goal of competing with *Sega* in the market for Genesis-compatible games. He argues that the copier's

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<sup>145</sup> See, e.g., Hugh Aldersey-Williams, *Inventors With Time To Think CA Look at the Potential of Independent Projects*, FIN. TIMES, July 21, 1994, at 18; Foremski, *supra* note 144; John Markoff, *Will Video Game Machines Turn Into PC Killers?*, N.Y. TIMES, Jan. 8, 1995, ' 3, at 7.

<sup>146</sup> Similarly, the Second Circuit's recent decision in *American Geophysical Union v. Texaco, Inc.*, 37 F.3d 881 (2d Cir. 1994), acknowledges that the user's status as a for-profit company will not necessarily dispose of the question of whether the particular use is commercial. *Id.* at 889.

<sup>147</sup> *Sega Enters. Ltd v. Accolade, Inc.*, 977 F.2d 1510, 1522 (9th Cir. 1992), *as amended*, 1993 U.S. App. LEXIS 78 (9th Cir. 1993).

<sup>148</sup> *Id.*

<sup>149</sup> See *Walker v. University Books, Inc.*, 602 F.2d 859 (9th Cir. 1979). No fair use defense was raised in *Walker*.

<sup>150</sup> *Sega*, 977 F.2d at 1522-23.

long range commercial goals should determine the outcome, even if the final product is noninfringing.<sup>151</sup> Yet his consideration of Accolade's intermediate purpose is as cursory as the Ninth Circuit's consideration of its ultimate purpose.

The language of section 107 is instructive in this regard. The first statutory fair use factor seems to require only that a court evaluate the purpose and character of the use that is challenged as infringing—here, the intermediate use.<sup>152</sup> The preamble further suggests that, in general, privileged uses will be those that are intermediate in some fundamental sense.<sup>153</sup> To the extent that criticism, comment, news reporting, teaching, scholarship, and research all involve the use of copyrighted materials, they do so as a means to a different end, whether that end is the creation of a new work or simply the attainment of new understanding that may lead to the creation of new works in the future. In each case, the copier does not profit or benefit from distribution of the chosen portions of the copied work, but rather from the original contribution added or from the knowledge gained, which may then be applied to the copier's own creative projects. The copied work serves as raw material for both endeavors.

Self-evidently, not all intermediate uses will be fair ones. Some intermediate uses involve no more than steps toward unauthorized cutting and pasting of another's creative material; in that case, the copied work is both the raw material and, essentially, the final product. Thus, for example, the use of a scanner to scan works into a computer for redistribution would not, standing alone, be a fair use, but simply an unauthorized appropriation. However, as the foregoing discussion illustrates, a rule that privileges only transformative uses is too narrow. Under the transformative use standard as outlined by Judge Leval, to be fair, a use must seek to comment on the copied material in some meaningful way. Yet the inclusion of teaching and research among uses that are presumptively fair establishes that pedagogical uses of copied material can be protected and that no new work incorporating portions of the copied work need be created.<sup>154</sup> Thus, the language of section 107 suggests that in appropriate circumstances, a

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<sup>151</sup> See Miller, *supra* note 16, at 1018-19 & n.193. According to Professor Miller, *Sega* threatens to consume the rule against intermediate copying. *Id.* at 1019 n.193. Properly speaking, there is no rule against intermediate copying, *per se*. There is a rule against copying; in some cases, fair use carves out exceptions to that rule.

<sup>152</sup> 17 U.S.C. ' 107.

<sup>153</sup> *Id.*

<sup>154</sup> 17 U.S.C. ' 107.

use that simply enables understanding of the copied material may also qualify as a fair use.<sup>155</sup>

How does Accolade's use of Sega's copyrighted work fare under the “enabling use” standard I have suggested? Assuming that Accolade conformed to prescribed procedures for reverse engineering (we will later consider ways to ensure that the copier adheres to those procedures), Accolade sought only to understand Sega's work, not to comment on or “transform” it. That motivation cannot be a reason to hold Accolade's use unfair. Logically, whether a fair use has occurred cannot turn solely on whether a new work is created that comments on protected portions of the copied work. It would be odd if a use that does not seek or rely on copyrighted material at all, other than to understand it, were penalized more harshly than uses that do seek and rely on creative material.<sup>156</sup>

Logic aside, the copier's motive is centrally relevant to consideration of the purpose and character of its use. Although it is hornbook law that neither the copier's motive nor the nature of the use is relevant to a determination of whether the copying has *infringed* the owner's exclusive rights under the Copyright Act,<sup>157</sup> fair use requires a different, inherently equitable analysis. Motive alone will not determine whether a transformative or enabling use has occurred, but it is indisputably relevant to any analysis conducted according to an “equitable rule of reason.”<sup>158</sup> Equity may consider whether a copyrighted material was intended to transform, to gain access to knowledge not otherwise available, or merely to exploit.

Returning to Accolade's motive, we must consider whether the motive of gaining access is legitimate in the eyes of the copyright laws. Professor Miller argues that “the law imposes no duty on authors to provide access to the ideas in a copyrighted work.”<sup>159</sup> His views on

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<sup>155</sup> Cf. Weinreb, *supra* note 106, at 1143 (arguing that a nontransformative use that makes copied material available may be fair). Thus, contrary to the conclusion reached in *American Geophysical Union v. Texaco, Inc.*, 37 F.3d 881, 888 n.7 (2d Cir. 1994), copying done to assist with future research would meet that standard.

<sup>156</sup> “Creative,” as used here, is a term of art that refers to original expression protected by copyright under section 102(a) of the Copyright Act. While Sega's system interface might have been “creative” in the sense that a management information system is creative or a mathematical proof elegant, the creativity of systems or procedures is not the sort of creativity that the Copyright Act encompasses. See 17 U.S.C. § 102(b); *infra* part III.B.

<sup>157</sup> See *Walker v. University Books, Inc.*, 602 F.2d 859, 863-64 (9th Cir. 1979); 17 U.S.C. § 106, 501.

<sup>158</sup> See H.R. REP. NO. 1476, 94th Cong., 2d Sess. 65 (1976), *reprinted in* 1976 U.S.C.C.A.N. 5659, 5679.

<sup>159</sup> Miller, *supra* note 16, at 1022.



access are rooted in his belief that “the base objective of copyright is for society to benefit from the *availability* of creative works—that the progress of science and the useful arts be ‘promoted’—whether or not the literal expressions or underlying ideas of those works are directly available to the public.”<sup>160</sup> As a practical matter—and the Copyright Act is nothing if not practical in intention—this view ignores the fact that access to existing works by authors is closely related to the continued availability of new works to the public.<sup>161</sup> Inspiration does not occur in a vacuum. As the Supreme Court has recognized, the freedom to build on the public domain elements of existing works promotes copyright’s overall purpose of promoting innovation.<sup>162</sup> By necessary implication, the Constitution and the Copyright Act mandate a right of access to those elements.<sup>163</sup>

Professor Miller is, of course, correct that the Copyright Act contains no express provision mandating the accessibility of ideas. Before the advent of computer programs, such a provision would have been meaningless.<sup>164</sup> However, whether the law mandates accessibility and whether it allows access are separate questions. Permission to gain access is implicit in the statutory provision that copyright protection will not, under any circumstances, be granted to facts, functional principles, or ideas—so that the flow of new works will stimulate, not preclude, further innovation.<sup>165</sup> Allowing copying to gain access to a program’s functional elements thus does not frustrate the purpose of copyright, but furthers it.

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<sup>160</sup> *Id.* at 1029.

<sup>161</sup> See Karjala, *Computer Documents*, *supra* note 6, at 1007-09.

<sup>162</sup> See, e.g., *Feist Publications, Inc. v. Rural Tel. Serv. Co.*, 499 U.S. 340 (1991).

<sup>163</sup> See Samuelson, *CONTU Revisited*, *supra* note 16, at 706-12; Daughtrey, *supra* note 77, at 177-79. Thus, Professor Rice correctly notes that the *Sega* court’s treatment of this issue does not go far enough, because the court required that the copying be both necessary and for a legitimate purpose. Rice, *Sega and Beyond*, *supra* note 16, at 1183-92. The constitutional requirement of access to public domain principles dictates that this precautionary language be read broadly. Anthony Clapes suggests that, at most, there is a right of access only to the ideas and expression Asought to be imparted, which in the case of computer programs would include only those features visible to the user during operation. Anthony L. Clapes, *Confessions of an Amicus Curiae: Technophobia, Law, and Creativity in the Digital Arts*. 19 U. DAYTON L. REV. 903, 943 (1994) (emphasis omitted). There is nothing in the language of the Copyright Act to support such a distinction, and it is flatly inconsistent with a purpose of promoting the continuing creation of new programs.

<sup>164</sup> See Samuelson, *CONTU Revisited*, *supra* note 16, at 676; *supra* text accompanying notes 106-11 (discussing the unique difficulties posed by machine-readable object code for access to the ideas and principles expressed in copyrighted computer programs).

<sup>165</sup> See 17 U.S.C. § 102(b); Samuelson, *CONTU Revisited*, *supra* note 16, at 670 (arguing that access to the contents of a copyrighted work is of constitutional significance).

Professor Miller's final criticism with respect to the purpose and character of decompilation is a practical one. He argues that under the regime established by *Sega*, courts will be unable to detect and punish thefts of creative material in the competitor's final product, because a competitor could “electronically massage the copy until every trace of that illicit reproduction is obscured.”<sup>166</sup> This observation betrays a telling unfamiliarity with the actual process of computer programming.<sup>167</sup> Even if Professor Miller is right, however, the “massaging” process would not obviate the need for creative effort. Because elements of a computer program's structure, sequence, and organization may be protected by copyright, it is likely that a great deal of effort would be required to remove all traces of creative expression and idiosyncratic style.<sup>168</sup> Moreover, the incentives to “overmassage” the copy, and thereby avoid a judgment of infringement, are considerable.

Arguably, however, a competitor who uses a copyrighted computer program as a template for producing a program with the same functionality is no different from an aspiring suspense novelist who writes with the works of John LeCarre, Robert Ludlum, and Tom Clancy arrayed on the desk, or a romance novelist who consults Danielle Steele and Judith Krantz in the course of developing an “original” plot line. The only difference, once again, is that the programmer must decompile the program to understand what it is doing. The quantum of originality required to bring a work within the ambit of the Copyright Act is very small.<sup>169</sup> A work may be “derivative,” critically speaking, without being a derivative work. In short, even if computer programs are properly classified as “literary works,” there are many more Danielle Steeles among programmers than Ernest Hemingways. More to the point, a pre-existing program, like a pre-existing novel, may be consulted for ideas, systems, procedures, and methods of operation—elements that copyright does not protect.<sup>170</sup> The second programmer who also imitates protected expression might infringe, but to bar programmers from consulting the copyrighted

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<sup>166</sup> Miller, *supra* note 16, at 1026.

<sup>167</sup> Reverse engineering is not a substitute for hard work. See Michael A. Jacobs, *Copyright and Compatibility*, 30 JURIMETRICS J. 91, 102 (1989); Johnson-Laird, *supra* note 12, at 895901; Daughtrey, *supra* note 77, at 151-52.

<sup>168</sup> See *infra* part III.A.

<sup>169</sup> See, e.g., *Alfred Bell & Co. v. Catalda Fine Arts, Inc.*, 191 F.2d 99 (2d Cir. 1951).

<sup>170</sup> See 17 U.S.C. § 102(b); CONTU, FINAL REPORT, *supra* note 4, at 20 (noting that “programmers are free to read copyrighted programs and use the ideas embodied in them in preparing their own works”).

program at all would confer more protection on computer programs than on other copyrighted works.

Assuming, however, that allowing the competitor continued access to the copied work creates too great a risk, there is a simple enough solution: make “clean room” programming a precondition for a finding of fair use. Under a clean room protocol, the task of decompiling the copyrighted program and that of developing a new program are carried out by two different teams of programmers. The second team, charged with program development, is provided with the functional specifications extracted from the decompiled program by the first team, but no more.<sup>171</sup> Accolade used clean room procedures, and that fact weighed heavily in its favor.<sup>172</sup> Courts assessing decompilation could easily require that clean room procedures be followed and documented; the burden would then shift to the copyright owner to show, as it must for a finding of infringement with respect to the copier’s final product, that protected material was taken.

### C. HOW MUCH DECOMPILATION IS TOO MUCH?

The Ninth Circuit in *Sega* agreed with the district court that the third statutory factor, the amount and substantiality of the copying, weighed against Accolade.<sup>173</sup> However, the court noted that the factor was “of very little weight” given the limited nature of Accolade’s ultimate use of *Sega*’s code.<sup>174</sup> The court’s dismissive treatment of the third factor is consistent with the case law, which indicates that the amount copied is perhaps the least critical factor of the four.<sup>175</sup> However, as Professor Miller notes, the court’s sudden focus on ultimate use is inconsistent with its approach to the purpose and character inquiry.<sup>176</sup> Where the use alleged to be fair is intermediate, the court should consider the amount and substantiality of the copying done at the intermediate stage.

As the *Sega* court observed, evaluation of the amount and substantiality of Accolade’s intermediate copying did not bode well for

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<sup>171</sup> See *Sega Enters. Ltd. v. Accolade, Inc.*, 977 F.2d 1510,1526 (9th Cir. 1992), as amended, 1993 U.S. App. LEXIS 78 (9th Cir. 1993).

<sup>172</sup> *Id.* at 1522.

<sup>173</sup> *Sega*, 977 F.2d at 1526-27.

<sup>174</sup> *Id.*

<sup>175</sup> See, e.g., *Sony Corp. v. Universal City Studios*, 464 U.S. 417, 449-50 (1984); *Williams & Wilkins Co. v. United States*, 487 F.2d 1345, 1353 (Ct. Cl. 1973), *aff’d without opinion by an equally divided Court*, 420 U.S. 376 (1975).

<sup>176</sup> See Miller, *supra* note 16, at 1018.

Accolade, because it had copied Sega's entire game program during the course of its reverse engineering efforts.<sup>177</sup> However, to hold that Accolade had copied "too much" would overlook the fact that until Accolade had decompiled the entire program it could not know whether it had all the information necessary to produce Genesis-compatible games. The object-coded representation of a computer program produced by a decompiler lists program steps in the order in which they are coded, not the order in which they are executed.<sup>178</sup> For example, a series of interoperability-related instructions performed during the startup of a game program may be dispersed throughout the program microcode, linked by "jump" commands that tell the computer to skip to a different portion of the microcode.<sup>179</sup> The reverse engineer must decompile the entire program to locate those instructions. Other interoperability-related instructions may be performed while the game program is running, and those also may proceed via "jump" commands. Once again, the reverse engineer cannot know whether all steps necessary for interoperability have been located without checking the entire program. Thus, decompiling Sega's entire program was not an indulgence, but a necessity.

Generally speaking, legal scholars have agreed that courts evaluating claimed fair uses should consider the amount and substantiality of the copying in light of the nature of the use and the other statutory factors.<sup>180</sup> The foregoing analysis is consistent with this consensus. The third statutory factor still weighs against the reverse engineer who uses decompilation to discover interoperability requirements, but given the other characteristics of that use, the fact that it entails copying the entire program should not preclude a finding that the use is a fair one.

#### D. DISTINGUISHING BETWEEN MARKET USURPATION AND LAWFUL COMPETITION

The *Sega* district court's analysis of the fourth statutory factor, the effect of the unauthorized copying on the market for the copied work,<sup>181</sup> paralleled its analysis of the first. Judge Caulfield read *Harper & Row* to establish a presumption that heavily favored the

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<sup>177</sup> *Sega*, 977 F.2d at 1526.

<sup>178</sup> See Johnson-Laird, *supra* note 12, at 875-78.

<sup>179</sup> See *id.*

<sup>180</sup> See Leval, *supra* note 107, at 1122-24; Weinreb, *supra* note 106, at 1146.

<sup>181</sup> See 17 U.S.C. ' 107(4).

copyright owner, *Sega*.<sup>182</sup> Again, the Ninth Circuit indicated that fair use requires a more fact-specific approach,<sup>183</sup> and again, the *Acuff-Rose* Court later agreed.<sup>184</sup> This time, however, *Acuff-Rose* does less to dispel the prevailing confusion about how courts should evaluate the market effects flowing from “commercial” uses.

Judge Caulfield relied on the *Harper & Row* Court's statement that “[f]air use, when properly applied, is limited to copying by others which does not materially impair the marketability of the work which is copied.”<sup>185</sup> Many fair use decisions by lower courts subsequent to *Harper & Row* have read “materially” out of this test, finding challenged uses unfair if they would have any effect at all on the market for the copyrighted work.<sup>186</sup> Literally, of course, any use of a copyrighted work has some effect on the market for that work. However, just as section 107 does not require that every use with a commercial purpose be found unfair, neither does it require that any market effect preclude a finding of fair use. It merely instructs courts to consider that effect as one factor among many.<sup>187</sup> In particular, as the Supreme Court recognized in *Acuff-Rose*, the fact that a work is used in a commercial or for-profit setting does not create a presumption of market harm.<sup>188</sup> The question remains, as always, at what point—short of every use, or every “commercial” use, of copyrighted material—to draw the line.

The *Acuff-Rose* Court distinguished between “potentially remediable displacement and unremediable disparagement” in the form of criticism.<sup>189</sup> Defendants' parody of the plaintiffs' copyrighted song fell into the latter category, and was held potentially fair, pending further factfinding. In light of the high intellectual and First Amendment values placed on criticism in all its forms, the Court's conclusion seems unimpeachable. However, *Acuff-Rose* should not be read to

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<sup>182</sup> *Sega Enters. v. Ltd. v. Accolade, Inc.*, 785 F. Supp. 1392, 1398 (N.D. Cal.), *aff'd in part and rev'd in part*, 977 F.2d 1510 (9th Cir. 1992), *as amended*, 1993 U.S. App. LEXIS 78 (9th Cir. 1993).

<sup>183</sup> *Sega*, 977 F.2d at 1523.

<sup>184</sup> *Campbell v. Acuff-Rose Music, Inc.*, 114 S. Ct. 1164, 1177 (1994).

<sup>185</sup> *Sega*, 785 F. Supp. at 1398 (quoting *Harper & Row Publishers, Inc. v. Nation Enters.*, 471 U.S. 539, 566-67 (1985)).

<sup>186</sup> *See, e.g.*, *New Era Publications Int'l v. Henry Holt & Co.*, 973 F.2d 576, 583 (2d Cir. 1989); *Salinger v. Random House, Inc.*, 811 F.2d 90, 99 (2d Cir.), *cert. denied*, 484 U.S. 890 (1987); *Original Appalachian Artworks, Inc. v. Topps Chewing Gum, Inc.*, 642 F. Supp. 1031, 1035 (N.D. Ga. 1986).

<sup>187</sup> *See* 17 U.S.C. § 107.

<sup>188</sup> *Acuff-Rose*, 114 S. Ct. at 1177.

<sup>189</sup> *Id.* at 1178.

indicate that every instance of “potentially remediable displacement” is unfair: First, as a technical matter, that question was not before the Court. Given the Court’s express rejection of the Eleventh Circuit’s attempt to read *Sony* and *Harper & Row* as establishing bright-line rules for separating fair from unfair uses, reading its remarks on displacement to create such a rule would amount to willful misunderstanding.<sup>190</sup> Second and more important, the “transformative use” criterion adopted by the Court implicitly broadens the category of permissible uses. There are many conceivable commercial uses of a work (including research and news reporting) that do not necessarily constitute “disparagement” in the sense of parody or unfavorable criticism. Finally, as a matter of logic, the fact that a particular use is “potentially remediable” cannot alone be grounds for a finding of unfairness; many fair use disputes have arisen precisely because a license to use the work has been denied.<sup>191</sup>

The question left unresolved by *Acuff-Rose*, but directly addressed in *Sega*, is: Under what circumstances is a use that occasions displacement of the copyrighted work fair? The *Sega* court held that analysis of market effect must include consideration of the extent to which a given use simply enables a competitor to enter the market with another work of the same type.<sup>192</sup> For Professor Miller, that conclusion is tantamount to sanctioning piracy.<sup>193</sup> However, as discussed above, the connection between use of the copyrighted work and competition with the copyright owner is indirect.<sup>194</sup> As the *Sega* court recognized, simple common sense dictates that the absolute rule applied in *Harper & Row*, which involved a “scoop” of the heart of a copyrighted work that threatened to supplant the market for the work entirely, cannot logically be extended to works that are “the same” only to the extent that both are compatible with the same computer operating system.<sup>195</sup> To exclude those competitors from the market for that reason would effectively protect not only the copyrighted work’s expression, but the underlying ideas as well. Of course, allowing access

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<sup>190</sup> *Id.* at 1174, 1177.

<sup>191</sup> See generally Wendy J. Gordon, *Fair Use as Market Failure. A Structure and Economic Analysis of the Betamax Case and its Predecessors*, 82 COLUM. L. REV. 1600 (1982) (advocating a market approach to fair use that includes consideration of Antidissemination motives on the part of the copyright owner).

<sup>192</sup> *Sega Enters. Ltd. v. Accolade, Inc.*, 977 F.2d 1510, 1523 (9th Cir. 1992), *as amended*, 1993 U.S. App. LEXIS 78 (9th Cir. 1993).

<sup>193</sup> See Miller, *supra* note 16, at 1026-27.

<sup>194</sup> See *supra* text accompanying notes 147-58 (discussing intermediate uses).

<sup>195</sup> *Sega*, 977 F.2d at 1523.

to interoperability requirements affects the market for the copyrighted work, because it facilitates increased competition in that market. However, the purpose of copyright—to encourage the production and distribution of creative works—is best served by allowing such competition, not by blocking new market entrants.<sup>196</sup>

If a use that enables production of a *competing* product is unfair, then the result of the fair use analysis would have been very different if Accolade had simply decompiled Sega's operating system rather than its games. In that case, disassembly would have resulted in the development of a complementary product rather than a competing one. Accolade's final product, however, would be the same, as would its effect—whatever that may have been—on the market for Sega's games. Moreover, as applied to computer programs, the term “displacement” may be misleading. As a result of the interdependence among applications programs and operating systems, the consequences of a “displacing” use are by no means one-sided. At the very least, it is possible that the increased availability of compatible games translated into increased sales of Sega's console, which in turn would translate into increased demand for *all* Genesis-compatible games. If so, the work created through copying complements and supplements the original. This does not justify holding all such uses fair, but it is reason enough to hold that not all such uses are unfair per se.<sup>197</sup>

For Professor Miller, the *Sega* court's emphasis on access to unprotected functional principles is, “at bottom...an argument for standardization.”<sup>198</sup> This conclusion mistakenly conflates two quite different concepts. As at least one commentator has observed, there

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<sup>196</sup> The decompilation privilege established in *Sega* does not leave the copyright owner without a means of protecting its name and reputation. If, after decompiling a copyrighted computer program, the copier appropriates the copyright owner's good name for purposes of marketing its program, the trademark and unfair competition laws afford a remedy. Conversely, if those laws do not reach the copier's conduct, as in both *Sega* and *Atari*, no misappropriation or unfairness has occurred. See *Sega*, 977 F.2d at 1528-30; *Atari Games Corp. v. Nintendo of Am., Inc.*, Nos. C-88-4805, C-89-0027, slip op. at 9-20 (N.D. Cal. May 5, 1993). If that is the case, the copyright laws should not be stretched to reach conduct that the trademark laws do not.

<sup>197</sup> It is worth repeating that the *Sega* court did not hold that Sega's games had lost their copyright protection; far from it. The court emphasized that Sega might still prevail if it could establish that Accolade's final product infringed. *Sega*, 977 F.2d at 1528. The court held only that as a matter of law Sega's copyright could not be allowed to bar access to the principles on which the unpatented Genesis operates. *Id* at 1527-28.

<sup>198</sup> Miller, *supra* note 16, at 1019.

is a world of difference between removing legal barriers to compatibility and making system incompatibility illegal.<sup>199</sup> While mandated standardization would foreclose, or at least inhibit, the development of new computing methods and operating systems, its polar opposite, the complete absence of interoperability, also would prove detrimental to innovation, and to consumers.<sup>200</sup> Taken to extremes, complete incompatibility would require consumers to buy a different computer system—or, in the future, install a different set-top box—for each application desired. More realistically, selective licensing would make available a limited number of preselected combinations of copyrighted products, depriving consumers of the opportunity to mix and match individual applications according to their individual tastes. Only two parties will have the power to determine what combinations of copyrighted applications will be made available: the manufacturer of the uncopyrighted, and in most cases uncopyrightable, hardware system, and (in the case of the set-top box) the telecommunications provider. Although some manufacturers of computers and operating systems release interoperability-related information, it has become clear that others will not. The video game industry, which is immensely profitable, is simply the most egregious and the earliest example.<sup>201</sup> Clearly, the effective monopoly over functional principles that results from such a policy is not a situation anticipated by Congress or by the members of CONTU. However, given that copyright does not protect functional features, such a monopoly cannot be what Congress would have intended.<sup>202</sup>

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<sup>199</sup> Teter, *supra* note 6, at 1062 & n.13. It is for this reason that proposed federal legislation regarding the so-called Clipper Chip standard for communications encryption required federal contractors to use the new standard. Otherwise, purveyors of communications technologies would have been free to develop their own competing encryption standards that competed with the government's standard.

<sup>200</sup> See *Lotus Dev. Corp. v. Borland Int'l, Inc.*, 49 F.3d 807, 819-21 (1st Cir. 1995) (Boudin, J., concurring); Karjala, *Computer Documents*, *supra* note 6, at 1016-18, Daughtrey, *supra* note 77, at 173-74, 180.

<sup>201</sup> See *supra* notes 23-27 and accompanying text.

<sup>202</sup> In fact, there is evidence that it did not so intend. See H.R. REP. NO. 1476, 94th Cong., 2d Sess. 57 (1976), reprinted in 1976 U.S.C.C.A.N. 5659, 5670:

Some concern has been expressed lest copyright in computer programs should extend protection to the methodology or processes adopted by the programmer, rather than merely to the *expression* of his ideas. Section 102(b) is intended, among other things, to make clear that the expression adopted by the programmer is the copyrightable element in a computer program, and that the actual processes or methods embodied in the program are not within the scope of the copyright law.

See also CONTU, FINAL REPORT, *supra* note 4, at 20 (observing that in the absence of a patent a programmer "is always free to make a machine perform any conceivable process").



## E. TOWARD AN OVERREACHING VISION OF FAIR USE

As the foregoing discussion makes clear, the controversy over *Sega's* application of the fair use doctrine to the reverse engineering of computer interoperability requirements concerns more than just a narrow and highly technical subject. It is also a debate about the purposes of copyright protection and the role of the fair use defense within the larger statutory scheme. The task of crafting copyright doctrines that are responsive to the needs of new technologies, as well as to those of more traditional forms of creative expression, cannot proceed without a clear and shared understanding of what copyright protection seeks to accomplish, and how the particular rule at issue furthers that agenda.

Professor Fisher identifies four objectives of “copyright law in general and the doctrine of fair use in particular” that emerge from *Sony* and *Harper & Row*:

- (a) advancing social utility by increasing the supply of intellectual products and facilitating their distribution; (b) enforcing an author's natural right to a reasonable portion of the fruits of his labor; (c) protecting an author's interest in controlling the way in which his creations are presented to the world; and (d) aligning the law with custom and popular conceptions of decent behavior.<sup>203</sup>

Certainly, to varying degrees all four are objectives of copyright law. With respect to fair use in particular, however, the list is overinclusive.

A finding of fair use effects a contraction of the scope of copyright protection. With each successful assertion of the defense, a use of a copyrighted work that ordinarily would constitute infringement entitling the copyright owner to redress is held, instead, to be lawful.<sup>204</sup> The second and third objectives identified by Professor Fisher, in contrast, are reasons for according copyright protection broader, not narrower, scope. Natural rights justifications for copyright and theories of “moral rights” or “artistic integrity”<sup>205</sup> are not concerned

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<sup>203</sup> Fisher, *supra* note 115, at 1668-69.

<sup>204</sup> Section 107 provides: “Notwithstanding the provisions of section 106, the fair use of a copyrighted work is not an infringement of copyright.” 17 U.S.C. § 107.

Professor Patterson has argued that as originally conceived by Justice Story, the fair use doctrine worked an expansion of copyright protection from the original, very limited grant to publishers to a broader, natural rights-based concept. L. Ray Patterson, *Understanding Fair Use*, LAW & CONTEMP. PROBS., Spring 1992, at 249. However, the modern conception of fair use is as a tool for limiting author's rights when the larger public interest, however defined, requires it. See Leval, *supra* note 107, at 1110; Weinreb, *supra* note 106, at 1141-42.

<sup>205</sup> Although Article 6 *bis* of the Berne Convention for the Protection of Literary and Artistic Works, to which the United States is a signatory, accords authors such rights, United States law generally has not recognized a moral rights basis for copyright. *But see* Note, *An Author's Artistic Reputation Under the Copyright Act of 1976*, 92 HARV. L. REV. 1490 (1979) (arguing that the 1976 act creates a limited right of artistic reputation).

with questions of larger social utility, in particular the increase in social utility that might result from allowing access to and limited fair use of copyrighted works.<sup>206</sup> Accordingly, natural rights concepts can never be affirmative justifications for a finding of fair use. They are important only in the negative sense, as reasons for declining to find fair use in particular cases.<sup>207</sup>

The fourth objective, tailoring the scope of copyright protection to custom or community standards of acceptable conduct, may favor either expanding or contracting the scope of copyright protection, depending on the circumstances. Unlike natural rights and moral rights theories, therefore, custom is a plausible underpinning for the fair use doctrine. A community standards or “fairness” approach also is consistent with the fair use doctrine’s equitable origin and intent.<sup>208</sup> A legislatively sanctioned element of “gut instinct” lies, at the core of every fair use determination.<sup>209</sup> Finally, to a significant degree, a fairness justification for fair use reflects reality. Professor Weinreb, in particular, has shown that custom and community standards go a long way toward explaining what judges actually do in fair use cases.<sup>210</sup>

However, recourse to community standards of fairness can resolve only those cases in which the community standard or “customary practice” invoked truly is a shared one and transcends the particular commercial interests and agendas of those involved in the case. *Sega* is a case in point. In some sectors of the computer programming industry, reverse engineering is an accepted method of innovation and competition. In others, it is viewed as barely one step above industrial espionage.<sup>211</sup> In general, at least in this country, the smaller software companies are of the former persuasion, while the

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<sup>206</sup> Such theories are, of course, concerned with social utility in the indirect sense that more of it may result from strong protection for individuals. *See, e.g.*, Gordon, *The Merits of Copyright*, *supra* note 125, at 1388-93.

<sup>207</sup> *Cf.* Leval, *supra* note 107, at 1111 (observing that the justification for finding fair use must overcome factors favoring the copyright owner®).

<sup>208</sup> *See supra* text accompanying notes 157-58.

<sup>209</sup> *See* H.R. REP. NO. 1476, 94th Cong., 2d Sess. 65-66 (1976), *reprinted in* 1976 U.S.C.C.A.N. 5659, 5679.

<sup>210</sup> Weinreb, *supra* note 106, at 1152-53.

<sup>211</sup> *See, e.g.*, Graerne Browning, *Code Breakers*, 26 NAT'L J. 594 (1994); James Evans, *Intellectual Property Bar Protests Letter on Software*, S.F. DAILY J., Nov. 23, 1993, at 1; T.R. Reid & Peter Behr, *A Software Fight's Blurred Battle Lines*, WASH. POST, Jan. 11, 1994, at D1. Another area in which subcommunities with radically different notions of fairness are fighting for control over the copyright law concerns some musicians' practice of sampling® other recorded works in the process of creating their own compositions. *See, e.g.*, Richard Harrington, *U2s Obscure Distraction*, WASH. POST, Feb. 10, 1993, at B7.

larger, established manufacturers of hardware and operating systems—those with the strongest interest in keeping operating systems proprietary—espouse the latter.<sup>212</sup> Had the Ninth Circuit attempted to resolve *Sega* based solely on the parties' representations as to accepted practice, its task would have been impossible. Moreover, a choice between values advanced by competing business lobbies smacks of mere politics, and lacks legitimacy. If considerations of accepted practice are the primary factor motivating judicial decisionmaking in the area of fair use, the results may be perceived as unprincipled and, to both authors and would-be infringers, readily manipulated. In cases where a real, widely shared consensus exists, that consensus can assist judges in evaluating claims of fair use.<sup>213</sup> In cases where representations regarding accepted practice simply reflect the commercial agendas of the parties, notions of custom and fair play cannot supply enduring and principled rules for determining when the boundaries of copyright protection should contract.

Of the four objectives of the copyright laws identified by Professor Fisher, only the first—increasing the supply of creative works and facilitating their distribution to the public—remains as a potentially viable unifying justification for fair use. In a very real sense, therefore, the debate over fair use reduces to a debate over how this goal is best achieved.<sup>214</sup> As a threshold matter, we must consider whether protecting authors' exclusive rights does not in itself accomplish this goal. Clearly, it does—that is the rationale for according authors copyright protection in the first place.<sup>215</sup> However, the existence of the fair use privilege reflects an implicit consensus that protecting authors' rights to the hilt is not always enough to ensure adequate supply and distribution of creative works. If it were, the scope of copyright

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<sup>212</sup> In *Sega*, the American Committee for Interoperable Systems, an association composed mostly of smaller and mid-sized computer companies, filed an amicus brief on behalf of Accolade, while the Computer and Business Equipment Manufacturers' Association, which includes among its members large computer manufacturers such as IBM and Apple, weighed in on behalf of Sega. See *Sega Enters. Ltd. v. Accolade, Inc.*, 977 F.2d 1510,1513 (9th Cir. 1992), *as amended*, 1993 U.S. App. LEXIS 78 (9th Cir. 1993).

<sup>213</sup> *Sony*, for example, involved a conflict between community notions of fairness and the letter of the law. See Weinreb, *supra* note 106, at 1154-55.

<sup>214</sup> See Leval, *supra* note 107, at 1110; Rice, *Sega and Beyond*, *supra* note 16, at 1178. Indeed, most of the scholarly literature dealing with the fair use doctrine can be viewed as addressing this question.

<sup>215</sup> See U.S. CONST. art. I, ' 8, cl. 8.

protection with the fair use doctrine would be coextensive with the scope of copyright protection without it.

Thus, the fair use doctrine represents a determination that affirmative measures to increase the supply and distribution of creative works may occasionally be necessary. The forms taken by these exceptions to the general rules governing infringement will depend on how “supply” and “distribution” are conceived. As discussed above, commentators differ as to whether the Copyright Act (and the Copyright Clause) were intended only to secure the widespread availability of creative works to the public or also to secure access to the expressive and nonexpressive building blocks used to create them.<sup>216</sup> I have argued that particularly in the case of computer programs, access and public availability are inseparably related. If interoperability-related information is denied to programmers, the flow of new creative works into the market may slow to a trickle. Fair use thus must promote access to creative works as well as their distribution for public consumption.

The “transformative use” criterion developed by Judge Leval and adopted by the *Acuff-Rose* Court serves this dual purpose, for it rewards the use of copyrighted works as raw material in the creative<sup>217</sup> process. However, I have argued for a broader conception of fair use than either Judge Leval or the *Acuff-Rose* Court recognized. It appears that Judge Leval would not privilege an “enabling use” aimed only at understanding a work unless that use could be directly traced to the production of a new creative work.<sup>218</sup> Yet, section 107’s enumeration of teaching and research as presumptively fair uses suggests that exploration alone, without more, may be fair, and that interpretation makes sense.<sup>219</sup> Privileging the acquisition of knowledge, even without a close temporal connection to new expression, creates a society in which authors and the creative process can flourish.<sup>220</sup> New creative output, however remote in time, still must meet the standard for noninfringement. Fear of hypothetical future infringement cannot

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<sup>216</sup> See *supra* text accompanying notes 161-67.

<sup>217</sup> See *supra* text accompanying notes 140-43.

<sup>218</sup> See Leval, *supra* note 107, at 1126-28.

<sup>219</sup> As Professor Weinreb trenchantly observes, there is no compelling need to *restrict* fair use to uses that satisfy the transformative standard. Weinreb, *supra* note 106, at 1141. Similarly, in those cases where a broad consensus as to fairness exists, that should suffice to support a finding of fair use. *Id.* at 1158-61.

<sup>220</sup> Cf. Fisher, *supra* note 115, at 1744-83 (adumbrating a vision of fair use as promoting a societal vision of the good life).

justify limiting access to the information and expression contained in existing works.

Of course, fair use should privilege enabling uses only to the extent that it does not thereby undermine the other objectives of the copyright law so greatly that it produces a net disincentive to create and disseminate new works.<sup>221</sup> Once again, this is a slippery standard. As a matter of logic, whenever the fairness of a particular use is disputed, it is likely that a finding of fair use will undermine at least one of the other goals to some degree. If fair use is to have any scope at all, there must be occasions when the other goals of copyright should give way, but it is important as well to identify those occasions when they should not. Although fair use is inherently irreducible to general rules, certain broad parameters suggest themselves.

First, the use should not offend fundamental, universally shared community standards regarding commercial fair play. In contrast, community standards of fairness should play a lesser role when there is significant, pervasive disagreement—or no widespread public opinion at all—on the commercial fairness of the use.<sup>222</sup>

Second, to be fair, a use should not strike at the core of the author's "natural right to a reasonable portion of the fruits of his labor."<sup>223</sup> Thus, for example, an incorporation of any of an author's creative expression into a final product should not constitute an attempt to appropriate the heart of the original work and supplant market demand for that work. However, as the debate over decompilation and interoperability demonstrates, the same rule should not extend to a use of creative material that enables creation of a new work that simply competes with the original in the market for works of its type. In particular, where copying is necessary to gain access to and understanding of the ideas and principles embodied in a work, copying solely to gain understanding should be deemed fair use.

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<sup>221</sup> See Fisher, *supra* note 115, at 1700; Leval, *supra* note 107, at 1107-08.

<sup>222</sup> There is an important distinction, however, between notions of commercial fair play—definable, loosely, as consensus regarding how much creative expression may fairly be taken—and notions of morality and decency—definable as opinion about the genre or substantive content of new creative works in which that expression "should" be used. As in the case of the parody in *Acuff-Rose*, such uses may have pronounced First Amendment implications and the fair use doctrine has a crucial role to play in shielding them. See *Campbell v. Acuff-Rose Music, Inc.*, 114 S. Ct. 1164, 1172 (1994). Discussion of those implications is beyond the scope of this Article.

<sup>223</sup> Fisher, *supra* note 115, at 1669.

### III. ARE COPYRIGHT AND INTEROPERABILITY COMPATIBLE?

The *Sega* court's decision to sanction decompilation was based on its belief that the program attributes that dictate interoperability requirements are functional features that copyright does not protect and that reverse engineers have a right to copy.<sup>224</sup> It follows that the freedom to decompile established in *Sega* must be accompanied by the right to produce a final product compatible with the desired computer system. The same principles and policies govern both inquiries. At each stage, the court must weigh considerations of functionality, public access, and creatorship. The balances reached, and the incentives that result, should be consistent. It makes little sense to allow intermediate copying where necessary to understand the requirements for interoperability, only to withhold permission to incorporate the copied work's functional features to the extent necessary to make the reverse engineered produce interoperable. Both types of conduct should be allowed, or disallowed, to the same extent and in the same manner.<sup>225</sup>

What, then, to make of *Sega* and *Atari*? Are they consistent—as I have defined that term—with each other and with the language and overall purpose of the copyright laws? They are not. Atari's misconduct aside, the result of the copyright inquiry in *Atari* should have been no different from that in *Sega*. The same principles that dictated that Accolade be allowed to disassemble Sega's programs also dictated that Atari be allowed to design a program that incorporated *all* of the functional characteristics of the 10NES. Instead, the *Atari* court relied too heavily on doctrinal formulations developed for analyzing traditional literary works, and in doing so lost sight of exactly which aspects of computer programs copyright does not protect. This part explores the application of the “idea-expression” distinction and its offshoots, the doctrines of merger and *scènes à faire*, to lock-out routines and other interoperability-related features of computer programs.

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<sup>224</sup> See *Sega Enters. Ltd. v. Accolade, Inc.*, 977 F.2d 1510, 1526 (9th Cir. 1992), *as amended*, 1993 U.S. App. LEXIS 78 (9th Cir. 1993); *supra* text accompanying notes 42-44.

<sup>225</sup> Recognizing the logical connection between the two, Professor Miller concludes that *Sega* could presage the disintegration of copyright protection for computer works. See Miller, *supra* note 16, at 1026-27. In fact, as this part demonstrates, the right to create a compatible program like the decompilation privilege recognized in *Sega*, follows from the literal language of the Copyright Act.

A. COMPUTER PROGRAMS AND THE  
“IDEA-EXPRESSION” DISTINCTION

Whether the Copyright Act permits duplication of the functional features necessary for interoperability has been said to depend on where the boundary between protected expression and unprotected idea is drawn.<sup>226</sup> The location of the boundary between protectable and unprotectable subject matter is, of course, the central project of copyright. Drawn too narrowly, copyright protection will provide insufficient incentives to invest creative effort; drawn too broadly, copyright in existing works may impoverish future creative efforts.<sup>227</sup> Lost in the formulation of the boundary-drawing project as an idea-expression distinction, however, is the fact that copyright also does not protect systems, processes, procedures, or methods of operation—much more relevant and analytically useful concepts in the computer programming context.<sup>228</sup> In part because of the idea-expression formulation, early cases concerning the scope of copyright protection for computer programs swept too much within copyright's scope. Recent decisions have begun to correct that imbalance. However, considerable uncertainty remains among courts as to which program elements copyright protects, and how to approach the tasks of describing and identifying them.

At first, beginning with *Whelan Associates, Inc. v. Jaslow Dental Laboratory, Inc.*,<sup>229</sup> courts defined originality in computer programming largely without reference to external constraints. The “idea” of a program was defined with reference to the program as a whole, such

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<sup>226</sup> See, e.g., *Computer Assocs. Int'l, Inc. v. Altai, Inc.*, 982 F.2d 693, 703-06 (2d Cir. 1992); *Whelan Assocs., Inc. v. Jaslow Dental Lab., Inc.*, 797 F.2d 1222, 1236 (3d Cir. 1986), *cert. denied*, 479 U.S. 1031 (1987). Copyright does not protect ideas, but only original expression. See 17 U.S.C. § 102; *Feist Publications, Inc. v. Rural Tel. Serv. Co.*, 499 U.S. 340, 345-46 (1991).

<sup>227</sup> A too-expansive conception of copyright protection jeopardizes future creative efforts by removing from the public domain material on which those works might otherwise be based. See *Feist*, 499 U.S. at 345-50. The recognition that copyright seeks a middle ground has deep roots in Anglo-American law. More than two hundred years ago, Lord Manfield observed that we must take care to guard against two extremes equally prejudicial; the one, that men of ability may not be deprived of their just merits, and the reward for their ingenuity and labour the other, that the world may not be deprived of improvements, nor the progress of the arts be retarded. *Sayre v. Moore*, 102 Eng. Rep. 138, 140 n.6 (1785).

<sup>228</sup> 17 U.S.C. § 102(b); see *Baker v. Selden*, 101 U.S. 99 (1879); Samuelson, *Critique of Paperback*, *supra* note 16; Pamela Samuelson, *The Nature of Copyright Analysis for Computer Programs*. *Copyright Law Professors' Brief Amicus Curiae in Lotus v. Borland*, 16 HASTINGS COMM. & ENT. L.J. 657 (1994) [hereinafter Samuelson, *Nature of Copyright*].

<sup>229</sup> 797 F.2d 1222 (3d Cir. 1986), *cert. denied*, 479 U.S. 1031 (1987).

as, for example, the idea of a word processing program.<sup>230</sup> Most industry commentators and legal scholars argued that efficiency considerations and interoperability requirements, properly understood, operate as functional constraints, and that program subroutines or processes designed to satisfy those constraints therefore should not be considered part of the programmer's creative expression.<sup>231</sup> However, although subsequent courts criticized or rejected various aspects of *Whelan*, few questioned its basic premise that the creative content of a computer program could be assessed without looking beyond the program itself,<sup>232</sup> and none undertook a major reformulation of the *Whelan* court's approach to evaluating the "substantial similarity" of nonliteral program elements.<sup>233</sup>

Not until May 1992, less than two months before oral argument in *Sega*, did a federal appellate court systematically attempt to dismantle and replace the *Whelan* paradigm. In *Computer Associates International, Inc. v. Altai, Inc.*,<sup>234</sup> the Second Circuit held that program features dictated by efficiency or interoperability constraints must be

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<sup>230</sup> *Id.* at 1236 (A[T]he purpose or function of a utilitarian work would be the work's idea, and everything that is not necessary to that purpose or function would be part of the expression of the idea. (emphasis omitted)). *But see* *Plains Cotton Coop. Assn. of Lubbock v. Goodpasture Computer Serv., Inc.*, 807 F.2d 1256, 1262 (5th Cir.) (holding that program elements dictated by external constraints imposed by market factors may constitute 'ideas' in a computer context), *cert. denied*, 484 U.S. 821 (1987). Although later Fifth Circuit decisions have declined to read *Plains Cotton* broadly enough to deny copyright protection to all nonliteral aspects of computer programs, they have reaffirmed its rejection of *Whelan* as to program elements dictated by external constraints. See *Kepner-Tregoe, Inc. v. Leadership Software, Inc.*, 12 F.3d 527, 536 n.20 (5th Cir.), *cert. denied*, 115 S. Ct. 82 (1994); *Engineering Dynamics, Inc. v. Structural Software, Inc.*, 26 F.3d 1335, 1346-47 (5th Cir. 1994) (remanding, pursuant to *Plains Cotton*, for consideration of whether industry standards dictated program input and output formats), *modified*, 46 F.3d 408 (5th Cir. 1995).

<sup>231</sup> See, e.g., Kajala, *New Protectionism*, *supra* note 6, at 64-66; Menell, *Tailoring Legal Protection*, *supra* note 8, at 1361-63; Chisum et al., *LaST Fronder Conference Report*, *supra* note 77, at 20-21.

<sup>232</sup> In *Plains Cotton*, the Fifth Circuit recognized that conventions followed within an industry can significantly constrain a programmer's creative options, but did not address interoperability-related issues. *Plains Cotton*, 807 F.2d at 1262. The Ninth Circuit and two district courts acknowledged existence and effect of interoperability constraints, but did not address other limitations. See *Data East USA, Inc. v. Epyx, Inc.*, 862 F.2d 204 (9th Cir. 1988); *Manufacturers Technologies, Inc. v. Cams, Inc.*, 706 F. Supp. 984 (D. Conn. 1989); *Q-Co Indus., Inc. v. Hoffman*, 625 F. Supp. 608 (S.D.N.Y. 1985).

<sup>233</sup> The Ninth and Fifth Circuits, which never adopted *Whelan*, also never made any attempts to develop a more compelling paradigm that might persuade other circuits to abandon it. See *infra* text accompanying notes 252-55.

<sup>234</sup> 982 F.2d 693 (2d Cir. 1992).



“filtered” out of the substantial similarity analysis in software infringement cases.<sup>235</sup> In so holding, it became the first appellate court to treat computer programs as fundamentally interdependent and highly utilitarian works, with at least some features driven by functional constraints rather than creative choice.<sup>236</sup> Professor Miller has suggested that *Altai*'s “abstraction-filtration-comparison” test does not constitute a philosophical departure from *Whelan*, but merely fleshes out issues identified in *Whelan*.<sup>237</sup> As discussed below, *Altai*, like *Whelan*, framed the problem as one of demarcating “idea”—as opposed to “system” or “process”—from “expression.”<sup>238</sup> However, one may search *Whelan* in vain for any recognition that a computer program is dependent, to a degree, upon the functional constraints imposed by its operating environment. Under *Whelan*, every program element is presumptively protected by copyright to the extent that it conveys information—which, of course, is what program elements do.<sup>239</sup> As a result of this inclusive approach, comparison of the challenged and copyrighted works sweeps broadly, encompassing program elements that are substantially similar by necessity rather than by design. In

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<sup>235</sup> See *id.* at 707-10. Drawing on Professor Nimmer's treatise, the *Altai* court set forth a three-part abstraction-filtration-comparison test for the analysis of allegedly infringing computer programs. *Id.* at 706-11 (citing, *inter alia*, 3 MELVILLE B. NIMMER & DAVID NIMMER, NIMMER ON COPYRIGHT ' 13.03 (1991)). As the first step, the structure of the program is analyzed at different levels of abstraction. *Altai*, 982 F.2d at 706-07. Once the program's abstraction levels have been discovered, the substantial similarity inquiry moves from the conceptual to the concrete. *Id.* at 707. At each level of abstraction, unprotectable material—that is, material dictated by efficiency, industry demands, or interoperability requirements—is filtered out, leaving an identifiable “core of protectable material.” *Id.* (quoting NIMMER & NIMMER, *supra*, ' 13.03[F][51, at 13-72). Finally, the challenged program and the copyrighted program are compared to determine whether any of this protectable core has been copied. *Altai*, 982 F.2d at 710-11.

<sup>236</sup> Based on surveys of programmers, Anthony Clapes has argued that the functional constraints argument is a myth. See, e.g., Clapes, *supra* note 163, at 926-28 & n.100; Symposium, *Copyright Protection: Has Look and Feel Crashed?*, 11 CARDOZO ARTS & ENT. L.J. 721, 746-50 (1993) (remarks of Mr. Clapes). I suspect that, like the blind men who disagreed about the elephant's shape, the programmers who emphasize creativity and those who emphasize constraint are focusing on different program features. Certainly it is no myth that the chosen operating environment for a program imposes constraints that must be met if the program is to function at all.

<sup>237</sup> See Miller, *supra* note 16, at 1001-02, 1006-10. In the narrowest sense, this is true. The defendant in *Whelan* essentially translated many aspects of the copyrighted program into a different programing language. *Whelan*, 797 F.2d at 1226. Thus, even applying the *Altai* abstraction-filtration-comparison test, the result in *Whelan* might have been the same. But it was not the result in *Whelan* that software experts and legal scholars found untenable so much as the broad rule that a program could have only one idea or unprotected aspect.

<sup>238</sup> See *infra* text accompanying notes 273-77.

<sup>239</sup> *Whelan*, 797 F.2d at 1243.

contrast, under *Altai*, it is presumed that many elements of a copyrighted program will *not* be protected because although they convey information, they do so in a way that is necessary to the operation of the program and cannot be expressed in a substantially different manner; “filtration” of these elements must precede any comparison of the challenged work.<sup>240</sup> The upshot is that the comparisons undertaken by *Altai* and *Whelan* are materially different. The inclusion of inevitably similar unprotected elements cannot help but affect the degree of perceived similarity between the copyrighted program and the allegedly infringing one.<sup>241</sup>

Drawing once again on an analogy to traditional literary works, Professor Miller cautions against reading *Altai* to require only thin copyright protection for nonliteral program elements. He notes that “the mere fact that the expression is efficient should not, without more, bar protection for original authorship in the programming context any more than it does in prose works. An uncritical application of *Altai's* language would penalize the most effective (and in some senses the most artistic) programmers.”<sup>242</sup> As an initial matter, *Altai* did not hold that efficient programs would be unprotected, but only that sequences dictated by considerations of efficiency might be.<sup>243</sup> The two concepts are quite different. For example, a program routine for calling a lookup table during a complex calculation is a sequence dictated by considerations of efficiency that might be unprotected under *Altai*. Lookup tables are the prevailing industry method for performing complex calculations quickly with minimum memory, and there are only so many ways for a program to call one.<sup>244</sup> In contrast, a relational database might be an efficient solution to the problem of storing and retrieving data pertaining to bank loans, but that does not mean that relational database programs are not protected by copyright. There are a number of different ways to write such programs, and several leading programs are available for purchase.<sup>245</sup>

More important, the Copyright Act does not protect efficiency *per se*. It protects “original expression,” a term of art that refers to

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<sup>240</sup> *Altai*, 982 F.2d at 707, 710.

<sup>241</sup> See Clapes, *supra* note 163, at 920-21 (criticizing *Altai* for this reason).

<sup>242</sup> Miller, *supra* note 16, at 1004-05.

<sup>243</sup> *Altai*, 982 F.2d at 708-09.

<sup>244</sup> See generally Stem, *supra* note 16, at 382 (discussing the value of lookup tables for performing complex calculations).

<sup>245</sup> See, e.g., Yael Li-Ron & John Montgomery, *Double-Duty Databases*, PC COMPUTING, Mar. 1995, at 146; Kim S. Nash, *Informix Fights Also-Ran Image*, COMPUTERWORLD, Mar. 20, 1995, at 1.

the particular instantiation given to an idea or theme.<sup>246</sup> That instantiation may be efficient, but efficiency is not synonymous with originality, and the expression as a whole may be efficient and original for different reasons. An effective surgeon may be considered an artist within the medical profession, but the procedures the surgeon has developed and perfected are not protected by copyright. If the procedures are novel enough, they may qualify for patent protection; otherwise, they belong in the public domain—even if the surgeon writes a book about them that details how they are to be performed.<sup>247</sup> The fact that other surgeons may describe the procedures as “creative” or “elegant” is beside the point. In the copyright context, those words are terms of art, and section 102(b) of the Act makes clear that they do not apply to systems, procedures, or routines.<sup>248</sup>

In other cases, a programmer may be efficient, in the sense of getting a task done, without being at all creative, if the most efficient way to perform the various steps needed to complete the task is well-known and standard within the industry. The fact that the programmer accomplishes the task *by writing* should not occasion a quantum leap in the level of protection afforded the work. Here again, the treatment of computer programs as literary works obscures the issue; to the extent that industry-standard efficient routines are comparable to literary works at all, they are comparable to the alphabetical arrangement of entries in a telephone directory or dictionary, a convention so commonplace that it has been held uncopyrightable as a matter of law.<sup>249</sup> If the programmer incorporates some idiosyncratic features into the efficient routine, copyright may protect those features, but not the routine itself. Even if the efficient routine is what gives the program its commercial value, copyright does not permit the programmer to complain when the routine is duplicated.<sup>250</sup>

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<sup>246</sup> See 17 U.S.C. § 102(a) (Copyright protection subsists in original works of authorship fixed in any tangible medium of expression.)

<sup>247</sup> This is exactly the scenario proposed, and rejected, in *Baker v. Selden*, 101 U.S. 99 (1879). The description of a system or procedure may be protected if sufficiently original, but the system or procedure itself may not be.

<sup>248</sup> See 17 U.S.C. § 102(b); Karjala, *Computer Documents*, *supra* note 6, at 997-98 & nn.66, 67. Thus, the argument that programmers view their creations as creative misses the point. See Clapes et al., *supra* note 16, at 1510-11.

<sup>249</sup> *Feist Publications, Inc. v. Rural Tel. Serv. Co.*, 499 U.S. 340, 356-57 (1991) (holding that the telephone white pages lack the constitutionally required minimum originality).

<sup>250</sup> As the Court explained in *Feist*, free riding may not be used to bootstrap an infringement claim. *Id.* at 349-50, 357.

The *Sega* court invoked *Altai* as a prelude to its fair use analysis, and listed as unprotected program elements those “dictated by the function to be performed, by considerations of efficiency, or by external factors such as compatibility requirements and industry demands.”<sup>251</sup> For the *Sega* court, however, approval of the *Altai* approach was almost a foregone conclusion. The Ninth Circuit, which as the “Silicon Valley court” has assumed a central role in the evolution of computer copyright law, had never adopted *Whelan*, although that fact went largely unnoticed in the academic community. Instead, in previous computer program copyright cases, the court had applied the idiosyncratic “intrinsic-extrinsic” test it had developed for evaluating similarity of all types of challenged and copyrighted works.<sup>252</sup> In *Brown Bag Software v. Symantec Corp.*,<sup>253</sup> decided several months before *Altai*, the Ninth Circuit explained that the first, or “extrinsic,” part of the test requires “analytic dissection” of the copyrighted work to identify the core of protectable expression.<sup>254</sup> In *Altai*, the Second Circuit relied on *Brown Bag* to support its “filtration” and “comparison” steps.<sup>255</sup> Thus, although *Sega* was a literal copying case, not a substantial similarity case, and although the *Sega* court did not cite *Brown Bag* to support its approval of *Altai*, *Altai* was wholly consistent with Ninth Circuit law.

Although the Third Circuit (the *Whelan* court) has yet to comment on *Altai*, every other court to consider the issue has endorsed at least some aspects of the *Altai* approach to substantial similarity.<sup>256</sup> In the formal sense, *Whelan* has become a whipping boy, the artifact of an earlier, less technologically sophisticated era. However, that does

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<sup>251</sup> *Sega Enters. Ltd. v. Accolade, Inc.*, 977 F.2d 1510, 1524 (9th Cir. 1992) (citing *Computer Assocs. Int'l, Inc. v. Altai, Inc.*, 982 F.2d 693 (2d Cir. 1992)), *as amended*, 1993 U.S. App. LEXIS 78 (9th Cir. 1993).

<sup>252</sup> *See Brown Bag Software v. Symantec Corp.*, 960 F.2d 1465 (9th Cir.), *cert. denied*, 113 S. Ct. 198 (1992); *Data East USA, Inc. v. Epyx, Inc.*, 862 F.2d 204 (9th Cir. 1988); *Sid & Marty Krofft Television Prod., Inc. v. McDonald's Corp.*, 562 F.2d 1157 (9th Cir. 1977).

<sup>253</sup> 960 F.2d 1465.

<sup>254</sup> *Id.* at 1475-76.

<sup>255</sup> *Altai*, 982 F.2d at 707, 710.

<sup>256</sup> *See Apple Computer, Inc. v. Microsoft Corp.*, 35 F.3d 1435, 1445 (9th Cir. 1994); *Engineering Dynamics, Inc. v. Structural Software, Inc.*, 26 F.3d 1335, 1341-43 (5th Cir. 1994), *modified*, 46 F.3d 408, 409 (5th Cir. 1995); *Keppner-Tregoe, Inc. v. Leadership Software, Inc.*, 12 F.3d 527 (5th Cir.), *cert. denied*, 115 S. Ct. 82 (1994); *Gates Rubber Co. v. Bando Chem. Indus., Ltd.*, 9 F.3d 823 (10th Cir. 1993); *Autoskill, Inc. v. National Educ. Support Sys., Inc.*, 994 F.2d 1476 (10th Cir.), *cert. denied*, 114 S. Ct. 307 (1993); *Sega Enters. Ltd. v. Accolade, Inc.*, 977 F.2d 1510, 1524 (9th Cir. 1992), *as amended*, 1993 U.S. App. LEXIS 78 (9th Cir. 1993); *MiTek Holdings, Inc. v. Arce Eng'g Co., Inc.*, 864 F. Supp. 1568, 1577-79 (S.D. Fla. 1994); *Lotus Dev. Corp. v. Borland Int'l, Inc.*, 799 F. Supp. 203, 211-17 (D. Mass. 1992).

not necessarily reflect a new unanimity on the question of how to determine which features of a computer program constitute protected expression. To the contrary, the application of *Altai's* abstraction-filtration-comparison test has proved extremely malleable. As a recent district court decision (now reversed) from the Tenth Circuit illustrates, it is possible to craft a test that, though derived from *Altai*, nonetheless looks suspiciously like *Whelan*.

In *Gates Rubber Co. v. Bando American, Inc.*,<sup>257</sup> which involved two computer programs for calculating the dimensions and capacities of industrial belts, a Colorado district court attempted to apply a version of the *Altai* test. Relying on expert testimony, the court compared the programs and found them substantially similar in many respects.<sup>258</sup> It then applied what it termed the “abstractions” test to determine whether the similarities were excused, and found that many were not.<sup>259</sup> Like the *Whelan* approach, the court's analysis put the cart before the horse, with predictable result. Because the two programs contained common errors and there was evidence of deliberate copying, the outcome—a judgment of infringement—probably was warranted.<sup>260</sup> However, the court also found infringement in the use of mathematical constants necessary for performing the calculations, and in the engineering modules that performed those calculations using published formulas.<sup>261</sup> It rejected Bando's argument that the formulas and constants could be protected, if at all, only under patent laws, on the ground that “[s]uch a holding would tend to fragment further the rather tenuous continuity found in copyright law concerning computer programs.”<sup>262</sup> But on that point Bando, copier though it was, was absolutely right; copyright does not protect formulae or processes.<sup>263</sup> Fear of discontinuity is insufficient reason to ignore the plain language of the Copyright Act and is ultimately beside the point; discontinuity is inherent in the statutorily mandated task of separating

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<sup>257</sup> 798 F. Supp. 1499 (D. Colo. 1992), *aff'd in part and rev'd in part sub nom.* Gates Rubber Co. v. Bando Chem. Indus., Ltd., 9 F.3d 823 (10th Cir. 1993).

<sup>258</sup> *Id.* at 1514-16.

<sup>259</sup> *Id.* at 1516-18.

<sup>260</sup> Johnson-Laird suggests that common errors should not necessarily be read to denote theft of protectable expression. Johnson-Laird, *supra* note 12, at 900. Certainly, the question whether a reverse engineer has duplicated an error of logical function should be separated from whether the engineer has taken protected expression. The prevalence and significance of common errors may, however, be relevant to that determination.

<sup>261</sup> *Gates Rubber*, 798 F. Supp. at 1518.

<sup>262</sup> *Id.* at 1518 (citing *Whelan Assocs., Inc. v. Jaslow Dental Lab., Inc.*, 797 F.2d 1222, 1229 (3d Cir. 1986), *cert. denied*, 479 U.S. 1031 (1987)).

<sup>263</sup> 17 U.S.C. § 102(b).

protected expression from unprotectable ideas and processes, and in the constitutionally mandated separation of subject matter protected by copyright from subject matter protected by patent. The Tenth Circuit reversed, and directed the lower court to reevaluate the two programs after filtering out unprotected matter.<sup>264</sup> However, the district court's opinion demonstrates that a mandate to conduct "filtration" is useless without an understanding of what elements must be filtered out, and why.

It is still too early to determine with precision *Altai's* impact. It is certain that after *Altai*, however broadly or narrowly applied, the universe of protected programming elements has shrunk, while that of unprotected elements has expanded. In individual cases, however, the basis for distinguishing between creative and functional programming elements is imperfectly defined, as *Gates Rubber* illustrates. Without question, some of this imprecision is inherent in the test itself, however formulated. As Judge Learned Hand concluded over sixty years ago, "[n]obody has ever been able to fix that boundary, and nobody ever can."<sup>265</sup> For software engineers concerned with creating interoperable programs, however, pinpointing the location of that boundary is of critical importance, and a matter of commercial survival. And some of the uncertainty regarding which program elements are subject to filtration is neither necessary nor desirable. We turn now to *Atari* and the interoperability question, and attempt to develop a clearer test.

#### B. PROCESS-EXPRESSION AND INTEROPERABILITY: A FUNCTIONALITY-BASED APPROACH

Technically, the *Atari* court did not hold that Atari was barred from duplicating the features of the 10NES that were necessary for interoperability with the NES console; in light of *Sega*, it could not.<sup>266</sup> The court simply held that Atari had duplicated more than was required to achieve that goal. However, what Atari had duplicated too much of, according to the court, was functionality. The court was unpersuaded by Atari's contention that the functionality in question

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<sup>264</sup> *Gates Rubber Co. v. Bando Chem. Indus., Ltd.*, 9 F.3d 823 (10th Cir. 1993).

<sup>265</sup> *Nichols v. Universal Pictures Corp.*, 45 F.2d 119, 121 (2d Cir. 1930), *cert. denied*, 282 U.S. 902 (1931).

<sup>266</sup> *Atari Games Corp. v. Nintendo of Am., Inc.*, 30 U.S.P.Q.2d (BNA) 1420,1422-23 (N.D. Cal. 1993) (citing *Sega Enters. Ltd. v. Accolade, Inc.*, 977 F.2d 1510, 1524 (9th Cir. 1992), *as amended*, 1993 U.S. App. LEXIS 78 (9th Cir. 1993), and *Computer Assocs. Int'l, Inc. v. Altai, Inc.*, 982 F.2d 693 (2d Cir. 1992)).

would materially affect interoperability with future versions of the NES.<sup>267</sup> Essentially, *Atari* stands for the proposition that “surplus” functionality at the program-to-program interface—functionality not needed for *current* compatibility with the target system—constitutes protectable, and protected, expression. In light of the fact that the Copyright Act does not protect functionality at all, that result seems curious.<sup>268</sup> This section considers how the court came to reach it, and how the idea-expression distinction both illumines and obscures copyright issues relating to interoperability.

Before *Altai*, the only significant appellate decision that dealt with the question of copying to achieve interoperability was *Apple Computer, Inc. v. Franklin Computer Corp.*,<sup>269</sup> decided three years before *Whelan*. Franklin Computer copied Apple's operating system so its own computers would support Apple-compatible applications programs. To justify the copying, Franklin argued, among other things, that the idea of a computer operating system merged with its expression because of the multitude of functional constraints imposed by existing applications programs.<sup>270</sup> Finding Apple's operating system protected and infringed by Franklin's verbatim copying, the court observed: “Franklin may wish to achieve total compatibility with independently developed application programs written for the Apple II, but that is a commercial and competitive objective which does not enter into the somewhat metaphysical issue of whether particular ideas and expressions have merged.”<sup>271</sup> *Altai* represents a major reassessment of that view.<sup>272</sup>

In *Altai*, the Second Circuit clearly and unambiguously held that interoperability-related features must be filtered out of the substantial

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<sup>267</sup> *Id.* at 1423-24. See *supra* text accompanying notes 66-67.

<sup>268</sup> See 17 U.S.C. § 102(b); *Baker v. Selden*, 101 U.S. 99, 101 (1879); Karjala, *Computer Documents*, *supra* note 6, at 976-83.

<sup>269</sup> 714 F.2d 1240 (3d Cir. 1983), *cert. dismissed*, 464 U.S. 1033 (1984).

<sup>270</sup> *Id.* at 1253; see *supra* note 59.

<sup>271</sup> *Franklin Computer*, 714 F.2d at 1253; see also *Lotus Dev. Corp. v. Paperback Software Int'l*, 740 F. Supp. 37, 69 (D. Mass. 1990) (“The desire to achieve ‘compatibility’ cannot override the rights of authors to a limited monopoly in the expression in their intellectual ‘work.’”). However, a district court in the Fourth Circuit held, without citing *Franklin Computer*, that copyright could not be invoked to protect the protocols that governed access to a secure facsimile machine system developed under contract to the Department of Defense. *Secure Serys Technology, Inc. v. Time & Space Processing, Inc.*, 722 F. Supp. 1354, 1354-55 (E.D. Va. 1989).

<sup>272</sup> The *Altai* court did not cite the *Franklin Computer* dictum, *Paperback*, or *Secure Services* in its discussion of compatibility. *Franklin Computer* involved verbatim copying and so may be distinguishable on its facts. See *infra* text accompanying notes 280-81.

similarity analysis.<sup>273</sup> However, the court reached that conclusion in a fashion that should have struck industry observers as nothing short of bizarre. It invoked the doctrine of *scènes à faire*, a rule developed to aid in the substantial similarity analysis of fictional and theatrical works. Under the *scènes à faire* doctrine, “standard” literary elements or devices are not copyrightable if they are viewed as virtually indispensable to a literary treatment of the subject matter.<sup>274</sup> The *Altai* court reasoned that interoperability-related features are indispensable to a program written for a particular computing environment, and so should be treated as *scènes à faire* for purposes of copyright.<sup>275</sup>

The analogy between interoperability-related routines and “stock” literary devices is—rather far-fetched. The two types of expression serve very different conceptions of necessity, and are valued for different reasons. Stock literary devices function as a sort of shorthand for the communication of perceived cultural truths; they are deemed “necessary” because they greatly facilitate audience recognition of a particular cultural or historical milieu.<sup>276</sup> The value of *scènes à faire* lies in the particular expressions of the ideas that they represent. It is entirely conceivable that a work that omitted them might nonetheless be extremely effective. Interoperability-related routines, in contrast, are necessary in the most literal sense possible: Without them, the program will not function. Such routines are valued, in short, not for the expression they contain, but for the result they produce.

Although the *Altai* court set forth a rigorous, systematic method for identifying and excluding interoperability-related program elements, the test it devised does not appear to be rooted in a firm understanding of why those elements are unprotectable in the first place. The reason is deceptively simple. Program elements necessary for interoperability with another computer program are unprotectable not because they represent “ideas,” but because they are systems, procedures, or methods of operation—in short, functional things—and so, under section 102(b) of the Copyright Act, unprotectable just as ideas are unprotectable.<sup>277</sup> The Copyright Act does not prohibit, but rather

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<sup>273</sup> See *Computer Assocs. Int'l, Inc. v. Altai, Inc.*, 982 F.2d 693, 709-10 (2d Cir. 1992).

<sup>274</sup> See, e.g., *Hoehling v. Universal City Studios, Inc.*, 618 F.2d 972, 979 (2d Cir.) (holding that *scènes à faire* are uncopyrightable as a matter of law), *cert. denied*, 449 U.S. 841 (1980).

<sup>275</sup> *Altai*, 982 F.2d at 709-10.

<sup>276</sup> Thus, among the literary elements determined to be *scènes à faire* by the *Hoehling* court were representations of beer halls in Nazi Germany and the use of particular Nazi-era songs to convey, presumably, Germanness. *Hoehling*, 618 F.2d at 979.

<sup>277</sup> See 17 U.S.C. § 102(b); Kajala, *Computer Documents*, *supra* note 6, at 976-83.



expressly allows, the creation of an exact functional analogue of a copyrighted utilitarian work. To take a well-known example, the lamp in *Mazer v. Stein*,<sup>278</sup> the copyright protected only the design of the lamp base. It did not protect the lighting mechanism, or the on-off switch, or the method of using a lampshade to reduce glare.

*Atari* is proof that the “why” of unprotectability matters. The “surplus” functions in the 10NES program did not become expression by virtue of their surplusage. They were designed to perform particular functions at the interface between console and cartridge, whether or not those functions were necessary in the sense of *scènes à faire* to unlock a particular version of the NES. There is no reason that a competing program that merely duplicated those functions—not the programming sequences by which they were expressed—should be deemed to contain *expression* substantially similar to the original. In a sense, Atari's characterization of the issue as a question of present versus future interoperability, with the attendant emphasis on competitive positioning, was a tactical error that confused the court. Atari argued that if copyright permitted only duplication of those functional features that were currently necessary for interoperability, Nintendo would be free to reprogram the NES master chip to look for other functional features of the slave chip, thereby freezing out *all* of Atari's previously released products with each new release of the NES console.<sup>279</sup> However, nothing in the Copyright Act prohibits a copyright owner from altering the expression in its copyrighted work to gain a competitive advantage. Copying to achieve future interoperability is entirely consistent with the language and purpose of the Copyright Act, not because an applications developer has any suprastatutory right to preempt changes in another's proprietary technology, but because all functionality at the interface between computer programs is unprotectable *ex ante*.<sup>280</sup>

Here it is worth returning, briefly, to the *Franklin Computer* problem. *Franklin Computer* involved the opposite situation from *Sega* and *Atari*. Accolade and Atari produced game programs that were compatible with their competitors' operating systems; Franklin

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<sup>278</sup> 347 U.S. 201 (1954) (upholding expressive features of statuettes intended for functional use as lamp bases copyrightable).

<sup>279</sup> *Atari Games Corp. v. Nintendo of Am., Inc.*, 30 U.S.P.Q.2d (BNA) 1420,1423 (N.D. Cal. 1993).

<sup>280</sup> *Atari's scènes à faire* approach lends further weight to the argument that the interoperability dilemma is best resolved by abandoning the Aliterary work® classification altogether, and treating computer programs simply as a sui generis category of utilitarian work containing copyrightable elements.

sought to create an operating system that would support applications originally developed for Apple's operating system. Under *Altai's scènes à faire* approach to interoperability, as applied in *Atari*, Franklin would have no right to do so, because the interoperability-related routines necessary to run a particular application could not be considered virtually indispensable to any functioning operating system. Under a functionality-based approach to interoperability, the outcome is quite different. An operating system that duplicates the systems and procedures necessary to run particular preexisting applications does not infringe. Although that rule still would not excuse Franklin's outright copying of Apple's entire operating system, Franklin could not be barred from designing its own operating system that provided the required functional base for Apple II-compatible programs.<sup>281</sup>

Nor does the doctrine of merger afford sufficient basis for determining the degree to which interoperability-related program features should be excluded from the substantial similarity analysis. Like *scènes à faire*, merger is a tool for identifying instances in which expression otherwise protectable by copyright is not protected. As the name implies, merger excuses copying when the expression taken is the only way, or one of a very few ways, to convey the underlying idea.<sup>282</sup> The merger doctrine does not tell us how to identify those aspects of a copyrighted work that are ineligible for copyright protection in the first instance. The *Atari* court understood the limited role

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<sup>281</sup> The interesting question raised by the *Franklin Computer* situation is whether Franklin would be permitted to duplicate the systems and procedures necessary to support interoperable applications even if verbatim copying were the only way to achieve that result. If so, the necessary implication would be that operating systems contain insufficient original expression to qualify for copyright protection. The *Franklin Computer* court held that operating systems did merit copyright protection, but it did not consider this test; it merely observed that neither CONTU nor Congress had drawn a distinction between operating systems and other types of programs. *Franklin Computer*, 714 F.2d at 1252. Because originality of expression is the sine qua non of copyright protection, that analysis was misdirected. *Feist Publications, Inc. v. Rural Tel. Serv. Co.*, 499 U.S. 340 (1991). However, the *Franklin Computer* opinion suggests that verbatim copying was not the only way to achieve interoperability. Franklin Computer argued that it had explored the possibility of writing its own routines, but had concluded that it would be too much work. Under the copyright laws as currently written, too much work® is not a sufficient excuse.

<sup>282</sup> *Concrete Mach. Co. v. Classic Lawn Ornaments, Inc.*, 843 F.2d 600, 606 (1st Cir. 1988); *Herbert Rosenthal Jewelry Corp. v. Kalpakian*, 446 F.2d 738, 742 (9th Cir. 1971). Both the merger doctrine and the seeds of its confusion with copyrightability originate in the Supreme Court's decision in *Baker v. Selden*, 101 U.S. 99 (1879). As Professors Reichman and Samuelson have demonstrated, although in recent years *Baker* has been read narrowly to address only the merger question, its larger holding addresses, and rejects, the copyrightability of systems and processes. Reichman, *supra* note 77, at 693 n.288; Samuelson, *Critique of Paperback*, *supra* note 16, at 228-34 & nn.81-82.

that merger plays in the analysis of utilitarian works.<sup>283</sup> However, several courts that have subsequently considered the *Altai* test have not. The Fifth and Tenth Circuits, in applying *Altai*'s “filtration” step to computerized diagnostic and training systems, found the categories and subcategories within each system to be protectable expression because there were other ways to design diagnostic and training Systems.<sup>284</sup> Both ignored the fact that the Copyright Act expressly excludes systems from the subject matter it protects, regardless of whether or not other possible systems exist.<sup>285</sup>

Judge Keeton's much publicized “Key Reader” opinion in *Lotus Development Corp. v. Borland International, Inc.*,<sup>286</sup> recently reversed by the First Circuit, illustrates the consequences of confusing the doctrine of idea-expression merger with more fundamental principles that govern copyrightability. The “Key Reader” dispute in *Borland* involved two spreadsheet programs, Lotus 1-2-3 and Borland's Quattro Pro. Key Reader, a module of Quattro Pro, was designed to read and execute users' short programs, or “macros,” written using the Lotus 1-2-3 command hierarchy. To that end, it duplicated the Lotus command structure, including the first letters of the commands.<sup>287</sup> Judge Keeton likened the arrangement of commands chosen by Lotus to the arrangement of facts in a compilation, in which the organizing principle may be protected if sufficiently creative—in other words, if it is one of many possible organizing principles, and so does not merge with the underlying information.<sup>288</sup> Relying on his earlier rulings in the *Borland* dispute<sup>289</sup> and in *Lotus Development Corp. v. Paperback Software International*<sup>290</sup> that the Lotus 1-2-3 menu structure was only one of many possible ways to organize spreadsheet commands, he characterized the organization of the command hierarchy as protected expression.<sup>291</sup>

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<sup>283</sup> *Computer Assocs. Int'l, Inc. v. Altai, Inc.*, 982 F.2d 693, 707-09 (2d Cir. 1992).

<sup>284</sup> *Kepner-Tregoe, Inc. v. Leadership Software, Inc.*, 12 F.3d 527, 535-37 (5th Cir.), *cert. denied*, 115 S. Ct. 82 (1994); *Autoskill Inc. v. National Educ. Support Sys., Inc.*, 994 F.2d 1476, 1494 (10th Cir.), *cert. denied*, 114 S. Ct. 307 (1993).

<sup>285</sup> See Karjala, *Computer Documents*, *supra* note 6, at 988 (The systems and processes described in a copyright-protected work are unprotected no matter how many other possible systems or processes may exist to accomplish the same result and regardless of whether they accomplish that result less, equally, or more efficiently.®).

<sup>286</sup> 831 F. Supp. 223 (D. Mass. 1993), *rev'd*, 49 F.3d 807 (1st Cir. 1995).

<sup>287</sup> *Id.* at 226-27.

<sup>288</sup> *Id.* at 231.

<sup>289</sup> *Lotus Dev. Corp. v. Borland Int'l, Inc.*, 799 F. Supp. 203 (D. Mass. 1992); *Lotus Dev. Corp. v. Borland Int'l, Inc.*, 788 F. Supp. 78 (D. Mass. 1992).

<sup>290</sup> 740 F. Supp. 37 (D. Mass. 1990).

<sup>291</sup> *Borland*, 831 F. Supp. at 231.

In support of this reasoning, Judge Keeton observed only that a novel could be characterized as a system for communicating ideas, and that “the ability to describe a work as a ‘system’ is not decisive of whether the work is a ‘system,’ or instead is protected expression, under copyright law.”<sup>292</sup> Of course, the same is true of the ability to describe a utilitarian work as an exercise in the arrangement of facts and ideas. The fact that metaphor may part company with reality does not excuse inability (or refusal) to tell the difference.<sup>293</sup> Given the division between copyrightable and uncopyrightable subject matter set forth in section 102(b) of the Copyright Act, the fact that it is possible to describe a novel as a system for communicating ideas and the fact that it is possible to describe a computer program as a compilation of information are equally irrelevant.<sup>294</sup>

The First Circuit's opinion recognizes the lesson of *Baker v. Selden*, codified in section 102(b), that a system is not copyrightable subject matter, and that its designer may not invoke the copyright laws to prevent others from practicing it even if other possible systems exist.<sup>295</sup> Only the expression of a system, method, or procedure implicates the copyright laws, and then only to the extent that there are many possible methods of expression, rather than just a few.<sup>296</sup> At that point doctrines such as merger and *scènes à faire* become relevant. Another well-known example, the jeweled bee pin in *Herbert Rosenthal Jewelry Corp. v. Kalpakian*,<sup>297</sup> illustrates this distinction. The issue in *Kalpakian* was whether the defendant's bee pin duplicated protected expression in the plaintiff's pin, or only expression that was necessary to the idea of a bee. In contrast, interoperability concerns infrastructure, not appearance. *Kalpakian* would be analogous to *Atari* or to *Borland* if the jeweler had sued its competitor for using a pin to attach its bee to the wearer's clothing. Had it done so, it

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<sup>292</sup> *Id.*

<sup>293</sup> See also Miller, *supra* note 16, at 1030 n.244 (suggesting that Shakespeare may be characterized as Auseful®).

<sup>294</sup> As in *Paperback*, Judge Keeton did not discuss the history of section 102(b) or cite *Baker v. Selden* and its progeny. *Borland*, 799 F. Supp. at 230-34. This omission is all the more egregious in light of the thorough and well-supported criticism that followed the *Paperback* decision. See Samuelson, *Critique of Paperback*, *supra* note 16, at 232-42.

<sup>295</sup> *Lotus Dev. Corp. v. Borland Int'l, Inc.*, 49 F.3d 807, 816-17 (1st Cir. 1995); see H.R. REP. NO. 1475, 94th Cong., 2d Sess. 57 (1976), reprinted in 1976 U.S.C.C.A.N. 5659, 5670 (explaining that section 102(b) is intended to exclude Aprocesses or methods embodied in the [computer] program® from the scope of copyright).

<sup>296</sup> *Baker v. Selden*, 101 U.S. 99, 104-05 (1879). Thus, Professor Rice's suggestion that section 102(b) simply codifies the merger doctrine appears to be ill-considered. Rice, *Sega and Beyond*, *supra* note 16, at 1139.

<sup>297</sup> 446 F.2d 738 (9th Cir. 1971).

would have been laughed out of court. The result for a party who attempts to bar others from practicing a system that happens to be embodied in a computer program should be no different.

It is worth noting that using the merger doctrine to identify unprotected program elements also risks erring too far on the side of underprotection. If interoperability may be defined as an idea with which particular program routines are deemed to have merged,<sup>298</sup> there is no reason that any other functional attribute of a program may not be similarly characterized. Taken to its logical extreme, that approach could sanction outright copying of all arguably functional program features.<sup>299</sup> *Sega* and *Atari* illustrate the shortcomings of this approach to interoperability.

The security system used by Sega was relatively simple: a twenty to twenty-five byte “header file” containing object-coded representations of the letters S-E-G-A.<sup>300</sup> Strictly speaking, Accolade's decision to incorporate the header file into its final product was not at issue in the appeal because Sega challenged only Accolade's intermediate copying.<sup>301</sup> However, Sega specifically argued that Accolade's duplication of its header file was not a fair use.<sup>302</sup> The Ninth Circuit rejected this suggestion. Among other reasons, the court noted that the sequence was “probably unprotected under the words and short phrases doctrine.”<sup>303</sup> Even from a strict protectionist perspective, the court's conclusion seems unimpeachable. There is only one way to express the “S-E-G-A” sequence in object-coded representations of ASCII characters. Accordingly, even though the letters spelled Sega's name, copying them could not take protected expression from Sega. In copyright parlance, the idea—the name “Sega”—and its expression had merged. In that respect, *Sega* was not a difficult case.

The difficulty with holding that the merger doctrine excuses copying of all interoperability-related features arises in cases like *Atari*

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<sup>298</sup> See, e.g., Teter, *supra* note 6, at 1072-87.

<sup>299</sup> For this reason, although he argues that nonliteral program elements are wholly unprotectable by copyright, Professor Kajala believes that copyright protection for computer software should extend to literal code. See Kajala, *Computer Documents*, *supra* note 6, at 984-86; see also Samuelson, *CONTU Revisited*, *supra* note 16, at 769 (arguing against copyright protection for computer programs but recommending that courts apply misappropriation, unfair competition, or trade secret law to pirates).

<sup>300</sup> *Sega Enters. Ltd. v. Accolade, Inc.*, 977 F.2d 1510, 1515 (9th Cir. 1992), *as amended*, 1993 U.S. App. LEXIS 78 (9th Cir. 1993).

<sup>301</sup> *Id.* at 1526.

<sup>302</sup> *Id.* at 1524 n.7.

<sup>303</sup> *Id.*

when more complex code sequences are at issue. Nintendo's 10NES program was considerably more complex than the Sega header file.<sup>304</sup> Accordingly, in an attempt to avoid infringing the expressive elements of the 10NES, Atari devised new programming sequences that would generate the same results as the 10NES at the required points in time.<sup>305</sup> The result was the "Rabbit" program, which Nintendo acknowledged was not a literal copy.<sup>306</sup> If the object-coded version of the 10NES embodied a complete merger of idea and expression, Atari could simply have copied it, just as Accolade copied Sega's header file. As applied to *Atari*, however, that approach is flawed. As I have explained, "merger" is not simply a term employed to register the presence of unprotectable functional or utilitarian matter. In the copyright context, it has a specific, technical meaning. For idea and expression to merge, there must be only one or a few means of expression available to the author, so that no real choice exists as to the manner of the expression.<sup>307</sup> That is true of many, but not all, functions that an operating system, or any computer program, performs. Atari's Rabbit program demonstrated that there were a number of ways to produce the mathematical results required by the 10NES. A simpler, and sounder, statement of the right to create a compatible program is that the reverse engineer may duplicate systems or procedures necessary for interoperability, because copyright does not protect them.<sup>308</sup>

As applied to the 10NES program, or to any other complex program element, the use of the merger doctrine to justify duplication of interoperability-related program elements simply resurrects the reductionist fallacy of *Whelan*. Under *Whelan*, all was expression, no matter how utilitarian. If the merger doctrine is construed broadly to excuse copying of literal code whenever that code is "functional," all is utilitarian, no matter how expressive. Neither approach does justice

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<sup>304</sup> See *Atari Games Corp. v. Nintendo of Am., Inc.*, 30 U.S.P.Q.2d (BNA) 1420,1422 n.6 (N.D. Cal. 1993); *Atari Games Corp. v. Nintendo of Am., Inc.*, 30 U.S.P.Q.2d (BNA) 1401, 1404 (N.D. Cal. 1993).

<sup>305</sup> *Atari*, 30 U.S.P.Q.2d (BNA) at 1403.

<sup>306</sup> *Id.*

<sup>307</sup> See, e.g., *Herbert Rosenthal Jewelry Corp. v. Kalpakian*, 446 F.2d 738, 742 (9th Cir. 1971). In this respect, the *Franklin Computer* court was right. Merger is a somewhat metaphysical issue. See *Apple Computer, Inc. v. Franklin Computer Corp.*, 714 F.2d 1240,1253 (3d Cir. 1983), *cert. dismissed*, 464 U.S. 1033 (1984).

<sup>308</sup> See Karjala, *Computer Documents*, *supra* note 6, at 976-83; Samuelson, *Critique of Paperback*, *supra* note 16, at 235-42. Using the products of decompilation to generate clean room specifications is the simplest and most satisfactory way to ensure that no original expression is taken during that process. See *supra* text accompanying notes 171-72.

to the unique blend of creativity and functionality present in most programs—even, however attenuated, in object-coded form—and neither recognizes that copyright already allows complete *functional* duplication of interoperability-related “systems,” “procedures,” or “methods of operation.” Under the analysis set forth in *Altai*, the concept of merger has a useful contribution to make to the analysis of functional similarities.<sup>309</sup> However, merger is simply a tool for ensuring that copyright does not inadvertently shield expression that has assumed de facto functionality. As to whether others may practice a system, method, or series of procedures for achieving interoperability embodied in a copyrighted computer program, there should be no doubt; those aspects of the program simply are not part of what the author's copyright protects.

#### IV. ENDGAME: PATENT PROTECTION FOR LOCK-OUT PROGRAMS

Properly understood, copyright does not bar reverse engineering of lock-out routines and the programs they protect, nor does it bar the development of functional analogues to those lock-out routines and other interoperability-related features. As *Atari* demonstrates, however, in the real world that may be irrelevant. Under the doctrine of equivalents, a reverse engineered product that substantially duplicates the functions performed by a patented lock-out program infringes the patent.<sup>310</sup> On its face, *Atari* stands for the proposition that a patented lock-out program provides ironclad protection for the computer system in which it is incorporated. What *Atari* did not consider is whether such a patent can—or should—be valid.<sup>311</sup>

Answering those questions in any meaningful way requires consideration of both the theoretical and institutional underpinnings of

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<sup>309</sup> *Computer Assocs. Int'l, Inc. v. Altai, Inc.*, 982 F.2d 693, 707-09 (2d Cir. 1992).

<sup>310</sup> The doctrine of equivalents prevents competitors from appropriating the substance of a patented invention by designing around the literal language of the patent claims. Under the doctrine, a process or apparatus that performs substantially the same function in substantially the same way to accomplish substantially the same result as that claimed in a patent infringes the patent. *See Graver Tank & Mfg. Co. v. Linde Air Prod. Co.*, 339 U.S. 605 (1950). *See generally* 4 DONALD S. CHISUM, PATENTS ' 18.04 (1994) (discussing the doctrine's rationale and scope). Judge Smith relied on the doctrine of equivalents in granting Nintendo's motion for summary judgment of infringement of certain claims of the patent and denying Atari's summary judgment motion with respect to other claims. *Atari Games Corp. v. Nintendo of Am., Inc.*, 1993 U.S. Dist. LEXIS 8864, \*3-\*6 (N.D. Cal. June 30, 1993); *Atari Games Corp. v. Nintendo of Am., Inc.*, 30 U.S.P.Q.2d (BNA) 1401, 1414 (N.D. Cal. 1993).

<sup>311</sup> The question whether such a patent, if valid, is enforceable against the bona fide reverse engineer is addressed in Part V, *infra*.

the patent system. Doctrinally, the federal courts have failed to develop a workable rule for distinguishing patentable from unpatentable computer programs. Institutionally, the Patent and Trademark Office ("PTO"), which functions as the initial gatekeeper and presumptive expert on questions of patentability, has proved ineffective at discharging its statutory mandate where computer programs are concerned. Together, these systemic failures undermine the presumption of validity that attaches to a duly approved patent, and on which the *Atari* court relied.<sup>312</sup> Judged against a more rigorous standard of patentability by a more demanding gatekeeper, the 10NES might well have been found undeserving of patent protection. Such a standard has been proposed, but so far has received little scholarly or judicial attention. The example of the 10NES patent makes a persuasive case for its adoption, and for changes in the organization and operation of the PTO to respond to the unique challenges posed by computer program-related inventions.

#### A. A PROFUSION OF SLIPPERY SLOPES: THE FAILURE OF EFFORTS TO ISOLATE PATENTABLE SUBJECT MATTER

While copyright scholars and computer programmers were debating whether computer programs constituted copyrightable subject matter and whether CONTU had struck the right balance for protecting them, an equally vigorous debate focused on the question whether computer programs satisfied the requirements for patentable subject matter.<sup>313</sup> Over the past two decades, resistance to software patents by the PTO and the courts has all but vanished. Thousands of software patents have been issued and are routinely upheld.<sup>314</sup> Within the scientific, business, and academic communities, however, the debate over whether computer programs are or should be statutory subject matter continues.<sup>315</sup> Regrettably, there is no indication that this debate informed the parties or the court in *Atari*.

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<sup>312</sup> See 35 U.S.C. § 282 (1998); *Atari*, 30 U.S.P.Q.2d (BNA) at 1409.

<sup>313</sup> See Samuelson, *Benson Revisited*, *supra* note 3, at 1032-99.

<sup>314</sup> See Simson L. Garfinkel, *Patently Absurd*, *WIRED*, July 1994, at 104, 106 (stating that over 12,000 software patents have been issued); John T. Soma & B.F. Smith, *Software Trends: Who's Getting How Many of What? 1978 to 1987*, 71 J. PAT. & TRADEMARK OFF. SOC'Y 415, 419-21, 428-32 (1989).

<sup>315</sup> See, e.g., Chisum, *supra* note 16, at 977-92; Allen Newell, *Response: The Models Are Broken, The Models Are Brokent*, 47 U. PITT. L. REV. 1023 (1986); Oddi, *supra* note 16, at 41022; Samuelson, *Benson Revisited*, *supra* note 3, at 1103-32; Stern, *supra* note 16, at 397-89; Garfinkel, *supra* note 314. This Article argues that debate over whether computer programs are patentable or are no more than expressions of unpatentable mathematical principles is best approached via the requirements of novelty and nonobviousness. See *infra* Part IV.B.



As provided in section 101 of the Patent Act, any new and useful process or machine is potentially patentable subject matter.<sup>316</sup> On its face, this provision encompasses computer programs. However, long-standing judicially developed doctrines prohibit patent protection for mathematical formulae and mental processes, on the ground that “processes” that simply describe existing natural laws (whether as basic as  $2 + 2 = 4$  or as complex as  $e = mc^2$ ) or recite steps performable by the human mind do not fall within the category of “useful arts” and are not statutory subject matter.<sup>317</sup> Some commentators have argued that many computer programs are simply mathematical formulae or mental processes made concrete.<sup>318</sup> Others have argued that the “machine-like” nature of computer programs brings them squarely within the class of potentially patentable inventions.<sup>319</sup> A principled basis for evaluating whether computer program-related claims recite statutory subject matter has proved elusive.

1. *From Freeman-Walter-Abele to Alappat: The Corruption of the “Otherwise Statutory Process or Apparatus” Standard*

Although the Court of Customs and Patent Appeals (“CCPA”) decided a number of cases dealing with computer program-related applications in the late 1960s and early 1970s, the history of the current approach begins with *Gottschalk v. Benson*.<sup>320</sup> In that case, the Supreme Court rejected under section 101 an attempt to patent a

<sup>316</sup> See 35 U.S.C. § 101 (1988).

<sup>317</sup> See, e.g., *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127, 130 (1948) (“[P]atents cannot issue for the discovery of the phenomena of nature. [T]hese are part of the storehouse of knowledge of all men.” (citation omitted)); *In re Shao Wen Yuan*, 188 F.2d 377 (C.C.P.A. 1951); *Halliburton Oil Well Cementing Co. v. Walker*, 146 F.2d 817, 821 (9th Cir. 1944), *rev’d on other grounds*, 329 U.S. 1 (1946); *Don Lee, Inc. v. Walker*, 61 F.2d 58 (9th Cir. 1932). See generally CHISUM, *supra* note 310, § 1.03 (discussing the scope and boundaries of the statutory class of processes). The Patent Clause of the Constitution authorizes the grant of exclusive rights “to promote the progress of Useful Arts.” U.S. CONST. art. I, § 8, cl. 8. The term “useful arts” has been construed to encompass “the realm of technological and industrial improvements.” Samuelson, *Benson Revisited*, *supra* note 3, at 1033 n.24; see also *id.* at 1112; CHISUM, *supra* note 310, § 1.01. As Professor Samuelson details, however, no coherent, satisfactory explanation or model has been offered for the exclusion of mathematical formulae and mental processes. Samuelson, *Benson Revisited*, *supra* note 3, at 1036 n.34.

<sup>318</sup> See, e.g., Newell, *supra* note 315, at 1028-31; Samuelson, *Benson Revisited*, *supra* note 3, at 1063, 1122-24.

<sup>319</sup> See, e.g., Chisum, *supra* note 16, at 980-81; Irah H. Donner & J. Randall Beckers, *Throwing out Baby With the Bath Water: Proposing a New Test for Determining Statutory Subject Matter*, 33 JURIMETRICS J. 247 (1993); cf. Oddi, *supra* note 16, at 416-20 (criticizing analogy of computer programs to mental steps). This view has gained ascendancy in recent cases. See *infra* text accompanying notes 346-58.

<sup>320</sup> 409 U.S. 63 (1972).

computerized process for converting binary-coded numerals to pure binary form, on the grounds that the patent covered no more than a mathematical formula, and if granted would preempt its use.<sup>321</sup> Six years later, in *Parker v. Flook*,<sup>322</sup> the Court rejected for similar reasons an attempt to claim patentability for a computerized method for continuously recalculating the “alarm limit” during a chemical conversion process.<sup>323</sup> Nonetheless, in both cases the Court stopped conspicuously short of precluding patentability for all computer programs.<sup>324</sup> The *Benson* Court indicated that it was concerned less with patentability per se than with the potentially preemptive reach of claims based on “mathematical algorithms.”<sup>325</sup> Ultimately, the Court made good on its implicit guarantee that a sufficiently narrow patent would be upheld. In *Diamond v. Diehr*,<sup>326</sup> it held that a process for continuously monitoring the temperature inside a synthetic rubber mold, using a computer and the well-known Arrhenius equation for measuring cure time as a function of temperature and other variables, was patentable subject matter. Central to the Court's decision was that the inventor did not claim all rights to future uses of the Arrhenius equation, but only to the particular application that he had invented in the context of an “otherwise statutory” industrial process.<sup>327</sup>

In the wake of the Supreme Court's decisions in *Benson*, *Flook*, and *Diehr*, the CCPA and its successor, the Federal Circuit, elaborated a two-part test for assessing the patentability of computer program-related inventions under section 101. Known as the *Freeman-Walter-Abele* test, after the three cases from which it emerged,<sup>328</sup> the test first asked whether the invention directly or indirectly recited a

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<sup>321</sup> *Id.* at 71-72.

<sup>322</sup> 437 U.S. 584 (1978).

<sup>323</sup> *Id.* at 589-91. The Court reasoned that if it ignored the mathematical algorithm the applicant had developed for updating the alarm limit, the claimed invention contained nothing new or inventive. For further discussion of this aspect of the Court's reasoning, see part IV.B, *infra*.

<sup>324</sup> *Flook*, 437 U.S. at 595 (Neither the dearth of precedent, nor this decision, should therefore be interpreted as reflecting a judgment that patent protection of certain novel and useful computer programs will not promote the progress of science and the useful arts, or that such protection is undesirable as a matter of policy.); *Benson*, 409 U.S. at 71 (We do not hold that no process patent could ever qualify if it did not meet the requirements of our prior precedents. It is said that the decision precludes a patent for any program servicing a computer. We do not so hold.)

<sup>325</sup> *Benson*, 409 U.S. at 72-73.

<sup>326</sup> 450 U.S. 175 (1981).

<sup>327</sup> *Id.* at 187.

<sup>328</sup> *In re Freeman*, 573 F.2d 1237, 1245 (C.C.P.A. 1977); *In re Walter*, 618 F.2d 758 (C.C.P.A. 1980); *In re Abele*, 684 F.2d 902 (C.C.P.A. 1982).

mathematical algorithm.<sup>329</sup> If so, it directed the court to inquire whether the claimed invention was no more than the algorithm itself, or whether instead the algorithm was applied as part of an otherwise statutory process or apparatus claim.<sup>330</sup> If the former, patent protection should be denied.<sup>331</sup> In theory, this test appeared to provide a means for limiting patent protection to advances within the “useful arts.”<sup>332</sup> In practice, the Federal Circuit's decisions under *Freeman Walter-Abele* strongly suggested that that court had little interest in recognizing any meaningful limitation on the patentability of computer program-related inventions. A trio of decisions issued in 1994 has confirmed just that. These decisions establish that the “otherwise statutory process or apparatus” requirement may be satisfied by the simple expedient of drafting claims to include a general purpose computer or standard hardware or memory element that would be necessary for any useful application of the algorithm.<sup>333</sup> As explained below, that course of action ignores constitutional limitations that separate patentable inventions from public domain science, and so threatens the continuing vitality of the patent system.<sup>334</sup>

As developed by the PTO and the Federal Circuit prior to 1994, the “otherwise statutory process or apparatus” limitation of *Freeman - Walter-Abele* was not much of a limit at all. Nearly any physical element or step would suffice to render statutory a claim that recited a mathematical or “mental process” algorithm. That held true even if the physical element or step was well-known or an industry standard, and the mathematical algorithm was the heart of the invention. As a result, although the rule was designed to satisfy the *Benson* Court's concerns about algorithm preemption, it was incapable of doing so.

The case that best exemplified this problem was *In re Iwahashi*,<sup>335</sup> which concerned a system for voice pattern recognition. Broadly speaking, the claim in *Iwahashi* recited a novel pattern recognition algorithm and “a read only memory” (“ROM”) device as elements of a claimed apparatus.<sup>336</sup> For the Federal Circuit, the presence of the

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<sup>329</sup> *Abele*, 684 F.2d at 905.

<sup>330</sup> *Id.* at 905-07.

<sup>331</sup> *Id.*

<sup>332</sup> See *supra* text accompanying note 317.

<sup>333</sup> See *infra* text accompanying notes 346-58. Richard Stern has termed this the Anominal hardware® limitation. See Stern, *supra* note 16, at 379-87.

<sup>334</sup> See *infra* text accompanying notes 369-81.

<sup>335</sup> 888 F.2d 1370 (Fed. Cir. 1989).

<sup>336</sup> *Id.* at 1373. A ROM is a memory device, such as a semiconductor chip, in which information is stored to be read by the computer as needed. See Samuelson, *CONTU Revisited*, *supra* note 16, at 673 n.32. The ROM in *Iwahashi* was a Alook-up ROM,® a device for storing a list of data representing mathematical correlates of possible input from the program. See Stern, *supra* note 16, at 379 & n.16. The patent application contained only one claim. *Iwahashi*, 888 F.2d at 1371.

ROM was sufficient to qualify the claimed invention as a statutory “machine” or “manufacture.”<sup>337</sup> As has been elegantly demonstrated, however, the ROM limitation is meaningless because a ROM is a basic component found in all general purpose computers and is necessary whenever complex calculations involving lookup tables, such as the calculation required by the *Iwahashi* algorithm, are performed.<sup>338</sup> The real innovation claimed in *Iwahashi* was the new pattern recognition algorithm. By upholding the patent, the court effectively preempted its use—exactly the result it maintained was avoided by the ROM limitation.<sup>339</sup>

*Iwahashi* was not an aberration. Subsequently, in *Arrhythmia Research Technology v. Corazonix Corp.*,<sup>340</sup> the Federal Circuit upheld a patent for a computerized method of analyzing electrocardiograph (“ECG”) patterns to detect persons at risk for certain heart diseases. The *Arrhythmia* patent also clearly preempts the algorithm it contains. The Federal Circuit's opinion briefly raised its application of the “otherwise statutory process or apparatus” limitation to the level of the absurd.

Although the invention claimed in *Arrhythmia* had a number of steps, those can be grouped into three stages. First, it converted the analog signals obtained using the ECG into digital signals. It then

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<sup>337</sup> Relying on *Freeman-Walter-Abele*, the court reasoned:

The claim as a whole certainly defines apparatus in the form of a combination of interrelated means and we cannot discern any logical reason why it should not be deemed statutory subject matter as either a machine or a manufacture as specified in ' 101. The fact that the apparatus operates according to an algorithm does not make it nonstatutory.

*Id.* at 1375.

<sup>338</sup> Stern, *supra* note 16, at 381-84. Realizing this, the PTO immediately sought to minimize *Iwahashi*'s impact by issuing a notice limiting *Iwahashi* to its facts and promising a case-by-case approach to future applications. See Notice Interpreting *In re Iwahashi* (Fed. Cir. 1989), 1112 Off. Gaz. Pat. Office 16 (Mar. 13, 1990). For discussion of the PTO's initial resistance to the Federal Circuit's expansive approach to the patentability of computer program-related inventions in the post-*Benson* era, see Samuelson, *Benson Revisited*, *supra* note 3, at 1062-94. According to Professor Samuelson, after *Diehr*, the PTO capitulated and fell in line with the Federal Circuit. *Id.* at 1093-94 & n.256. In fact, the PTO's actions regarding *Iwahashi* and *In re Alappat*, 23 U.S.P.Q.2d (BNA) 1340 (Bd. Pat. App. 1992), *rev'd*, 33 F.3d 126 (Fed. Cir. 1994), discussed *infra* at text accompanying notes 346-53, indicate that a spark of resistance remained. However, the new guidelines recently proposed for evaluating software patents represent the PTO's unconditional surrender. See 60 Fed. Reg. 28,778 (June 2, 1995), discussed *infra* note 369.

<sup>339</sup> *Iwahashi*, 888 F.2d at 1374-75.

<sup>340</sup> 958 F.2d 1053 (Fed. Cir. 1992).

applied a well-known digital filtration technique to analyze the wave characteristics of the digitized ECG data. Finally, it performed additional mathematical analysis of the filtered ECG data to identify particular patterns and values, using a new mathematical model.<sup>341</sup> In holding the invention statutory, the court reasoned: “These claimed steps of ‘converting,’ ‘applying,’ ‘determining,’ and ‘comparing’ are physical process steps that transform one physical, electrical signal into another.”<sup>342</sup> But the conversion of analog signals to digital ones is a well-known process, as is the operation of a digital computer to transform one set of digital signals into another.<sup>343</sup> And if digital-to-digital transformation of electrical signals constitutes a physical limitation sufficient to establish otherwise statutory subject matter, then any computer-driven algorithm is statutory subject matter anyway, and no additional “otherwise statutory process or apparatus” need be shown. More recently, the Federal Circuit has clarified that it did not mean to go that far, and that the signals must correspond to some underlying physical steps.<sup>344</sup> According to the court, the manipulation of ECG output counts as such a physical process.<sup>345</sup> Nevertheless, in *Arrhythmia*, as in *Iwahashi*, the real innovation was not any physical process or structure, but the mathematical model developed by the inventor for predicting heart failures based on ECG patterns. The discovery that certain naturally occurring ECG patterns are correlated with a likelihood of later heart failure is not something that the patent system can protect.

Finally, in *In re Alappat*,<sup>346</sup> decided by the en banc court in July 1994 after more than a year of deliberation, the Federal Circuit unambiguously held that a claim for the use of general purpose computing

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<sup>341</sup> *Id.* at 1059.

<sup>342</sup> *Id.*

<sup>343</sup> Nonetheless, Professor Oddi argues that regarding analog-to-digital or digital-to-digital transformation as a sufficient useful arts limitation is consistent with the Supreme Court's definition of patentable subject matter, in a non-computer-program-related case, as anything under the sun that is made by man. Oddi, *supra* note 16, at 415-16 (quoting *Diamond v. Chakrabarty*, 447 U.S. 305, 309 (1980)). Even so, because both analog-to-digital and digital-to-digital transformations are well-known prior art, the mere idea of computerizing a particular task, whether analog or digital input is required, cannot satisfy the threshold requirements that a patented invention be novel and nonobvious as well as manmade. *See infra* part IV.B.

<sup>344</sup> *In re Trovato*, 42 F.3d 1376, 1380-81 (Fed. Cir. 1994); *In re Schrader*, 22 F.3d 290, 294 (Fed. Cir. 1994). The claims in *Schrader*, for a method for calculating competitive bids, and in *Trovato*, for a method for calculating the shortest, or least cost, path between two points, were disallowed.

<sup>345</sup> *Trovato*, 42 F.3d at 1380; *Schrader*, 22 F.3d at 294.

<sup>346</sup> 33 F.3d 1526 (Fed. Cir. 1994) (en banc).

equipment to perform a mathematical operation recites a patentable apparatus—namely, “a combination of known electronic circuitry elements to produce a specific new result.”<sup>347</sup> Accordingly, the court ruled, it need not even perform the two-part inquiry required by the *Freeman-Walter-Abele* line of cases.<sup>348</sup> The PTO had rejected Alappat’s claims, which covered a process known as a “rasterizer,” developed for controlling the illumination of pixels on a computer screen to minimize discontinuity and jaggedness.<sup>349</sup> The PTO concluded that the applicant’s claims were broad “process” claims that stated a mathematical algorithm for pixel control, and would preempt it.<sup>350</sup> In an opinion by Judge Rich, the author of *Iwahashi* and the court’s leading advocate of an expansive approach to computer program patentability, a majority of the Federal Circuit reversed. Citing *Iwahashi*, the court held that even though the claims were in process form, the application “unquestionably” claimed a machine because it referred to circuitry elements.<sup>351</sup> Regarding the objection that those elements—used for performing mathematical calculations—would be present in any general purpose computing system, the court observed that “a general purpose computer in effect becomes a special purpose computer once it is programmed to perform particular functions pursuant to instructions from program software.”<sup>352</sup> In effect, then, *Alappat* establishes that a mathematical algorithm becomes patentable subject matter merely by virtue of its being programmed into a general purpose computer.

The *Alappat* court paid lip service to the concerns about preemption of the “laws of nature” and “abstract ideas” stated by the Supreme Court in *Benson* and *Diehr*,<sup>353</sup> but went on to reach a result that ignored those concerns entirely. The Federal Circuit’s first significant *post-Alappat* decisions, *In re Warmerdam*<sup>354</sup> and *In re Lowry*,<sup>355</sup>

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<sup>347</sup> *Id.* at 1541.

<sup>348</sup> *Id.* at 1540-41.

<sup>349</sup> *See id.* at 1537-39.

<sup>350</sup> *See id.* at 1539-40.

<sup>351</sup> *See id.* at 1541, 1543-44.

<sup>352</sup> *See id.* at 1545. Of course, that is nonsense. As the dissent explained, “[w]hether or not subject matter is a ‘new machine’ within ‘101 is precisely the same question as whether or not the subject matter satisfies the ‘101 analysis. [A] player piano playing Chopin’s scales does not become a ‘new machine’ when it spins a roll to play Brahms’ lullaby.” *Id.* at 1566-67 (Archer, CJ., concurring in part and dissenting in part).

<sup>353</sup> *See id.* at 1542-45.

<sup>354</sup> 33 F.3d 1354 (Fed. Cir. 1994).

<sup>355</sup> 32 F.3d 1579 (Fed. Cir. 1994).

illustrate just how facile the court's conception of the “otherwise statutory apparatus” requirement has become. The court rejected the claims in the *Warmerdam* patent that were drafted as process claims, on the ground that they recited no more than a mathematical algorithm,<sup>356</sup> but allowed the claims that were drafted to recite “a machine having a memory which contains data...generated by” the same algorithm described in the process claims.<sup>357</sup> Together with *Alappat*, *Warmerdam* teaches that if otherwise unpatentable computer program-related claims are drafted in specific apparatus form, the mathematical algorithm limitation will simply disappear.<sup>358</sup>

*Lowry* involved claims for a method of storing and managing data in a computer memory. The PTO had rejected the claims under the “printed matter” doctrine, on the ground that the claims merely recited the arrangement of data and did not define a new functional relationship between the data and the computer memory that served as the substrate.<sup>359</sup> The Federal Circuit held that “[t]he printed matter cases have no factual relevance where ‘the invention as defined by the claims requires that the information be processed not by the mind but by a machine, the computer.’”<sup>360</sup> The court reasoned that electronically specified data hierarchies “impart a physical organization on the information stored in the memory.”<sup>361</sup> Technically, the “printed matter” rejection was based on section 103 of the Patent Act, which requires that an invention be nonobvious, and not on section 101.<sup>362</sup> (As to section 101, the PTO found, and the court agreed without discussion, that a computer memory was a statutory “article of manufacture.”<sup>363</sup>) However, a section 103 “printed matter” rejection bears close affinity to a “mental steps” rejection under section 101. In both cases, the objection to patentability is that the claimed invention does not contribute to the “useful arts,” but simply restates human thought

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<sup>356</sup> *Warmerdam*, 33 F.3d at 1358-60.

<sup>357</sup> *Id.* at 1360-61.

<sup>358</sup> *But see In re Trovato*, 42 F.3d 1376, 1382-83 (Fed. Cir. 1994) (rejecting computer program-related claims drafted in apparatus form where the claims merely recited a series of means that were “simply software instructions” and did not disclose “a specific hardware embodiment”). The lesson of *Trovato*, apparently, is that maintaining the fiction of “specific hardware” is all-important.

<sup>359</sup> *Lowry*, 32 F.3d at 1582-83.

<sup>360</sup> *Id.* at 1583 (quoting *In re Bernhart*, 417 F.2d 1395, 1399 (C.C.P.A. 1969)).

<sup>361</sup> *Id.*

<sup>362</sup> *Id.* at 1582; see 35 U.S.C. § 103.

<sup>363</sup> *Lowry*, 32 F.3d at 1582; see 35 U.S.C. § 101.

processes.<sup>364</sup> In the context of computer program-related inventions, the question in both cases is whether the program steps merely mimic those processes. The Federal Circuit's decision categorically rejects any such implication. After *Lowry*, an algorithm for data arrangement, expressed digitally, is patentable as long as (per *Warmerdam*) a memory device is specified.

The *Atari* court did not subject the issued 10NES patent to the then-applicable *Freeman-Walter-Abele* test. Had it done so, the outcome is a foregone conclusion, and affords yet another illustration of just how nominal the physical limitation required under *Freeman-Walter-Abele* (and *Alappat*) need be to satisfy current standards for statutory subject matter. Each of the 10NES claims, in essence, recites a mathematical algorithm for the synchronous generation of initial numbers, followed by mathematical comparison of the results of arithmetic operations performed on those numbers. The first claim recites the following physical limitations: "a main data processor unit for executing a videographics software program" (a video game console); "a main data processor unit for storing the videographics software program" (a video game cartridge); "a first authenticating processor device"; "a second authenticating processor device"; and a reset switch.<sup>365</sup> The description of the inventor's preferred embodiment makes clear that the first and second "authenticating processor devices" are microprocessors, or computer chips.<sup>366</sup> Just as it is "difficult to imagine" any complex system for pattern recognition that does not

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<sup>364</sup> See *Lowry*, 32 F.3d at 1582-83, Samuelson, Benson *Revisited*, *supra* note 3, at 1033-41, 1106-07 (describing the Amental steps doctrine and the CCPA's eventual repudiation of it as a tool for evaluating computer program-related claims).

<sup>365</sup> In full the first claim of the 10NES patent reads as follows:

A system for determining whether a videographics software program is authorized for use in an information processing apparatus, comprising:

a main data processor unit for executing a videographics software program;

an external memory for storing the videographics software program and for removable connection to said main processor unit, said external memory and main processor unit together constituting the information processing apparatus for executing the videographics software program;

a first authenticating processor device associated with said external memory for executing a first predetermined authenticating program to determine the authenticity of said external memory;

a second authenticating processor device which is installed in said main data processor unit for executing a second predetermined authenticating program to determine the authenticity of said external memory; and

control means for resetting said main data processor unit unless the execution of said first authenticating program by said first processor device exhibits a predetermined relationship to the execution of said second authenticating program by said second processor device.

U.S. Patent No. 4,799,635, col. 11, ll. 8-33 (1989).

<sup>366</sup> U.S. Patent No. 4,799,635, col. 11, ll. 44-55 (1989).



incorporate a ROM,<sup>367</sup> it is difficult to imagine any computerized lock-and-key system for use with a video game cartridge and machine that does not incorporate microprocessors. In any event, the patent provides for that eventuality; the specification discusses adaptations of the lock-and-key system for floppy disks and magnetic cards, and the claims cover use of the invention with both digital and analog processing devices.<sup>368</sup>

In sum, there is no question that based on the then-applicable standard for patentability, the 10NES patent reads on statutory subject matter. Under *Alappat*, of course, the patent claims an apparatus because it incorporates general purpose computing equipment. *Alappat*, *Warmerdam*, and *Lowry* signal a new era for computer program-related patents, in which anything, or virtually anything, goes.<sup>369</sup> It is difficult to imagine a claim that would not pass muster under the

<sup>367</sup> Stern, *supra* note 16, at 382.

<sup>368</sup> U.S. Patent No. 4,799,635, col. 11, ll. 37-50 (1989).

<sup>369</sup> After opposing the applications in all three cases, the PTO recently withdrew its opposition to an application that claimed a computer program embodied in a floppy disk. *In re Beauregard*, 53 F.3d 1583 (Fed. Cir. 1995). Shortly thereafter, it proposed new guidelines for the examination of computer program-related patent applications. See 60 Fed. Reg. 28,778 (June 2, 1995). In essence, the proposed guidelines restate the holdings of *Alappat* (as to apparatus), *Lowry* (as to computer memory devices), and *Arrhythmia* (as to otherwise statutory processes). They recite:

(i) A computer or other programmable apparatus whose actions are directed by a computer program or other form of software is a statutory machine.

(ii) A computer-readable memory [defined to include compact discs and floppy disks] that can be used to direct a computer to function in a particular manner when used by the computer is a statutory article of manufacture.

(iii) A series of specific operational steps to be performed on or with the aid of a computer is a statutory process.

*Id.* at 28,778-79 (endnote omitted); see *id.* at 28,780 (endnote defining computer-readable memory to include compact discs and floppy disks). The proposed guidelines exclude data structures "independent of any physical element," *id.* at 28,779, but this limitation is less a restriction on patentability than a reminder of the importance of proper claim drafting. Also excluded are processes that do [ ] nothing more than manipulate abstract ideas or concepts...." *Id.* In light of *Arrhythmia's* holding that the manipulation of ECG signals corresponded to physical steps, however, this language excludes only the most facially abstract claims. See *supra* text accompanying notes 341-45. Moreover, the proposed guidelines make clear that even an algorithm for manipulating abstract concepts may be saved by the recitation of computer implemented steps." 60 Fed. Reg. at 28,780. The PTO cautions that in some cases "a claim classified as a statutory machine or article of manufacture may define nonstatutory subject matter," but notes that these situations will be "rare." *Id.* at 28,779.) In short, the proposed guidelines, like the Federal Circuit case law that they follow, fail to provide a meaningful rule for excluding nonstatutory claims.

It is worth noting that the PTO views its actions as a response to *Lotus Dev. Corp. v. Borland Int'l, Inc.*, 49 F.3d 807 (1st Cir. 1995), and other recent cases (discussed in Part III, *supra*) that have restricted the scope of copyright protection for computer programs. See James Evans, *Patent Office Works on New Rules for Software Protection*, S.F. DAILY J., April 6, 1995, at 6 ("We are focused on how best to serve our customers, and our customers are sending us the message that they need more protection for computer-related inventions." (quoting PTO solicitor Nancy Linck)). Current PTO Commissioner Bruce Lehman, a former lawyer and lobbyist for Lotus, is presumably well-acquainted with the issues raised in the *Borland* litigation. See Teresa Riordan, *Controversial Pick for Patent Chief: Clinton's Selection Called 'Political Debt'*, S.F. CHRON., May 8, 1993, at A16. Nonetheless, the scope of copyright protection for computer programs is not within the PTO's purview, and the trend toward thin copyright protection for nonliteral program aspects cannot, standing alone, constitute justification for changes in the PTO's position on the proper patent treatment of computer programs. Nor may the PTO interpret the patent laws solely to satisfy its customers.

“nominal hardware” standard.<sup>370</sup> However, there is something terribly wrong with a system of decisionmaking that routinely produces exactly the result it claims to prohibit—the result that its highest court has stated would vitiate the purpose of the patent regime. Unfortunately, alternative proposed frameworks for assessing whether computer program-related inventions constitute statutory subject matter are equally unpromising.

## 2. Rethinking the Mathematical Algorithm Bar

One proposed solution, of course, is to abandon the mathematical algorithm bar altogether on the ground that a mathematical algorithm in digital form constitutes a process like any other, and so is statutory subject matter under the literal language of the Patent Act. Along with Judge Rich of the Federal Circuit, Professor Chisum has long been a leading advocate of this approach.<sup>371</sup> In effect, *Arrhythmia*, *Alappat*, *Warmerdam*, and *Lowry* reach this result, while giving only the barest nod to the Supreme Court's clear intent to preserve some limitations on patentability. Certainly, classifying all computer programs as statutory subject matter eligible for patent protection would greatly simplify the process of evaluating computer program-related patent applications. However, abandoning the rule against preemption of mathematical formulae would violate the fundamental requirement that patents be granted only for the application of scientific principles, not for their development—that is, not for equations, calculations, or formulations of natural laws.<sup>372</sup> The resulting ease of administration would come at too great a social cost; ultimately, it would

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<sup>370</sup> Stern, *supra* note 16, at 392-93. The patent bar has been quick to respond to the Federal Circuit's move away from *Benson* and *Flook*. See, e.g., David S. Benyacar, *Mathematical Algorithm Patentability: Understanding the Confusion*, 19 RUTGERS COMPUTER & TECH. L.J. 129, 196-97 (1993) (offering a primer on claim drafting to satisfy the standards set forth in *Iwahashi* and *Arrhythmia*).

<sup>371</sup> Chisum, *supra* note 16, at 1009-10.

<sup>372</sup> See *Diamond v. Chakrabarty*, 447 U.S. 303, 309 (1980) (“Einstein could not patent his celebrated law that  $E=mc^2$ ; nor could Newton have patented the law of gravity. Such discoveries are ‘manifestations of Y nature, free to all men and reserved exclusively to none.’” (quoting *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127, 130 (1948))); *Mackay Radio & Tel. Co. v. Radio Corp. of Am.*, 306 U.S. 86, 94 (1939).

frustrate the patent system's constitutionally mandated goal of inducing progress in the useful arts.

If mathematical algorithms are statutory subject matter, patents may issue for computer programs that simply execute complex calculations and are not tied to any "industrial" process. It may be argued that a computer program is not a mathematical formula at all, but an improved process for executing one.<sup>373</sup> In the digital age, however, a rule premised on a distinction between mathematics and process is facile. Complex physical and mathematical discoveries, such as Mandelbrot's theory of fractals or Lorenz' theory of chaos, often see their first and only expression in digital form. To perform the required calculations by hand would take decades, even centuries. The distinction between silicon and paper is too slim a reed on which to hang satisfaction of the statutory subject matter requirement.<sup>374</sup>

The requirement that mathematical formulae be excluded from patentability, moreover, is of constitutional stature. The Constitution authorizes Congress to grant "inventors" the exclusive right to their "discoveries" in order "[t]o promote the [p]rogress of...the useful [a]rts."<sup>375</sup> Granting exclusive rights to mathematical formulae merely because they have been expressed in digital form would have the opposite effect. That fundamental mathematical, chemical, and physical principles may be termed "discoveries" is of no moment.<sup>376</sup> A crucial premise of the patent system is that such principles remain in the public domain for future inventors to use.<sup>377</sup> Thus, the patent laws may protect novel and useful *applications* of those principles, but not the

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<sup>373</sup> See Chisum, *supra* note 16, at 1006.

<sup>374</sup> The argument that computerized algorithms are merely expressions that "approximate" laws of nature, see Donner & Beckers, *supra* note 319, is unpersuasive, for it begs the question how such laws may ever be expressed exactly by humans.

<sup>375</sup> U.S. CONST. art. 1, ' 8, cl. 8.

<sup>376</sup> See *In re Alappat*, 33 F.3d 1526,1551 (Fed. Cir. 1994) (Archer, C.J., concurring in part and dissenting in part) (quoting GEORGE CURTIS, A TREATISE ON THE LAW OF PATENT'S FOR USEFUL INVENTIONS xxiii-xxv (4th ed. 1873)):

In this inquiry it is necessary to commence with the process of exclusion; for although, in their widest acceptance, the terms "invention" and "discovery" include the whole vast variety of objects on which the human intellect may be exercised, so that in poetry, in painting, in music, in astronomy, in metaphysics, and in every department of human thought, men constantly invent or discover, in the highest and the strictest sense, their inventions and discoveries in these departments are not the subject of the patent law.

See also Samuelson, *Benson Revisited*, *supra* note 3, at 1112 (noting that "discoveries...in nontechnological arts, such as—theoretical mathematics—are not patentable" (quoting I CHISUM, *supra* note 310, ' 1.01)).

<sup>377</sup> See *Graham v. John Deere Co.*, 383 U.S. 1, 5-6 (1966):

The Congress in the exercise of the patent power may not overreach the restraints imposed by the stated constitutional purpose. Nor may it enlarge the patent monopoly without regard to the innovation, advancement or social benefit gained thereby. Moreover, Congress may not authorize the issuance of patents whose effects are to remove existent knowledge from the public domain.... Innovation, advancement, and things which add to the sum of useful knowledge are inherent requisites in a patent system which by constitutional command must promote the Progress of...useful Arts. This is the standard expressed in the Constitution and it may not be ignored.

See also *Diamond v. Chakrabarty*, 447 U.S. 303, 309 (1980); *Le Roy v. Tatham*, 55 U.S. (14 How.) 156, 175 (1853). Thus, the applied science requirement for patent protection is analogous to the idea-expression distinction in copyright law, and serves the same purpose. See *Feist Publications, Inc. v. Rural Tel. Serv. Co.*, 499 U.S. 340, 346-47 (1991).

principles themselves. If a mathematical discovery expressed digitally is transmuted into a patentable process, more and more formerly unpatentable discoveries will be removed from the public domain for the statutory seventeen-year term. According patent protection to computerized mathematical algorithms in this indiscriminate fashion would vitiate the terms of the constitutional grant.

The world would be a very different place if Einstein had received a patent on his discovery that  $e = mc^2$ , or if Millikan or Schrödinger had patented their pathbreaking work in electromagnetism and particle physics, or if any of them had been required to license the principles they used along the way.<sup>378</sup> The truly patentable inventions that these pioneering discoveries enabled might never have occurred, and certainly would have occurred more slowly, if those discoveries had not been freely available.<sup>379</sup> Under a regime that makes distinctions between mathematical formulae based on the mode in which they are expressed, the future of research and development in this country may strongly resemble that world. While a robust public sector might still preserve a core of public domain science, ours may not be up to that task. Even nominally public research is increasingly

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<sup>378</sup> Erwin Schrödinger developed a wave equation for describing quantum mechanics and solving for characteristics of atomic behavior. See DANIEL J. KEVLES, *THE PHYSICISTS: THE HISTORY OF A SCIENTIFIC COMMUNITY IN MODERN AMERICA* 164 (1977). Robert Millikan devised a method for measuring the precise charge of the electron. *Id.* at 89-90.

<sup>379</sup> Professor Chisum argues that "[t]here is every reason to believe that algorithm patents will be extensively licensed at reasonable royalty rates." Chisum, *supra* note 16, at 1017. In the context of closed proprietary computer systems such as the NES, that conclusion seems dubious. But even assuming that a license is offered, the cost to small software development companies (such as Accolade), especially those needing to license technology under more than one patent, may be prohibitive. See Garfinkel, *supra* note 314, at 106. The implications for the increasingly cash-strapped public sector, which includes many university research programs, are even worse. A university can license its own patents to fund its licenses of someone else's patents. The result, however, will be universities that "behave[e] more and more like corporations," Reichman, *supra* note 77, at 718, and an atmosphere that "divert[s] attention away from the teaching function and retard[s] the free and open exchange of knowledge that is a tenet of scientific progress," *id.* at 719.

privatized; joint ventures, faculty consultancies, and technology transfer agreements abound.<sup>380</sup> The Balkanization of scientific knowledge into competing accretions of proprietary rights will greatly weaken existing incentives to inventors.<sup>381</sup>

But to except only mathematical algorithms and their equivalents, such as the formal expression of a chemical reaction, from section 101's ambit is to return to the original problem: how to distinguish those computer program-related inventions that are "no more than" mathematical algorithms from those that are properly within the useful arts. The rejection of Professor Chisum's solution only underscores that dilemma.

### 3. An "Information Processing" Exclusion

Professor Samuelson's proposed solution to the problem of when to treat computer program-related inventions as statutory subject matter is the opposite of Professor Chisum's. She argues that both the mathematical algorithm and mental process doctrines are directed at "information processing," rather than at the "industrial arts," and accordingly proposes excluding information processing-related developments—including, it would appear, all computer programs—from the ambit of the Patent Act.<sup>382</sup>

An "information processing" limitation on patentability is problematic for two reasons. First, some information processing developments, such as pioneering advances in data compression technology or color reproduction, are true, qualitative departures from the prior art.<sup>383</sup> Denying patent protection to those inventions would weaken incentives for development, and so would err too greatly on the side of underprotection, confirming the fears of Judge Rich, Professor

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<sup>380</sup> Reichman, *supra* note 77, at 708-10; *supra* text accompanying notes 144-45.

<sup>381</sup> Reichman, *supra* note 77, at 719. Professor Reichman suggests that patent and trade secret protection for computer programs may end cooperative academic research as we know it. *Id.* at 715. Professor Chisum observes that the judicially developed experimental use exception to patent infringement may be expanded to protect research uses of algorithm patents. Chisum, *supra* note 16, at 1017-19. However, he admits that the exception may not apply to research usage that has an ultimate commercial objective. *Id.* at 1018. It is unclear whether that would include research conducted pursuant to a university-sponsored joint venture or technology transfer program.

<sup>382</sup> Samuelson, Benson *Revisited*, *supra* note 3, at 1148-49. Samuelson does not argue that computer program-related developments should go completely unprotected, but advocates adoption of a *sui generis* system for protecting and encouraging such innovation. *See id.* at 1148-53; Samuelson et al., *Manifesto*, *supra* note 19, at 2406-13.

<sup>383</sup> *See, e.g.*, U.S. Patent No. 4,500,919 (Schreiber, assigned to Massachusetts Institute of Technology); U.S. Patent No. 5,126,739 (Whiting, assigned to Stac Electronics).

Chisum, and others who maintain that restricting the patentability of computer program-related inventions will bring about the demise of the patent system as we know it.<sup>384</sup> Computer technology is, broadly speaking, a “useful art,”<sup>385</sup> and innovations of appropriate stature should be rewarded, and thereby encouraged, to the same degree as innovations in other fields. Whether the balance of incentives that results from the current overinclusive approach to all computer program-related developments is a healthy one is a separate question.<sup>386</sup>

Second, and ultimately far more important, to the extent that an “information processing” exclusion would preclude protection for all computer programs, it would shortly render the patent system obsolete. As the flood of software patents issued in recent years demonstrates, industrial processes of all sorts are increasingly computerized.<sup>387</sup> Once the commands required to execute such processes are expressed digitally, each such process has a built-in “information processing” component. If inventions are to be considered “as a whole,” as *Freeman-Walter-Abele* and *Alappat* require,<sup>388</sup> then no patents may be issued for any of those inventions. And if inventions are not to be considered as whole, how are we to determine which computer program-related inventions are *not* properly considered information processing devices? The question whether a claimed invention reads on an information processing device merely restates the question whether the claims recite, in essence, no more than a mathematical algorithm, and brings us no closer to answering it. In short, Professor Samuelson's answer to Professor Chisum takes us out of the frying pan and into the fire. While under Professor Chisum's solution to the mathematical algorithm dilemma the patent system would consume the public domain, under Professor Samuelson's the public domain (or a *sui generis* scheme of quasi-patent protection for information processing inventions) would consume the patent system.

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<sup>384</sup> *In re Alappat*, 33 F.3d 1526,1542-45 (Fed. Cir. 1994) (Rich, J.); Chisum, *supra* note 16.

<sup>385</sup> U.S. CONST. art. I, ' 8, cl. 8.

<sup>386</sup> Professor Oddi, for example, has argued that the most important function of the patent system is the inducement of revolutionary-type inventions, and that the market may play a greater role in inducing other types of inventions. Oddi, *supra* note 16, at 375-78 (discussing the taxonomy of inventions developed in F.M. SCHERER, INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE 444-54 (2d ed. 1980)).

<sup>387</sup> Garfinkel, *supra* note 314, at 106, Soma & Smith, *supra* note 314, at 419-21.

<sup>388</sup> *Alappat*, 33 F.3d at 1543; *In re Abele*, 684 F.2d 902, 907 (C.C.P.A. 1992).

#### 4. Claim Construction and the Particularity Requirement

Since *Iwahashi*, some commentators have suggested that the debate over when computer programs constitute statutory subject matter under section 101 is better understood, and more precisely resolved, as a debate over the particularity requirement imposed by section 112 of the Patent Act.<sup>389</sup> Among other things, section 112 requires that the patent describe with particularity—and thereby limit—the claimed invention.<sup>390</sup> Adherents of the section 112 approach argue that the particularity requirement serves as a built-in safeguard against preemption of a particular formula, equation, or sequence of digital steps.<sup>391</sup>

The security afforded against algorithm preemption by section 112 is illusory, because, as demonstrated above, there is no assurance that the limitation proposed by the inventor and accepted by the PTO will be a meaningful one, and no guarantee for applicants that rejections for lack of particularity will be made in a consistent manner. *Iwahashi*, *Arrhythmia*, *Alappat*, *Warmerdam*, *Lowry*, and *Atari* all involved very particularized, precise claims. In none was overbreadth a function of vagueness; instead, it arose from the attempt to cast items of general purpose computing equipment as meaningful physical limitations. The inescapable conclusion is that while section 112 prevents the patentee from precluding *all* uses of a formula claimed as part of an invention, it does not prevent it from precluding all meaningful or practicable uses.<sup>392</sup> Thus, the particularity requirement cannot solve the statutory subject matter problem.

#### B. POINT OF NOVELTY RECONCEIVED: THE INNOVATIVE PROGRAMMER STANDARD

The absence of a principled basis under section 101 of the Patent Act for separating statutory inventions from claimed inventions that are “no more than” nonstatutory mathematical algorithms is disturbing. However, the intense focus on statutory subject matter ignores the existence of other statutory requirements for patentability. In particular, the requirements set forth in sections 102 and 103 of the

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<sup>389</sup> 35 U.S.C. ' 112 (1988); see, e.g., Charles E. Bruzga, *The Benson Court's Approach to Computer Software or Other Patent Claims Reciting a Mathematical Algorithm*, 74 J. PAT. & TRADEMARK OFF. SOC'Y 135 (1992).

<sup>390</sup> 35 U.S.C. ' 112.

<sup>391</sup> Bruzga, *supra* note 389, at 142.

<sup>392</sup> See *Alappat*, 33 F.3d at 1564 (Archer, C.J., concurring in part and dissenting in part) (AWhat is going on here is a charade.©).

Patent Act, that a claimed invention be novel and nonobvious to those ordinarily skilled in the field,<sup>393</sup> may be used to accomplish what the statutory subject matter inquiry cannot achieve: a rule that permits analytic dissection of claims into statutory and nonstatutory elements for purposes of identifying which computer program-related inventions are patentable.

Intuitively, the most troubling aspect of many computer program-related patents is that they appear to reward the inventor for recognizing the obvious—that a given function may be performed more efficiently or more accurately if computerized—and using general purpose computer equipment and standard programming techniques to computerize it. Other computer program-related patents simply reward the programmer for developing otherwise unpatentable mathematical formulas. In that sense, the objections to the *Iwahashi*, *Arrhythmia*, and *Alappat* patents, like the objection to the *Lowry* patent, are really based on obviousness and lack of novelty. In each case, the new and nonobvious element was not the physical apparatus, which was well-known and widely used, but rather the otherwise unpatentable mathematical algorithm developed to analyze the data and compute the desired output.<sup>394</sup>

In response to *Iwahashi*, Richard Stern, former chief of the Department of Justice's Intellectual Property Section, proposed reconceiving the standard for nonobviousness for computer program-related inventions. His solution, which may be termed the “innovative programmer” standard, adds a third step to the *Freeman-Walter-Abele* test. If a claimed invention recites a mathematical algorithm, but appears to be statutory subject matter when taken as a whole, the examiner must ask whether the claimed invention would have been obvious to “a person of ordinary skill...who: (a) knew the particular algorithm; (b) desired to accomplish the function or task to be performed; and (c) desired to do so with the aid of a computer...”<sup>395</sup> If not, it is nonobvious, and so patentable. By taking general purpose computer equipment and the mathematical algorithm as part of the prior art for purposes of assessing nonobviousness, the innovative programmer standard is intended to avoid the pitfalls described in Part IV.A, above.

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<sup>393</sup> See 35 U.S.C. §§ 102, 103.

<sup>394</sup> See *supra* text accompanying notes 335-52.

<sup>395</sup> Stern, *supra* note 16, at 395



The innovative programmer standard is similar to an approach known as the “point of novelty” test, which has been disfavored by the courts. That treatment was ill-considered. The point of novelty test offered a logically and doctrinally viable method for assessing the patentability of computer program-related inventions. The innovative programmer standard improves upon it, by tailoring the test to the unique nature of computer software.

The point of novelty approach first surfaced in the early days of computer programming. As set forth in *In re Abrams*,<sup>396</sup> it involved analytic dissection of the claimed invention to determine whether its novelty resided in its physical elements or in “one or more of the so-called mental steps.”<sup>397</sup> However, the court then confused the section 102 requirement of novelty with the section 101 requirement of statutory subject matter. It held that if the novelty of the claimed invention resided in “mental steps,” the claimed invention was not statutory subject matter.<sup>398</sup> In *Application of Musgrave*<sup>399</sup> Judge Rich rejected the *Abrams* approach as based on a logical fallacy. He reasoned:

[I]f [Abrams] were the law, a given process...could be statutory during the infancy of the field of technology to which it pertained, when the physical steps were new, and non-statutory at some later time after the physical steps became old, acquiring prior art status, which would be an absurd result. Logically, the identical process cannot be first within and later without the categories of statutory subject matter, depending on such extraneous factors.<sup>400</sup>

The *Musgrave* court concluded that because an invention cannot be considered statutory subject matter only at certain points in time, each claimed invention must be assessed as a whole for purposes of the inquiry required by section 101.<sup>401</sup>

Eight years after its rejection by the CCPA, the *Abrams* point of novelty analysis resurfaced in the Supreme Court's opinion in *Parker v. Flook*.<sup>402</sup> Without citing either *Abrams* or *Musgrave*, the Court observed that “the proper analysis for this case” was that “[t]he process itself, not merely the mathematical algorithm, must be new and useful.

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<sup>396</sup> 188 F.2d 165 (C.C.P.A. 1951).

<sup>397</sup> *Id.* at 166.

<sup>398</sup> *Id.*

<sup>399</sup> 431 F.2d 882 (C.C.P.A. 1970).

<sup>400</sup> *Id.* at 889.

<sup>401</sup> *Id.* at 889-90. That remains the rule under *Freeman-Walter-Abele*. See, e.g., *In re Abele*, 684 F.2d 902, 907 (A 'In the final analysis under ' 101, the claimed invention, as a whole, must be evaluated for what it is.'@ (quoting *In re Sarkar*, 588 F.2d 1330, 1333 (C.C.P.A. 1978))).

<sup>402</sup> 437 U.S. 584 (1978).

Indeed the novelty of the mathematical algorithm is not a determining factor at all... [I]t is treated as though it were a familiar part of the prior art.”<sup>403</sup> The Court then went on to duplicate the fallacy of *Abrams*, however. It ruled that if the novelty of the claimed invention resided in the mathematical algorithm, then the claimed process could not constitute statutory subject matter under section 101.<sup>404</sup> In fact, properly stated, the ill-fated *Abrams/Flook* test for patentable subject matter turns entirely upon a novelty and nonobviousness analysis. A slight reformulation of the test avoids Judge Rich's objection: A claimed invention that, taken as a whole, is (or may be) statutory subject matter is nonetheless unpatentable if its novelty and nonobviousness inheres in its nonstatutory elements. This reformulated test is similar to the innovative programmer standard proposed by Stern in that both would require the examiner to separate the mathematical algorithm from the other elements of the claimed invention when conducting the separate inquiry into novelty and nonobviousness.<sup>405</sup>

In *Diamond v. Diehr*,<sup>406</sup> the Court recognized its error of logic. Adopting the CCPA rule, it held unambiguously that “ ‘novelty’...is of no relevance in determining whether the subject matter of a claim falls within the § 101 categories of possibly patentable subject matter,” and that the claim “must be considered as a whole” for that determination.<sup>407</sup> After *Diehr*, then, it is undisputed that a claimed invention may not be dissected into its component parts for purposes of the statutory subject matter inquiry. However, the Court also rejected the *Flook* point of novelty analysis on independent grounds. It opined that a rule requiring that mathematical algorithms be considered part of the prior art “would, if carried to its extreme, make all inventions unpatentable because all inventions can be reduced to underlying principles of nature which, once known, make their implementation

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<sup>403</sup> *Id.* at 591-92.

<sup>404</sup> *Id.* at 594. This reasoning was sharply criticized by the CCPA, thinly disguised as a criticism of the brief of the party that suggested it. *In re Bergy*, 596 F.2d 952, 962-63 (C.C.P.A.), *vacated sub nom.* *Diamond v. Bergy*, 444 U.S. 1028 (1980); *see also* David A. Blumenthal & Bruce D. Riter, *Statutory or Nonstatutory?: An Analysis of the Patentability of Computer Related Inventions*, 62 J. PAT. & TRADEMARK OFF. SOC'Y 454, 484-87 (1980) (criticizing confusion of section 101 and section 103 requirements in *Flook*).

<sup>405</sup> *Cf.* Alan P. Klein, *Reinventing the Examination Process for Patent Applications Covering Software-Related Inventions*, 13 JOHN MARSHALL J. COMPUTER & INFO. L. 231 (1995) (proposing that new mathematical algorithms be deemed abandoned into the prior art under ' 102(c) because they cannot be claimed separately as inventions in their own right).

<sup>406</sup> 450 U.S. 175 (1981).

<sup>407</sup> *Id.* at 188-89.

obvious.”<sup>408</sup> Although this analysis has received some critical support,<sup>409</sup> it is in its own way as ill-considered as *Flook*'s confusion regarding section 101.

As Professor Burk has noted, the *Diehr* Court's reasoning has its roots in Justice Frankfurter's concurrence in *Funk Bros. Seed Co. v. Kalo Inoculant Co.*<sup>410</sup> The *Funk Bros.* Court disallowed a patent for a mixed culture of naturally occurring bacteria on the ground that it claimed a preexisting phenomenon of nature<sup>411</sup>; Justice Frankfurter objected that a “‘laws of nature’” rationale “could fairly be employed to challenge almost every patent.”<sup>412</sup> The *Diehr* Court was also influenced by its recent decision in *Diamond v. Chakrabarty*,<sup>413</sup> which established the patentability of laboratory-grown bacteria. Together, *Chakrabarty* and *Diehr* might be read to establish that the touchstone for patentability must be the simple test of whether the claimed invention is “manmade,” and that the invention must be evaluated as a whole for all purposes. In fact, there is no logical reason that analytic dissection may not be employed during the inquiry into novelty and nonobviousness required under sections 102 and 103 of the Patent Act. To the contrary, such an analytic approach is a necessary part of the process of evaluating any claimed invention against existing prior art. The real question, dismissed in *Diehr* with a reference to “extreme[s],” is whether the patent laws forbid examiners and courts from dissecting out newly discovered scientific and mathematical principles. Because, as I have discussed, the patent laws cannot reward new and nonobvious advances in mathematics, the answer must be yes.<sup>414</sup>

Given the difficulties that attend any effort to separate unpatentable principles from their patentable applications, the Court's “slippery slope” argument is unpersuasive. As the “otherwise statutory process or apparatus” rule developed in *Freeman-Walter-Abele* illustrates,<sup>415</sup> a rule requiring isolation and exclusion of unpatentable elements is not the only approach to patentability that poses a danger of

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<sup>408</sup> *Id.* at 188 n.12.

<sup>409</sup> See Dan L. Burk, *Biotechnology and Patent Law: Fitting Innovation to the Procrustean Bed*, 17 RUTGERS COMPUTER & TECH. L.J. 1, 26-33 (1991).

<sup>410</sup> 333 U.S. 127 (1948); see Burk, *supra* note 409, at 27.

<sup>411</sup> 333 U.S. at 129-32.

<sup>412</sup> *Id.* at 135 (Frankfurter, J., concurring).

<sup>413</sup> 447 U.S. 303 (1980); see *Diamond v. Diehr*, 450 U.S. 175, 181-82 (1981) (citing *Chakrabarty*).

<sup>414</sup> See 35 U.S.C. ' 101; 1 CHISUM, *supra* note 310, ' 4.02 (1994); *supra* part IV.A.2.

<sup>415</sup> See *supra* part IV.A.1.

overbreadth. When carried to its extreme, as it has been by the Federal Circuit, the “otherwise statutory” rule can be applied to render any process that contains computer components patentable. Arguably, the danger of reduction to “phenomena of nature” is particularly acute in the case of biological inventions, which may too frequently be viewed as black boxes that produce results based on their (naturally determined) biochemical properties, even when those results did not formerly exist in nature.<sup>416</sup> Even so, however, generalizing that danger to all inventions is unwarranted. Although it is certainly possible to analyze computer program-related inventions in a way that reduces them to bedrock principles of conductivity and electromagnetism, computer programs as a class, unlike bacteria or proteins, do not exist in nature in any form. Rather, they are a wholly human-made class of articles that employ mathematical principles to accomplish results. Thus, although in the abstract the boundary between mathematical principle and application defies precise articulation,<sup>417</sup> it should be possible to separate the two in particular cases.

Ironically, *Diehr* is a case in point. The mathematical equation used in the rubber-curing process at issue in *Diehr* was the well-known Arrhenius equation.<sup>418</sup> The fact that the mathematical formula was “a familiar part of the prior art”<sup>419</sup> did not preclude the Court from finding the claimed application of the formula to be new and nonobvious, even as it rejected that test. Of course, isolating the mathematical formula component of a claim is not always so easy; if it were, the controversy over computer program-related patents would not exist. The advantage of a point of novelty approach over the “otherwise statutory process or apparatus” formulation developed in *Freeman-Walter-Abele* is that, unfettered by section 101's requirement that the claimed invention be taken as a whole, it allows courts and examiners to dissect principles and mathematical proofs, which are not patentable, from their applications, which may be, and determine where the inventive act lies and whether it is the kind of inventive act the patent system can reward.

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<sup>416</sup> Professor Burk's support for *Diehr*'s rejection of *Flook* is based on this reasoning. Burk, *supra* note 409, at 26-33, 42-43.

<sup>417</sup> For one view on where that boundary lies, see Irah H. Donner, *Two Decades of Gottschalk v. Benson: Putting the “Rithm® Back Into the Patenting of Mathematical Algorithms*, 5 SOFTWARE L.J. 418, 448-59 (1992). *But see* Newell, *supra* note 315, at 1024-38 (arguing that in computer science, no such boundary exists).

<sup>418</sup> *Diamond v. Diehr*, 450 U.S. 175, 177 (1981). *See supra* text accompanying note 327.

<sup>419</sup> *Parker v. Flook*, 437 U.S. 584, 592 (1978).

The innovative programmer standard differs from the reformulated *Abrams/Flook* test, however, in that it adds general purpose computing equipment to the list of givens.<sup>420</sup> As the analysis in Part IV.A demonstrates, that recommendation is sound and its adoption long overdue. A mathematical principle expressed digitally, though not patentable, may be new; general purpose computing equipment is not even that. We are fast approaching an era in which any industrial function can be directed by a general purpose computer with the appropriate software. As with any other useful art, the patent laws should reward only genuinely new and nonobvious advances in the application of computer technology, not the comparatively mundane, though complex, process of adapting a general purpose computer to a particular use with existing programming techniques.

In light of *Diehr* and the Federal Circuit's aggressive stance on software patentability, it is perhaps not surprising that the innovative programmer standard has drawn little response. For those who believe that any mathematical algorithm expressed digitally is a patentable process—or, with a “nominal hardware” or memory limitation, a patentable apparatus or article of manufacture—a standard designed to narrow the rule and close the floodgates will not constitute much of an improvement. However, the innovative programmer standard should satisfy those who concede that computerized mathematical formulae are unpatentable, but worry that there is no reliable means of identifying which claimed inventions fall into that category. The standard offers a doctrinally sound basis for dissecting out those elements of a claimed invention that alone cannot properly be considered patentable, either because they are public domain building blocks available to all, or because the idea of using them would be obvious to anyone conversant with computers. Decisions about whether the invention is sufficiently novel and nonobvious to qualify for patentability can then be made based on what the dissection reveals.

Under the innovative programmer standard, the patents at issue in *Iwahashi*, *Arrhythmia*, *Alappat*, *Warmerdam*, *Lowry*, and *Atari* might never have been granted. *Atari* is illustrative. Take away the two microprocessors and the reset switch that constitute the “nominal hardware” and all that remains is a specification for a series of mathematical functions. Take those functions as part of the prior art and all that remains is the relatively mundane task of assembling the physical

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<sup>420</sup> Stern, *supra* note 16, at 395.

building blocks of the lock-and-key system. The question the examiner should have asked was whether the combination of those physical elements would have been obvious to any ordinarily skilled programmer who wished to devise an effective lock-out device.<sup>421</sup> Because I am not an ordinarily skilled programmer, I do not attempt to answer that question. Instead, the next section examines the remaining factors that would bear on whether the examiner reached the correct answer.

### C. INSTITUTIONAL COMPETENCE

Developing a workable and doctrinally sound approach to assessing the patentability of computer program-related inventions is only half the battle. Because decisions on patentability are inherently fact specific, the technical competence of the decisionmaker—the PTO—is critical in determining whether the rules governing patentability will be applied correctly. Technical competence alone cannot cure the lack of a coherent standard, but it can significantly narrow the margin of error and reduce the number of erroneously granted patents. In the years since *Diehr* opened the floodgates to computer program-related claims, the PTO has failed in that respect because it lacked both the personnel and the resources to evaluate such claims for technical merit and to make informed judgments regarding nonobviousness. In response to the howls of criticism that followed the issuance of a patent covering a standard industry method of multimedia data retrieval,<sup>422</sup> the PTO has set in motion several organizational and procedural changes designed to address its shortcomings. Those changes, though important, do not go far enough.

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<sup>421</sup> The price of patent protection is disclosure; a patent must provide sufficient information to enable one ordinarily skilled in the field to practice the invention once it has passed into the public domain. 35 U.S.C. § 112. If certain facts or principles are already well-known in the art, the inventor need not provide them. *See, e.g.*, *Loom Co. v. Higgins*, 105 U.S. 580, 587 (1881); *Spectra-Physics, Inc. v. Coherent, Inc.*, 827 F.2d 1524, 1534 (Fed. Cir.), *cert. denied*, 484 U.S. 954 (1987).

<sup>422</sup> *See, e.g.*, Doug Bailey, *CD-ROM Multimedia Patent Draws Fire*, BOSTON GLOBE, Nov. 17, 1993, at 49, 51; Steve Hamm, *Patented Problems*, 11 PC WK., Jan. 24, 1994, at A1; John Markoff, *A High-Technology Outcry Against the U.S. Patent System*, N.Y. TIMES, Jan. 3, 1994, at C1; Michael Schrage, *Too-Broad Patenting of High Tech Points Up Patent Flaws In System*, L.A. TIMES, Nov. 18, 1993, at D1; Gina Smith, *Lines Drawn In Patent Battle*, S.F. EXAMINER, Nov. 28, 1993, at E1.

### 1. *The Decisionmakers*

In theory, the patent examination process consists of a rigorous analysis of the claimed invention by an examiner trained in the same scientific field. Until 1994, however, the PTO's list of accepted technical backgrounds for patent examiners did not include computer science, and the PTO did not hire computer scientists as examiners or technical staff members.<sup>423</sup> It is impossible to overstate the consequences of that policy, or lack of it, for the overprotection of computer program-related developments. A duly examined and approved patent is presumed valid.<sup>424</sup> To overcome this presumption in subsequent infringement litigation, a challenger must present clear and convincing evidence of some error by the patent examiner.<sup>425</sup> This standard is a high one, often prohibitively so. Because I patent examination requires technical competence that most judges do not possess, judges are reluctant to second-guess an examiner's decision. As a matter of logic, however, the presumption of validity is justified only if the examiner's qualifications warrant it.

Computer program-related applications are particularly difficult to evaluate because they may require knowledge of two different fields—computer science and some other field, such as chemistry or medicine, in which the invention is intended for use. For example, an application for an improved method of processing and interpreting seismic waves to detect the presence of fossil fuel deposits would be assigned to Class 367, for “Communications, Electrical: Acoustic Wave Systems and Devices,” while the application for an improved method of analyzing electrocardiograph readings to predict and treat heart disease, at issue in *Arrhythmia*, was assigned to Class 128, for “Surgery.”<sup>426</sup> What both inventions have in common, however, is that they are based in part on computer applications—applications that neither the examiner trained as a geologist nor the examiner trained in the biological sciences is equipped to evaluate. Moreover, the prospecting application might rely in part on programming techniques originally developed in a different industrial context altogether, such

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<sup>423</sup> See Sabra Chartrand, Patents, N.Y. TIMES, July 4, 1994, ' 1, at 36; James W. Morando & Christian H. Nadan, *Silent Enemies*, THE RECORDER, May 4, 1994, at 10.

<sup>424</sup> See 35 U.S.C. ' 282 (1988 & Supp. 1993).

<sup>425</sup> See, e.g., *Quad Envtl. Tech. Corp. v. Union Sanitary Dist.*, 946 F.2d 870, 872 (Fed. Cir. 1991).

<sup>426</sup> U.S. DEPT. OF COMMERCE, PATENT OFFICE, MANUAL OF CLASSIFICATION (Rev. No. 3 1994).

as chemistry or metallurgy. Yet the examiner trained in geology assigned to examine the prospecting patent would have no particular knowledge of patents recently granted in those fields.

In 1994 the PTO revised its hiring criteria to include computer science among the accepted technical backgrounds and, in mid-1994, hired nine individuals with computer science degrees to assist the examiner corps.<sup>427</sup> Although this is an important step in the right direction, the PTO will not be fully equipped to handle computer program-related claims until computer scientists have been accorded examiner status and can veto applications that are insufficiently novel or nonobvious to merit patent protection. Where appropriate, each such application should be assigned two examiners, one to evaluate the claimed invention with respect to the intended field of use and one to evaluate it with respect to the state of the computer science-related prior art; the approval of both should be required before a patent may issue. As to all computer program-related patents issued before the addition of the new computer science personnel to the PTO's technical staff, courts deciding issues of patent validity should discount the presumption of validity, and give greater weight to expert testimony offered by the parties.

## 2. *Prior Art*

The determination whether a claimed invention is novel and non-obvious is based on examination of relevant prior art in the applicable technical field. The applicant must cite prior art that bears on the claimed invention as part of the patent application, and the examiner also must look beyond what is cited before granting the patent.<sup>428</sup> The presumption of validity that applies to an issued patent is based not only on the examiner's technical qualifications, but also on the examiner's search of the prior art. Once again, that presumption is only as good as the resources that support it.

Within the last decade, many glaring defects relating to the organization and accessibility of the PTO's collection of prior art have been remedied. The PTO's database of issued patents has been automated, and examiners have access to commercially available on-line

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<sup>427</sup> See Chartrand, *supra* note 423; Morando & Nadan, *supra* note 423.

<sup>428</sup> 37 C.F.R. §§ 1.56, 1.104(a), 1.107, 1.98 (1994); U.S. DEPT. OF COMMERCE, PATENT OFFICE, MANUAL OF PATENT EXAMINING PROCEDURE § 706.03 (5th ed. 1983 & Supp. 1993) (The primary object of the examination of an application is to determine whether or not the claims define a patentable advance over the prior art.”).



databases as well.<sup>429</sup> However, in the field of computers and computer programs, much that qualifies as prior art lies outside the areas in which the PTO traditionally has looked—previously issued patents and previous scholarly publications. Many new developments in computer programming are not documented in scholarly publications at all. Some are simply incorporated into products and placed on the market; others are discussed only in textbooks or user manuals that are not available to examiners on line.<sup>430</sup> In an area that relies so heavily on published, “official” prior art, a rejection based on “common industry knowledge” that does not appear in the scholarly literature is unlikely.<sup>431</sup> Particularly where the examiner lacks a computer science background, highly relevant prior art may simply be missed. In the case of the multimedia data retrieval patent granted to Compton's New Media, industry criticism prompted the PTO to reexamine the patent and ultimately to reject it because it did not represent a novel and nonobvious advance over existing technology.<sup>432</sup> However, it would be inefficient, and probably impracticable, to reexamine every computer program-related patent, and the PTO is unlikely to do so.

Even when an examiner overlooks relevant prior art, the patent remains clothed in the presumption of validity. An accused infringer may offer the missed prior art to show invalidity, but the court must find the evidence of invalidity clear and convincing.<sup>433</sup> In *Atari*, that hurdle proved too high. A missed piece of prior art relating to a computer reset switch was a central element of Atari's defense against Nintendo's patent infringement claims.<sup>434</sup> Judge Smith declined to grant summary judgment in favor of Atari on the invalidity issue. After examining the reset reference, the district judge ruled that she could not conclude as a matter of law that Nintendo's application of

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<sup>429</sup> See D. Lee Antton & Theodore A. Feitshans, *Is the United States Automating A Patent Registration System for Software? A Critical Review of Information Management in the U.S.P.T.O.*, 72 J. PAT. & TRADEMARK OFF. SOC'Y 894 (1990); Garfinkel, *supra* note 314, at 109.

<sup>430</sup> See Antton & Feitshans, *supra* note 429; U.S. CONG., OFFICE OF TECHNOLOGY ASSESSMENT, COMPUTER SOFTWARE AND INTELLECTUAL PROPERTY—BACKGROUND PAPER 8-9 (1990); Garfinkel, *supra* note 314, at 109.

<sup>431</sup> As Richard Stern explains, unless a rejection is based on official prior art or generally accepted principles, the examiner must file an affidavit stating the basis for the rejection and citing personal expert knowledge. See 37 C.F.R. ' 1.107(b) (1994); Stern, *supra* note 16, at 38586 & n.30.

<sup>432</sup> See, e.g., Morando & Nadan, *supra* note 423, at 10.

<sup>433</sup> See, e.g., *Quad Envtl. Tech. Corp. v. Union Sanitary Dist.*, 946 F.2d 870,872 (Fed. Cir. 1991).

<sup>434</sup> *Atari Games Corp. v. Nintendo of Am., Inc.*, 30 U.S.P.Q.2d (BNA) 1401, 1416 (N.D. Cal. 1993). See *supra* text accompanying note 70.

the reset feature would have been obvious to a programmer of ordinary skill.<sup>435</sup> Subsequently, the jury also rejected Atari's invalidity argument. Absent the presumption of validity, the outcome could well have been different at either procedural stage.

Before the PTO can evaluate computer program-related applications competently, its database of relevant prior art must be made complete. Thus far, however, the PTO has taken no steps to do this. In response to the PTO's inaction, the Software Patent Institute in Ann Arbor, Michigan has begun assembling "a database of computer science folklore—techniques that are in use, but not widely published."<sup>436</sup> As conceived, the database also will include computer science textbooks and computer program-related magazine items.<sup>437</sup> If realized, such a database might constitute a significant step toward eliminating the prior art problem, but only if the PTO uses it on a regular basis. A more reliable alternative would be to place a database of computer program-related prior art within the PTO's control and require that it be used. Much of the raw material for such a database already is present in the archives of the Copyright Office and the Library of Congress. Every computer science textbook and computer system manual in which copyright is claimed must be deposited with the Copyright Office as part of the copyright registration process, and textbooks published with notice of copyright are deposited with the Library of Congress.<sup>438</sup> Under regulations adopted pursuant to the 1976 amendments to the Copyright Act, every computer program that is the subject of a copyright registration also is deposited, at least in partial form, with the Copyright Office, and every computer program "published" with notice of copyright is deposited with the Library of Congress.<sup>439</sup> It would be a relatively simple matter to amend the copyright and patent statutes to require that a separate copy of every computer program, every piece of supporting documentation, and every computer-related textbook or magazine deposited with the Copyright Office or the Library of Congress also be filed with the PTO. Accessing the knowledge contained in this prior art then would be a matter of hiring individuals with the requisite specialized knowledge to index and maintain the collection.

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<sup>435</sup> *Id.* at 1418.

<sup>436</sup> Garfinkel, *supra* note 314, at 142.

<sup>437</sup> *Id.* Garfinkel notes, however, that some publishers have been reluctant to authorize the inclusion of their works because they fear lost sales. *Id.*

<sup>438</sup> See 17 U.S.C. ' ' 407, 408 (1988 & Supp. 1993).

<sup>439</sup> 37 C.F.R. ' ' 202.19, 202.20 (1994).

### 3. *Shifting the Burden of Production*

In 1994, after the Compton's New Media debacle, the PTO supported an additional change in its examination procedures that reflected a newfound lack of confidence in its ability to examine computer program-related patent applications. The Patent Term and Publication Reform Act, submitted to Congress but not enacted in 1994, would have required that patent applications be disclosed to the public eighteen months after the patent application is filed.<sup>440</sup> Interested parties could then bring relevant prior art not contained in the PTO's database to the examiner's attention. A bill to require publication after eighteen months has been reintroduced in the 104th Congress,<sup>441</sup> as well as another bill that would afford third parties increased opportunities for participation in patent reexamination proceedings.<sup>442</sup> Both amendments would, in effect, shift the burden back to the computer industry, the PTO's most vocal critic, to police itself.

Ironically, the strongest opposition to publication at eighteen months may come from inventors themselves, who risk losing trade secret protection for their products if their patent applications are denied.<sup>443</sup> It might be argued that the disclosure provisions would deter inventors from seeking patent protection, with the result that many valuable, patentable inventions would be kept from the public. This is a valid argument against the amendment only if the applicants turned away are worthy, however, and there is no empirical evidence to suggest that this would be the case. Absent such evidence, it is at least as

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<sup>440</sup> S. 1854, 103d Cong., 2d Sess. (1994). Other terms of this bill, including patent term harmonization provisions, were subsequently enacted as part of the legislation implementing the Uruguay Round of the Global Agreement on Tariffs and Trade (GATT). See Pub. L. No. 103465, 108 Stat. 4809 (1994).

<sup>441</sup> H.R. 1733, 104th Cong., 1st Sess. (1995). A different proposed bill would provide for publication after 60 months. See H.R. 359, 104th Cong., 1st Sess. (1995). In light of the short product lifespan and rapid pace of development in the computer software industry, see Karjala, *New Protectionism*, *supra* note 6, at 39-41, a 60-month lag before publication will do little, if anything, to cure the problem of submarine patents like the Compton's patent, which surface after a lengthy examining period and take the industry by surprise. See, e.g., Garfinkel, *supra* note 314, at 142. The proposed regulations regarding reexamination suffer from the same defect; a patent cannot be reexamined until it has been issued.

<sup>442</sup> H.R. 1732, 104th Cong., 1st Sess. (1995). The PTO has also proposed regulations to this effect. See 60 Fed. Reg. 23,201 (May 8, 1995).

<sup>443</sup> This argument was raised in opposition to the proposed Patent Term and Publication Reform Act. For testimony addressing it and arguing that the perceived threat to trade secret protection is not significant, see *Patent Office Oversight: Hearings on S.1854 Before the Subcomm. on Patents, Copyrights and Trademarks of the Senate Commn. on the Judiciary*, 103d Cong., 2d Sess. (1994) (statement of Gary L. Newton, President, American Intellectual Property Law Association).

likely that the current system of nondisclosure encourages applications of dubious merit, submitted on the off chance that a patent will issue. If a patent is denied, the innovation can still be held as a trade secret. Under a system that subjects each application to public scrutiny, the applicants who weed themselves out may well be the undeserving ones. Weakening the incentives to seek patent protection for computer programs thus may yield results that are entirely consistent with the purposes of the Patent Act and the criteria for patentability. The proposed amendment regarding reexamination, a process that cannot be triggered until a patent is issued, will not produce a like effect.

However, neither publication of patent applications nor increased opportunities for reexamination will reduce the need for a qualified, well-informed examiner corps. Even under a public comment regime, the examiner assigned to each computer program-related application must be able to digest and evaluate the significance of materials submitted by interested members of the public, and must make the final decision as to patentability. The PTO cannot and should not cede that critical function to the public, particularly where, as a practical matter, the "public" will be made up largely of opponents of software patents and the prospective patentee's competitors. Accordingly, enactment of a provision for publication of patent applications should not foreclose continued self-examination by the PTO.

#### V. LOCK-OUT AS MISUSE: TWO PARADOXES

So far, no court has considered the misuse defense as applied to claims of intellectual property in lock-out programs. Misuse defenses were raised in *Sega* and *Atari*, but were not litigated in either case.<sup>444</sup> In the context of lock-out, the concept of misuse is singularly apt. From the copyright perspective, lock-out programs are creative works devised to bar others from utilizing ideas and functional principles that the Copyright Act does not protect. From the patent perspective, they are (or may be) novel and nonobvious inventions that operate to bar access to and use of unpatented computer systems and public domain principles and ideas. In each case, however, application of the

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<sup>444</sup> *Sega Enters. Ltd. v. Accolade, Inc.*, 785 F. Supp. 1392, 1399 (N.D. Cal.), *aff'd in part and rev'd in part*, 977 F.2d 1510 (9th Cir. 1992), *as amended*, 1993 U.S. App. LEXIS 78 (9th Cir. 1993). *See supra* note 56 (discussing misuse and antitrust allegations in *Atari*). In *Sega*, of course, there was no need to reach the issue of *Sega's* alleged misuse. *Atari's* misuse defenses were severed for later trial with *Atari's* antitrust claims against Nintendo, and the case settled before that second phase could occur. *See supra* text accompanying notes 73-75.

misuse defense results in a paradox. In the case of patent, the misuse doctrine as applied to lock-out threatens to nullify the patentee's intellectual property right. In the case of copyright, if functional duplication is permissible, as Part III argues, the copier who takes only functionality does not infringe, and the copier who takes too much—who duplicates protected expression in addition to unprotectable functionality—can never complain of misuse. One result seems too harsh; the other, not harsh enough. This part explores those results and the rules that produce them.

Part V.A addresses the application of the doctrine of patent misuse to a lock-out patent such as the 10NES. It first considers—and rejects—the suggestion that patents such as the 10NES simply should be disallowed for failure to satisfy the Patent Act's requirement of usefulness.<sup>445</sup> It then addresses the reach of the patent misuse doctrine in the lock-out context and argues that the doctrine should be narrowed, but not abandoned altogether in favor of an antitrust approach, as some have suggested.<sup>446</sup> Part V.B addresses the more intractable difficulties posed by application of the misuse doctrine to attempted enforcement of a copyright in a lock-out program. It argues that despite the exclusionary intent behind a copyrighted lockout program, denominating as misuse conduct that simply makes it more difficult for competitors to achieve interoperability would be inconsistent with the purposes of copyright protection.

#### A. THE PATENT MISUSE DEFENSE AND THE ENFORCEABILITY DILEMMA

The patent misuse doctrine affords an equitable defense to certain claims of patent infringement.<sup>447</sup> As articulated by the Supreme Court, the doctrine prohibits any attempt by the patentee to extend the lawful monopoly conferred on it by the patent laws to an area outside the scope of the patent.<sup>448</sup> Thus, Nintendo's use of the 10NES patent against Atari appears to present the most straightforward case of misuse imaginable. Nintendo's patent monopoly extended only to

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<sup>445</sup> 35 U.S.C. § 101.

<sup>446</sup> See, e.g., Mark A. Lemley, *The Economic Irrationality of the Patent Misuse Doctrine*, 78 CAL. L. REV. 1599 (1990) [hereinafter Lemley, *Economic Irrationality*]; see also Note, *Clarifying the Copyright Misuse Defense. The Role of Antitrust Standards and First Amendment Values*, 104 HARV. L. REV. 1289 (1991).

<sup>447</sup> See generally 5 CHISUM, *supra* note 310, § 19.04 (summarizing the law of patent misuse).

<sup>448</sup> See, e.g., *Morton Salt Co. v. G.S. Suppiger Co.*, 314 U.S. 488 (1942); *Motion Picture Patents Co. v. Universal Film Mfg. Co.*, 243 U.S. 502 (1917).

the lock-out programs embedded in its console and cartridges, not to the console itself, nor to the console operating system. Manufacturing the console to include the later-developed lock-out program did not change that fundamental fact. Accordingly, under the Supreme Court's formulation of the misuse defense, Nintendo's subsequent use of the lock-out patent to ensure that only its licensees could gain access to the console was an unlawful extension of the patent grant.

The arguments against application of the patent misuse defense in the context of lock-out are twofold. First, statutory restrictions on the defense limit its reach in that context to patentees with antitrust market power.<sup>449</sup> By definition, however, a computer system manufacturer that adopts a lock-out regime has such power in the market for programs compatible with its system. The second argument is one of logic, and might be made, roughly, as follows: If the patent may not be invoked against those who gain access to the console using a functional equivalent of the patented device, it is unenforceable, and the patent misuse defense may not be construed to render a duly approved patent unenforceable *ex ante*. Ultimately, this objection to the misuse defense fails for two reasons. First, if a patented lock-out device has no use other than to enlarge the scope of the patent grant, then the device lacks utility, the patent is invalid, and the question of its enforceability is moot.<sup>450</sup> Second, lock-out devices for computer systems do have other, legitimate uses.<sup>451</sup> However, the argument about enforceability raises important questions about the contours and practical consequences of the misuse doctrine in its current form.

### 1. *The Patent Misuse Reform Act of 1988*

The installation of a lock-out program in a computer system operates as a tie, by conditioning the initial sale of a system on the subsequent purchase of authorized programs developed by the system manufacturer or its licensees.<sup>452</sup> Thus, for example, installation of the 10NES tied the market for NES-compatible games, formerly open to

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<sup>449</sup> See 35 U.S.C. § 271(d)(5) (Supp. 1992).

<sup>450</sup> See *infra* part V.A.2.

<sup>451</sup> See *infra* text accompanying notes 478-83.

<sup>452</sup> See *Jefferson Parish Hosp. Dist. No. 2 v. Hyde*, 466 U.S. 2, 12 (1984) (The essential characteristic of an invalid tying arrangement lies in the seller's exploitation of its control over the tying product to force the buyer into the purchase of a tied product that the buyer either did not want at all, or might have preferred to purchase elsewhere on different terms.®).

anyone who could design a game with commercial appeal, to the market for NES consoles.<sup>453</sup> Under the patent misuse doctrine as originally formulated by the Supreme Court, *any* use of a patented item as the tying product constituted misuse per se.<sup>454</sup> However, the Patent Misuse Reform Act of 1988 narrowed the scope of the patent misuse defense as applied to tying arrangements.<sup>455</sup> Under the resulting section 271(d)(5) of the Patent Act, tying does not constitute a misuse unless “in view of the circumstances” the patentee has market power in the market for the tying product—here, the computer system or video game console.<sup>456</sup> Analysis of the misuse ramifications of lockout programs must begin with consideration of the extent to which section 271(d)(5) precludes or limits assertion of the misuse defense against the computer system manufacturers that install them.

The crucial question in the market power inquiry is, of course, the definition of the relevant market. In *Eastman Kodak v. Image Technical Services*,<sup>457</sup> the Supreme Court approved, at least in principle, the use of a single-product definition of the tying product market when the tied product market is derivative of the tying product market.<sup>458</sup> The first question, then, is whether the market for games or programs that are interoperable with a particular system is distinct from the market for that system, making it efficient to provide the two products separately.<sup>459</sup> The existence of independent game developers and the fact that multiple game programs may be purchased separately from the game console demonstrate the existence of distinct, separate markets. Whether a computer system manufacturer that installs lock-out programs has market power in the market for interoperable programs depends on the extent to which the initial system purchase locks the consumer in and precludes or militates against a later decision to switch systems.<sup>460</sup> Here the answer is less straightforward. Although the number, variety, and cost of available programs for different systems will change over time in a manner that consumers may not foresee, the cost of switching consoles—or even of owning two different

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<sup>453</sup> See Paul A. Durdik, *Reverse Engineering as a Fair Use Defense to Software Copyright Infringement*, 34 JURIMETRICS J. 451, 453 (1994).

<sup>454</sup> See *Morton Salt v. G.S. Suppiger, Co.*, 314 U.S. 488, 492 (1942) (“The privilege of a patent monopoly Y excludes from it all that is not embraced in the invention.”).

<sup>455</sup> Pub. L. 100-703, 102 Stat. 4674 (1988) (codified as amended at 35 U.S.C. § 271(d)(4) & (5) (Supp. 1992)).

<sup>456</sup> 35 U.S.C. § 271(d)(5).

<sup>457</sup> 112 S. Ct. 2072 (1992).

<sup>458</sup> *Id.* at 2090.

<sup>459</sup> *Id.* at 2080.

<sup>460</sup> *Id.* at 2083-87.

ones—is significantly lower than the cost at issue in *Kodak*, that of switching photocopiers.<sup>461</sup>

Even though “lock-in” costs may be less significant for computer systems, however, the unique manner in which the tie-in is accomplished constitutes a factor that “in view of the circumstances”<sup>462</sup> should lead courts inexorably to the conclusion that the market power requirement is met. The tying effect achieved by the adoption of a lock-out regime is devastatingly absolute.<sup>463</sup> The coercion required to show tying is not contractual and subject to negotiation, but rather physical and incontrovertible. A lock-out program does not merely restrict competitors’ ability to make and sell interoperable programs and consumers’ ability to obtain them, but confers, instantly, an absolute right to exclude competitors from making, using, or, selling the tied product at all.<sup>464</sup> And yet the patented program itself—the focus of the misuse defense, and the real tying product—is completely unnecessary to the intended function and use of the de facto tying product, the computer system.

Neither the text nor the legislative history of the Reform Act suggests that it was intended to shield a patentee's efforts to control the derivative market of an unpatented commodity by the simple expedient of manufacturing that commodity to include a supernumerary patented device. And no legitimate business reason exists for the adoption of a lock-out regime designed to control the market for programs compatible with an unpatented computer system. A system manufacturer concerned with quality control has other avenues of legal recourse.<sup>465</sup> Accordingly, the manufacturer of a proprietary but

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<sup>461</sup> See *id.* at 2085-87 (discussing the costs associated with photocopier purchases). Because both Nintendo and Sega license the rights to develop games interoperable with their consoles to third-party vendors under certain conditions, it might be argued that whether Nintendo or Sega has market power for antitrust purposes depends on whether the existence of third-party licenses outweighs their restrictive terms. However, that argument ignores the fact that Nintendo also reaps a profit from its licensees. As a matter of antitrust tying law, Nintendo need not sell all of the tied product itself; all that is necessary is that it have a financial interest in sales of the tied product. See Peter J. Klarfeld, *Tying Arrangements and Exclusive Dealing*, in 34th ANNUAL ANTITRUST LAW INSTITUTE 853, 908-10 (PLI 1993) (collecting cases).

<sup>462</sup> 35 U.S.C. § 271(d).

<sup>463</sup> See Durdik, *supra* note 453, at 466.

<sup>464</sup> For cases involving technological tying, at least one commentator has distinguished between accidental coercion as a result of technological development and interoperability requirements, and actual coercion motivated by a desire to compel the purchase of two products. Klarfeld, *supra* note 461, at 883-34 (citing cases). Plainly, the coercion accomplished by lock-out programs is of the latter type.

<sup>465</sup> See *supra* note 196.



unpatented computer system who installs a lock-out program that effectively ties the market for compatible programs to the system market should be deemed to satisfy the market power requirement.<sup>466</sup>

## 2. Lock-Out Patents and the Usefulness Requirement

To be patentable, an invention must be “useful” as well as novel and nonobvious.<sup>467</sup> Compared to the other two statutory requirements for patentability, the usefulness requirement has received relatively little attention, for obvious reasons. Most inventions have self-evident uses. Ordinarily, inventions are developed with an intended use in mind, and that use is disclosed as part of the patent application.<sup>468</sup> The 10NES patent is no exception; it was developed to provide lock-and-key functionality for a video game console, and the patent so states.<sup>469</sup> However, the usefulness requirement also includes a public policy element: The intended use may not be contrary to law.<sup>470</sup> If the intended and only use of the 10NES violates the public policy behind the Patent Act, then the 10NES arguably lacks utility.

As originally conceived, the public policy underlying the usefulness requirement was directed at inventions deemed “frivolous or injurious to the well-being, good policy, or sound morals of society.”<sup>471</sup>

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<sup>466</sup> The other theory of antitrust liability advanced in the interoperability context is monopolization of an essential facility. See, e.g., Jeff Barge, *High-Tech Firms Face Scrutiny*, A.B.A. J. July 1994, at 36, 37. Application of the essential facility doctrine in the context of lock-out is problematic, however, because its combination with a *Kodak*-type market power analysis is inherently circular. A variant on the classic essential facility fact pattern illustrates this circularity. Instead of a river with one bridge over it, see *United States v. Terminal R.R. Ass'n*, 224 U.S. 383 (1912), imagine three bridges. One, operated by the Nintendo Bridge Company, is a railroad trestle. Another, owned by the Sega Bridge Corporation, carries truck traffic. The third, operated by an upstart competitor of Nintendo and Sega called 3DO, is a monorail bridge. Once a freight company needing to transport goods across the river has purchased or leased its desired modes of transportation, the costs of switching are high. Under *Kodak*, each company has market power in the market for traffic over its bridge, but it does not follow that any one company’s bridge is an essential facility for crossing the river. Arguably, anyone denied access to the bridge of his or her choice can simply switch modes of transportation. If all three bridge proprietors deny access, there is no principled basis, other than assessment of each proprietor’s market power in the larger market for traffic across the river, for deciding whose bridge is truly “essential.”

<sup>467</sup> 35 U.S.C. ' 101.

<sup>468</sup> See 35 U.S.C. ' 112 (requiring disclosure of “the manner and process of making and using [the invention] Y [and] the best mode contemplated by the inventor of carrying out [the invention]”).

<sup>469</sup> U.S. Patent No. 4,799,635, abstract, p. 1 (1989).

<sup>470</sup> See, e.g., *Phillips Petroleum Co. v. U.S. Steel Corp.*, 673 F. Supp. 1278, 1325 (D. Del. 1987).

<sup>471</sup> *Lowell v. Lewis*, 15 F. Cas. 1018 (C.C.D. Mass. 1817); see generally ICHISUM, *supra* note 310, ' 4.03[1] (discussing public policy aspect of utility requirement).

During the first part of the twentieth century, several patents on devices for gambling or “games of chance” were invalidated on morality based grounds.<sup>472</sup> Gradually, however, courts retreated from a morality-based approach. At first, courts simply held that an otherwise immoral invention would satisfy the usefulness requirement if it had the capacity for beneficial use.<sup>473</sup> More recently, although current formulations of the public policy exception to the usefulness requirement retain “immorality” as a basis for rejecting a patent, courts considering utility-based challenges to patents have suggested that the public policy exception will be invoked only to reject patents covering devices whose use violates the law.<sup>474</sup> As a result, the scope of the modern public policy exception is extremely narrow. In the last fifty years, there is no reported case denying patent protection on public policy grounds.

Obviously, lock-out programs do not raise questions of immorality. Instead, lock-out programs test the reach of the public policy exception's illegality prong. Assuming, still, that a lock-out program such as the 10NES has no use other than to enlarge the scope of the patent grant by excluding competitors from creating and marketing programs for an unpatented computer system, its “usefulness” turns on whether triggering an equitable defense to an infringement claim is sufficient to establish illegality. Lock-out programs are not illegal in the formal sense. No law forbids their development or use, nor does their use violate any criminal law, in the way that use of a gambling machine violated nineteenth-century laws against gambling. The public policy underlying the Patent Act is violated only if the lock-out *patent* is enforced.<sup>475</sup> And even then, what is violated is not a provision of the Patent Act, but a judicially created, highly fact-specific, equitable rule.<sup>476</sup> Militating against a finding of usefulness, however, is the fact that the public policy in question is not based on moralistic notions of correct behavior, but rather on the legislative purpose embodied in a federal statute.

Ultimately, however, we need not resolve the question whether lock-out programs are illegal, and so nonuseful, because enforcement

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<sup>472</sup> See, e.g., *Brewer v. Lichtenstein*, 278 F. 512 (7th Cir. 1922); *Schultze v. Holtz*, 82 F. 448 (N.D. Cal. 1897).

<sup>473</sup> See, e.g., *Callison v. Dean*, 70 F.2d 55, 58 (10th Cir. 1934); *Fuller v. Berger*, 120 F. 274 (7th Cir. 1903), *cert. denied*, 193 U.S. 668 (1904); 1 CHISUM, *supra* note 310, ' 4.03[[[b].

<sup>474</sup> See, e.g., *Whistler Corp. v. Autotronics Inc.*, 14 U.S.P.Q.2d (BNA) 1885, 1886 (N.D. Tex. 1990); *Phillips Petroleum*, 673 F. Supp. at 1325.

<sup>475</sup> See *supra* text accompanying notes 447-48.

<sup>476</sup> See *supra* note 448 and accompanying text.

of a lock-out patent violates patent policy. Lock-out programs such as the 10NES also have the potential for lawful—that is, non-misuse—use. Accordingly, by analogy to the “beneficial use” rule developed in the turn-of-the-century gambling cases,<sup>477</sup> they are “useful” within the meaning of the Patent Act.

Consider four scenarios. The first, which I shall call scenario A, involves the *Atari* fact pattern, minus Atari's fraud on the Copyright Office.<sup>478</sup> Nintendo installs a lock-out program in its video game system, the NES, and Atari reverse engineers the device so that it can market NES-compatible game cartridges. Nintendo then sues Atari for patent infringement. In scenario B, the Rip-Off Company (“ROC”), an offshore computer company, copies Nintendo's games and imports the counterfeits into the United States for distribution. When ROC begins distributing counterfeit Nintendo games that incorporate the 10NES lock-and-key technology, Nintendo files suit for patent infringement. In scenario C, Nintendo decides to diversify its business portfolio. It begins marketing an office computer system (the “NOS”) that incorporates a lock-out device designed to restrict access to the system to those holding authorized access cards. Hacker, Inc. reverse engineers the device so that it can break into the secure system or, for a fee, enable others to do so, and Nintendo sues Hacker. In the final scenario, scenario D, a manufacturer of IBM-compatible clones installs a lock-out program in its computers to enable their use as a secure office system.

In scenario B, the lock-out program is employed, at least ostensibly, to make software counterfeiting more difficult—an indisputably lawful purpose.<sup>479</sup> When the 10NES is copied, the patent provides Nintendo with another remedy against ROC, in addition to any copyright, trademark, or unfair competition claims that Nintendo chooses to assert. As in scenario A, enforcement of the patent in scenario B

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<sup>477</sup> See *Fuller*, 120 F. 274; *Ex parte* Murphy, 200 U.S.P.Q. (BNA) 801 (P.T.O. Bd. App. 1977) (adopting the *Fuller* rule).

<sup>478</sup> See *supra* text accompanying notes 53-55.

<sup>479</sup> There is no question that the 10NES has this effect. Evidence in the *Atari* case showed that Atari's inability to decipher Nintendo's microcode was the stumbling block that led to its illfated decision to obtain a copy of the 10NES code from the Copyright Office under false pretenses. *Atari Games Corp. v. Nintendo of Am., Inc.*, 975 F.2d 832, 836 (Fed. Cir. 1992).

Nintendo also might argue, as Sega did with respect to its lock-out routine, that the device was intended primarily as a means of quality control, to protect consumers from counterfeit or otherwise inferior products. See *Sega Enters. Ltd. v. Accolade, Inc.*, 977 F.2d 1510, 1515 (9th Cir. 1992), *as amended*, 1993 U.S. App. LEXIS 78 (9th Cir. 1993). As discussed above, however, the law provides other mechanisms—specifically, the trademark and unfair competition laws—for controlling the quality of products associated with one's name. See *supra* note 196.

results in a type of exclusion. However, the excluded party in scenario B is in a poor position to invoke equity, because it has simply appropriated Nintendo's intellectual property—Nintendo's game programs and the 10NES program—for its own use.<sup>480</sup> In this context, Nintendo's use of the patent to identify and pursue ROC for software piracy constitutes an appropriate, though elaborate, strategy for protecting its intellectual property rights.<sup>481</sup>

The use of the 10NES technology suggested in scenarios C and D also is lawful. Although, technically speaking, the lock-out device installed in the NOS achieves the same result as that installed in the NES, the consequences for the purchaser of the system are very different. In scenario A, installation of a lock-out device in the NES results in fewer NES-compatible games available for purchase. In scenarios C and D, lock-out is precisely the result desired by purchasers of the system, whether it is the proprietary NOS or the adapted clone, to protect the security of information stored there. Nor does the use of lock-out technology in the NOS exclude competitors in the absolute sense, since it does not affect the market for interoperable software that can be installed on the system, and also leaves room for competitors to design and market their own secure systems to other customers. Put differently, in scenarios C and D, the lock-out program targets alien users, not alien programs, and thus does not effect an unlawful expansion of the patentee's intellectual property rights.

It may be argued that the possibility of scenarios C and D does not save the 10NES patent, because the claims asserted in the patent were limited to a device for authenticating “a videographics software program.”<sup>482</sup> The Nintendo patent contributes to the goal of the Patent Clause to advance knowledge in the “useful arts,” but the advancement of knowledge alone will not support a patent grant.<sup>483</sup>

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<sup>480</sup> See *Atari*, 975 F.2d at 846 (holding that Atari was precluded from invoking the copyright misuse defense by its own unclean hands).

<sup>481</sup> The elaborateness of the patented-device-as-decoy tactic would undermine any real-life argument by Nintendo that it conceived of the 10NES solely as an anti-counterfeiting measure. Nonetheless, Sega raised such an argument. *Sega*, 977 F.2d at 1515, 1530.

<sup>482</sup> See U.S. Patent No. 4,799,635, col. 12, ll. 61-63 (1989). If, as I have suggested, this limitation represents an attempt to comply with the physical limitation rule derived from *Benson* and *Iwahashi*, the idea that the patent might be too narrow to satisfy the utility requirement is not without irony. See *supra* section IV.A.

<sup>483</sup> See U.S. CONST. art. I, ' 8, cl. 8; *supra* part IV.A.2. Use of an external key device to unlock a secure system, such as a bank system, might be less desirable than a password system because the key device could be stolen. However, the question of an invention's market viability forms no part of the patent analysis. Forecasting economic viability requires a degree of prescience that neither courts nor patent examiners can reasonably be expected to attain. See *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1573 (Fed. Cir.) (Under our economic and patent systems, valuation of the *worth* of an inventor's contribution is left to the public, *not* to the judiciary in determining patentability.®), *cert. denied*, 481 U.S. 1052 (1987).

Thus, scenarios C and D constitute an argument for the utility of lock-out programs in general, not the 10NES in particular. However, under the “capacity for lawful use” standard advanced here, the possibility of scenario B is enough to establish the 10NES’ usefulness, or at least to incline courts to address that question on a case-by-case basis. Thus, we turn once again to the doctrine of misuse.

### 3. *Lock-Out as Patent Misuse*

The conclusion that lock-out programs have lawful uses, and so need not fail the public policy test for usefulness, also answers the argument that holding Nintendo’s enforcement of its patent against Atari to be a misuse would nullify the 10NES patent. Quite clearly, it would not. The preceding section has identified at least three non-*Atari* contexts in which a lock-out patent might be enforced. Unfortunately, that does not entirely solve the first of our two misuse paradoxes. As a practical matter, application of the misuse doctrine in *Atari* might in fact have barred any subsequent enforcement of the 10NES patent. That result is not unique to lock-out, however; it is a function of the current formulation of the patent misuse defense.

Consider again scenarios A and B. If Nintendo sues ROC, as in scenario B, it can enforce the 10NES patent; if Nintendo sues Atari, as in scenario A, it cannot. However, if the factual predicate for scenario A exists, Nintendo cannot enforce its patent against ROC, either. A finding of patent misuse bars the patentee from enforcing its patent against anyone, even a clear infringer who otherwise could raise no defense to the infringement claim.<sup>484</sup> Under this approach to the patent misuse doctrine, the core principle underlying the doctrine is one of reciprocal obligation. When a patent is issued, the patentee’s promise that it will not abuse the limited monopoly granted it is an implied *quid pro quo*.<sup>485</sup> A misuse of the patent constitutes voluntary divestiture by the patentee of its right to invoke the protection of the patent laws until the misuse is purged and its consequences “fully dissipated.”<sup>486</sup>

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<sup>484</sup> See, e.g., *Morton Salt Co. v. G.S. Suppiger Co.*, 314 U.S. 488, 490 (1942); *Transitron Elec. Corp. v. Hughes Aircraft Co.*, 487 F. Supp. 885, 892-93 (D. Mass. 1980), *aff’d*, 649 F.2d 871 (1st Cir. 1981).

<sup>485</sup> *Morton Salt*, 314 U.S. at 492.

<sup>486</sup> See, e.g., *B.B. Chem. Co. v. Ellis*, 314 U.S. 495, 498 (1942).

ROC, meanwhile, has received a windfall. It has defeated Nintendo's infringement claim even though Nintendo committed no misuse of the patent with respect to ROC. There is no requirement of standing to invoke the patent misuse defense.<sup>487</sup> Accordingly, ROC may invoke the defense to its own benefit, whether or not it has been injured by Nintendo's use of the 10NES. A corollary to the absence of a standing requirement is that there need not be even rough parity between the remedy—complete and unconditional nonenforcement of the patent—and the injury suffered by the infringer as a result of the patentee's attempt to extend its grant. Thus, for example, in scenario B, ROC benefits even though its injury is nil.

For these reasons and others,<sup>488</sup> Professor Lemley has suggested that the patent misuse defense should require an antitrust analysis. Antitrust principles, it is claimed, more precisely match the remedy afforded by law to the harm done, both to the accused infringer and to society generally.<sup>489</sup> As argued in Part V.A.1, system manufacturers who install lock-out programs to exclude competitors from unpatented computer systems should be deemed to satisfy the Patent Misuse Reform Act's requirement of antitrust market power. However, whether or not installation of the 10NES to prevent competitors from developing NES-compatible games constitutes an antitrust violation,

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<sup>487</sup> See 3 CHISUM, *supra* note 310, ' 19.04, at 19-38 (discussing *Morton Salt*).

<sup>488</sup> Advocates of an antitrust approach to patent misuse argue that allowing the misuse defense to exist separately from the antitrust laws affords the infringer a dual recovery. Not only is the patent declared unenforceable, but the infringer also may recover antitrust damages where applicable. See Lemley, *Economic Irrationality*, *supra* note 446, at 1617-18. In this way, they maintain, the patent misuse doctrine overrewards even its deserving beneficiaries. In a sense, this view is based wholly on wishful thinking: If the criteria for invoking the misuse doctrine were tightened to require antitrust injury for a finding of misuse, then the misuse doctrine would be redundant. Otherwise, the misuse doctrine will often be invoked by those to whom no antitrust recovery is available.

Moreover, a declaration of nonenforcement due to misuse is an equitable remedy, in essence an injunction. See, e.g., Robert P. Merges, *Reflections on Current Legislation Affecting Patent Misuse*, 70 J. PAT. & TRADEMARK OFF. SOC'Y 793, 796-98 (1988). Injunctions barring certain future conduct may be, and often are, awarded together with damages for past harm. Indeed, injunctive relief has long been available under the antitrust statutes, where it coexists peacefully with provisions authorizing recovery of damages. See 15 U.S.C. ' 26 (1988). Professor Lemley argues that a declaration of misuse is not equivalent to an injunction because there is no express requirement that courts find irreparable harm and an inadequate remedy at law. Lemley, *Economic Irrationality*, *supra* note 446, at 1618 n.121. Arguably, however, both findings are implicit in a determination that the patent grant has been improperly extended. The converse of the principle that a finding of infringement creates a presumption of irreparable harm and an inadequate remedy at law on behalf of the patentee.

<sup>489</sup> See Lemley, *Economic Irrationality*, *supra* note 446, at 1615-17; cf. Note, *supra* note 446, at 1297-1303 (advocating an antitrust-based standard for copyright misuse).

antitrust law does not afford an appropriate foundation for the doctrine of patent misuse, although courts may find certain antitrust principles useful in defining its scope.

It has been argued that the particular economic model adopted by the antitrust laws is uniquely ill-suited to evaluate the intellectual property system, because the antitrust laws focus exclusively on short-term, price-based competition among essentially fungible products.<sup>490</sup> The intellectual property laws take a longer-term view, focusing on competition through innovation.<sup>491</sup> One consequence of this difference in emphasis is that, despite their vaunted capacity to measure the harms done to competition and mete out the appropriate quanta of redress, the antitrust laws may not view as cognizable certain harms to the innovative process that flow from misuse of a grant of patent or copyright protection. For example, an attempt to enforce a lock-out patent against a legitimate software developer is, in essence, an attempt to preclude, or at least control, continuing innovation in a particular type of computer technology.<sup>492</sup> Such conduct need not drive up consumer prices—indeed, the intellectual property owner may use license royalty rates to keep its prices low, out of recognition that low prices heighten existing barriers to entry by restricting a new entrant's ability to recoup its research and development costs.

Even more fundamentally, the antitrust laws delineate the permissible bounds of private use of private property. Generally speaking, one may conduct a private enterprise for private gain until the point at which the public's interest in competition is injured. A patent or copyright, in contrast, implicates the public from the outset, and not only because the limited monopoly accorded is a public grant. Through doctrines such as fair use, the “idea-expression” distinction, and the rule against patent protection for natural laws and mathematical formulae, the public is given rights that overlap the boundaries of

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<sup>490</sup> Ramsey Hanna, Note, *Misusing Antitrust. The Search for Functional Copyright Misuse Standards*, 46 STAN. L. REV. 401 (1994). For a systematic critique of this Astatic® approach to antitrust theory, and an argument that antitrust law should be reconceived to protect Adynamic® competition and innovation, see ANTITRUST, INNOVATION, AND COMPETITIVENESS (Thomas M. Jorde & David J. Teece eds., 1992).

<sup>491</sup> Hanna, *supra* note 490, at 422-27.

<sup>492</sup> Cf. Robert P. Merges & Richard P. Nelson, *Market Structure and Technical Advance: The Role of Patent Scope Decisions*, in ANTITRUST, INNOVATION, AND COMPETITIVENESS, *supra* note 490, at 185, 213-15 (arguing that patents in science-based industries should be given a narrow scope in order to prevent them from blocking future innovation).

the copyright or patent even before the term of the grant has expired.<sup>493</sup> The specialized doctrines of patent and copyright misuse are better tailored to maintain the correct balance of public and private interests.<sup>494</sup>

In short, the overbreadth of the patent misuse doctrine as currently formulated does not justify abandoning the concept of patent misuse altogether. Both economically and normatively speaking, the patent misuse doctrine serves important purposes that the antitrust laws do not. However, the expansive “abuse-it-and-lose-it” approach to the patent misuse doctrine, which rewards “true” infringers and penalizes the patentee for far more than its unlawful conduct, seems overly harsh. Given that the application of patent and copyright principles to computer programs is often uncertain, and millions of dollars can turn on the answers, misuse as to one class of alleged infringers should not cost the patentee its rights as to others. In the copyright context, several courts have required that would-be beneficiaries of a misuse defense show some nexus between their infringement and the copyright owner's inequitable conduct.<sup>495</sup> Courts considering patent misuse defenses should do the same.<sup>496</sup>

The real problem with application of the patent misuse defense in the context of lock-out is one that the antitrust laws do not address. If enforcement of a lock-out patent against would-be creators of interoperable software constitutes misuse, such legitimate competitors need not expend the effort to develop their own functional equivalents of the lock-out program. They can simply copy the patented program, with the only barrier being the difficulty of copying. Courts are thus faced with a new dilemma. Use of the lock-out program to exclude those seeking to create interoperable software impermissibly extends the scope of the grant, but allowing copying destroys

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<sup>493</sup> Cf. Durdik, *supra* note 453, at 464-66 (discussing social costs of broad copyright monopoly).

<sup>494</sup> Cf. Merges, *supra* note 488, at 797-98 (A patent misuse...helps maintain patent law's equitable symmetry, in a way that antitrust critics, unschooled in the structure and balance of patent law, have overlooked.®).

<sup>495</sup> See e.g., *Bellsouth Advertising & Publishing Corp. v. Donnelly Info. Publishing, Inc.*, 933 F.2d 952, 961 (11th Cir. 1991) (adopting an antitrust standard), vacated on *other grounds*, 977 F.2d 1435 (11th Cir. 1992), *on reh'g*, 999 F.2d 1436 (11th Cir. 1993) (seven-judge panel), *cert. denied*, 114 S. Ct. 943 (1994); *Supermarket of Homes v. San Fernando Valley Bd. of Realtors*, 786 F.2d 1400, 1408 (9th Cir. 1986). *But see* *Lasercomb Am., Inc. v. Reynolds*, 911 F.2d 970, 979 (9th Cir. 1990) (rejecting the notion that some nexus should be required).

<sup>496</sup> The Sixth Circuit has attempted to import notions of standing into the doctrine of patent misuse. See *Kolene Corp. v. Motor City Metal Treating, Inc.*, 440 F.2d 77, 85 (6th Cir.), *cert. denied*, 404 U.S. 886 (1971).



the patentee's incentive to develop new technological solutions. However, the disincentive that results from literal copying is not one that the patent misuse doctrine can address, because the patent laws do not protect literal code, but only the product or process it embodies.<sup>497</sup> As a practical matter, although the patent misuse defense may be available to some literal copiers, it will avail only the competitor who infringes by equivalent. A competitor who copies the literal code of a lock-out device will be liable for copyright infringement.<sup>498</sup>

## B. THIN COPYRIGHTS AND THE CONTRACTION OF THE COPYRIGHT MISUSE DEFENSE

When the focus of the misuse inquiry shifts from patent to copyright, the outcome is radically different. If copyright allows a competitor like Atari to duplicate all of the functional features of a copyrighted lock-out program, as I have argued it does,<sup>499</sup> it appears that there is no conduct left for the copyright misuse defense to reach.<sup>500</sup> If Atari takes only such expression as is necessary to

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<sup>497</sup> See 35 U.S.C. § 101. Literal copying maybe an equitable factor militating against application of the misuse doctrine in certain cases, such as scenario B discussed at text accompanying notes 479-81, 484-87, *supra*.

<sup>498</sup> See 17 U.S.C. § 106(1); *Apple Computer, Inc. v. Franklin Computer Corp.*, 714 F.2d 1240, 1246-48 (3d Cir. 1983), *cert. dismissed*, 464 U.S. 1033 (1984).

<sup>499</sup> See *supra* part III.

<sup>500</sup> The doctrine of copyright misuse has been defined largely by negative implication. Many courts have conceded that under some circumstances a copyright misuse defense might apply, but only two have ever applied it. *Lasercomb Am., Inc. v. Reynolds*, 911 F.2d 970, 976-77 (4th Cir.1990); *M. Witmark & Sons v. Jensen*, 80 F. Supp. 843, 850 (D. Minn.1948); see also *Atari Games Corp. v. Nintendo of Am., Inc.*, 975 F.2d 832, 846 (Fed. Cir.1992) (Atari could not invoke copyright misuse defense because of unclean hands) (applying Ninth Circuit law); *qad inc. v. ALN Assocs., Inc.*, 974 F.2d 836 (7th Cir. 1992) (no jurisdiction to review lower court dismissal of copyright misuse defense); *Bellsouth Advertising & Publishing Corp. v. Donnelly Info. Publishing, Inc.*, 933 F.2d 952, 961 (11th Cir.1991) (refusing to find copyright misuse absent an antitrust violation), *vacated on other grounds*, 977 F.2d 1435 (11th Cir.1992), *on reh-g* 999 F.2d 1436 (11th Cir.1993), *cert. denied*, 114 S. Ct. 943 (1994); *United Tel. Co. of Mo. v. Johnson Publishing Co.*, 855 F.2d 604, 610-12 (8th Cir.1988) (copyright misuse defense available, but not supported by the facts in this case); *Supermarket of Homes, Inc. v. San Fernando Valley Bd. of Realtors*, 786 F.2d 1400, 1408 (9th Cir.1986) (no evidence of required fraud or misconduct that might support a copyright misuse defense); *CBS, Inc. v. ASCAP*, 607 F.2d 543, 544-45 (2d Cir.1979) (remanding for reconsideration of music licensing practices as misuse), *cert. denied*, 450 U.S. 970 (1981); *Mitchell Bros. Film Group v. Cinema Adult Theater*, 604 F.2d 852, 865 (5th Cir.1979) (copyright misuse defense may apply in some cases, but not this one), *cert. denied*, 445 U.S. 917 (1980). Consequently, academic commentators continue to debate whether the copyright misuse defense exists. See, e.g., Hanna, *supra* note 490; Philip Abromats, Note, *Copyright Misuse and Anticompetitive Software Licensing Restrictions: Lasercomb America, Inc. v. Reynolds*, 52 U. PITT. L. REV. 629 (1991). This Article takes the Second, Fourth, Fifth, Seventh, Eighth, Ninth, Eleventh, and Federal Circuits at their word and assumes that the defense exists in some form. There is considerable disagreement among the courts as to the nature and scope of the copyright misuse defense. Compare *Bellsouth*, 933 F.2d at 961 (requiring antitrust violation) and *Supermarket of Homes*, 786 F.2d at 1408 (requiring some nexus between the conduct alleged to be a misuse and the infringing conduct) with *Lasercomb*, 911 F.2d at 979 (no antitrust violation or nexus required). Because this Article concludes that installation of a lock-out program is not copyright misuse per se, it takes no position on that question.

allow it to duplicate interoperability-related processes and routines, there is no infringement. If Atari takes creative expression as well, Nintendo's assertion of its copyright to protest the qualitative difference in Atari's copying is not a misuse.<sup>501</sup> This section considers whether this contraction of the copyright misuse defense is justified in view of lock-out's exclusionary purpose, and, if so, whether the doctrine of copyright misuse retains any independent force in lock-out cases.

A lock-out program is, in a sense, a creative work designed to frustrate the production of other creative works. Lock-out programs are specifically designed to make copying and reverse engineering as difficult as possible.<sup>502</sup> The installation of a lock-out program in a computer system constitutes an attempt by the copyright owner to dictate who may create works based on a particular set of functional principles and who may not. Nintendo and Sega used their devices to control the number and selection of video games interoperable with their consoles<sup>503</sup>; in the future, the manufacturer of the "set-top box" that serves as my gateway to the "information superhighway" might use a lock-out program to control the number and selection of on-line services that I may access from my living room. Arguably, allowing any enforcement of copyright in a lock-out program against would-be creators of interoperable programs offends core principles of copyright by preventing or reducing the likelihood of the development and dissemination of new creative works. Under this view, such enforcement would constitute misuse *per se*, even if the competitor has taken creative expression.

From the programmer's perspective, however, the difficulty of reverse engineering a lock-out program is one measure of its creativity. According copyright protection to a newer and more ingenious lock-

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<sup>501</sup> Under the approach to copyright adopted by the *Atari* court, the concept of misuse plays a more central role. If copyright does *not* allow functional duplication, enforcement of the 10NES copyright has the same effect as enforcement of the 10NES patent. It denies would-be competitors in the market for NES-compatible games access to the unpatented console. In that case, the analysis of the scope of the copyright misuse defense parallels that set forth in Part V.A, *supra*.

<sup>502</sup> See *supra* text accompanying note 15.

<sup>503</sup> See *supra* text accompanying notes 26-27 (discussing Sega's and Nintendo's licensing practices).

out program rewards and encourages this creative effort.<sup>504</sup> A misuse allegation by an inartful reverse engineer thus pits two fundamental copyright principles—the rule against monopoly of functional principles<sup>505</sup> and the incentive structure for encouraging the production and distribution of new creative works—squarely against one another.

Ultimately, allowing the difficulty of reverse engineering to justify a finding of misuse would beg the question why the difficulties inherent in reverse engineering an operating system should be treated differently. Reverse engineering an operating system, or any other computer program distributed in object code, is difficult.<sup>506</sup> A lock-out program simply builds in another layer of programming that a reverse engineer must decipher, and another sequence whose function must be duplicated while avoiding substantial similarity to protected matter in the original. Moreover, given the short market life of many computer programs, increasing the difficulty of reverse engineering arguably promotes the purposes of copyright. Lock-out routines that are difficult to reverse engineer increase the copyright owner's lead time over would-be developers of interoperable products. The freedom to develop difficult lock-out routines thus increases the likelihood that the copyright owner will be able to recoup its initial investment before competing products developed through reverse engineering enter the market.<sup>507</sup> Accordingly, the added difficulty of reverse engineering a lock-out program is not something that the

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<sup>504</sup> Given the powerful market incentives for the development of lock-out programs, it is quite possible that such programs fall within the class of non-copyright-induced works and that no additional incentives need be provided by copyright law to encourage their creation. However, it is impossible to determine with certainty whether a particular computer program is primarily copyright-induced or market-induced, and there is a strong countervailing argument. Lock-out programs are important to their owners in large part because copyright protection can be invoked against copiers. It is likely, then, that the availability of copyright protection at least contributes to the inducement of lock-out programs. See Oddi, *supra* note 16, at 378-83.

<sup>505</sup> See *Sega Enters. Ltd. v. Accolade, Inc.*, 977 F.2d 1510, 1526 (9th Cir. 1992) (citing *Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141, 159-64 (1989)), *as amended*, 1993 U.S. App. LEXIS 78 (9th Cir. 1993).

<sup>506</sup> See Johnson-Laird, *supra* note 12, at 864-81.

<sup>507</sup> See Hanna, *supra* note 490, at 430-31; Karjala, *Computer Documents*, *supra* note 6, at 984-85; Samuelson et al., *Manifesto*, *supra* note 19, at 2337-42. Professor Leaffer has argued that holding anti-reverse engineering measures to constitute copyright misuse would harm industry competitiveness by forcing disclosure of trade secret information. Leaffer, *supra* note 13, at 1104-06. However, the copyright laws should not be used to protect trade secrets, which are unprotectable know-how that may lawfully be reverse engineered. See Samuelson et al., *Manifesto*, *supra* note 19, at 2355-56 & n.191. For discussion of the ways in which copyright protection for computer programs and Copyright Office registration and deposit practices currently serve a trade secrecy function, see McManis, *supra* note 76, at 67-69; Rice, *Sega and Beyond*, *supra* note 16, at 1156-57, 1163-64; and Samuelson, *CONTU Revisited*, *supra* note 16, at 715-19.

copyright law should recognize as a ground for a finding of misuse. Such a rule would have a chilling effect on the innovation that the law seeks to encourage. The Copyright Act may shelter the reverse engineer's efforts, but it does not forbid the copyright owner from making those efforts more difficult.

If the reverse engineer who takes protected expression in the course of duplicating unprotectable functionality may not argue difficulty as grounds for invoking the copyright misuse defense, what becomes of the copyright misuse defense in interoperability-related cases? Although the right to duplicate functional features of copyrighted computer programs significantly narrows the scope of the defense, it does not eliminate it entirely. Would-be creators of interoperable programs who choose to license the lock-out technology rather than reverse engineer it may be able to invoke the copyright misuse defense to challenge the console manufacturer's license agreement.<sup>508</sup> The fact that a reverse engineering option is available should not justify the imposition of contractual terms that amount to copyright misuse on software developers who, for whatever reason, choose not to avail themselves of the reverse engineering process.

It has been argued that the license restrictions in *Atari* and *Sega* actually furthered the distribution of creative works by enabling Nintendo and Sega to charge lower prices for their consoles, which in turn enabled more consumers to buy them. Under this theory, such licenses serve as variable-proportion tying arrangements that further the purpose of copyright by promoting overall "product diffusion."<sup>509</sup> Economically, that argument rests on the dubious assumption that courts should look to the total number of games distributed, rather than the number of *different* games available, in making that determination. The two measures are neither equivalent nor fungible, and maximizing the former number will not necessarily maximize the latter.<sup>510</sup> To the contrary, the licensing policies adopted by Sega and Nintendo impose a ceiling on the number of different games that will be approved for manufacture, and thus effect a decrease in the variety of games that would otherwise be available for purchase. Moreover, it

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<sup>508</sup> See, e.g., *Lasercomb Am., Inc. v. Reynolds*, 911 F.2d 970 (4th Cir. 1990); *Supermarket of Homes, Inc. v. San Fernando Valley Bd. of Realtors*, 786 F.2d 1400, 1408 (9th Cir. 1986). The right to create interoperable programs also leaves untouched the defense of fraud on the Copyright Office, which played such a critical role in favor of the copyright holder in *Atari*.

<sup>509</sup> See Hanna, *supra* note 490, at 432-35.

<sup>510</sup> See William M. Landes & Richard A. Posner, *An Economic Analysis of Copyright Law*, 18 J. LEGAL STUD. 325, 348 (1989).

strains credulity to argue that the purposes of copyright are served by a system that allows the console manufacturer to use its control over the uncopyrightable functional principles on which the console operates to dictate which creative works may be developed and distributed, and who may develop them. License agreements that restrict the development of interoperable products in the purported interest of product diffusion do not automatically or necessarily further the purposes of copyright, and should be scrutinized carefully to ensure that they do not have the opposite effect.

## VI. CONCLUSION: REFLECTIONS ON THE MODELS FOR INTELLECTUAL PROPERTY PROTECTION OF COMPUTER PROGRAMS

Where does this exploration of the intellectual property issues surrounding lock-out programs leave us? As I indicated at the outset, I believe that it enables a systematic and concrete assessment of whether copyright and patent protection for computer programs, as currently understood and applied, serves the purpose of “promot[ing] the progress of science and the useful [a]rts.”<sup>511</sup> Those questions are important because they affect the competitive structure of an entire industry, and, ultimately, each of us as consumers, whether of home entertainment systems, “set-top boxes,” or some other product yet to be conceived. If closed proprietary platforms and lock-out programs become more common, competition and innovation cannot continue to thrive without systematic rethinking of the way that intellectual property protection for computer programs is conceived and enforced.

As this Article has explained, a computer program, such as the 10NES, that satisfies the PTO's standard for novelty is currently protected under both patent and copyright law—that is, both as a useful invention and as a creative work. That result was largely fortuitous; the debates over copyright and patent protection for computer software, though roughly contemporaneous, were conducted by separate groups. The result was dual protection for computer programs, with virtually no attention paid to the potential consequences of the overlap.<sup>512</sup>

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<sup>511</sup> U.S. CONST. art. 1, § 8, cl. 8.

<sup>512</sup> Indeed, CONTU recommended copyright protection for computer programs in part because it doubted whether computer programs would be held patentable. CONTU, FINAL REPORT, *supra* note 4, at 17.

It has been argued that the overlap between patent and copyright protection for computer programs represents “a failure of consideration for the original patent grant” or “a form of ‘double patenting,’ ” because the protection afforded by copyright extends beyond the term of the patent.<sup>513</sup> That is true only if, as in *Atari*, copyright and patent are construed to protect the same program features. There is no reason that an individual cannot be both inventor and author, and that a computer program cannot constitute both a useful invention and a creative work. However, both designations cannot apply to the same element, and in particular, copyright protection cannot be invoked to bar duplication of functional program features that are protectable, if at all, only under the patent system.<sup>514</sup> For the copyright/patent overlap not to result in an unconstitutional failure of consideration, all functional program features of a patented computer program must enter the public domain when the term of the patent expires.<sup>515</sup> Put differently, under the current scheme of intellectual property protection for computer programs, the overlap between copyright and patent requires that the respective spheres of protection be clearly defined so that they are mutually exclusive, and so that neither sphere protects unpatentable, uncopyrightable ideas or mathematical principles.

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<sup>513</sup> Michael J. Kline, *Requiring An Election of Protection for Patentable/Copyrightable Computer Programs* (pt. II), 67 J. PAT. & TRADEMARK OFF. SOC'Y 339, 340-51 (1985).

<sup>514</sup> See Karjala, *Computer Documents*, *supra* note 6, at 983-97. The Federal Circuit's opinion in *Atari* recognized this principle of complementarity. *Atari Games Corp. v. Nintendo of Am., Inc.*, 975 F.2d 832, 839-40 (Fed. Cir. 1992). Unfortunately the district court ignored its guidance in evaluating Nintendo's copyright infringement claim. See *supra* text accompanying notes 279-80.

<sup>515</sup> This conclusion also disposes of the related argument that the disparity between the statutory terms of patent and copyright protection is itself illegal. See Kline, *supra* note 513, at 341. If copyright and patent protect different aspects as they must, whether one type of protection outlasts the other is irrelevant from a constitutional perspective. It may be that the terms of protection granted the same that apply to other copyrightable works or patentable inventions cover reward when considered in light of the relatively short commercial life of most computer programs and the rapid and cumulative nature of advances within the industry. Menell, *Application Programs*, *supra* note 16, at 1057-61. Historically, both the Copyright Act and the Patent Act have specified that all covered works receive terms of equal length. See 17 U.S.C. ' 302 (1988) (copyright extends for life of the author plus 50 years, or 75 years for works that are anonymous, pseudonymous, or for hire); 35 U.S.C. ' 154 (1988) (patent term is 17 years). In neither case does the Constitution mandate that result. The terms of protection for computer program-related works or inventions could easily be shortened.

It also may be that dual protection for computer programs confers more protection than necessary to induce their creation and distribution. If true, this would be a strong argument for a *sui generis* scheme of protection for these intellectual property rights. See Samuelson et al., *Manifesto*, *supra* note 19, at 2356-65.

The status of intellectual property protection for computer programs is shifting. In computer copyright cases, the trend is increasingly toward recognizing that copyright affords only “thin” protection.<sup>516</sup> In contrast, although some structural changes are underway at the PTO that will affect the initial processing of computer program-related applications, the Federal Circuit commitment to an expansive approach to patentability has grown more entrenched. Among commentators and legal scholars, the past decade has seen a groundswell of criticism for both legal frameworks, but, so far, little consensus on the appropriate solution. Some favor *sui generis* protection,<sup>517</sup> others advocate a copyright-based system,<sup>518</sup> and still others argue that a patent-based system is preferable.<sup>519</sup> From a political perspective, the likelihood of systemic or paradigmatic change in the mode of intellectual property protection of computer programs is small, because international accords regarding the source of protection for computer programs have taken shape based on the existing copyright and patent models.<sup>520</sup> As a practical matter, then, the options have been narrowed. The question, at least for the immediate future, is not whether a *sui generis* scheme of protection will be adopted, but whether and how to fine-tune the models we have.

Based on analysis of the interoperability and lock-out problems, I have attempted to set forth a blueprint for appropriate and desirable changes. I have argued that computer programs should be identified within the existing framework of the Copyright Act as a *sui generis* category of copyrightable works, and that the fair use doctrine should be reconceived to include intermediate copying solely to gain knowledge and understanding as a protected, “enabling” use. I have argued, as well, that section 102(b) functionality, rather than limited and inapposite doctrines such as *scènes à faire* or inherently slippery concepts of current and future use, should be the touchstone by which duplication of nonliteral program elements is evaluated. On the patent side, I have advocated adoption of an “innovative programmer” standard for judging the novelty and nonobviousness of computer program-related inventions, to preclude patentability for unprotectable

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<sup>516</sup> See *supra* part III.A.

<sup>517</sup> See, e.g., Samuelson et al., *Manifesto*, *supra* note 19, at 2356-65.

<sup>518</sup> See, e.g., Symposium, *supra* note 236, at 758-63 (comments of Prof. Rochelle Cooper Dreyfuss).

<sup>519</sup> See, e.g., Oddi, *supra* note 16.

<sup>520</sup> See Samuelson et al., *Manifesto*, *supra* note 19, at 2313 nn.7-8 (summarizing international accords).

mathematical and physical principles implemented via general purpose computing equipment. Finally, I have recommended that use of a patented lock-out program to exclude competing software developers from unpatented computer systems be deemed a misuse of the patent. Taken together, these changes are designed to ensure that intellectual property protection for lock-out programs in particular, and computer programs in general, will not protect what is unprotectable under copyright law, patent law, or both.

The preliminary report released by the Working Group on Intellectual Property Rights, an arm of the Clinton administration's Information Infrastructure Task Force, sets forth a very different vision of the future of computer program-related intellectual property rights.<sup>521</sup> Among other things, the Working Group has proposed changes to the copyright laws that would ban and criminalize the manufacture or importation of technology designed to defeat "anti-copying" devices installed in computer software.<sup>522</sup> Unmentioned in the report is the fact that the proposed changes would effectively eliminate the reverse engineering right recognized by the courts, and so render wholly academic the right to develop interoperable programs that follows from the language of section 102(b) of the Copyright Act.<sup>523</sup> As an initial matter, if the intellectual property laws are to be changed in a way that would deprive the public of rights it currently has, that fact should be admitted. More fundamentally, the Working Group's proposal to make copyright protection for computer programs virtually ironclad ignores the role of the patent system and the constitutional significance of the two-tiered patent/copyright model of protection for intellectual property rights.

Rarely in the development of any body of law have the lines of conflict been so clearly and acrimoniously drawn. Fearing the effect on nuanced, carefully developed bodies of law, some of the leading copyright and patent scholars have strenuously opposed any changes in copyright or patent doctrines premised on acknowledgment that computer programs are different from other covered works. Professor Miller envisions the gradual erosion of the idea-expression distinction

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<sup>521</sup> INFORMATION INFRASTRUCTURE TASK FORCE, INFORMATION POLICY COMMITTEE, WORKING GROUP ON INTELLECTUAL PROPERTY RIGHTS, INTELLECTUAL PROPERTY AND THE INFORMATION INFRASTRUCTURE, THE PRELIMINARY DRAFT OF THE WORKING GROUP ON INTELLECTUAL PROPERTY RIGHTS (1994).

<sup>522</sup> *Id.* at 100-04.

<sup>523</sup> For a thorough critique of this and other aspects of the report, see Pamela Samuelson, *Legally Speaking: The NII Intellectual Property Report*, COMM. OF THE ACM, Dec. 1994, at 21.



as a result of according “thin” copyright protection to computer programs; Professor Chisum and Judge Rich resist the exclusion of obviously artificial “processes” from the class of potentially patentable works, and foresee the disintegration of patent protection as claims are parsed ever more narrowly.<sup>524</sup> On the other side of the debate, opponents of copyright or patent protection for computer programs are increasingly adamant about the current systems’ inability to adapt to this particular technological change. One eminent computer scientist, responding to Professor Chisum’s call for sanity and a return to time-honored first principles of patent law, answered as follows: “The Models Are Broken!”<sup>525</sup>

Both sides are right to fear the consequences of expanding intellectual property doctrines to encompass computer programs, but, I believe, wrong about what will avoid the apocalypse. All models are by nature imperfect, but (as *Sega*, *Altai*, and *Flook* demonstrate) the core doctrines governing copyrightability, patentability, and the scope of copyright and patent protection remain vital and resilient. In order to avoid doing violence to these basic models, which have proved so well-suited to the other “sciences” and “useful arts,” new rules and new exceptions for computer programs must be incorporated into the models. The law must adjust to accommodate computer programs, so that the models will not break. As I have argued throughout this Article, the adjustments required are not wrenching, and are themselves based on fundamental precepts of copyright and patent protection that require excluding functional principles from the ambit of copyright and keeping mathematical algorithms in the public domain. The adjustments suggested are to secondary copyright and patent doctrines developed to effectuate those purposes. It would be surprising, given the faith placed in the models by their self-appointed guardians, if the models were not strong enough to bear the weight of these changes.

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<sup>524</sup> Rounding out the picture, and contributing substantially to the acrimony, are the Working Group on Intellectual Property Rights and various industry lobbying associations, which for the most part appear to view strong intellectual property protection for computer programs as a pure trade issue devoid of constitutional or philosophical significance. *See* sources cited in note 211, *supra*. The intellectual property laws cannot be so easily divorced from their constitutional and philosophical foundations. The debate over the proper application of copyright and patent doctrines to computer programs cannot be resolved without resort to first principles.

<sup>525</sup> Newell, *supra* note 315.