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## Copyrightability of Object Code and ROM in Japan, Australia, and Germany: Surpassing Traditional Copyright Limits, 6 Computer L.J. 513 (1985)

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# COPYRIGHTABILITY OF OBJECT CODE AND ROM IN JAPAN, AUSTRALIA, AND GERMANY: SURPASSING TRADITIONAL COPYRIGHT LIMITS\*

Computer software<sup>1</sup> is an intellectual product which has been rapidly and continuously evolving and expanding over the past several decades.<sup>2</sup> This growth of software technology has given rise to a multibillion-dollar international industry<sup>3</sup> devoted to the development and maintenance of software systems. This tremendous expansion of software and software research has also presented the international legal community with the problem of how best to protect proprietary interests in computer software and software derivatives such as firmware—integrated circuit chips imprinted with a computer program.<sup>4</sup>

Comprehensive international proprietary protection is necessary because the development of computer software and firmware requires large investments of time and money.<sup>5</sup> The creation of software and firmware relies primarily on human rather than mechanical capabilities, so “[a]s a result, many individuals and corporations in the computer

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\* National Second Place, Second Annual Computer Law Writing Competition.

1. Software generally includes programs, supporting documentation, flow charts, tapes, records, systems, compilers, and even definitions of computer languages. A. RALSTON & C. MEEK, *ENCYCLOPEDIA OF COMPUTER SCIENCE* 771 (1976). In this Note, software refers primarily to the programs needed to make a computer perform an intended task.

2. Note, *International Copyright Law Applied to Computer Programs in the United States and France*, 14 *LOY. U. CHI. L.J.* 105, 105 (1982) [hereinafter cited as Note, *International Copyright Law*].

3. International Bureau of the World Intellectual Property Organization & Advisory Group of Governmental Experts on the Protection of Computer Software, *Model Provisions on the Protection of Computer Software*, *COPYRIGHT*, Jan. 1978, at 7 [hereinafter cited as WIPO Report].

4. Firmware represents a hybrid of software and hardware. Hardware is the body of the computer and consists of the physical mechanisms of the computer. Firmware usually refers to “a small integrated circuit ‘chip’ which has been imprinted with a program or data, and which is then incorporated into the computer hardware.” Note, *Copyright Protection for Firmware: An International View*, 4 *HASTINGS INT’L & COMP. L. REV.* 473, 473-74 n.2 (1981) [hereinafter cited as Note, *Copyright Protection*].

5. *Id.* at 475.

industry have found original software development cost[s] prohibitive and have been tempted instead to misappropriate proprietary software [and firmware] for their own marketing purposes."<sup>6</sup> Computer programs, whether as software or firmware, are essentially information and are easily reproduced.<sup>7</sup> Like other forms of information, computer programs are highly mobile and may readily be transmitted from one country to another. They are, therefore, vulnerable to misappropriation across national borders.<sup>8</sup>

The world-wide interest in protecting computer programs, software, and firmware is increasing due to current industrial trends. The percentage of software cost as part of the total cost of a computer system is now estimated at seventy percent. The cost of microcomputers and other computers is decreasing, thus resulting in widespread computer use, especially in small businesses and homes. Finally, the development of standardized computer programs and the reduction of the number of programs written for a single user or computer provides a substantially larger market for pirated programs.<sup>9</sup>

While the debate over the appropriate form of the protection of computer programs has been raging for over twenty years, there remains a broad range of solutions<sup>10</sup> involving primarily patent, unfair competition or trade secret, copyright, and other registration systems.<sup>11</sup> Currently, however, there is no integrated, systematic approach to proprietary protection of computer programs, software, or firmware in most nations, let alone at the international level. The field of computer law, and specifically legal protection of intellectual computer property, is still evolving as a new legal specialty.<sup>12</sup> Progress towards a unified scheme for the protection of intellectual computer property is advancing slowly, despite the dissatisfaction with each of the various proposed schemes and alternatives. A consensus is emerging towards a system akin to copyright, the preferred method of intellectual computer property protection in the United States,<sup>13</sup> though the question of registration and other problems still exist in the copyright area.<sup>14</sup>

This Note analyzes the international developments in copyright protection for computer programs by focusing on the protection given to

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6. Note, *International Copyright Law*, *supra* note 2, at 106.

7. B. NIBLETT, *LEGAL PROTECTION OF COMPUTER PROGRAMS* 2 (1980).

8. *Id.* at 89.

9. See Note, *Copyright Protection*, *supra* note 4, at 475.

10. See Kolle, *Computer Software Protection—Present Situation and Future Prospects*, *COPYRIGHT*, Mar. 1977, at 70.

11. Note, *Copyright Protection*, *supra* note 4, at 476.

12. Raysman, *Of Computers and the Law*, *N.Y. Times*, Sept. 14, 1980, at F18, col. 3.

13. Note, *International Copyright Law*, *supra* note 2, at 107-08.

14. C. TAPPER, *COMPUTER LAW* 41 (3d ed. 1983).

object code<sup>15</sup> and read only memory (ROM)<sup>16</sup> in Japan, Australia, and West Germany. This Note generally discusses the benefits of copyright over other systems of protection for computer programs, but then draws attention to the limits of copyright protection if object code and ROM are left unprotected. After examining how a comparative analysis of major world trends of object code and ROM copyrightability is useful for evaluating the efficacy of international copyright protection for computer programs, the Note compares the international remedies available for copyright infringement and compares the international obstacles to copyright protection for object code and ROM. This Note then considers the effect of international copyright treaties. Finally, the Note concludes that the world trend is towards object code and ROM copyrightability, and that if this trend continues, copyright protection for computer programs will not only be desirable, but will also provide the most acceptable form of world-wide protection.

### I. COPYRIGHT PROTECTION

The focus on copyright-like protection stems, in part, from the inability of the other forms of protection, such as patent or trade secret, to meet basic protection objectives. The basic rationale of intellectual property protection systems in most of the world is the balancing of the needs of society, which desires full dissemination of new and useful

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15. A program consisting of a sequence of machine language is referred to as "object code." Object code is the original program broken down into its simplest form, and the only form in which the program's commands are directly understood by the machine and carried out. When printed, object code reads as a series of ones and zeros representing, respectively, the presence or absence of an electrical signal. This series is meaningless to most human beings.

Programs that are written in languages that more closely resemble English are referred to as source code (or source programs) and are considered to be written in "high-level" language. In order for the computer to execute a program, the source code must be translated into object code. A compiler translates source code into object code. Object code can also be written directly, but with greater difficulty than the writing of source code.

16. There are two kinds of memory in personal and other computers—random access memory (RAM) and read only memory (ROM). ROM has two variants: programmable ROM (PROM) and erasable, programmable ROM (EPROM). ROM usually refers to a memory device whose contents are permanently fixed by the manufacturer; the memory can only be read, not erased or rewritten. RAM, on the other hand, is "volatile" and only stores information while the computer is turned on; the information is lost when the computer is turned off. PROMs and EPROMs can be programmed at any time and allow the programmer himself to permanently store a program.

The ROM is usually a silicon chip physically implanted in the computer's circuit board and is comprised of thousands of semiconductor transistors. Transistors are on and off switches, which are represented by bits—the ones and zeros in a computer program. To be used in a computer, object code must be stored in a memory device such as a floppy disk, magnetic tape, or ROM.

ideas in order to assure sufficient management of its resources, and the proprietor (of computer software, for example), who seeks protection of his investment of time, thought, and money.<sup>17</sup>

#### A. PATENT PROTECTION

Patent protection for computer programs has serious weaknesses. In the United States, any software or firmware would have to meet a very high standard of nonobviousness, novelty, and usefulness to qualify for patent protection,<sup>18</sup> but it has been estimated that only one percent of computer programs are sufficiently inventive enough to satisfy these patent requirements.<sup>19</sup> Many of these standards are accepted throughout the industrialized world,<sup>20</sup> so certain countries exclude programs or software from patentability.<sup>21</sup> The European Patent Convention excludes computer programs from the definition of "invention,"<sup>22</sup> as does the 1973 Munich Patent Convention.<sup>23</sup> West Germany, for example, conforms to these conventions.<sup>24</sup> In Japan, patent will protect programs that are a part of an otherwise patentable method, but will not protect the large majority of programs that relate solely to calculations or those programs that are noninventive.<sup>25</sup>

In countries such as Japan or the United States, there is a large backlog of applications for patents. The average time from the filing of a patent to the issuing of a patent is approximately three years. This time period is longer than the two to three years of useful life for many programs.<sup>26</sup> This time lapse negates the practical effect of the advantageous monopoly granted by patents, since patents are limited to relatively short time periods, usually between ten and twenty years. Thus, most programs could become obsolete before receiving protection. An-

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17. Note, *World-Wide Protection of Computer Software: An Analysis of the WIPO Draft Proposal*, 2 N.Y.J. INT'L & COMP. L. 278, 281-82 (1981) [hereinafter cited as Note, *World-Wide Protection*].

18. See 35 U.S.C. §§ 101-103 (1982).

19. WIPO Report, *supra* note 3, at 2.

20. See Soltysinski, *Computer Programs and Patent Law: A Comparative Study*, 3 RUTGERS J. COMPUTERS & L. 1, 13 (1973).

21. Certain countries, including France, Poland, and Mexico, do not allow programs to be patented, while other countries, including Australia, The Netherlands, Sweden, Switzerland, and the socialist countries, do not allow software to be patented by other than legislative means. See Kollé, *supra* note 10, at 72.

22. Note, *Copyright Protection*, *supra* note 4, at 481.

23. See Note, *World-Wide Protection*, *supra* note 17, at 290 n.61.

24. See Betten, *Observations on the Legal Protection of Computer Programs in the Federal Republic of Germany*, INDUS. PROP. 31 (1983).

25. Note, *Copyright Protection*, *supra* note 4, at 482.

26. WIPO Report, *supra* note 3, at 8; see also Note, *Copyright Protection*, *supra* note 4, at 481-82.

other concern is that even if the granting of patents could encourage large-scale investment through the exclusive monopoly patents provide, the additional cost of obtaining a patent (\$2,500 to \$5,000)<sup>27</sup> and of policing and preventing infringement would benefit only the larger firms that could afford these extra costs.<sup>28</sup>

#### B. TRADE SECRET PROTECTION

The use of trade secrets to provide proprietary protection, while widely used, has serious drawbacks.<sup>29</sup> Usually, the holder of a trade secret is protected against unauthorized disclosure or use of the trade secret by those to whom the secret has been confided under the terms of an agreement. Trade secret laws, however, do not protect against discovery by fair and honest means, by one not in a confidential relationship, by independent investigation, or by accidental discovery.<sup>30</sup>

Once a trade secret is disclosed or discovered and becomes public, all protection under trade secret is lost. Hence, trade secret is not suitable for widely-distributed materials and is not effective in large-scale markets since maintaining secrets is costly. This is a result of development and enforcement costs since using trade secret causes a reduction in the possibilities of business transactions, a restriction of market information and techniques, and an inhibition of market entry.<sup>31</sup> Trade secret, however, has its advantages, because it allows for continual adaptation to rapidly changing situations and new technologies. Such flexibility, however, renders development of trade secret protection for computer programs, software, and firmware haphazard and incoherent, thus resulting in confusing and overly broad laws.<sup>32</sup>

#### C. THE CASE FOR COPYRIGHT

Copyright, with proper adjustments, may compensate for the shortcomings of patent and trade secret and may be the best means of protecting software and firmware. Copyright protects the expression of an idea, but not the underlying idea.<sup>33</sup> Since most software and firmware

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27. See Note, *Copyright Protection*, *supra* note 4, at 481 n.50.

28. C. TAPPER, *supra* note 14, at 11.

29. "A trade secret may consist of any formula, pattern, device or compilation of information which is used in one's business, and which gives him an opportunity to obtain an advantage over competitors who do not know or use it." RESTATEMENT OF TORTS § 757 comment b (1939).

30. Note, *Copyright Protection*, *supra* note 4, at 484-85.

31. Note, *World-Wide Protection*, *supra* note 17, at 292-93.

32. C. TAPPER, *supra* note 14, at 21-22.

33. "[T]he expression adopted by the programmer is the copyrightable element in a computer program, and . . . the actual processes or methods embodied in the programs are not within the scope of the copyright law." S. REP. NO. 473, 94th Cong., 1st Sess. 54 (1975).

are written or express ideas, it seems that copyright is the most appropriate form of proprietary protection for computer programs, software, and firmware.<sup>34</sup>

Copyright already fills some of the gaps of patent and trade secret protection. While the originality requirement for copyright is less stringent than that required for a patent,<sup>35</sup> a program with very few obvious steps would not meet the requirement of sufficient originality.<sup>36</sup> The cost of copyright registration (\$10) is minimal compared with the cost of obtaining a patent (\$2,500 to \$5,000), and copyright registration involves few, if any, formalities.<sup>37</sup> Unlike trade secret, copyright may be used for a work which enjoys wide-spread dissemination, since as long as an infringer can be identified, copyright may be asserted and will not be vitiated by proliferation.<sup>38</sup>

There are a number of problems that arise regarding copyright protection for software. In the majority of countries, copyright terms last for the equivalent of the life of the author plus fifty years after the author's death.<sup>39</sup> For software, such duration is extraordinary and is seen as potentially advantageous.<sup>40</sup> There is a contrary sentiment, however, that the term for software far exceeds the marketable life-span (two to three years) of a program, resulting in duplicated effort, because program designers are prevented from using a discarded program to aid in developing new or updated versions. Another disadvantage is that policing copyright infringements becomes more difficult as the degree of proliferation increases.<sup>41</sup>

#### D. OBJECT CODE AND ROM UNDER COPYRIGHT: A MAJOR UNCERTAINTY

One of the major uncertainties accompanying copyright protection for computer programs is whether object code falls within the scope of copyright, and if so, whether object code embodied in ROM-integrated circuit chips and other similar memory storage devices (such as tape,

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34. C. TAPPER, *supra* note 14, at 13; Note, *World-Wide Protection*, *supra* note 17, at 293; Note, *Copyright Protection*, *supra* note 4, at 486.

35. See Note, *World-Wide Protection*, *supra* note 17, at 293.

36. Note, *Copyright Protection*, *supra* note 4, at 488 n.111.

37. D. BENDER, 1 COMPUTER LAW § 4.09[1], at 4-124 (1985). For example, under the Australian Copyright Act of 1968, no system of registration or accompanying administration practices is provided. Lahore, *Computers and the Law: The Protection of Intellectual Property*, 9 FED. L. REV. 15, 27 (1978). Germany and Japan make registration optional. Note, *Copyright Protection*, *supra* note 4, at 499-502.

38. D. BENDER, *supra* note 37, § 4.09[1], at 4-124.

39. D. CHISUM, INTELLECTUAL PROPERTY: COPYRIGHT, PATENT AND TRADEMARK § 3.06, at 3-56 (1981).

40. D. BENDER, *supra* note 37, § 4.09[1], at 4-124.

41. *Id.* § 4.09[2], at 4-125.

disk, or semiconductor storage) are appropriate copyright subject matters. Whether object code and ROM are copyrightable is not solely an academic issue, since it also entails far-reaching implications for the computer and software industries. Because of recent advances in microelectronic technology and the concomitant development of a consumer market for personal microcomputers, it has become necessary for software to be available to lay users.<sup>42</sup> One consequence of this development is that most software vendors now sell programs in object code form,<sup>43</sup> which must be stored in a memory device such as a ROM. When programs are released in a general market where reproduction is both essential and easy,<sup>44</sup> vendors or authors of computer programs prefer to sell object code rather than source program, since it is more difficult for pirates to extract the fundamental ideas of the programs from object code and write programs to perform the same functions in a different computer language or in the same language with variations.<sup>45</sup> If the object code were to be copyrightable, it would be extremely difficult for a pirate to unlock or reproduce a program's particular secrets without infringing the copyright,<sup>46</sup> thus protecting the original developer (assuming that the source program was also copyrighted).

A related problem occurs when a copyrighted source program is embodied in ROM as object code with the ROM being duplicated without being translated back into source code. If the ROM is not copyrightable, then the original developer or owner would not be protected against a person who duplicates the ROM and who then contends that the duplicate "is not a 'copy' of the copyrighted source program, and therefore not an infringement of the copyright."<sup>47</sup>

Personal computer manufacturers who enjoy market dominance are especially susceptible to this problem.<sup>48</sup> Their computers are capable of running a great variety of software, most of which is written by other companies and individuals. In order to compete against the dominant computer companies, smaller computer manufacturers must produce computers that are compatible with those of the large manufacturers. In order to enable their computers to run the software designed for the computers of the larger manufacturers, the smaller

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42. C. TAPPER, *supra* note 14, at 182.

43. Note, *Copyright Protection of Computer Program Object Code*, 96 HARV. L. REV. 1723, 1724 (1983) [hereinafter cited as Note, *Protection of Object Code*].

44. C. TAPPER, *supra* note 14, at 182.

45. McKenzie, *Computer Programs and Copyright Law: The Object Code Controversy*, 11 SAN FERN. V.L. REV. 1, 4 (1983).

46. *Id.*

47. *Id.*

48. Comment, *Copyright Protection for Programs Stored in Computer Chips: Competing with IBM and Apple*, 7 HAMLINE L. REV. 103 (1984).



manufacturers must develop or obtain operating systems that are identical or substantially similar to the operating systems typically stored as object code in the ROMs of the computers of the larger manufacturers. The smaller manufacturers may accomplish this by duplicating the larger manufacturers' ROMs directly and incorporating the duplications into their own computers.<sup>49</sup> Unless the ROMs are copyrightable, the larger manufacturers would be left vulnerable to the pirating of their operating systems by smaller manufacturers that lack the incentive to create new systems. This situation thus potentially reduces innovation and productivity in the computer software industry. Keeping ROM and object code from being copyrighted would negate all rights in the program, since the program could be stolen electronically without ever infringing copyright or other laws. The determination as to whether object code and ROM are entitled to copyright protection is of substantial practical significance to the expanding computer industry and market and will undoubtedly have an impact on their future development.

The issue of whether object code and ROM are copyrightable goes to the heart of copyright, where "[t]he crucial issue in theory and practice is . . . the delimitation of what can and should, cannot or should not, be included in copyright protection."<sup>50</sup> The copyright status of ROM and object code is an important issue in determining whether copyright or copyright-like protection is indeed an appropriate and meaningful form of proprietary protection for computer programs, software, and firmware. If the world-wide trend is to deny copyright for object code or ROM, or if the traditional copyright framework cannot be stretched beyond its current limits to cover these new technologies, then it is questionable whether there should be a preference for copyright over traditional systems of proprietary protection.

## II. ASSESSING COPYRIGHT PROTECTION FOR COMPUTER PROGRAMS

### A. BENEFITS OF A COMPARATIVE APPROACH

An analysis of the underlying, major world trends regarding the copyrightability of object code and ROM serves as a basis for evaluating the sufficiency of international copyright protection for computer programs. An attempt to discern current developments in other nations can also be useful in assessing various alternatives to or variations of copyright that have been implemented or proposed. The "[r]eliance on the laws and trends in one country [such as the United States] is not sufficient. Protection of computer programs, to be efficient, must be

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49. *Id.* at 103-04.

50. E. PLOMAN & L. CLARK, COPYRIGHT 30 (1980) [hereinafter cited as E. PLOMAN].

truly international."<sup>51</sup> The emerging law in Japan, Australia, and Germany is representative of the various responses by several of the advanced technological nations to the unique features of the computer software industry. Although other nations<sup>52</sup> and international organizations, such as the World Intellectual Property Organization and Advisory Group of Governmental Experts on the Protection of Computer Programs (WIPO),<sup>53</sup> have been studying similar issues, Japan, Australia, and Germany were chosen as the focus of this inquiry "because they are principal characters in the worldwide computer market."<sup>54</sup>

By comparing the trends in these countries, the extent of protection for computer programs and ROMs originating or produced in a given country, such as the United States, can be ascertained. Additionally, in evaluating the effectiveness of copyright protection for software and firmware in a given country, it is instructive to view that country's system in light of the solutions developed by other countries. International copyright agreements "provide for the application of local laws to foreign works and set forth certain minimum requirements to be adopted by member countries."<sup>55</sup> The effect of these agreements will also be considered.

One general world-wide trend that supports an argument in favor of copyright protection for object code and ROMs is that such protection is available in most countries for a source program written in visible form.<sup>56</sup> Since May 1954, the United States Copyright Office has accepted source programs for deposit and registration as literary works.<sup>57</sup> In addition, statutes and case law make it clear that source code is copyrightable.<sup>58</sup> German courts have confirmed that software is protected under the Federal Republic's copyright law.<sup>59</sup> In Japan and France, courts have accorded computer programs copyright protection.<sup>60</sup> In Australia, precedent was set for the proposition that source code is entitled to copyright protection.<sup>61</sup>

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51. Note, *International Copyright Law*, *supra* note 2, at 107.

52. See E. PLOMAN, *supra* note 50, at 170.

53. See, e.g., Note, *World-Wide Protection*, *supra* note 17.

54. Note, *Copyright Protection*, *supra* note 4, at 474 n.4.

55. Note, *International Copyright Law*, *supra* note 2, at 108.

56. B. NIBLETT, *supra* note 7, at 93.

57. UNITED STATES COPYRIGHT OFFICE, COPYRIGHT REGISTRATION FOR COMPUTER PROGRAMS 31 (1964), *reprinted in* 11 BULL. COPYRIGHT SOC'Y 361 (1964).

58. See Note, *The Copyrightability of Object Code*, 59 NOTRE DAME L. REV. 412, 418 (1984) [hereinafter cited as Note, *Copyrightability*]; Note, *Protection of Object Code*, *supra* note 43, at 1724.

59. Betten, *supra* note 24, at 315.

60. *Id.* at 311.

61. Connors, *Protection of U.S. Computer Hardware and Software in Australia*, COMPUTER LAW., June 1984, at 5.

While there are countries such as England where it is not clear whether computer programs are entitled to copyright protection,<sup>62</sup> the movement towards the granting of copyright protection, at least to source code, is being manifested in a number of cases throughout the world. If source code is copyrightable, then determining whether object code or ROM is copyrightable becomes easier, since courts would not have to reach the question whether object code or ROM is per se copyrightable. Courts would only have to inquire as to whether the object code or ROM is a reproduction, copy, translation, or adaptation of the copyrighted source code.

As suggested above, even if source code is protected, copyright protection for computer programs is practically useless unless object code is also protected. First, a dedicated programming expert can deduce the underlying object code from a copy of the source code. If the object code lacks protection, then the deduced object code can be used to run a computer. Second, if the unprotected object code is etched onto a ROM, then the object code can be "read," albeit with great difficulty, and copied by an expert who uses a microscope to examine the physical construction of the ROM.<sup>63</sup> Finally, because ROMs are easily unplugged from computers, they can be easily inserted into ROM duplicators—laboratory devices that can copy the object code directly into another ROM or onto paper.<sup>64</sup> Consequently, one company can invest millions of dollars creating a copyrightable source code, while another company can duplicate the first company's program by deducing or directly copying the object code from either the copyrighted source code or ROM for only a fraction of the first company's investment costs.

If copyright protection for object code and ROM is not international, then any such protection would be insufficient, since the codes can be transmitted instantaneously (via the international telephone system) from one country to another,<sup>65</sup> where it can then be copied with impunity. International copyrightability of object code and ROM is needed not only to prevent competitors from "catching a free ride on the creativity, financial investment, and hard work of others,"<sup>66</sup> but also to provide an incentive to software producers to disclose their techniques, thereby resulting in a reduction of costs and unnecessary duplication of effort and programs that occur when software is kept secret. Moreover, protection would foster the licensing of programs to foreign

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62. Haines, *No Copyright in Computer Software?*, SOLIC. J., Feb. 24, 1984, at 126.

63. Note, *Copyrightability*, *supra* note 58, at 419.

64. Note, *Protection of Object Code*, *supra* note 43, at 1725-27.

65. Rumbelow, *Computer Law*, 8 INT'L BUS. LAW. 65, 65 (1980).

66. Comment, *supra* note 48, at 127.

companies<sup>67</sup> and expand international markets for computer programs.

B. COMPARISON OF INTERNATIONAL REMEDIES  
FOR COPYRIGHT INFRINGEMENT

Under the various copyright systems, copyrightable object code and ROM would grant their owners rights that would make the piracy of computer programs a copyright infringement. Australia's Copyright Act of 1968 gives authors of literary works the exclusive right to reproduce the work in a material form, to publish the work, and to make an adaptation (or translation) of the work.<sup>68</sup> If a person other than the copyright owner or a person without a license from the owner reproduces a work (or a substantial part thereof) in a material form, then that act of reproduction constitutes an infringement. Under Japan's Copyright Law of 1970, owners of copyrighted object code and ROM would have exclusive rights of reproduction.<sup>69</sup> The transgression of these copyrights would constitute actionable infringement and would allow the owner to obtain injunctive relief and/or damages against an infringer. An owner or assignee of exclusive rights, however, would not have legal recourse against a distributor of illegal copies of object code or ROM, unless the distributor was aware that the copies were products of copyright infringement.<sup>70</sup> Germany's Copyright Law of 1965 grants exclusive rights of exploitation, which consists of the rights of reproduction (article 16), distribution (article 17), and exhibition (article 18). The right of reproduction is broad and includes the right to make copies of the work without regard to method or number.<sup>71</sup> In addition, Germany and Japan grant personal (or moral) rights, which consists of the right of dissemination, the right of recognition of authorship, and the right against distortion of the work.<sup>72</sup> These moral rights are limited exclusively to the creator of software and are nonalienable,<sup>73</sup> thus protecting an owner in cases where competitors made slight variations in the copied code and then claimed that there was no infringement. Regardless of any other rights granted by their respective copyright systems, none of the countries protects ideas, since only the expression or

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67. Note, *The Protection of Computer Programs in Japan*, 6 LOY. L.A. INT'L & COMP. L.J. 105, 107 (1983) [hereinafter cited as Note, *Protection of Computer Programs*].

68. Liberman, *The Legal Protection of Computer Programs in Australia*, INDUS. PROP. 320, 322 (1983). The pertinent section is § 31(1)(a).

69. Note, *Protection of Computer Programs*, *supra* note 67, at 109.

70. *Id.* at 110.

71. Note, *Copyright Protection*, *supra* note 4, at 499.

72. *Id.* at 499-501.

73. Doi, *The Scope of Copyright Protection Against Unauthorized Copying—Japan's Experience and Problems*, 29 J. COPYRIGHT SOC'Y 367, 369 (1982).

form of ideas or concepts is protected.<sup>74</sup>

### C. COMPARISON OF OBSTACLES TO COPYRIGHT PROTECTION FOR OBJECT CODE AND ROM

Progress has been made towards protecting object code and ROM, but as of yet, the trend has not extended copyright protection to object code and ROM. The copyright systems of the various countries are grounded in "traditional" categories which have not kept pace with the technological advances of computer programs, software, and firmware. Existing copyright concepts and categories originated when computers did not exist, and thus are not able to solve the problems now posed by computer technology.<sup>75</sup>

Copyright encompasses the protection of cultural works in all media: literature, music, art, architecture, movies, and audio-visual productions.<sup>76</sup> As technological advances occurred in the forms and dissemination of written and graphic matter and of music, legal structures were created or adopted to protect the new technologies.<sup>77</sup> Japan, for example, protects works that fall "within the literary, scientific, artistic, or musical domain" (article 2(1)), including sound and visual recordings and works diffused by wire or communicated by means of broadcasting or other telecommunications installations.<sup>78</sup> Similarly, Germany's Copyright Law protects literary, musical and artistic works; pantomimes and choreographic works; photography and cinematography; and illustrations of a scientific or technical nature. Other provisions of the Copyright Law protect sound recordings and broadcast material.<sup>79</sup> The Australian Copyright Act of 1968 also separates literary, dramatic, musical, and artistic works from such works as sound recordings or cinematographic films.<sup>80</sup>

No country has yet carved out an area of protection that would specifically cover programs, software, object code, or ROM under their copyright acts, although such proposals have been suggested.<sup>81</sup> The present laws were all adopted at a time when computer programs were more like science fiction than an everyday aspect of commercial or daily

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74. See Betten, *supra* note 24, at 315; Liberman, *supra* note 68, at 321.

75. Lahore, *Computers and the Law: The Protection of Intellectual Property*, 9 FED. L. REV. 15, 16 (1978).

76. E. PLOMAN, *supra* note 50, at 23.

77. Lahore, *supra* note 75, at 28.

78. E. PLOMAN, *supra* note 50, at 136-37.

79. *Id.* at 114.

80. Lahore, *supra* note 75, at 29.

81. See, e.g., Bill of June 4, 1984 to become the Copyright Amendment Act of 1984, introduced into Australia's Parliament. See also Conners, *supra* note 61, at 8-9.

life.<sup>82</sup> Consequently, the notion that ROM and object code are suitable copyright subject matters has met resistance. In Australia, for example, it is unclear whether object code is a "literary work," because a literary work must be visible and intelligible to human beings and must not be mechanically functional.

Object code conflicts with other established copyright requirements that are common to Japan, Germany, and Australia. Japan requires thoughts or sentiments to be expressed in a creative way,<sup>83</sup> and the work must be original.<sup>84</sup> Germany's originality standard is phrased in terms of intellectual creation.<sup>85</sup> Australia requires works to be "original."<sup>86</sup> In Germany, if the work exhibits minimal new matter or is produced through mechanical skill rather than a creative intellectual process, then a copyright may not be secured.<sup>87</sup> It has been argued in Germany that object code does not reveal a creative mental accomplishment<sup>88</sup> and lacks the form of an intellectual-aesthetic substance.<sup>89</sup> The originality of object code is questioned, because, as a rule, a computer program known as a "compiler" mechanically translates high-level programs into corresponding object code,<sup>90</sup> though object code can be written directly.

Some countries deny copyrightability to utilitarian objects, machine parts, or three-dimensional works based on a master plan. ROM (chips especially) are physical components plugged into the circuit boards of computers.<sup>91</sup> These are arguably mechanically functional when they contain operating systems that control the transfer of information into and within the computer.<sup>92</sup> In addition, they are three-dimensional objects that are created by imprinting (from patterns fabricated on glass) the design of an integrated circuit onto a silicon wafer.<sup>93</sup> Thus, unless established categories are expanded, ROMs may be excluded from copyright protection. Other unresolved issues resulting from the unique nature of object code and ROM in applying traditional copyright

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82. In Japan, the law was passed in 1970. In Australia, the law was passed in 1968. In Germany, the law was passed in 1965. See Liberman, *supra* note 68, at 231.

83. E. PLOMAN, *supra* note 50, at 137.

84. Note, *Protection of Computer Programs*, *supra* note 67, at 109.

85. Note, *Copyright Protection*, *supra* note 4, at 498.

86. Lahore, *supra* note 75, at 28.

87. E. PLOMAN, *supra* note 50, at 114.

88. Betten, *supra* note 24, at 313.

89. *Id.* at 314.

90. Note, *Protection of Object Code*, *supra* note 43, at 1725.

91. *Id.*

92. Comment, *supra* note 48, at 112 n.59.

93. Note, *Copyright Protection*, *supra* note 4, at 491.

concepts<sup>94</sup> include whether ROM or object code can validly be considered a copy of a copyrighted source code, whether ROM or object code is a tangible medium of expression, and whether object code and ROM are expressions of ideas or are the underlying ideas themselves.

### III. INTERNATIONAL COPYRIGHT CONVENTIONS

International copyright agreements neither hinder nor promote the copyrightability of object code and ROM, but these treaties do facilitate international protection among the parties to the treaties. Australia,<sup>95</sup> Japan, and Germany<sup>96</sup> are parties of two such copyright agreements—the Berne Convention and the Universal Copyright Convention (U.C.C.).

#### A. BERNE CONVENTION

The Berne Convention of 1886<sup>97</sup> has members primarily from the Western European and Western Alliance countries, but does not include the U.S.S.R., United States, or other Pan-American countries (with the exception of Canada). The Berne Union is administered by WIPO, but the U.C.C. is not.<sup>98</sup> The Berne Convention provides that each country is to provide the same protection to each other countries' nationals as it provides for its own.<sup>99</sup> The prerequisite for obtaining protection is to have one's work published first in a member nation or to be published within thirty days of a work being published first elsewhere.<sup>100</sup> Works are considered published when copies have been made public, no matter how the copies were manufactured.<sup>101</sup> "Every production in the literary, scientific and artistic domain, whatever may be the mode or form of its expression"<sup>102</sup> is within the scope of the agreement's protection. Thus, object code and ROM arguably fall within this Convention's ambit.

#### B. UNIVERSAL COPYRIGHT CONVENTION

The U.C.C.,<sup>103</sup> like the Berne Convention, provides for national

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94. E. PLOMAN, *supra* note 50, at 168 (quoting Radack, *Copyright and the Computer*, INFORMATION HOTLINE, Jan. 1979, 15-17).

95. Lahore, *supra* note 75, at 36-37.

96. Note, *Copyright Protection*, *supra* note 4, at 502-03.

97. Berne Convention for the Protection of Literary and Artistic Works, *opened for signature* Sept. 9, 1886, 331 U.N.T.S. 217 [hereinafter cited as the Berne Convention].

98. B. NIBLETT, *supra* note 7, at 91; E. PLOMAN, *supra* note 50, at 49.

99. Berne Convention, art. 4(1), 331 U.N.T.S. at 223.

100. *Id.* art. 4(3), 331 U.N.T.S. at 225.

101. *Id.* art. 4(4), 331 U.N.T.S. at 225.

102. *Id.* art. 2(1), 331 U.N.T.S. at 221.

103. Universal Copyright Convention, Sept. 6, 1952, 6 U.S.T. 2731, T.I.A.S. No. 3324.

treatment, but there are limitations that may potentially reduce its usefulness in protecting object code and ROM. The primary limitation is that whether protection is to be afforded depends on whether a publication renders a work visually perceivable (unless domestic law does not define publication in terms of visual perceptibility). The U.C.C. defines publication as "the reproduction in tangible form and the general distribution to the public of copies of a work from which it can be read or otherwise visually perceived."<sup>104</sup> If a work is not distributed in a form that is visually perceptible, widespread dissemination of the work may place it in the public domain, depending on the laws of the country where the work is distributed. Thus, the requirement of visual perceptibility would most likely exclude programs distributed in object code or ROM.<sup>105</sup> Neither Japan nor Germany requires that a work be in a visually perceptible form in order to be published. Works distributed in these countries (by nationals of a member to the U.C.C.) would, accordingly, be published,<sup>106</sup> thus providing copyright protection.

Neither the U.C.C. nor the Berne Convention discourages protection of object code and ROM.<sup>107</sup> Under both the U.C.C. and Berne Convention, however, the scope of protection is determined by the domestic law in each country. Thus the laws which apply in each country of interest must be considered in detail.

#### IV. COPYRIGHT LAWS IN SELECTED COUNTRIES

##### A. JAPAN

Article 2(1) of the Copyright Law (*Chosakuku ho*) of 1970 protects "works of authorship" in which thoughts or emotions are expressed in a creative way and which fall in the literary, scientific, artistic, or musical domain.<sup>108</sup> To be eligible, a work must be an original literary or artistic work of a Japanese national or be published first in Japan.<sup>109</sup> Computer programs, software, and firmware could be regarded as literary works of a scientific nature, since they are creations of technical ideas.<sup>110</sup> Technical ideas must be fixed in a tangible form in order to be considered a work of authorship (article 2(1)(xv)); otherwise, fixation is

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104. *Id.* art. VI, 6 U.S.T. at 2740.

105. See Note, *Copyright Protection*, *supra* note 4, at 503.

106. *Id.* at 503 n.235.

107. B. NIBLETT, *supra* note 7, at 92.

108. Doi, *supra* note 73, at 377; Note, *Copyright Protection*, *supra* note 4, at 500.

109. First publication in Japan includes those works first published abroad, provided that they are subsequently published in Japan within thirty days. Note, *Protection of Computer Programs*, *supra* note 67, at 109.

110. MITI, *A Registration and Certification Type of System to Protect Computer Programs*, MITI BULL., June 5, 1972, reprinted in 5 COMPUTER L. SERV. (CALLAGHAN) § 9-4, art. 3, at 3 (1979). [hereinafter cited as MITI.]



not required.<sup>111</sup> There is no requirement of visual perceptibility in the definition of protected work, copy, or reproduction,<sup>112</sup> and the Japanese law does not exclude utilitarian designs from copyright protection.<sup>113</sup>

The Japanese copyright law does not specifically mention computer programs of any level, so whether object code and ROM are protected must be determined from the statutory framework. Object code and ROM could be protected if they are copies of a source program. Reproduction (*fukusei*) is defined in article 2(1)(xv) as: "to reproduce (*saisei*) in a tangible form by means of printing, photography, copying (*fukusha*), sound recording, visual recording or other method."<sup>114</sup> Under such a broad definition of reproduction, when a source program is compiled into object code and/or etched onto a ROM chip, the object code and/or ROM (which is almost certainly a tangible form of expression) would be a reproduction of the source program. Copying the object code and/or ROM into another ROM or object code would be yet another distinct reproduction,<sup>115</sup> so that an unauthorized reproduction would infringe the copyright owner's exclusive right to reproduce. Because fixation in a tangible medium can be achieved by any method, the imprinting of circuits onto ROM chips from masks, for example, would most likely qualify as a method of fixation. Since there is no requirement of visual perceptibility, and since utilitarian designs are not excluded from copyright protection, determining that a copyrightable source program is fixed in a tangible form completes the inquiry as to whether object code in ROM (magnetic tape, disk, chip) is a copyrightable copy.

Object code can be written directly without being translated from a source program.<sup>116</sup> Whether object code which has not been translated from a source program is copyrightable depends on whether it is a work of authorship of adequate originality. To copyright a program, it must be an original work, and it must qualify as a creative expression of thought. Clear criteria for the required originality and creativity with respect to computer programs have not been established,<sup>117</sup> but under present Japanese copyright law, the work must contain some minimum level of creative expression of the author's thoughts.<sup>118</sup>

It would not be logical, however, to grant copyright protection for object code which was translated from source code without granting

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111. Doi, *supra* note 73, at 378.

112. Note, *Copyright Protection*, *supra* note 4, at 501.

113. *Id.* at 502.

114. Doi, *supra* note 73, at 378.

115. *Id.*

116. McKenzie, *supra* note 45, at 3.

117. Note, *Protection of Computer Programs*, *supra* note 67, at 109.

118. *Id.* at 116 n.76.

such protection for object code not so translated. Both the translated object code and the directly written object code can perform identical functions and may have identical forms of expression. If the translated code is considered to have the requisite creativity and originality, an identical, indistinguishable code should also meet the authorship requirements. Moreover, object code that is directly written by a programmer runs counter to the notion that a translation of a source program into object code appears to be authorless.<sup>119</sup> Thus, directly written object code should be copyrightable given the broad definition of reproduction. The unauthorized copying of directly written object code into object code, ROM, or source code should be an infringement of the author's exclusive rights of reproduction.

At present, the availability of copyright protection for object code and ROM in Japan is undetermined. The government has set up two committees to study the protection of computer software. One of the committees, set up under the auspices of the Ministry of International Trade and Industry (MITI), has studied the question with a view to promote the effective development and utilization of computer software and to enhance the disclosure of software. The other committee, set up under the auspices of the Education Ministry's Agency for Cultural Affairs, has studied whether copyright is generally applicable to software.<sup>120</sup> MITI has developed a legislative proposal to create a special form of protection for computer software, while the Education Ministry has proposed a traditional fifty-year term of copyright protection for computer programs.<sup>121</sup> The two ministries will have to forge a compromise bill, since government agencies are not permitted to submit separate legislation on the same issue to the *Diet* (Japanese Parliament).<sup>122</sup> The MITI proposal, even when taken alone, will only minimally enhance copyrightability of object code and ROM.

MITI has suggested that laws specifically designed to protect software should have no minimum creativity or originality requirements.<sup>123</sup> By allowing all computer programs prepared by creators to be protected, MITI would remove any existing doubts about the copyrightability of object code or ROM that is written directly or translated from source programs. By extending the scope of protection to all programs

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119. Note, *Copyrightability*, *supra* note 63, at 423-24.

120. *WIPO: Legal Protection of Computer Software*, 17 J. WORLD TRADE L. 537, 539 (1983).

121. *Japan Weighs Extending Copyright Protection to Computer Programs*, 27 PAT. TRADEMARK & COPYRIGHT J. (BNA) 309 (Feb. 2, 1984) [hereinafter cited as *Japan Weighs*].

122. *U.S. Opposes Japanese Proposal for Limited Software Protection*, 27 PAT. TRADEMARK & COPYRIGHT J. (BNA) 424, 425 (Mar. 1, 1984) [hereinafter cited as *U.S. Opposes*].

123. MITI, *supra* note 110, at 5.

regardless of how they were created, MITI would risk diluting the strength of protection for each program, because without an originality requirement, copied or slightly modified programs would also seem to qualify for protection.

The MITI proposal, if passed, would remove protection for computer programs from coverage under Japan's copyright statute and replace it with a form of protection that would last for only fifteen years, as opposed to the current copyright protection of fifty years plus the life of the author.<sup>124</sup> The current copyright term far exceeds the marketable lifespan of most computer programs. Programmers are, therefore, effectively barred from improving discarded programs to develop newer, updated versions. This results in an unnecessary duplication of effort. Reducing the term of protection to fifteen years may liberate some discarded programs from superfluous protection; but, since the useful life of many programs is between two and three years,<sup>125</sup> fifteen years may itself be an excessively long term of protection. Adjusting the duration of the copyright to correspond to the useful life of programs may qualitatively improve protection, but it would not alter the scope of protection for software, object code, or ROM.

More significantly, the MITI proposal would require registration of source programs, and in certain cases, compulsory licensing.<sup>126</sup> Presently, Japan's Copyright Law has no registration and deposit requirements. Program developers thus run a substantial risk of creating programs that have already been developed, as there are no indices or catalogues of existing programs marketed in Japan. While a registration and deposit system might prevent programmers from recreating programs already in existence and might encourage the development of more powerful software, the status of object code or ROM as copyrightable subject matters would not be affected under the MITI proposal. Likewise, compulsory licensing would make programs more accessible, but would not bear on the question of object code or ROM copyrightability.

Under the MITI proposal, infringement would consist of any unauthorized duplication, use, transfer of possession, lease, or use in preparation of another program of any registered program.<sup>127</sup> In order to give the registration system "teeth," the MITI proposal would place the burden of proof, once a program is registered, on an alleged infringer, who would then be required to prove that the allegedly infringing program

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124. Klasson, *Japanese Copyright Proposal Could Damage Software Trade*, COMPUTER L. STRATEGIST, May 1984, at 3.

125. See *supra* note 26 and accompanying text.

126. Klasson, *supra* note 124, at 3.

127. MITI, *supra* note 110, at 6.

was not created by an act of infringement.<sup>128</sup> By defining infringement in terms of registration, the MITI proposal can minimize or completely offset the disadvantages of not having any originality or creativity requirements for computer programs.

The reaction to the MITI proposal has been generally negative. The Education Ministry has argued that MITI's proposal is unacceptable, since it conflicts with the international practice of placing software under the protection of copyright laws.<sup>129</sup> The Education Ministry also claims that the MITI bill will increase the availability of foreign software, thereby inhibiting Japan's own software development efforts.<sup>130</sup> United States trade officials and corporations also oppose the MITI bill on the ground that the unilateral removal of computer software from copyright protection would violate the Berne and Universal Copyright Conventions to which Japan is a party. The United States trade representatives also assert that MITI's proposed mandatory licensing is unnecessary, since potential users are free to buy the programs from developers and develop similar programs on their own.<sup>131</sup> In addition, a retaliatory loss of protection for Japanese software in the United States has been threatened if the MITI proposal is enacted.

The opposition of the United States to the proposed bill stems from the current situation in which Japan uses much more software produced in the United States and other foreign countries than it creates and exports. The net effect of the proposed law would be to advance Japan's use and understanding of foreign software at relatively little cost to its own software production efforts. The United States government and industry oppose the increased competitive advantage such a law would provide Japan, so American software firms would likely file suit to restrict the sale of Japanese software on the grounds that Japan has "unfairly or unduly harmed or hindered their interests."<sup>132</sup> The United States is probably not opposed to all forms of registration of computer programs, since registration is a fundamental aspect of copyright in the United States. Deposit in the United States, however, consists of only the first and last twenty-five pages of the program, may be in object form, and is optional.<sup>133</sup> The Japanese proposal, on the other hand, would require the mandatory deposit of the entire source pro-

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128. "An infringement is presumed if a suitor can prove that an infringer's program is the same as that of his registered program, and then the infringer is liable thereto unless he can not give antiproof." *Id.*

129. *Japan Weighs*, *supra* note 121, at 309.

130. *Klasson*, *supra* note 124, at 3.

131. *U.S. Opposes*, *supra* note 122, at 424.

132. *Id.*

133. A. RALSTON & E. REILLY, *ENCYCLOPEDIA OF COMPUTER SCIENCE AND ENGINEERING* 845 (2d ed. 1980).

gram. The United States' chief opposition to the Japanese proposal is this requirement of mandatory and complete disclosure.

#### B. AUSTRALIA

The Australian Copyright Act of 1968 contains no specific references to computer software. If computer programs are protected under the Australian Copyright Act, it would be on the basis that they may be classified as literary works. Section 10 of the 1968 Act defines "literary work" as including "a written table or compilation."<sup>134</sup> "Writing" means a "mode of representing or reproducing words, figures or symbols in a visible form," and "written" has a corresponding meaning.<sup>135</sup> A literary work is created when it is first reduced to writing or some other material form (section 22(1)). "Copyright does not subsist in an idea or a scheme or an information as such, but only in the form in which the idea, scheme, or information is expressed by the skill or labor of the author."<sup>136</sup> Thus, in order to obtain protection under the 1968 Act, a literary work must be original and must be produced by an author who has the appropriate residency or nationality qualifications.<sup>137</sup> By virtue of the provisions of the Universal Copyright Convention, copyrightable subject matters created by United States citizens and published first in the United States will be entitled to the same protection in Australia as if they had been created and published first in Australia.<sup>138</sup> The term of protection is life of the author plus the fifty years.<sup>139</sup> Copyright law, however, does not give protection against the use of methods or processes.<sup>140</sup>

As in Japan, there are no registration procedures under the 1968 Act. Therefore, there has been no guidance from administrative practice as to what may legitimately be classified as a literary work. Hence, the availability of copyright protection for software, object code, and ROM must be determined from the language of the statute and judicial interpretations.

In *Apple Computer, Inc. v. Computer Edge Pty, Ltd.*, the Federal Court of Australia (New South Wales District) ruled that computer programs are not entitled to copyright protection. Apple claimed that Computer Edge had infringed their copyright by including Apple's operating system, embedded in ROM and EPROM chips, in Computer

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134. Liberman, *supra* note 68, at 321.

135. *Id.*

136. Lahore, *supra* note 75, at 29.

137. Liberman, *supra* note 68, at 321. The relevant provision is § 32 of the 1968 Copyright Act.

138. Connors, *supra* note 61, at 6.

139. Lahore, *supra* note 75, at 30. The relevant sections are 35(2) and 33(2).

140. *Id.* at 29.

Edge's Wombat computer. The court rejected Apple's contention that a computer program is a proper subject for copyright protection as a literary work, holding that a "literary work" is something which was intended to afford "either information or instruction or pleasure in the form of literary enjoyment."<sup>141</sup> The court noted that computer programs control the sequence of operations carried out by a computer and emphasized the distinction between a work that is "merely intended to assist the functioning of a mechanical device and [a] literary work."<sup>142</sup> Finally, the court determined that the Act's silence as to computer programs indicated Parliament's intent to deny copyright protection for computer programs. According to the court, computer programs existed at the time the Act was passed, and computers were "developed and well known."<sup>143</sup> The court found that Parliament's intent was to have such matters regulated by legislation dealing with patents and industrial designs.

On appeal, a majority of the full court of the Federal Court of Australia reversed the earlier decision. The court held that Apple's operating system programs, expressed in source code, were "literary works" within the meaning of the Copyright Act. The court found that source codes express meaning as to the arranging and ordering of instructions for the storage and reproduction of knowledge. The court rejected the lower court's description of programs as merely components of a machine, and held that object code embodied in ROMs are "adaptations" of the original literary works (source programs). Section 10 of the Copyright Act provides that "adaptation" means, in relation to a literary work, a translation of the work. The court said, "[t]he object code contained in the . . . ROM's [is] a straightforward electronic translation into a material form of the source codes and it would be entirely within ordinary understanding to say that they are translations of the source codes."<sup>144</sup> Thus, there is strong precedent in Australia for the notion that an unauthorized copying of object code, translated from source code, constitutes copyright infringement. The court, however, expressly declined to rule on whether object code itself can be regarded as a literary work. The decision is on appeal to the High Court of Australia, the country's highest appellate court.

Object code that is directly written is most likely not protected under the 1968 Act. Unlike Japan, Australia implicitly requires the presence of three elements for a work to be considered a literary work. First, the work must be a mode of representing or reproducing words,

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141. *Australian Court: No Copyright in Software*, COMPUTER LAW., Feb. 1984, at 4.

142. *Computer Programs Not Protected by Australian Copyright Statute*, 27 PAT. TRADEMARK & COPYRIGHT J. (BNA) 172, 172 (Dec. 22, 1983).

143. *Id.*

144. Connors, *supra* note 61, at 7.

figures, or symbols in a visible form. Second, the work must be humanly intelligible. Finally the work must *not* be mechanically functional (utilitarian).<sup>145</sup> Object code, while usually in machine readable form, can also be represented in humanly readable printouts. In its machine readable form, object code does not satisfy all of the elements necessary to be considered a literary work. Machine readable object code is neither visible nor humanly intelligible. While not actually a mechanical component of a computer, object code (when not an adaptation) is mechanically functional, to the extent that it controls the sequence of operations carried out by a computer. By comparison, object code in its humanly readable form, while visible, is intelligible only to experts;<sup>146</sup> yet, it is not mechanically functional.<sup>147</sup>

In the United States, it is argued that object code is copyrightable if it is perceptible to any of the five senses (even with the aid of a machine).<sup>148</sup> Such an argument would not succeed under Australia's Copyright Act of 1968. The United States Copyright Act expressly grants protection to "original works of authorship fixed in any tangible medium of expression, now known or later developed, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device."<sup>149</sup> The Act of 1968, however, requires works to be actually visible, not just generally perceivable. Therefore, the argument that object code is copyrightable because it is capable of communicating with humans or capable, when interacting with a computer, of creating perceivable output results directed at a human audience,<sup>150</sup> cannot be successfully made under the Australian Act.

Nevertheless, section 22(1) of the Act also provides that a literary work is created when it is first reduced to writing or some other material form. The term "other material form" is broader in scope than "writing." The embodiment of a program in ROM is arguably a reduction of the program into a material form, thus protecting even machine readable object code. Thus, directly written object code might be copyrightable on narrow grounds, though the weight of the Act goes against object code copyrightability. Not only does directly written object code most likely lack protection, but even object code adapted from source code has only tenuous protection under the 1968 Act. This is shown in *Apple v. Computer Edge*, where the court indicated that it was plain from the language of the Act that an adaptation of a literary work does

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145. Liberman, *supra* note 68, at 322.

146. Note, *Copyrightability*, *supra* note 63, at 424.

147. Liberman, *supra* note 68, at 322.

148. Note, *Copyrightability*, *supra* note 63, at 424-25.

149. 17 U.S.C. § 102(a) (1982).

150. Note, *Copyrightability*, *supra* note 63, at 425-30.

not itself have to be a literary work or capable of being the subject of copyright.<sup>151</sup> In addition, even if object code can be viewed as a "literary work" for purposes of the 1968 Act, doubt exists as to the extent of any right to make an adaptation of such object code.<sup>152</sup>

In the context of computer software, the term "translation" means translation from one language to another or from one level of language to another level of language.<sup>153</sup> Thus, while an unauthorized reproduction of source code that has been adapted from object code (itself adapted from source code) might be an infringing reproduction of an adaptation, there can be no adaptation of object code from another object code (assuming that both codes are either machine readable or human readable), and hence no infringing reproduction of an adaptation. Infringement will occur only if there is a reproduction of the literary work itself or a reproduction of an adaptation of the literary work (section 31(1)(a)(i), (vii)). Moreover, there is no infringement of a copyright where the alleged infringer makes a reproduction of a reproduction. Therefore, characterizing object code as a reproduction of source code (or vice-versa) will not protect a code which is labeled a reproduction.

In light of the uncertainties arising both from the full federal court's decision in the *Apple* case and from the structure of the 1968 Act, a bill to add significant amendments to the Copyright Act was introduced into Parliament on June 21, 1984. The bill, known as the Copyright Amendment Act of 1984, would define computer programs to include both source code and object code, either as originally created or as created after translation and/or reproduction into a material form. The bill redefines "literary works" to include computer programs or compilations of computer programs. Thus, the object code, regardless how it was created, would be unequivocally protected. In addition, the bill redefines "infringing copy" to cover the reproduction of an adaptation of a work whenever such a reproduction infringes the copyright in the work itself. Furthermore, the bill redefines "adaptation" to cover translations between source code and object code or equivalent codes. The new definitions of infringing copy and adaptation together could provide protection for adaptations of adaptations, as well as for the original works upon which the subsequent adaptations are based. For example, a source code adapted from an object code that has been translated from a source program would most likely violate the copyright in the original source program. Finally, the bill redefines "material form" to include any form (whether visible or not) or storage from

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151. Connors, *supra* note 61, at 7.

152. Liberman, *supra* note 68, at 325.

153. *Id.*



which the work or adaptation, or a substantial part thereof, can be reproduced. The new definition would make it clear that ROMs, for example, are included in "material form." The proposed amendments to the Copyright Act would remove the major obstacles to maximum protection for object code, ROM, and software by effectively eliminating the requirements of visibility, human intelligibility, and non-utility. The new bill would not only satisfy the major concerns that led to the bill's introduction, but would also anticipate advances in technology.

### C. GERMANY

In section 2 of the German Copyright Act of 1965 (*Urheberrechtsgesetz*), literary, scientific, and artistic works are protected. Computer programs are not specifically mentioned as being copyrightable, but according to a series of court decisions, computer programs and software are copyrightable. The existing statutory copyright law, however, is not as favorable to computer programs as the court decisions have been.

Although "[t]here is no exclusion of utilitarian designs,"<sup>154</sup> and no explicit "requirement of visual perceptibility"<sup>155</sup> in the German Copyright Act, there is, nonetheless, an unwritten requirement that protected works must be perceivable by the human senses and intellect.<sup>156</sup> The fact that a computer program is perceived by a machine is a novel situation under the copyright law.<sup>157</sup> The German Federal Supreme Court held in the *Einheitsfahrerschein* decision that in order to qualify for protection as a literary work, object code must make thoughts perceivable by using language as its medium and must reveal a creative mental accomplishment. Although object code may be presented visibly in a printout, while in the form of a hexadecimal "dump" decipherable by an expert, the object code itself is humanly incomprehensible.<sup>158</sup> Several German scholars have expressed the view that object code is neither a creative intellectual achievement nor a means of communicating human ideas or feelings, but merely a means of realizing the concepts underlying the computer program. Thus, it is difficult to assert that object code fits the definition of a "literary work" under the Copyright Act. Moreover, if one assumes that computer programs only make use of an existing technical system (i.e., the computer), then, in accordance with the case law of the German Federal Supreme Court, it is doubtful whether computer programs are "creations" within the meaning of copyright law. Under this view, computer programs are techni-

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154. Note, *Copyright Protection*, *supra* note 4, at 500.

155. *Id.* at 499.

156. Betten, *supra* note 24, at 311.

157. *Id.* at 313.

158. *Id.*

cal, non-cultural products entitled to industrial property protection rather than copyright protection.<sup>159</sup>

Notwithstanding theoretical claims to the contrary, German courts have gradually come to hold that computer programs are copyrightable. The development of consistent case law confirming the copyrightability of computer programs is a strong indication that copyright is available for object code and software in Germany. This is especially true, since Germany is "a civil law jurisdiction which does not recognize the doctrine of *stare decisis*, that is, courts are generally constrained to 'find the law.'"<sup>160</sup>

In 1981, the Mannheim District Court, referring to object code, denied copyright protection for computer programs on the grounds that a computer program lacked the required intellectual-aesthetic substance to enable it to be perceived by the senses.<sup>161</sup> The Mosbach District Court held that computer programs generally qualify for copyright protection, that suitability for copyright is to be examined in each individual case, and that the "aesthetics" of the program is not a controlling criterion.<sup>162</sup>

Subsequently, in 1982, the Munich District Court in its *VisiCalc* opinion ruled that computer programs can be regarded as linguistic works within the meaning of section 2(1)(1) of the Copyright Act and as representations of scientific or technical nature within the meaning of section 2(1)(7) of the Copyright Act.<sup>163</sup> The court held that the classification of computer programs as literary works was not impeded by the fact that the programs were written in computer language and can be read only by special means. The court found that computer programs can fulfill the general requirement that the works be personal, intellectual creations within the meaning of section 2(2). The court indicated that if a set task to be performed by a computer program can be achieved in several ways, and if the choice among solutions allows the author of the program to use a wide variety of ideas, then the program will be copyrightable. The creative, intellectual content would be expressed in the choice, collection, review, arrangement, and classification of the information and instructions. Thus, the court held that every program that is not wholly trivial will show a remarkable individual character, particularly when the program is more complex.<sup>164</sup> This

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159. *Id.* at 312.

160. Seemann, *Sound and Video-Recording and the Copyright Law: The German Approach*, 2 CARDOZO ARTS & ENTERTAINMENT L.J. 225, 233 (1983).

161. Betten, *supra* note 24, at 314.

162. *Id.*

163. *Decisions—Germany's VISICALC Case*, 14 INT'L REV. INDUS. PROP. & COPYRIGHT L. 437, 439 (1983).

164. *Id.*

opinion would seem to cover both object code and source programs.

In 1983, the Munich District Court confirmed copyright protection for "somewhat complex not altogether banal programs (from about 500 to 1,000 processing steps upward)."<sup>165</sup> By conditioning copyrightability on high quality and originality, the court, in effect, required that there be a personal, intellectual creation. Under the court's "step" formula, almost any commercially available program can and must be granted copyright protection. Shortly after the Munich District Court's decision, the Karlsruhe Regional Appeal Court ruled that, in principle, computer programs are entitled to copyright protection. This court similarly held that if a personal, intellectual creation can be perceived in the preparation, selection, arrangement, or presentation of the subject, then copyright protection should be granted in the program's form of expression.<sup>166</sup>

Despite the decisions handed down by the courts in favor of copyright protection for computer programs, uncertainties and shortcomings remain. Even if computer programs are considered to be scientific literary works (as they were in the *VisiCalc* decision), the scope of protection for such works has been very narrowly drawn. The *Staatsexamensarbeit* decision of the Federal Court of Justice implies that a third party can circumvent the scope of protection by merely publishing a program in a slightly modified linguistic version. Thus, protection would be inadequate, since it is extremely easy to alter a source program and its compiled object code so that the program will look different on its face but perform without changes.<sup>167</sup>

It is questionable whether a program embodied in ROM is covered by copyright. One opinion is that ROMs are not covered, because three-dimensional works based on and corresponding to copyrightable master plans are not themselves eligible for copyright protection. On the other hand, ROM may be considered a literary work if the program is an individual and original expression of an author. Under the German law, ROMs arguably need not be visible and are not excluded even if considered utilitarian. In addition, programs stored in ROMs may be considered as works produced by processes analogous to photography.<sup>168</sup> Such works are eligible for protection,<sup>169</sup> provided that they are produced through a creative, intellectual process, rather than through mechanical skill.<sup>170</sup>

As in Japan and Australia, the term of copyright protection in Ger-

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165. Betten, *supra* note 24, at 315.

166. *Id.*

167. *Id.* at 316.

168. Note, *Copyright Protection*, *supra* note 4, at 500-01.

169. *Id.* at 498-99.

170. E. PLOMAN, *supra* note 50, at 114.

many is much longer than the useful life of most programs. The German term is seventy years after the author's death. While certain, well-tested subroutines, routines, and macros may have a long useful life and can benefit from such long protection, the majority of programs cannot. Progress in the software industry could stagnate as a result, especially if the Munich District Court's "500 step" formula is used to determine copyrightability. Practically all commercially available programs would be entitled to copyright protection if 500 program lines are sufficient for copyright protection. There could be much unavoidable duplication for which there would be little economic justification. These uncertainties and problems regarding copyright protection suggest that the enactment of special regulations to protect computer programs would be desirable.

The Karlsruhe Regional Appeal Court deliberated over whether copyright law should remain the basis of legal protection for computer programs or whether a special and more formalized regulation should be established.<sup>171</sup> One suggestion is to shorten the period of protection. An analysis of the Japanese proposal shows that in order to be effective, the duration of protection should coincide with the useful life of the program. Another suggestion is to institute a system of registration. Currently, German copyright protection arises upon the creation of the work, and there are no mandatory procedures to comply with as a prerequisite to protection. The name of the author may, however, be recorded in a copyright register and be kept at the Patent Office in order to document copyright. Again, experience with the Japanese proposal shows that while some form of registration is beneficial, a system that is too severe and requires complete disclosure may not only antagonize other nations, but may actually be counterproductive.

Australia's copyright amendment bill suggests that legal protection for all forms of computer programs should be clearly defined and made as explicit as possible within the context of general statutory legislation. Australia's bill also shows that it is possible to adopt laws which defer to the novel nature of computer programs by requiring originality, while circumventing the strict traditional requirements of visibility, human intelligibility, and non-utility. Although reliance on the judicial process for effective copyright protection of computer programs is not necessarily misplaced, experience with the Australian *Apple* case demonstrates that the judicial process alone cannot adequately keep up with the rapidly changing computer industry. Legislation which anticipates future developments is also advisable for an effective, durable system of copyright protection for computer programs.

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171. Betten, *supra* note 24, at 315.

## CONCLUSION

The use of computer programs is world-wide. In addition, computer communication is almost instantaneous and intercontinental. Thus, it is practical and advisable that the laws protecting computer software and firmware be consistent among the major civilized nations to avoid international legal problems where works are used outside an author's homeland.<sup>172</sup> Although the Berne Convention and the Universal Copyright Convention provide a minimum level of protection for computer programs, the effectiveness of copyright as a system for computer software and firmware protection depends upon how the individual nations implement their own copyright protection.

A comparative look at current and proposed copyright protection in Japan, Australia, and Germany reveals that copyright protection for computer programs is diverse, and that similar facts and circumstances may lead to differing results in different jurisdictions.

In Japan, where business and legal disputes are resolved primarily through compromise and accommodation rather than through litigation,<sup>173</sup> there are few reported cases directly relating to the copyrightability of object code and ROM.<sup>174</sup> Given Japan's broad definition of reproduction and lack of visibility and non-utility requirements, an argument for object code and ROM copyrightability under Japan's Copyright Act can be made, but such an argument rests on unsure footing.

In Australia and Germany, courts of second instance have confirmed the copyrightability of computer programs generally, but these courts have not completely dispelled doubts that programs in all forms of object code (translated or directly written) or ROM are eligible for copyright protection. Australia's *Apple* decision protects only object code translated from source code. In Germany, it is questionable whether ROM is protected. In addition, the uncertainty regarding the status of object code and ROM in both countries is increased because the courts of ultimate review in each country have not ruled on issues relating to object code or ROM copyrightability.

Thus, the world-wide trend seems to be towards accelerating the inclusion of object code and ROM into the class of copyrightable subject matters. In each country, courts and scholars include some forms of object code or ROM under traditional copyright categories, such as works of authorship, or literary or scientific works. The appropriateness of such inclusion, however, is constantly questioned, and arguments espousing copyrightability for object code and ROM are at times strained and tortuous. Perhaps, this is because the arguments are made under

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172. Seemann, *supra* note 160, at 257.

173. Note, *Protection of Computer Programs*, *supra* note 67, at 108.

174. *But see* Doi, *supra* note 73, at 377.

“traditional” copyright acts which were not written with computer technology in mind. Technological progress has always been ahead of legislation because statutes are written on the basis of current and foreseeable facts. Throughout the twentieth century, new technologies have not been covered by existing statutes, making statutory reforms necessary.<sup>175</sup>

The time for reform is apparently ripe. This is manifested by legislative bills and proposals in both Japan and Australia which attempt to accommodate computer programs and maximize the protection for computer software and firmware. In Australia, where the copyright statute would be amended and tailored to the unique nature of computer software and firmware, copyright protection would be sophisticated and of an optimum degree. On the other hand, the effect of the MITI proposal in Japan would be to remove computer software and firmware from protection under Japan's Copyright Act. Such removal is of questionable effectiveness and may ultimately be counterproductive. Opposition to the proposal in Japan and internationally may be justified not only on the ground that the proposal is ineffective or contrary to its original intent, but may also indicate that world-wide expectations place computer software and firmware under some form of copyright protection. Furthermore, such expectations may reflect a solidifying world-wide acceptance of copyright as the best means of protecting computer programs, software, firmware, object code, and ROM.

Provided that the copyright laws of countries expand and change to meet the specialized needs of computer technology, copyright protection may indeed be the best and most apposite form of intellectual property protection available. Consequently, as more countries experiment with different approaches to copyright protection and follow successful leads offered by other countries, computer programs will enjoy increased protection under laws that will become less and less divergent. The need for greater, explicit, and clear copyright protection still exists; therefore, creators, developers, and manufacturers of software and firmware should not rely solely on copyright to protect their creations. Nevertheless, if the legislative and judicial trend of protecting all forms of programs under copyright continues to evolve, such protection may soon be the international touchstone of intellectual property protection for computer programs, whether it be source code, object code, or ROM.

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175. Seemann, *supra* note 160, at 233; E. PLOMAN *supra* note 50, at 114.

