

CONTENTS

HIGH TECHNOLOGY LAW JOURNAL FALL 1991 VOLUME 6 NUMBER 2

ARTICLES

- Computer Programs, User Interfaces, and Section 102(b) of the Copyright Act of 1976: A Critique of *Lotus v. Paperback***
Pamela Samuelson 209
- New Telecommunications Technologies and Regulation: The Case of Personal Communications Services**
Alexander C. Larson and Terrence J. Schroepfer271

COMMENTS

- The View From on High: Satellite Remote Sensing Technology and the Fourth Amendment**
Lisa J. Steele 317
- High Technology Consortia: A Panacea for America's Competitiveness Problems?**
Michelle K. Lee and Mavis K. Lee 335
- Product Liability Barriers to the Commercialization of Biotechnology: Improving the Competitiveness of the U.S. Biotechnology Industry**
Michael D. Stovsky 363

- CASE UPDATE** 383

ARTICLE

COMPUTER PROGRAMS, USER INTERFACES, AND SECTION 102(b) OF THE COPYRIGHT ACT OF 1976: A CRITIQUE OF LOTUS V. PAPERBACK

PAMELA SAMUELSON[†]

Table of Contents

I.	INTRODUCTION	210
II.	THE <i>LOTUS V. PAPERBACK</i> DISPUTE	214
III.	THE "UNCOPYRIGHTABILITY" OF "NONLITERAL ELEMENTS" DEFENSE	217
	A. The Nonliteral Elements Defense	218
	B. <i>Whelan's</i> Rejection of One "Bright Line" Test and Adoption of Another	219
	C. <i>Paperback's</i> Use of the <i>Whelan</i> Test	221
	D. The Errors of the <i>Whelan</i> Test	223
IV.	WAS THE LOTUS COMMAND STRUCTURE PART OF THE LOTUS SPREADSHEET OR MACRO SYSTEM?	226
	A. <i>Baker v. Selden</i> : The Arrangement of Words As Part of a System	227
	B. The Macro Facility of Lotus 1-2-3 As a System	235
	C. The "Compatibility" Defense	239
V.	WHAT WAS "EXPRESSIVE" ABOUT THE LOTUS INTERFACE?	243
	A. Copyright Cases and Principles That <i>Paperback</i> Should Have Discussed	245

© 1992 Pamela Samuelson

† Professor of Law, University of Pittsburgh School of Law. An earlier version of this article was published in the Spring 1992 issue of *Law & Contemporary Problems*. This article, like the symposium published in that journal, is dedicated to Robert Kastenmeier in appreciation for his many contributions to U.S. copyright law and policy, especially his foresight in recognizing the need to codify some of the limiting principles of copyright law, such as those that appear in 17 U.S.C. § 102(b) (1988). The author wishes to thank Robert J. Glushko, Mitchell D. Kapor, and Professors Ralph Brown, Randall Davis, Dennis Karjala, and Jerome Reichman for their insightful comments on an earlier draft of the article and her research assistant Linda Sharif for her thoughtful, thorough, and cheerful help in the preparation of this article.

B. <i>Paperback's</i> Unwillingness To Accept the Proper Copyright Consequences of The Functionality of Computer Programs And User Interfaces.....	251
C. Two Kinds of Expressiveness Inquiries That <i>Paperback</i> Might Have Made	256
VI. CONCLUSION	262
APPENDIX	264

I. INTRODUCTION

Judges in computer software copyright cases have paid scant attention to a provision of the copyright statute¹ intended to limit the scope of copyright protection in accordance with the principles of the most venerated of American copyright cases, *Baker v. Selden*.² That provision is § 102(b) of the Copyright Act of 1976. It states: "In no event does copyright protection for an original work of authorship extend to any idea, procedure, process, system, method of operation, concept, principle or discovery."³ That § 102(b) has been so little analyzed in software copyright cases is especially surprising because it was added to the copyright statute in part to ensure that copyright protection for computer programs would not be construed too broadly.⁴

1. See, e.g., *Whelan Assoc. v. Jaslow Dental Lab., Inc.*, 609 F. Supp. 1307 (E.D. Pa. 1985) (no mention of § 102(b) in trial court ruling; section mentioned, but not incorporated into the appellate court's infringement test or infringement analysis), *aff'd* 797 F.2d 1222, 1234-42 (3d Cir. 1986), *cert. denied*, 479 U.S. 1031 (1987); *Manufacturers Technologies, Inc. v. CAMS, Inc.*, 706 F. Supp. 984, 995-96 (D. Conn. 1989) (§ 102(b) only invoked to render certain user interface navigational conventions unprotectable by copyright law); *Broderbund Software, Inc. v. Unison World, Inc.*, 648 F. Supp. 1127, 1131 (N.D. Cal. 1986) (one "see also" reference to § 102(b), but no discussion of the provision in the court's analysis of the copyright issues).

2. 101 U.S. 99 (1879). The extent to which Congress intended to codify *Baker v. Selden* by enacting 17 U.S.C. § 102(b) (1988) is the subject of some academic debate. See J.H. Reichman, *Computer Programs As Applied Scientific Know-How: Implications of Copyright Protection for Commercialized University Research*, 42 VAND. L. REV. 639, 693, n.288 (1989). Courts interpreting § 102(b) have construed it as codifying substantial portions of *Baker v. Selden*. See, e.g., *NEC v. Intel Corp.*, 10 U.S.P.Q.2d (BNA) 1177, 1179 (N.D. Cal. 1989); *Signo Trading Int'l v. Gordon*, 535 F. Supp. 362, 365 (N.D. Cal. 1981). The words of the provision, particularly those that refer to the unprotectability of processes, procedures, systems, and methods of operation are derived from *Baker v. Selden* and the many cases following it, as Section IV will show.

3. 17 U.S.C. § 102(b).

4. The House and Senate Reports state quite clearly:

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 'writing' expressing 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 copyright law.

In the twelve years since the copyright statute was amended to state explicitly that computer programs could be protected by copyright law,⁵ there have been numerous controversies about the proper application of copyright law to computer programs.⁶ Especially controversial have been several cases involving user interfaces of computer programs.⁷ A case

H.R. REP. NO. 1476, 94th Cong., 2d Sess. 57 (1976), reprinted in 1976 U.S.C.C.A.N. 5659, 5670 and in S. REP. NO. 473, 94th Cong., 2d Sess. 54 (1976). Professor Arthur Miller testified at hearings leading up to passage of the 1976 Act that without a provision of this sort in the statute, copyrights in computer programs might become the equivalent of patents for important elements of programs. This, he asserted, would stultify development of software. See *Hearings on S. 597 Before the Senate Subcomm. on Patents, Trademarks, and Copyrights of the Comm. on the Judiciary*, 90th Cong., 1st Sess. 197 (1967). See also Letter from Professor Arthur R. Miller, Professor, Harvard Law School, to Salem M. Katsh, Esq., Weil, Gotshal & Manges 6-7 (Oct. 29, 1985) (on file with author) (expressing the view that § 102(b) codified *Baker v. Selden*; also indicating that it was for patent law, not copyright, to protect the processes, systems, and methods of operations embodied in programs).

5. In 1980 Congress amended the copyright statute to make clear that copyright protection was available for computer programs. See An Act to Amend the Patent and Trademark Laws, H.R. 6943, 96th Cong., 2d Sess. (1980), which became Pub. L. No. 96-517, 94 Stat. 3007 (1980) (codified at 17 U.S.C. §§ 101, 117). This legislation implemented the recommendations of the National Commission on New Technological Uses of Copyrighted Works ("CONTU"). See FINAL REPORT OF THE NATIONAL COMMISSION ON NEW TECHNOLOGICAL USES OF COPYRIGHTED WORKS, ch. 3 (1979) [hereinafter CONTU REPORT].

Notwithstanding the 1980 amendments, there were a number of challenges to the "copyrightability" of operating system programs and microcode because of their highly functional nature. See, e.g., Peter S. Menell, *Tailoring Legal Protection for Computer Software*, 39 STAN. L. REV. 1329 (1987); Pamela Samuelson, *CONTU Revisited: The Case Against Copyright Protection for Computer Programs in Machine-Readable Form*, 1984 DUKE L.J. 663 (1984) [hereinafter *CONTU Revisited*]. Although these challenges were unsuccessful, the functionality of computer programs or particular aspects of them has continued to be problematical in the copyright caselaw, as *Lotus v. Paperback* illustrates.

6. An overview of the many controversies about the application of copyright to computer programs can be found in Pamela Samuelson, *Reflections on The State of American Software Copyright Law and the Perils of Teaching It*, 13 COLUM.-VLA J.L. & ARTS 61 (1988) [hereinafter *Reflections on American Copyright Law*]. For a more in-depth treatment of copyright issues raised by the protection of structural abstractions of computer programs and user interfaces, see Peter S. Menell, *An Analysis of the Scope of Copyright Protection for Application Programs*, 41 STAN. L. REV. 1045 (1989) [hereinafter *Copyright Protection for Application Programs*]; *LaST Frontier Conference Report on Copyright Protection of Computer Software*, 30 JURIMETRICS J. 15 (1989) [hereinafter *LaST Frontier Report*].

7. Because the first several software user interface copyright cases did not involve major software firms (see, e.g., cases cited *supra* note 1), the cases were not much noticed in the software industry. Some of them, however, laid the groundwork for the later more publicized user interface lawsuits brought by Lotus, Ashton-Tate, Apple, and Xerox. Until these lawsuits, the general view in the technical community seemed to be that as long as someone wrote his or her own code, it was legal to develop a competing application program with the same or very similar user interface. The apparent legality of computer hardware clones may have caused people in the industry to think, particularly in view of the interchangeability of hardware and software, that software clones would be legal as well. Software clones are thought by some in the technical community to offer many of the same benefits to consumers that hardware clones had offered: more product choices, price competition, and improved or additional features. See generally Pamela Samuelson, *Why The Look and Feel of Software User Interfaces Should Not Be Protected by Copyright Law*, 32 COMM. ACM 563 (1989) [hereinafter *Look and Feel of Software User Interfaces*]. See also

that was widely expected to yield a landmark ruling on one set of controversial user interface issues was *Lotus Dev. Corp. v. Paperback Software Int'l*.⁸ In June of 1990, Judge Keeton issued a lengthy opinion in which he ruled that Lotus' copyright in its popular 1-2-3 spreadsheet program protected the user interface of that program, and that Paperback had infringed the Lotus copyright by copying a number of aspects of that interface.⁹

This article will argue that some important aspects of the Lotus interface copied by Paperback may have been constituent elements of a "system" which under *Baker v. Selden*, its progeny, and § 102(b) are unprotectable by copyright law.¹⁰ The court in *Paperback* seems to have been so distracted by defense arguments about the "uncopyrightability" of "nonliteral elements" of computer programs that it failed to make an appropriate inquiry about this matter. A number of statements in *Paperback* indicate that some important aspects of the Lotus interface were constituent elements of a spreadsheet or macro "system." Yet the court failed to explain why these elements, if constituent parts of a "system," were not as unprotectable under § 102(b) as the ledger sheets that the Supreme Court ruled were unprotectable components of Selden's bookkeeping system more than a century ago.¹¹ By failing to make an appropriate § 102(b) inquiry, the court in *Paperback* missed an important opportunity to provide an updated interpretation of *Baker v. Selden*, the copyright principles it represents, the embodiment of these principles in § 102(b), and how these principles should be applied in copyright disputes involving user interfaces of computer programs.

In addition, this article will argue that the *Paperback* opinion fails to offer persuasive reasons for its ruling that the aspects of the Lotus

Pamela Samuelson & Robert J. Glushko, *Comparing the Views of Lawyers and User Interface Designers on the Software Copyright "Look and Feel" Lawsuits*, 30 JURIMETRICS J. 121 (1989) (reporting on a survey of user interface designers on the "look and feel" lawsuits).

8. 740 F. Supp. 37 (D. Mass. 1990).

9. *Id.* The *Lotus v. Paperback* lawsuit was settled out of court some months after issuance of the opinion that this article will discuss at length. Under the settlement agreement, Paperback agreed not to appeal the district court's ruling, to take VP-Planner off the market, and to pay \$500,000 to Lotus. Although Paperback still regards the court's ruling as erroneous, it decided that settling the dispute was in its best business interest. See *Lotus Development to Get \$500,000 in Copyright Case*, WALL ST. J., Oct. 18, 1990, at B4; *Lotus Settles Copyright Case*, N.Y. TIMES, Oct. 18, 1990, at C4.

10. See, e.g., Brief Amicus Curiae of Copyright Law Professors, *Lotus Dev. Corp. v. Borland Int'l, Inc.* (Civ. A No. 90-1162-K) (1992) [hereinafter Copyright Professors Amicus Brief] (criticizing *Paperback* for its failure to make a proper kind of § 102(b) inquiry). Paperback did argue that § 102(b) precluded copyright protection for certain aspects of the Lotus interface, but the defense seems not to have been as well-focused as it could have been. See Pretrial Brief of Defendants Paperback Software Int'l and Stephenson Software, Ltd., at 28, *Lotus Dev. Corp. v. Paperback Software Int'l* (Civ. A No. 87-0076-K) (Feb 1, 1990) [hereinafter Paperback Pretrial Brief].

11. *Baker v. Selden*, 101 U.S. 99 (1879).

interface on which the court based its infringement determination were "expressive" in a copyright sense. It will also criticize the court's analysis of the functionality of the Lotus user interface and the court's failure to appreciate the proper copyright implications of this functionality. Copyright protection for functional writings, such as spreadsheet programs, is traditionally quite "thin."¹² Only exact or near-exact copying will generally be found to be an infringement. Had the court used this approach to judging infringement in *Paperback*, and persuasively explained what it found to be expressive about Lotus' interface, the *Paperback* opinion might have been the landmark opinion for which many were hoping, one on which the law of copyright as applied to computer programs could have been firmly built.

As things stand now, *Paperback* seems to have stirred up more controversy than it has settled. It has met with distinctly mixed reactions in the technical community, in part because people are uncertain about how broad or narrow the court's ruling really was.¹³ Several articles critical of the court's analysis in *Paperback* have already appeared in the law review literature.¹⁴ Moreover, *Paperback* is in direct conflict with a recent decision of the Ninth Circuit Court of Appeals affirming a trial court ruling that there was no expressiveness in the arrangement of commands for a spreadsheet program.¹⁵ There is an opportunity in a

12. See, e.g., *LaST Frontier Report*, *supra* note 6, at 18-19.

13. See sources cited in Pamela Samuelson, *How to Interpret the Lotus Decision (And How Not to)*, 33 COMM. ACM 27 (Nov. 1990).

14. See, e.g., Ronald Abramson, *Why Lotus-Paperback Uses the Wrong Test and What the New Software Protection Legislation Should Look Like*, 7 COMPUTER L. 6 (Aug. 1990); D. Lee Antton & Gary M. Hoffman, *Copyright Protection and Innovation: The Impact of Lotus Dev. v. Paperback Software*, 7 COMPUTER L. 1 (Aug. 1990); Richard H. Stern, *Legal Protection of Screen Displays and Other User Interfaces for Computers: A Problem in Balancing Incentives for Creation Against Need for Free Access to the Utilitarian*, 14 COLUM.-VLA J.L. & ARTS 283 (1990) [hereinafter *Legal Protection of Screen Displays*]; Gerard Lewis, Jr., Comment, *Lotus Dev. Corp. v. Paperback Software Int'l: Broad Copyright Protection For User Interfaces Ignores the Software Industry's Trend Toward Standardization*, 52 U. PITT. L. REV. 689 (1991); Elizabeth G. Lowry, Comment, *Copyright Protection for Computer Languages: Creative Incentive or Technological Threat?*, 39 EMORY L.J. 1293 (1990).

15. *Ashton-Tate Corp. v. Ross*, 916 F.2d 516 (9th Cir. 1990) (command structure for user interface of spreadsheet program held to be "idea" under § 102(b)). The Ninth Circuit decision in *Ross* was decided after the *Paperback* ruling. It does not cite to that opinion. *Paperback* did not cite to the trial court opinion in *Ross*, even though *Ross* was decided before the court's ruling in *Paperback*. See *Ashton-Tate Corp. v. Ross*, 728 F. Supp. 597, 602 (N.D. Cal. 1989), *aff'd*, 916 F.2d 516, 521-22 (9th Cir. 1990). *Ashton-Tate v. Ross* is discussed in Section V.

In a previous article, the author observed that software copyright cases have tended to be either lengthy and elaborately flawed or so cryptic as to provide little guidance on the proper analysis supporting the court's conclusions. See *Reflections on American Copyright Law*, *supra* note 6, at 71-72. That article gave *Whelan*, 797 F.2d 1222, as an example of the lengthy but flawed variety, and *Plains Cotton*, 807 F.2d 1256, as an example of the too cryptic variety. The facts and legal issues presented by *Plains Cotton* were quite similar to those in *Whelan*, but the Fifth Circuit rejected *Whelan's* legal conclusion and reasoning.

new Lotus lawsuit against another of its spreadsheet competitors¹⁶ for Judge Keeton, or perhaps the First Circuit Court of Appeals, to clarify the application of copyright law to user interfaces so that software developers will have the legal guidance they so urgently need.¹⁷

II. THE *LOTUS V. PAPERBACK* DISPUTE

The facts presented by the *Lotus v. Paperback* case are simple and straightforward. Lotus Development Corp. owns a copyright in the very popular spreadsheet program, Lotus 1-2-3. While preparing its own spreadsheet program, VP-Planner, Paperback Software decided to copy several aspects of the Lotus 1-2-3 user interface, including its command hierarchy. Paperback wanted to give consumers already familiar with the Lotus commands and macro facility a lower priced alternative product that could not only achieve the same functionality as Lotus 1-2-3, but also offered some other desirable features that the Lotus product did not then have.¹⁸

Lotus then sued Paperback for copyright infringement. The complaint detailed a number of specific aspects of the Lotus interface that Paperback had allegedly wrongfully copied.¹⁹ These included the instruction, command, and menu language of the 1-2-3 interface, the "structure, sequence, and organization" ("SSO") of its screen displays and

Paperback now joins *Whelan* in the lengthy and elaborately flawed category, and *Ross* joins *Plains Cotton* in the too cryptic category.

Of the two kinds of cases, the lengthy and elaborately flawed variety is the more worrisome because judges in subsequent cases may tend to equate length and elaborateness with sound analysis, which is sometimes not the case. Judges in subsequent cases may find it easier to follow a prior ruling based on a lengthy analysis of the issues than to dissect the lengthy analysis, locate its flaws, and construct the sounder analysis that should have been done. The Ninth Circuit's recent decision in *Brown Bag Software v. Symantec Corp.*, 960 F.2d 1465 (9th Cir. 1992) is an example of a well-reasoned decision applying traditional principles of copyright law to software user interfaces.

16. Some months after the *Paperback* decision, Lotus Development Corp. brought suit against Borland International, Inc. for infringement of the Lotus 1-2-3 copyright because Borland's Quattro Pro spreadsheet program has, in addition to its own "native" user interface for the spreadsheet program, an "emulation" interface that includes the Lotus command hierarchy, although presenting the commands in a different way than the Lotus program does. Judge Keeton, who is presiding over this case as well, has denied cross-motions for summary judgment in the *Borland* case. See *Lotus Dev. Corp. v. Borland Int'l, Inc.* (Civ. A No. 90-11662-K) (Mar. 20, 1992) (memorandum and order) [hereinafter *Borland Order*].

17. See, e.g., NATIONAL RESEARCH COUNCIL, COMPUTER SCIENCE AND TELECOMMUNICATIONS BOARD, INTELLECTUAL PROPERTY ISSUES IN SOFTWARE 4-6, 51-57 (1991) [hereinafter *NRC REPORT*] (concerning the need for more certainty in the legal rules applicable to software).

18. VP-Planner had a data base capability that Lotus 1-2-3 did not then have.

19. The differences between the Lotus and Paperback user interfaces are set forth in *Paperback*, 740 F. Supp. at 70.

sequences of screen displays, the macro commands and syntax of Lotus 1-2-3, and its overall "look and feel."²⁰

Paperback asserted a number of defenses to these claims. Its chief defense was that Paperback had copied only "uncopyrightable" elements of the Lotus program.²¹ Under the umbrella of this main defense, Paperback raised several more specific defenses. One was that only "literal" elements of computer programs (that is, source or object code) are protectable by program copyrights. Because user interfaces are "nonliteral" elements of programs, Paperback asserted that the copying of a user interface could not infringe a program copyright.²² A second was that user interface screen displays are only protectable by copyright law if separately registered with the Copyright Office. Because Lotus had only registered the Lotus 1-2-3 program with the Copyright Office, Paperback argued that the court lacked jurisdiction over the copyright dispute pending before it.²³ A third defense was that the Lotus interface

20. See Complaint of Lotus Development Corp., *Lotus Dev. Corp. v. Paperback Software, Int'l* (D. Mass. Jan. 1987) (Civ. A No. 87-76-K). The "look and feel" claim was among the more controversial claims in the Lotus complaint. "Look and feel" is sometimes used in the technical community to describe the valuable functional behavior of a program that is exhibited when the user interacts with the program via the user interface. See, e.g., NRC REPORT, *supra* note 17, at 53, and *Computer Assoc., Inc. v. Altai*, 775 F. Supp. 544, 559-60 (E.D.N.Y. 1991) (discussing program behavior). As a matter of copyright law, there are a number of reasons to question whether the "look and feel" of programs could be protected by copyright law. See, e.g., *Look and Feel of Software User Interfaces, supra* note 7, at 563. Strong opposition exists within the technical community to copyright protection for the "look and feel" of programs. See Samuelson & Glushko, *supra* note 7, at 126. At trial, Lotus seems not to have emphasized the "look and feel" claim. In *Paperback*, the court states that it did not find "look and feel" very helpful in resolving the copyright issues in the case. *Paperback*, 740 F. Supp. at 62.

Whether the "look and feel" of computer programs is protectable by copyright law may be determined in Apple Computer's lawsuit against Microsoft and Hewlett-Packard. See *Apple Computer, Inc. v. Microsoft Corp.* (Civ. No. C-88-20149-VRW), Hearing Transcript at 16 (April 14, 1992) [hereinafter *Apple Hearing Transcript*]. Most of Apple's other claims (as to the protectability of individual element of the Macintosh interface) were excised from the case when the judge ruled against Apple on summary judgment motions by Microsoft and Hewlett-Packard on the ground that these individual elements were either unprotectable by copyright law or licensed by Apple. *Id.* at 83-87.

21. Two other Paperback defenses were laches and estoppel. Paperback asserted that Lotus had known, six months before VP-Planner appeared on the market, that it would look and work like 1-2-3, and yet had waited fourteen and a half months after the Paperback product was released to raise any objections. Lotus also only made its objections known by initiating the lawsuit against Paperback. The court was persuaded that the delay in bringing suit was reasonable, citing cases that had found excusable delays in order to give the plaintiff time to evaluate the matter and prepare to bring suit. *Id.* at 82. It may be, however, that Lotus was waiting to see what the Supreme Court would do with the appeal of the *Whelan* decision, for the Lotus lawsuit against Paperback was filed the day the Supreme Court denied certiorari in that case. For more discussion of the impact of the *Whelan* ruling on the *Paperback* case, see section III.

22. *Paperback*, 740 F. Supp. at 51-55, 73.

23. *Id.* at 79. Although the court emphatically rejected this defense as "frivolous" and based on a "word game" by the defense lawyers, it is worth observing that there was at

was a functional human-machine interface that was uncopyrightable under the "useful article" doctrine of copyright law.²⁴ A fourth defense was that Paperback had not infringed the Lotus copyright because most of what it had copied from the Lotus interface was part of the macro language facility of Lotus 1-2-3. Languages, Paperback asserted, were not copyrightable.²⁵ Paperback's fifth defense was that it had been necessary for Paperback to copy certain aspects of the Lotus interface in order to offer a "compatible" product to consumers. This seems to have been an argument that "idea" and "expression" had "merged" in the certain aspects of the Lotus interface.²⁶ A sixth defense was that user interests in standardization of spreadsheet interfaces overrode the private interests of Lotus in certain aspects of the 1-2-3 interface, which seems to have been a variant of the "merger" argument.²⁷ Paperback seems also to have argued that on public policy grounds, copyright law should not be construed to extend protection to the elements of user interfaces for which Lotus was seeking protection because it would impede incremental innovation in the software industry.²⁸

Judge Keeton wrote an extensive opinion rejecting each of Paperback's defenses. A close examination of this opinion suggests that certain defense strategies backfired and may have prevented the judge from engaging in some inquiries that would have proved more fruitful to the defense's objectives. By making more extreme arguments than were necessary to advance their cause, the defense lawyers failed to focus the court's attention on the proper kind of copyright inquiry for such a case. As a consequence, a number of fundamental principles of copyright law that were quite relevant to the case went unanalyzed. The next section will demonstrate how one of Paperback's principal defenses got the copyright inquiry off on the wrong track.

least one precedent, *Digital Communications Assoc., Inc. v. Softklone Distrib. Corp.*, 659 F. Supp. 449 (N.D. Ga. 1987), that had ruled, after a thoughtful analysis on the relationship between computer programs and user interface screen displays, that such screen displays were separate works from the programs and required separate copyright registrations. At the time Lotus filed the lawsuit against Paperback, the Copyright Office policy had not been clear on the subject of whether user interfaces needed to be separately registered or were covered by the underlying program copyright. For further discussion of this issue, see *infra* Appendix.

24. This defense is discussed *infra* in Section V-B.

25. This defense is discussed *infra* in Section IV-B.

26. This defense is discussed *infra* in Section IV-C.

27. This defense is discussed *infra* at note 126.

28. Both Paperback and Lotus presented opinion evidence concerning the effect its ruling would have on the software industry. The court also took note of an article reporting the results of a survey of user interface designers which reflected strong opposition to the copyright look and feel lawsuits. See Samuelson & Glushko, *supra* note 7, at 127-28. Although the court permitted the proffered evidence to be put into the record, it ultimately concluded that this kind of evidence was irrelevant to the copyright issues in the case. See *Paperback*, 740 F. Supp. at 73-77.

III. THE "UNCOPYRIGHTABILITY" OF "NONLITERAL ELEMENTS" DEFENSE

One of Paperback's principal defenses was that only "literal" elements of computer programs (that is, source and object code) are protectable by a copyright in a computer program. Paperback asserted that because a user interface was a "nonliteral" element of a computer program, it was an "uncopyrightable" element of the program.²⁹ Whether it is appropriate to conceive of a user interface as a "literal" or "nonliteral" element of a computer program is a more complex intellectual problem than the *Paperback* opinion might suggest.³⁰ But for purposes of this section, it will suffice to accept the characterization of the Lotus interface as a "nonliteral" element of the program, and to concentrate, for the moment, on the effects that the "uncopyrightability of nonliteral elements" defense had on the nature of the copyright discourse in the case.

29. The origins of the "uncopyrightable subject matter" defense raised in *Paperback* can be traced to *Baker v. Selden*, 101 U.S. 99 (1879) in which the Supreme Court indicated that the ledger sheets demonstrating Selden's accounting system were not copyrightable subject matter. *Id.* at 107. A more modern characterization for this kind of defense would be that the aspect of the work for which the plaintiff was seeking protection was beyond the scope of the protection available under copyright law to that kind of work. *See, e.g., Brown Bag*, 960 F.2d 1465. Nevertheless, some cases continue to discuss whether certain aspects of copyrighted works are "copyrightable." *See, e.g., Freedman v. Grolier Enters.*, 179 U.S.P.Q. (BNA) 476 (S.D.N.Y. 1974) (discussing the "copyrightability" of a certain notation system for playing cards).

In modern copyright parlance, no "copyrightability" issue is present in a copyright case as long as the work meets the requirements of § 102(a) as an "original work[] of authorship fixed in [a] tangible medium of expression." *See* 17 U.S.C. § 102(a) (1988). Paperback was not arguing that there was no original expression in the Lotus program, nor that the program was not fixed enough to be copyrighted, nor that the program was otherwise disqualified from being considered a protectable "work of authorship" under the statute. Only these are today considered to be "copyrightability" challenges. Even if the defense lawyers in *Paperback* mischaracterized the nature of their defense, it would have been possible for the court to have straightened matters out, but instead the court adopted the defense's characterization of the defense, and from that flowed the errors discussed in the rest of the article.

One reason that *Baker v. Selden* is in need of an updated interpretation is to clarify this distinction between "copyrightability" and "beyond the scope of protection" defenses. The Supreme Court not only speaks of Selden's ledger sheets as uncopyrightable subject matter, but also refers to the "uncopyrightability" of news reports and advertisements. *See* 101 U.S. at 105-06. These two kinds of works were later ruled to be "copyrightable subject matter." *See, e.g., Bleistein v. Donaldson Lithography Co.*, 188 U.S. 239, 251 (1903) (advertisement was copyrightable) and *International News Serv. v. Associated Press*, 248 U.S. 215, 234 (1918) (reflecting view that Associated Press newspapers could have been copyrighted).

30. *See infra* Appendix. Notwithstanding the court's apparent adoption of Paperback's assertion that the Lotus interface was a "nonliteral" element of the program, the opinion seems to rely on near-verbatim copying to support the conclusion of infringement. *See Paperback*, 740 F. Supp. at 70. Section V-C *infra* will discuss how *Paperback* might have been analyzed had the court been consistent in its treatment of the Lotus interface as a nonliteral element of the program; it will also analyze *Paperback* as a "literal copying" case.

One very important effect of this defense was to narrow dramatically the analytic focus of the case. The copyright discourse shifted from one about the proper scope of the Lotus copyright in the context of an infringement analysis to one about the "copyrightability" of "nonliteral" elements of computer programs. The "nonliteral elements" defense affected virtually everything about the case, including the manner in which the judge "phased" the trial of the case and the test the court adopted for judging the copyright issues in the case.³¹

The "nonliteral elements" defense was very risky because if the court could be persuaded that *any* nonliteral element of *any* computer program could properly be protected by copyright law, the defense would founder. Because several previous cases had ruled that some nonliteral elements of computer programs could be protected by copyright law, including the widely cited Third Circuit Court of Appeals decision, *Whelan Assoc. v. Jaslow Dental Lab*,³² a defense based on the uncopyrightability of nonliteral elements of programs was, as a strategic matter, almost suicidal.

A. The Nonliteral Elements Defense

Paperback made much the same argument in the *Lotus* case that Jaslow had made in the *Whelan* case. Support for the proposition that copyright protection is only available for source and object code of computer programs is said to come from three sources: the statutory definition of computer programs,³³ the absence of legislative history indicating an intent to bring nonliteral elements of programs within the

31. The first phase of the trial was supposed to determine "whether and to what extent plaintiff's computer spreadsheet program, Lotus 1-2-3, was copyrightable." 740 F. Supp. at 42. Phase two was to be a jury trial on issues of fact relating to whether Paperback had copied protected expression from the Lotus program, including from the source or object code of the Lotus program. *Id.* After ruling that the Lotus interface was a copyrightable component of the program, *id.* at 68, the court decided that there was no genuine issue of fact requiring a phase two proceeding. The court observed that Paperback had conceded it had copied many elements of the Lotus interface. Because these elements were substantial components of the Lotus program, the court found infringement. The test the court devised for determining infringement in *Paperback* is discussed *infra* in Section III-C.

32. 797 F.2d 1222 (1986). *Whelan* has been cited with approval in several cases for the proposition that nonliteral elements of programs can be protected by copyright. *See, e.g., Manufacturers Technologies*, 706 F. Supp. at 992; *Pearl Sys. v. Competition Elec.*, 8 U.S.P.Q.2d (BNA) 1520, 1524 (S.D. Fla. 1988); *Broderbund*, 648 F. Supp. at 1133.

33. The copyright statute defines "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." 17 U.S.C. § 101. The user interface of a program can accurately be described as among the "results" that can be generated when a program is executed in a computer. The user interface itself is not among the set of statements or instructions of a program that can be processed in the computer to bring about results. *See, e.g., Dennis S. Karjala, Copyright, Computer Software, and the New Protectionism*, 28 JURIMETRICS J. 33 (1987); *Legal Protection of Screen Displays*, *supra* note 14, at 350. The statute does not say that the "results" of the program are protectable by copyright law.

scope of copyright protection,³⁴ and judicial decisions that had denied copyright protection to some nonliteral elements of programs.³⁵ In addition, the defendants in both *Whelan* and *Paperback* argued there was a need for a "bright line" standard, such as that between literal and nonliteral elements of programs, so that software developers could know what they could lawfully do.³⁶ A narrow scope of copyright protection for programs was also claimed to be desirable so as not to interfere with the kind of incremental development that characterizes software innovation.³⁷

B. *Whelan's* Rejection of One "Bright Line" Test and Adoption of Another

The Third Circuit rejected the "nonliteral elements" defense in *Whelan*. Because nonliteral elements of "literary works" have long been protected by copyright law,³⁸ the court thought it appropriate for such

34. There is no consensus among former CONTU Commissioners and staff members about whether CONTU thought that nonliteral elements of programs, such as their "structure, sequence, and organization," would be protectable by copyright law. The Executive Director of the CONTU staff and the chairman of the CONTU subcommittee on the copyrightability of computer programs think not. See Kenneth A. Liebman, Salem M. Katsch & David D. Leitch, *Back to Basics: A Critique of the Emerging Judicial Analysis of the Outer Limits of Computer Program "Expression,"* 2 COMPUTER L. 1 (Dec. 1985) (discussing CONTU Commissioner Miller's and Director Levine's views); Arthur J. Levine, *Comment on Bonito Boats Follow-Up: The Supreme Court's Likely Rejection of Nonliteral Software Copyright Protection,* 6 COMPUTER L. 29 (July 1989). Two other CONTU Commissioners disagree. See E. Gabriel Perle, Christopher Meyer, and Victor Siber, *Bonito Boats Redux,* 7 COMPUTER L. 1 (Feb. 1990) (discussing the views of Commissioner Perle and the now-deceased CONTU Commissioner Nimmer on CONTU's intent with regard to protection of nonliteral elements of programs). Both sides have found something in the CONTU Report to support their views on this matter. *Id.* It is, however, worth noting that all of the examples of wrongful copying that CONTU discusses are "literal" copying examples. See CONTU REPORT, *supra* note 5, at 22.

Because of this nonconsensus, the CONTU Report is not an especially helpful source of information about the Commission's understanding of what it was recommending. There is little else in the legislative history of the 1980 software amendments to indicate Congressional intent on this issue. See *CONTU Revisited*, *supra* note 5, at 666 & n.9. The *Paperback* opinion indicates that CONTU had not explicitly addressed the central issue presented by the case then before the court. 740 F. Supp. at 50. It nonetheless quotes from Nimmer's views, and merely notes the differing views of Miller and Levine. *Id.* at 51.

35. See, e.g., *Synercom Technology, Inc. v. University Computing Co.*, 462 F. Supp. 1003, 1011 (N.D. Tex. 1978); *Plains Cotton*, 807 F.2d 1256.

36. See *Whelan*, 797 F.2d at 1237-38; *Paperback*, 740 F. Supp. at 73.

37. *Whelan*, 797 F.2d at 1237-38; *Paperback* 740 F. Supp. at 77-79. *Paperback* treats this as a "policy" argument rather than as a principle of copyright law applicable to functional writings. See *infra* Section V.

38. *Whelan*, 797 F.2d at 1234; *Paperback*, 740 F. Supp. at 51. Although *Paperback* acknowledges that the statutory definition of a "literary work" is far broader than "works of literature" (which the term would, in ordinary discourse, connote), 740 F. Supp. at 51, it nonetheless cites a string of cases involving works of literature and other artistic and fanciful works in support of the proposition that nonliteral elements of copyrighted works can be protected by copyright law. *Id.* at 51-52. As Section V-A will show, functional

elements to be protected in programs as well. It rejected the "bright line" standard argument as inconsistent with the Congressional intent to have courts use the traditional idea/expression distinction,³⁹ and the incremental innovation argument as one which, if accepted, would provide too little incentive to invest in software development.⁴⁰ Consequently, it concluded that nonliteral elements of a program, such as its "structure, sequence, and organization" could be protected by copyright law.⁴¹

Although rejecting the "bright line" standard proposed by the defense, the Third Circuit in *Whelan* proffered a highly protectionistic one in its stead: "the purpose or function [of a program is] the work's idea, and everything that is not necessary to that purpose or function [is] part of the expression."⁴² Necessity, the court declared, would be tested by determining whether more than a small number of ways existed to achieve the function. Although this test has been extensively criticized by commentators,⁴³ it has been used with some frequency in software copyright cases,⁴⁴ for it has the apparent virtue of all "bright line" tests of providing judges faced with complicated legal arguments about factually complex phenomena with a simple basis for making distinctions that will resolve the case before them.⁴⁵

writings, such as spreadsheet programs, generally have a much narrower scope of copyright protection than literature, drama, and other artistic and fanciful works.

39. The aspect of the CONTU Report that both *Whelan* and *Paperback* considered to be a reliable reflection of Congressional intent is that which expresses confidence that the courts could draw the proper line between "idea" and "expression" in computer program cases. See CONTU REPORT, *supra* note 5, at 18-23. Had CONTU and Congress intended for the line between copyrightable and uncopyrightable elements of programs to be drawn between their literal and nonliteral elements, the courts reasoned they would have said so. *Whelan*, 797 F.2d at 1241; *Paperback*, 740 F. Supp. at 54, 73.

40. *Whelan*, 797 F.2d at 1237. For similar reasoning in *Paperback*, see 740 F. Supp. at 75-76.

41. *Whelan*, 797 F.2d at 1240. The *Whelan* test was rejected by the Court of Appeals for the Fifth Circuit in *Plains Cotton*, 807 F.2d 1256. *Whelan's* "SSO" concept was rejected as "technically incoherent" and its test for infringement was rejected as unsound copyright law in *Computer Associates, Inc. v. Altai*, 755 F. Supp. 544, 559-560 (E.D.N.Y. 1991).

42. *Whelan*, 797 F.2d at 1236.

43. See, e.g., Karjala, *supra* note 33, 76-79; *Copyright Protection for Application Programs*, *supra* note 6, at 1045; *LaST Frontier Report*, *supra* note 6, at 90.

44. See, e.g., *Broderbund*, 648 F. Supp. at 1133; *Pearl Systems*, 8 U.S.P.Q.2d (BNA) 1520 (both applying the *Whelan* test).

45. *Paperback* indicates that despite their superficial appeal, "bright line" rules often result in injustice. To reach just results, the opinion states, it is necessary to carefully weigh the facts and circumstances of each case. 740 F. Supp. at 73. Yet, by adopting the *Whelan* approach, the court in *Paperback* seems to have unconsciously slipped into the error of a "bright line" standard, one that is inconsistent with copyright statute and caselaw, as will be demonstrated further in sections IV and V.

C. *Paperback's* Use of the *Whelan* Test

Although the court in *Paperback* purported to model its legal test in the case on Judge Learned Hand's "patterns of abstraction" test,⁴⁶ a close examination of the *Paperback* opinion reveals that the court actually applied the Third Circuit's *Whelan* test, thereby taking that court's shortcut through what would otherwise have been a dense thicket of copyright issues in the case.

Paperback sets forth its "legal test for copyrightability" which the court said it intended to use to judge the protectability of various aspects of the Lotus program.⁴⁷ The first "element" of this test, said to be derived from Judge Learned Hand's "patterns of abstraction" test was that "the decisionmaker must focus upon alternatives that counsel may suggest, or the court may conceive, *along the scale from the most generalized conception to the most particularized*, and choose some formulation—some conception or definition of the 'idea'—for the purpose of distinguishing between the idea and its expression."⁴⁸ The second "element" of the test was that "the decisionmaker must focus upon whether an alleged expression of the idea is limited to elements essential to expression of *that* idea (or is one of only a few ways of expressing the idea) or instead includes identifiable elements of expression not essential to every expression of that idea."⁴⁹ The third was "having identified elements of expression not essential to every expression of the idea, the decisionmaker must focus on whether those elements are a substantial part of the allegedly copyrightable 'work,'" which the court pointed out was to be judged on a qualitative, not just a quantitative, basis.⁵⁰

Yet, in the section of the *Paperback* opinion in which the court purports to apply its legal test to the facts of the case,⁵¹ the court uses an approach that is much more like that of *Whelan*. It begins by identifying "the idea" of the Lotus program as that of "an electronic spreadsheet."⁵² This was, of course, unprotectable by copyright law. More specific aspects of the program, such as the rotated "L" creating the spreadsheet

46. See *Nichols v. Universal Pictures Corp.*, 45 F.2d 119, 121 (2d Cir. 1930).

47. The *Paperback* test is a highly idiosyncratic and erroneous analytic procedure for assessing the copyright issues raised by the *Paperback* case. See Copyright Professors Amicus Brief, *supra* note 10, at 1-2. A more appropriate way to frame the copyright issues in *Paperback* would have been to inquire, as part of a copyright infringement analysis, whether the aspects of the Lotus interface for which Lotus was seeking protection were properly considered within the scope of copyright protection available for the Lotus program. That is, were these aspects part of the protectable "expression" of the program and had Paperback copied that expression from the Lotus program? See *Brown Bag*, 960 F.2d 1465; PAUL GOLDSTEIN, COPYRIGHT PRINCIPLES, LAW & PRACTICE, ch. 7 (1989).

48. 740 F. Supp. at 60 (emphasis in the original) (quoting *Nichols*, 45 F.2d at 121).

49. *Paperback*, 740 F. Supp. at 61 (emphasis in the original).

50. *Id.*

51. *Id.* at 65-68.

52. *Id.* at 65.

grid, the "/" key for invoking the menu of commands, and the command structure, were treated, in accordance with the *Whelan* test, as presumptively expressive. Unless the court found them to be necessary elements of a spreadsheet program, they would be established as expressive elements.⁵³

Although recognizing that there were some spreadsheet programs that did not use the rotated "L" as a spreadsheet grid or the "/" to invoke the menu of commands, the court in *Paperback* concluded that there was only a limited number of options for accomplishing the functions these details served.⁵⁴ The court thus concluded that they were "necessary" elements of spreadsheet programs, and consequently, were instances in which idea and expression had "merged," and what would otherwise have been "expression" had become "idea."⁵⁵

Other elements of the Lotus user interface, particularly its command structure, were found by the court to be unnecessary to accomplishing spreadsheet program functions because it was possible to design a spreadsheet program different from Lotus' as to these features, as could be seen by looking at the user interfaces of a number of other spreadsheet programs.⁵⁶ Having determined that these aspects of the Lotus interface were "expression" because they flunked the "necessity" test, the remaining question the court addressed was whether they were substantial components of the Lotus program, to which the court thought it "incontrovertible" that the answer must be yes.⁵⁷

53. *See id.* at 66-67.

54. *Id.* Stern questions the factual basis of the court's assertion that there were a limited number of ways to achieve these functions. *Legal Protection of Screen Displays, supra* note 14, at 335. A better copyright analysis of these details of the Lotus interface, as with *Paperback's* use of "+" to represent addition and "-" to represent subtraction, would have been that these elements, because so commonly found in spreadsheet programs, had become conventional elements of such programs, which should be treated in the same manner as *scenes a faire* typically are in copyright law—as unprotectable by copyright. *See, e.g., Brown Bag, 960 F.2d 1465; Apple Hearing Transcript, supra* note 20, at 84-86. The court in *Paperback* seems to have avoided this way of analyzing the copyright status of these details because of the deep disfavor with which it viewed *Paperback's* "standardization" defense. *See infra* note 126.

55. *Paperback, 740 F. Supp.* at 66-67.

56. The court listed seven spreadsheet programs that had different menu structures from Lotus 1-2-3, but also said that the idea of a menu structure for a spreadsheet program "could be expressed in a great many if not literally unlimited number of ways." *Paperback, 740 F. Supp.* at 67-68. For similar statements in *Whelan, see 797 F.2d* at 1239. What does not seem to have occurred to the court in either case is that the different structures of other programs might reflect use of different "systems" or "methods of operation," rather than differences in expression.

57. *Paperback, 740 F. Supp.* at 68. The court stated, in support of this proposition, that the Lotus interface was "its most unique element, and is the aspect that has made 1-2-3 so popular." *Id.* Further proof of its substantiality was said to be that the defendants had bothered to copy it. *Id.*

What may have caused the court in *Paperback* to use the *Whelan* test instead of a more traditional approach, such as Hand's abstractions test, was that the court got almost no help from the lawyers in conceptualizing what an abstractions scale for a spreadsheet program might look like, and where on such a scale the Lotus interface or various aspects of it might be found.⁵⁸ Lotus' lawyers were apparently arguing that everything about its user interface was "expressive" (because of different ways functions could be done) and Paperback's lawyers were arguing that all aspects of the user interface were "ideas."⁵⁹ So, instead of building a fairly elaborate scale of abstractions, as Hand's test would have suggested was proper,⁶⁰ the court ended up with a dichotomy in which the only perceived generality at the "idea" pole was that of an electronic spreadsheet, and all of the particularities of the Lotus interface were lumped together at the "expression" pole, as would be the result of applying the *Whelan* test.

D. The Errors of the *Whelan* Test

Even if one has no quarrel with the conclusion of *Whelan* and *Paperback* that nonliteral elements of computer programs can sometimes be protected by copyright law, one can nonetheless object to the *Whelan* test for infringement as one "inconsistent with the copyright statute, the copyright caselaw, and traditional principles of copyright law."⁶¹

The principal criticism that has been leveled at the *Whelan* test is that it takes an overly narrow view of what copyright law considers to be an "idea."⁶² On its face, the test begins with the presumption that there is only one idea to be found in every computer program, and that all else in the work is expression unless a necessity test takes it out of the expression category and propels it into the idea category.⁶³ It also fails to distinguish

58. *Paperback*, 740 F. Supp. at 62.

59. *Id.*

60. *See id.* at 60 ("Upon any work, and especially upon a play, a great number of patterns of increasing generality will fit equally well, as more and more of the incident is left out," (quoting *Nichols*, 45 F.2d at 121) (emphasis added)).

61. Copyright Professors Amicus Brief, *supra* note 10, at 2.

62. *See, e.g., LaST Frontier Report*, *supra* note 6, at 20.

63. The *Whelan* test would give "functional works," such as Lotus' spreadsheet program, a far broader scope of copyright protection than is available for artistic and fanciful works, a result out of keeping with traditional principles of copyright law. *See* discussion *infra* in Section V.

The *Whelan* test also contributes to confusion about what is protectable by copyright in a program and what is protectable by patents. The general purpose or function of a program is probably no more patentable than it is copyrightable. A particular way of achieving a program function, however, seems now to be patentable. *See infra* note 136. Only a cursory study of patent law is required to discern that patent specifications routinely describe the different ways that the general function(s) of the invention had been accomplished in the prior art as a basis for establishing the novelty of the claimed inventive new way to do it. Thus, the existence of other ways of doing something is as

between higher level and lower level abstractions, which Hand's abstractions test would do.⁶⁴

The *Whelan* test is particularly unsuitable as a test for copyright infringement for computer programs because programs are often assemblages of components that could be packaged separately instead of being combined together. A spreadsheet program, for example, might include a calculation component, a graphing component, and a data base component. If the *Whelan* test is applied to a software package combining these functions into one program, "the idea" in the program will be that of an electronic spreadsheet, and the three components, because they are more specific details, would be treated as presumptively expressive. If, however, the three components were packaged as separate programs, graphing would now be "the idea" of the graphing program, and only lower level details would be presumptively expressive (even though some of them too may well be methods or processes). This demonstrates how much of a "word game" the *Whelan* test can be.⁶⁵

More importantly, the *Whelan* test fails to take account of the fact that the term "idea" in copyright parlance is not confined in its meaning to abstract generalized conceptions, such as the general purpose or function of a program. Rather, it is a metaphor used in copyright law to describe the unprotectable elements in a copyrighted work, that is, the things that are beyond the scope of protection available to the work.⁶⁶

In particular, the *Whelan* test fails to consider the full text of § 102(b) which indicates that such things as processes, procedures, systems and methods of operation are unprotectable by copyright law even when embodied in the text of a copyrighted work.⁶⁷ It also fails to recognize

likely to indicate that there are other patentable methods for achieving the same function as it is to indicate that there are other copyrightable nonliteral expressions of how to do it.

64. See *LaST Frontier Report*, *supra* note 6, at 20.

65. The court in *Paperback* criticized the defense lawyers for engaging in "word games" in connection with several of its defenses. *Paperback*, 740 F. Supp. at 71-73, 79. Yet the court seems to have engaged in some word games of its own concerning the meaning of § 102(b). See also *Borland Order*, *supra* note 16, at 28-32 (exhibiting an unwillingness to give the words of § 102(b) more content than as a restatement of the idea/expression distinction).

66. *Paperback* seems at one point to recognize this, for it states that the idea/expression distinction "embraces also the process-expression, method-expression, and useful-expressive distinctions." 740 F. Supp. at 53. But the court fails to carry through with this kind of analysis.

67. Section 102(b) is duly quoted in a background section of *Paperback*. *Id.* at 49. Although occasionally referred to in a cursory manner thereafter, neither this section nor its contents (except that referring to the unprotectability of "ideas") is discussed in the subsection of the opinion on functionality issues, *id.* at 54-58, in the subsection describing the legal test for copyrightability to be used in the case, *id.* at 59-62, or in the sections that analyze the "copyrightability" of various elements of the Lotus interface and *Paperback's* copying of them, *id.* at 63-70. Given that the court in *Paperback* was so insistent on the need to follow Congressional "mandates," *id.* at 53, 58, its failure to conduct any meaningful inquiry into § 102(b) issues is very surprising.

that it is in the nature of processes, procedures, systems and methods of operation to have constituent elements, and that the caselaw interpreting § 102(b) or from which its meaning is derived have frequently held constituent elements of a system unprotectable by copyright.⁶⁸

The *Whelan* test also ignores the legislative history of the 1976 Act which indicates that § 102(b) was being added to the statute in part to ensure that copyright protection for programs would not be construed too broadly, that is, to ensure that such things as the "methods" and "processes" of "a program" would not be protected by copyright law.⁶⁹ The text of 102(b), as well as the caselaw from which it was derived and that properly interprets it, demonstrates unequivocally that not all "nonliteral" elements of a program are to be treated equally under copyright law, as they are under the *Whelan* test, and not all should be presumed to be expressive. Because there may well be more than a few methods or systems of achieving some general purpose, the mere existence of alternatives does not demonstrate that a nonliteral aspect of a computer program is "expressive" enough for copyright protection to be available for it.⁷⁰

The proper inquiry in copyright cases involving computer programs must be much broader than the highly protectionist *Whelan* "bright-line" test permits. *Paperback* erred in applying the *Whelan* test for software copyright infringement. The remainder of this article will set forth the kind of the inquiry the court might have made had it not been distracted from doing so by *Paperback's* nonliteral elements defense. Section IV will discuss the kind of copyright inquiry the court should have made about whether any aspects of the Lotus interface that *Paperback* copied—most particularly, the Lotus command structure—were constituent elements of a system for managing spreadsheet functions or for constructing macros. Section V will discuss the kind of inquiry the court should have made about what was expressive in the Lotus interface and whether expressive elements were appropriated by *Paperback*.

68. See Copyright Professors Amicus Brief, *supra* note 10, at 7. See also cases cited *infra* in Section IV.

69. In a background section of the opinion, 740 F. Supp. at 49, *Paperback* quoted the relevant passage from the House Report (see *supra* note 4), but made no effort to give it content. The terms "methods" and "processes" are emphasized in the text because the legislative reports' use of the plural expression demonstrates quite clearly that Congress thought there would be more than one of them per program.

70. *Baker v. Selden*, discussed *infra* in Section IV-A, is one example of this principle. See also *Bibbero Sys. v. Colwell Sys.*, 893 F.2d 1104 (9th Cir. 1990) (existence of alternative arrangements did not mean that plaintiff's form was "expressive" enough to be protectable by copyright law).

IV. WAS THE LOTUS COMMAND STRUCTURE PART OF THE LOTUS SPREADSHEET OR MACRO SYSTEM?

Paperback contains lengthy discussions of the "idea/expression" distinction,⁷¹ but no analysis of whether any aspects of the Lotus interface might have been part of an unprotectable "system" for managing spreadsheet functions or for constructing macros, even though there are statements in the opinion strongly suggesting that this was the case.⁷² Section 102(b) indicates that "systems" are as unprotectable as abstract ideas, in harmony with a long line of copyright cases that go virtually unmentioned in the *Paperback* opinion.⁷³ The Supreme Court's *Baker v. Selden* decision is among the numerous precedents that hold that when an arrangement of words is a constituent part of a system, the arrangement is not within the scope of copyright protection for the work, no matter

71. See 740 F. Supp. at 53-61, 65-68.

72. The strongest of these statements can be found *id.* at 65, discussed *infra* in the text accompanying note 114. See also *id.* at 67 (comparing the "menu command system" of Visicalc with that of Lotus); *id.* at 78 (referring to use of "/" to invoke the "menu command system" and Lotus' "macrocommand facility" and "command facility").

73. See, e.g., *Affiliated Enters. v. Gruber*, 86 F.2d 958 (1st Cir. 1936) (promotional system not protectable by copyright); *Brief English Sys. v. Owen*, 48 F.2d 555 (2d Cir.), *cert. denied*, 283 U.S. 858 (1931) (shorthand system not protectable by copyright on booklets explaining it); *Chautauqua Sch. of Nursing v. National Sch. of Nursing*, 238 F. 151 (2d Cir. 1916) (twelve step hypodermic injection procedure not protectable by copyright in lecture); *Long v. Jordan*, 29 F. Supp. 287 (N.D. Cal. 1939) (old age pension system not protectable by copyright for pamphlet); *Burk v. Johnson*, 146 F. 209 (8th Cir. 1906) (system for organizing mutual burial associations not protected by copyright in pamphlet); *Amberg File & Index Co. v. Shea Smith & Co.*, 82 F. 314 (7th Cir. 1897) (indexing system not copyrightable); *Arica Inst. v. Palmer*, 1991 Copyright L. Rptr. (CCH) ¶ 26,712 (S.D.N.Y. 1991) (spiritual system not protectable by copyright in training manuals); *Kepner-Tregoe, Inc. v. Carabio*, 203 U.S.P.Q. (BNA) 124 (E.D. Mich. 1979) (system for teaching problem-solving techniques not protectable by copyright); *Freedman*, 179 U.S.P.Q. (BNA) 476 (notation system for playing cards not protectable by copyright); *Aldrich v. Remington Rand*, 52 F. Supp. 732 (N.D. Tex. 1942) (tax recording system not protectable by copyright); *Muller v. Triborough Bridge Auth.*, 43 F. Supp. 298 (S.D.N.Y. 1942) (traffic separation system not within scope of copyright on drawings); *Seltser v. Sunbrock*, 22 F. Supp. 621 (S.D. Cal. 1938) (roller derby system not protectable by copyright in book); *Stone & McCarrick, Inc. v. Dugan Piano Co.*, 210 F. 399 (E.D. La. 1914) (system of salesmanship not protectable by copyright on instruction manual); *Simms v. Stanton*, 75 F. 6 (N.D. Cal. 1896) (physiognomy classification systems not protectable by copyrights in books); *Griggs v. Perrin*, 49 F. 15 (C.C.N.D.N.Y. 1892) (stenography system not protected by copyright in book). See also *Healthcare Affiliated Servs. v. Blue Cross of W. Penn.*, 701 F. Supp. 1142 (W.D. Pa. 1988) (use of similar systems and methods in computer program not copyright infringement); *Fishing Concepts, Inc. v. Ross*, 226 U.S.P.Q. (BNA) 692 (D. Minn. 1985) (processes in computer program not protectable by copyright); *Midway Mfg. v. Bandai-America, Inc.*, 546 F. Supp. 125 (D.N.J. 1982) (game rules not protectable by copyright).

None of these decisions is discussed in *Paperback*. Even after eleven copyright law professors urged the court in the *Lotus v. Borland* case to look to *Baker v. Selden* and its progeny in interpreting what the term "system" in § 102(b) means, see Copyright Professors Amicus Brief, *supra* note 10, at 5-9, the court did not do so, saying that *Baker v. Selden* was inapposite because it was decided before computer programs were invented and because the Court didn't have the benefit of the wisdom of Judge Hand's "patterns of abstraction" test. *Borland Order*, *supra* note 16, at 32-33.

how valuable or innovative it might be.⁷⁴ In addition to reviewing *Baker v. Selden* as a representative of the word-arrangement-as-system-elements cases, this section will suggest that, properly construed, Paperback's "language" and "compatibility" defenses were § 102(b) "system" defenses that the court should have taken more seriously.

A. *Baker v. Selden*: The Arrangement of Words As Part of a System

Baker v. Selden is an important precedent to consider in assessing the *Lotus v. Paperback* dispute, not only because it is the venerable Supreme Court decision that ruled that constituent elements of systems embodied in copyrighted works are not protected by the copyright,⁷⁵ but also because it seems to be the only prior copyright case to have involved a claim of copyright infringement based on spreadsheet similarities. It is therefore somewhat surprising how little attention *Paperback* gives to *Baker v. Selden*. That case is discussed in two sentences in the middle of a long paragraph in a part of the opinion remote from the analysis of the merits of Lotus' claim and of Paperback's defenses.⁷⁶ Although *Paperback* makes a passing reference comparing the Lotus electronic spreadsheet to paper spreadsheets,⁷⁷ the larger similarities between the two cases, in terms of their facts, the parties' legal contentions, and the Court's ruling seem to have escaped the court's attention.

74. A number of the "system" decisions involve arrangements of words as elements of the system. *Arica Institute*, 1991 Copyright L. Rptr. (CCH) ¶ 26,712, is a recent example of a case in which the arrangement of words was considered to be outside the scope of copyright because of its role as an element of a system. Palmer had written a book discussing the Arica philosophy, and reproduced diagrams closely resembling those in Arica's manuals. Arica sued for copyright infringement. Palmer defended by asserting that what she had copied were elements of Arica's system for curing ego fixation problems, which were illustrated by the diagrams consisting of nine-pointed stars surrounded by a circle. Each point of the stars was inscribed with a word or phrase that symbolized a component of the system. The ordering of the components was also part of the system. The court stated: "The copyright laws do not confer a monopoly on Arica in the method of describing a particular and interrelated set of characteristics or traits." *Id.* at 24,159.

75. CONTU described *Baker v. Selden* as a "venerable case." CONTU was confident that *Baker v. Selden* and cases like it would provide guidance to the courts in attempting to distinguish what in a program should be regarded as idea or expression. CONTU REPORT, *supra* note 5, at 18.

76. See *Paperback*, 740 F. Supp. at 53-54. The "legal test for copyrightability" is found in the opinion, *id.* at 59-62, and the discussion of the protectable elements of the Lotus interface is found at 65-68.

77. *Id.* at 63.

1. PAPERBACK ON BAKER V. SELDEN

Paperback begins its brief discussion of *Baker v. Selden* by referring to it as a "seminal case,"⁷⁸ and goes on to say that it had held "that the text of a book describing a special method of double-entry accounting on paper spreadsheets . . . was copyrightable *expression*, but that the . . . *idea* of this particular kind of double-entry bookkeeping, was not."⁷⁹ The Supreme Court's statement of its holding in the case was importantly different from the court's description of it in *Paperback*. The Court actually said that Selden's copyright protected his "explanation" of the accounting method, but not the useful "art" (that is, the bookkeeping method or system) explained in the book.⁸⁰ This correct formulation of the rule of *Baker v. Selden* makes clear something that is sometimes forgotten about the case: that *Baker v. Selden* is fundamentally a case about the unprotectability of the functional content of written works, and the right of others to copy that content to make use of it.⁸¹ To speak of the

78. *Id.* at 54.

79. *Id.* (emphasis in the original).

80. *Baker*, 101 U.S. at 105.

81. *Baker v. Selden* has truly been a "seminal case," for from it have grown a number of important doctrines of American copyright law: (1) that the scope of protection for writings embodying functional content is quite narrow, for the functional content is not protectable by copyright, *see, e.g.*, *Continental Casualty Co. v. Beardsley*, 253 F.2d 702, 705-06 (2d Cir.), *cert. denied*, 358 U.S. 816 (1958) and *Kepner-Tregoe*, 203 U.S.P.Q. (BNA) 124, 130-32; (2) that constructing a useful article depicted in a copyrighted work does not infringe the copyright, *see, e.g.*, *Muller*, 43 F. Supp. 298, 300; (3) that blank forms are not copyrightable, *see, e.g.*, *Bibbero*, 893 F.2d 1104, 1106; (4) that when there are significant constraints on the manner in which an idea can be expressed, even using the same expression will not be infringing as an instance in which idea and expression are said to be merged, *see, e.g.*, *Morrissey v. Proctor & Gamble*, 379 F.2d 675, 678-79 (1st Cir. 1967); (5) that when useful elements of a copyrighted work must be copied in order to be used by others, no copyright infringement should be found, *see, e.g.*, *Kepner-Tregoe*, 203 U.S.P.Q. (BNA) 124, 131; and (6) that which is within the subject matter of utility patent law is outside the subject matter of copyright, and that it would be a fraud on the public to give copyright protection to that which has not satisfied the standards and procedures required by the patent system or to that which is the subject of an expired patent. *See, e.g.*, *Brief English Sys.*, 48 F.2d 555, 556; *Muller*, 43 F. Supp. 298, 299; *Korzybski v. Underwood & Underwood, Inc.*, 36 F.2d 727, 729 (2d Cir. 1929).

Some regard this latter proposition to have been called into question by dicta in *Mazer v. Stein*, 347 U.S. 201, 217 (1954) ("Neither the Copyright Statute nor any other says that because a thing is patentable it may not be copyrighted") and by *In re Yardley*, 493 F.2d 1389, 1393 (C.C.P.A. 1974) (design patent can issue on copyrighted work). *See, e.g.*, 1 MELVILLE B. NIMMER & DAVID NIMMER, NIMMER ON COPYRIGHT, § 2.19 (1991) [hereinafter NIMMER ON COPYRIGHT]. Both of these decisions, however, involved design patent and copyright issues, an area in which Congress may have contemplated some degree of overlap in coverage. There is, however, no case holding that utility patents and copyrights can protect the same aspect of the same work. Several cases, *Baker v. Selden* among them, express the contrary view. *See also* *Taylor Instrument Co. v. Fawley-Brost Co.*, 139 F.2d 98, 99 (7th Cir. 1943), *cert. denied*, 321 U.S. 785 (1944). *Mazer* itself cites approvingly not only *Baker v. Selden*, but two other cases in which the courts observed that plaintiffs should have sought a patent if they wanted to protect the innovation which they were trying to protect through copyright law. *Mazer*, 347 U.S. at 217-18. The issue whether utility

case as concerning only the unprotectability of abstract ideas oversimplifies the Court's ruling.⁸²

A more serious mischaracterization of *Baker v. Selden* appears in the next sentence of *Paperback*: "The Court thus concluded that Baker did not

patents and copyrights can protect the same aspect of computer programs is currently hotly debated among intellectual property lawyers. See, e.g., Perle, Meyer, and Siber, *supra* note 34, at 7-8 and Toedt, *Bonito Boats Follow-up*, 6 COMPUTER L. 28 (July 1989).

This author contends that, notwithstanding the dicta quoted above, *Mazer v. Stein* did not effect any significant change in the holding of *Baker v. Selden*. The Court in *Mazer* merely decided that the copyright in a statuette (which qualified for protection as a "work of art") was not invalidated because of the subsequent reproduction of it to serve as a base for a lamp. The statuette served the same aesthetic function as a lamp base as it had as a free-standing sculpture. The Court in *Mazer* made clear that had the sculpture served a utilitarian function, or had any utilitarian function been intermingled with its aesthetic function, it would have regarded the matter differently. 347 U.S. at 212-213. The 1976 Act has codified this aspect of *Mazer*. See 17 U.S.C. § 101 (definitions of "pictorial, sculptural, and graphic work" and "useful article"). See also 17 U.S.C. § 113. If anything, *Mazer* clarified that *Baker v. Selden* should be understood as a case concerning the appropriate scope of protection for copyrighted works, an issue generally arising in the course of an infringement determination. See Reichman, *supra* note 2, at 693-95.

82. A number of decisions have recently cited *Baker v. Selden* as though the only proposition for which it stands concerns the unprotectability of abstract ideas. See, e.g., *Cable/Home Communication Corp. v. Network Prods., Inc.*, 902 F.2d 829, 842 (11th Cir. 1990); *Whelan Assoc. v. Jaslow Dental Lab.* 797 F.2d 1222, 1236 (3d Cir. 1986); *Toro Co. v. R & R Prods. Co.*, 787 F.2d 1208, 1212 (8th Cir. 1986); *Apple Computer, Inc. v. Formula Int'l, Inc.*, 725 F.2d 521, 524 (9th Cir. 1984); *Atari, Inc. v. North Am. Philips Consumer Elec. Corp.*, 672 F.2d 607, 615 (7th Cir. 1982); *Rubin v. Boston Magazine Co.*, 645 F.2d 80, 82 (1st Cir. 1981); *Reyher v. Children's Television Workshop*, 533 F.2d 87, 90 (2d Cir. 1976).

Mazer v. Stein, 347 U.S. at 217, does seem to give *Baker v. Selden* as an illustration of the principle that copyright protection is available only for the expression of an idea, not the idea itself. Professor Nimmer relied on this aspect of *Mazer* to argue that *Baker v. Selden* should be understood as limited to the idea/expression distinction. See 1 NIMMER ON COPYRIGHT, *supra* note 81, § 2.18 [D]. Professor Reichman has pointed out that the idea-expression distinction predated *Baker v. Selden*, and if that was all the case represented, it would have been superfluous at the time it was rendered. Reichman has observed that the important historical role of *Baker v. Selden* "was to override the exclusive reproduction rights as applied to utilitarian works . . . [when] the standard defenses (including idea-expression) appeared insufficient to guarantee a third party's right to use functional features embodied in the work . . ." Reichman, *supra* note 2, at 693-95, n.288.

That *Mazer* did not mean by this reference to *Baker v. Selden* to effect a radical change in the meaning of that case is demonstrated by the fact that, in the same paragraph as its discussion of *Baker v. Selden*, *Mazer* cited approvingly two other cases in which defendants had copied the functional designs depicted in plaintiffs' copyrighted drawings by constructing the functional work depicted in the drawing. The courts in these two cases applied the principles of *Baker v. Selden* in ruling that the copyright had not been infringed. See *Muller*, 43 F. Supp. 298 (design for controlling the flow of automobile traffic approaching a bridge not protectable by copyright in drawings); *Fulmer v. United States*, 103 F. Supp. 1021 (Ct. Cl. 1952) (copyright in drawings depicting design for parachutes not infringed by manufacture of parachutes embodying the design), cited in *Mazer* at 347 U.S. at 217 n.39. These cases indicate that by failing to seek patent protection for the functional designs depicted in the drawings, plaintiffs had lost the right to exercise control over the functional implementation of the design by others. *Muller*, 43 F. Supp. at 299-300; *Fulmer*, 103 F. Supp. at 1022. For further discussion of how *Baker v. Selden* has been understood over time, see Reichman, *supra* note 2, at 693-95, n.288.

infringe Selden's copyright when Baker wrote his own treatise, in his own words, describing the special double-entry method of bookkeeping."⁸³ This statement implies that the court thought that Selden sued Baker for copyright infringement because of similarities in the explanatory material in Baker's and Selden's books. This was not so. Selden sued Baker for copyright infringement because Baker's book contained sample ledger sheets that were substantially similar in arrangement to those found in Selden's book.⁸⁴ *Baker v. Selden* was, in other words, a "nonliteral similarity" or "structure, sequence, and organization" ("SSO") case.⁸⁵ To put it in a slightly different way, Baker's book offered potential users of Selden's accounting system a substantially similar "user interface" to that of Selden's.

2. SELDEN'S AND BAKER'S LEGAL CONTENTIONS

A review of the parties' arguments in *Baker v. Selden* reveals the parallels between the legal contentions in that case and those in *Lotus v. Paperback*. Selden, who had won in the lower courts, was, in effect, arguing that there was original expression in the selection, ordering and arrangement of the columns and headings of the ledger sheets contained in his copyrighted book.⁸⁶ That such elements could be protected by

83. *Paperback*, 740 F. Supp. at 54. It is a small point, but neither Baker nor Selden had written a "treatise" on this accounting method. The Court described Selden's book as consisting of "an introductory essay explaining the system of bookkeeping referred to, to which are annexed certain forms or blanks, consisting of ruled lines and headings, illustrating the system and showing how it is to be used and carried out in practice." *Baker*, 101 U.S. at 100.

Although the *Paperback* opinion characterized *Baker v. Selden* as a "seminal case," the same court, after having been informed in briefs submitted by Borland and eleven copyright law professors of its misunderstanding of the holding in that case, is now of the view that *Baker v. Selden* has no application to computer program cases because the Supreme Court decided that case before computer programs were invented. Borland Order, *supra* note 16, at 32-33. This ignores the fact that Congress codified substantial portions of *Baker v. Selden* in § 102(b) and that CONTU also affirmed the applicability of *Baker v. Selden* and its progeny to computer programs.

84. That Baker's ledger sheets were substantially similar to Selden's can be discerned from the Supreme Court's observation that if Selden's copyright extended to the accounting system, the Court would agree that Baker's book infringed the copyright. *Id.* at 100. The court stated that Baker's work "use[d] a similar plan so far as the results are concerned; but makes a different arrangement of the columns, and uses different headings." *Id.*

85. Neither in *Paperback* nor in the *Whelan* decision was there any recognition that *Baker v. Selden* was a nonliteral similarity or "SSO" case in which the "SSO" was ruled outside the scope of copyright.

86. Selden's arguments are summarized in 25 L. Ed. at 842, as well as described by the Court in the body of the opinion. The Court understood Selden to be contending "that the ruled lines and headings, given to illustrate the system, are a part of the book and, as such, are secured by the copyright; and that no one can make or use similar ruled lines and headings . . . made and arranged on substantially the same system, without violating the

copyright law was evident, Selden asserted, from cases involving maps, charts, and diagrams,⁸⁷ among others.⁸⁸ Selden insisted that Baker's arguments about "uncopyrightable subject matter" simply missed the point.

In support of his "uncopyrightable subject matter" defense, Baker pointed out that Selden had gone to the Patent Office to get a patent for his bookkeeping system.⁸⁹ Baker argued that this demonstrated that the *system* was not the proper subject matter of copyright, but should be protected, if at all, by a patent.⁹⁰ It was a contribution to the useful arts, Baker argued, not to literature. Baker insisted that the ledger sheets conveyed no thought, provided no information, and expressed no idea over and above the system they embodied.⁹¹

Baker relied on some cases denying copyright protection to forms,⁹² as well as on the Court's then very recent decision in *The Trademark Cases*.⁹³ In that set of cases, the Court had very clearly distinguished between those things that were "writings" of "authors," and hence the within the subject matter of copyright, and those that were "inventions" in the "useful arts," which were the province of the patent system.⁹⁴

copyright." *Baker*, 101 U.S. at 101. Section V *infra* will discuss some subsequent copyright "blank forms" cases.

87. See synopsis of Selden's argument preceding the Court's opinion, 25 L. Ed. at 842.

88. The Court's opinion indicates that Selden relied heavily on *Drury v. Ewing*, 7 F. Cas. 113 (C.C.S.D. Oh. 1862), a case in which copyright was claimed in a chart of patterns for clothing. *Baker*, 101 U.S. at 107. The Court questioned the *Drury* decision, but concluded that in any event it was not a controlling case. *Id.*

89. That Baker relied on this point is demonstrated in the summary of his argument in 25 L. Ed. at 841. The Court's opinion indicated that no patent issued on Selden's system. 101 U.S. at 104. The opinion does not reveal whether the patent was denied or merely withdrawn.

90. More recent cases would suggest that Selden's system was not patentable subject matter because it was a business method, see, e.g., *Ex Parte Murray*, 9 U.S.P.Q.2d (BNA) 1819 (P.T.O. Bd. App. 1988) although one case suggests the method might be patentable if carried out by computer. See *Paine, Webber, Jackson & Curtis, Inc. v. Merrill Lynch, Pierce, Fenner, & Smith, Inc.*, 564 F. Supp. 1358 (D. Del. 1983).

91. See synopsis of Baker's argument preceding the Court's opinion, 25 L. Ed. at 841.

92. *Id.* at 842; see also 101 U.S. at 106-107 for the court's discussion of a case that had denied copyright protection to a cricket scoring sheet.

93. 100 U.S. 82 (1879). In that opinion, the Court ruled that the Constitutional clause empowering Congress to legislate to give exclusive rights to "authors" for their "writings" and to "inventors" for their "discoveries" in the "useful arts" did not give Congress power to pass a uniform national trademark statute. Baker's reliance on these cases is referred to at 25 L. Ed. at 842.

94. 100 U.S. at 94. Interestingly enough, the Court's opinion in *Baker v. Selden* contains no direct reference to *The Trademark Cases*, although the Court's concern about not allowing copyright law to be used to protect things in the patent domain is evident from the *Baker v. Selden* opinion, 101 U.S. at 102-03. It is worth noting that the Supreme Court's recent decision *Feist Publications, Inc. v. Rural Tel. Serv. Co.*, 111 S. Ct. 1282 (1991) relied heavily on and quoted approvingly from both *The Trademark Cases* and *Baker v. Selden* concerning the meaning of original expression and authorship in copyright law, as well as what copyright law can properly protect in a work.

Baker argued that having been unable to get a patent, Selden should not be able to use copyright to get indirectly the kind of protection that the Patent Office would not grant him directly. Even embodied in a copyrighted book, the system still remained outside the subject matter of copyright. As long as he wrote his own explanatory material about the system, Baker insisted that no copyright liability could arise from having substantially similar ledger sheets in his book, for he needed to be able to reproduce similar ledger sheets in order to illustrate the bookkeeping system in his own book.

3. THE SUPREME COURT DECISION IN BAKER V. SELDEN

The Supreme Court overturned the ruling in Selden's favor, and ordered the complaint against Baker to be dismissed.⁹⁵ The Court agreed with Selden that he held a lawful copyright in the book he wrote explaining his accounting system.⁹⁶ But the Court agreed with Baker that the copyright in the book no more gave its owner exclusive rights in the accounting system than the copyright in a book on the composition and uses of medicines would give its author exclusive rights over manufacture and application of the medicines.⁹⁷ To get exclusive rights for innovations of these sorts, an innovator would have to go to the Patent Office. "To give to the author of a book an exclusive property in the art described therein, when no examination of its novelty has ever been officially made, would be a surprise and a fraud upon the public. That is the province of letters patent, not of copyright."⁹⁸ From copyright, the Court insisted, an innovator could get only exclusive rights to print and distribute his book.⁹⁹ The Court pointed out that the novelty of the art being described in the book had no relevance in determining whether copyright protection was available for it.¹⁰⁰

95. *Baker v. Selden*, 101 U.S. at 107.

96. *Id.* at 101-102.

97. *Id.* at 102. The Court noted that a book on an accounting system might "contain[] detailed explanations of the art, [and] it may be a very valuable acquisition to the practical knowledge of the community." *Id.* But this did not make the detailed knowledge concerning the art a protectable element of the copyrighted book. *Id.* The last substantive line of the recent *Feist* decision quotes *Baker v. Selden* on a similar point: "'great praise may be due to the plaintiffs for their industry and enterprise in publishing this paper, yet the law does not contemplate their being rewarded in this way,'" *Feist*, 111 S. Ct. at 1297 (quoting *Baker v. Selden*, 101 U.S. at 105).

98. *Baker*, 102 U.S. at 102.

99. *Id.* at 102-103.

100. *Id.* at 102. This aspect of the Court's opinion is worth noting because *Paperback* emphasizes the "unobviousness" of the Lotus interface as if this had significant bearing on its protectability by copyright. The court even states that "obviousness" was one of five concepts to be considered in analyzing a case such as *Paperback*, 740 F. Supp. at 58. (The others were the idea-expression distinction, functionality, originality, and merger. *Id.* at 58-59). "Obviousness" is an important concept in patent law, but not in copyright law. The court's frequent references to "obviousness" in *Paperback* indicate that the court may

The Court explained further:

The copyright of a work on mathematical science cannot give to the author an exclusive right to the methods of operation which he propounds, or to the diagrams which he employs to explain them, *so as to prevent an engineer from using them whenever occasion requires*. The very object of publishing a book on science or useful arts is to communicate to the world the useful knowledge which it contains. But this object would be frustrated if the knowledge could not be used without incurring the guilt of piracy of the book. And *where the art it teaches cannot be used without employing the methods and diagrams used to illustrate the book, or such as are similar to them, such methods and diagrams are to be considered as necessary incidents to the art, and given therewith to the public . . .*¹⁰¹

The Court noted that the plausibility of Selden's claim arose from the unusual nature of the useful art the case involved: "In describing the art, the illustrations and diagrams employed happen to correspond more closely than usual with the actual work performed by the operator who uses the art."¹⁰² While in most instances useful arts were embodied in wood, metal, or stone, the peculiar art this case involved was embodied in a writing. But, the Court announced, "the principle is the same in all. The description of the art in a book, though entitled to the benefit of copyright, lays no foundation for an exclusive claim to the art itself."¹⁰³

have been confused on this point. See, e.g., *Paperback*, 740 F. Supp. at 58 (asserting that it would be wrong to deny copyright protection to the "most original and least obvious" aspects of a work). *Id.* at 65 (asserting that although the core idea of a spreadsheet program was "functional and obvious," not "every possible method" of designing a spreadsheet program was obvious, and originality in a copyright sense involved "pressing beyond the obvious"). *Id.* at 66 (use of "+" to represent addition was "obvious if not essential" (emphasis in the original)). *Id.* at 68 (referring to the command structure of 1-2-3 as "original and nonobvious"). See also *id.* at 79 (concerning the need to protect "strikingly innovative" aspects of programs by copyright). These statements suggest that the court in *Paperback* had lost sight of a fundamental point of the *Baker v. Selden* opinion that the novelty (or nonobviousness) of Selden's accounting system had no bearing on whether it was protectable by copyright law.

101. *Baker*, 101 U.S. at 104 (emphasis added). Much of this passage was quoted with approval in *Feist*, 111 S.Ct. at 1290.

Cases such as *Whelan*, 797 F.2d 1222, 1236 assert that they are consistent with *Baker v. Selden* because if a particular detail of a program is "necessary" to achievement of a program's general purpose or function, idea/expression merger will be found. Indeed, the Third Circuit in *Whelan* purported to derive its test for infringement from *Baker v. Selden*. *Id.* at 1235-36. *Whelan*, however, fundamentally misconstrues the larger meaning of *Baker v. Selden*, especially its importance in substantially limiting the scope of copyright protection available for functional writings, such as rulebooks, engineering drawings, and nonfanciful computer programs such as spreadsheet programs. See cases cited in note 81.

102. *Baker*, 101 U.S. at 104.

103. *Id.* at 105 (emphasis added). The Court indicated that the "useful art" was not protectable regardless of whether it was explained in a book or illustrated by diagrams: "Those illustrations are the mere language employed by the author to convey his ideas more clearly. Had he used words of description instead of diagrams, which merely stand in the place of words, there could not be the slightest doubt that others, applying the art to

As all this pertained to Selden's claims, the Court reasoned that since Selden's copyright did not give him any exclusive rights in the accounting system, Baker was free to put similar ledger sheets illustrating use of the system in his book as well. To hold otherwise would indirectly give Selden exclusive rights in his system which the Court regarded as improper to recognize directly.¹⁰⁴ In effect, the Court decided that the selection, ordering, and arrangement of these columns and items in the ledger sheets were constituent parts of Selden's accounting system, and hence, not a part of the book's protectable expression.¹⁰⁵

Given that Baker may have made his sample ledger sheets somewhat different from Selden's out of fear that making them identical would almost inevitably bring on a lawsuit, it is worth inquiring whether there is anything in the Court's opinion suggesting that the Court would have ruled differently if Baker had copied Selden's ledger sheets exactly, column for column, heading for heading. The question has a clear bearing on the implications of *Baker v. Selden* for the *Lotus v. Paperback* dispute which involved at least some exact copying. The last substantive statement of *Baker v. Selden* directly answers this question: "The conclusion to which we have come, is that blank account-books are not the subject of copyright; and that the mere copyright of Selden's book did not confer upon him the exclusive right to make and use account-books, ruled and arranged as designated by him and described and illustrated in said book."¹⁰⁶ The Court's decision, then, did not rest on a finding that Baker's ledger sheets were different enough from Selden's that they did not infringe. The Court ruled that Selden's ledger sheets were simply not protectable by copyright law, just as Baker asserted.

Baker v. Selden is one of many U.S. copyright cases in which an arrangement of words has been found to be a constituent element of a "system," and unprotectable by copyright law. It is from such cases that the meaning of § 102(b)'s exclusion of "systems" and "methods of operation" is to be found. Yet because of its use of the erroneous *Whelan* test, the court in *Paperback* neglected to make an inquiry about whether any of the aspects of the Lotus interface copied by Paperback were constituent elements of a "system" that under *Baker v. Selden* and § 102(b), should have put those elements outside the scope of copyright protection available to the Lotus program. A number of statements in *Paperback*,

practical use, might lawfully draw the lines and diagrams which were in the author's mind, and which he thus described by words in his book." *Id.* at 104 (emphasis added).

104. *Id.* at 104-105.

105. Copyright Professors Amicus Brief, *supra* note 10, at 6-7.

106. 101 U.S. at 107 (emphasis added). See also Copyright Professors Amicus Brief, *supra* note 10, at 7 (indicating that in a proper case, even exact copying of system elements can be noninfringing conduct); BENJAMIN KAPLAN, AN UNHURRIED VIEW OF COPYRIGHT LAW 64 (1967). The system or method will typically constrain the range of possible variations by which the system or method can be illustrated.

particularly those dealing with Lotus' macro facility, suggest that the command hierarchy of the Lotus interface was a constituent element of a system.

B. The Macro Facility of Lotus 1-2-3 As a System

The original Lotus complaint asserted that the command language and syntax of the 1-2-3 interface were protectable by copyright law.¹⁰⁷ Although the syntax claim seems not to have been directly pressed at trial,¹⁰⁸ it is evident from *Paperback* that Lotus was still asserting that the command language of 1-2-3 was protectable by copyright law.¹⁰⁹ Paperback attempted to counter this claim by arguing that languages were unprotectable by copyright law, and offering evidence to show that the Lotus macro facility involved a language.¹¹⁰

How little regard the court had for Paperback's language defense is illustrated by the fact that it is only discussed near the end of the opinion in a section entitled "A Postscript on the Nature of Decisionmaking in This Case" in a subsection entitled "Strained Analogies and Word Games."¹¹¹ Curiously, the court acted as though Paperback, rather than Lotus, had introduced the language issue into the case and criticized the

107. See Complaint of Lotus Development Corp., *supra* note 20.

108. Syntax is, by definition, a set of abstract rules which must be followed for statements in a language to be meaningful. Since it is well-established in copyright law that "rules" are not protectable by copyright law, *see, e.g.,* *Morrissey v. Proctor & Gamble*, 379 F.2d 675 (1st Cir. 1967), a direct claim for the Lotus syntax as a protectable element of the program would be on shaky grounds. Because of its importance in the ordering of commands in the Lotus 1-2-3 command structure, syntax remained indirectly in the case. For the court's recognition of this, *see infra* note 114 and accompanying text. That syntax affects semantics can be easily demonstrated with an example in the English language. "The dog bit the man" has a different meaning than "the man bit the dog," notwithstanding the fact that both sentences have the same words. The meanings differ because of English syntactic rules about the placement of subjects of sentences vis-à-vis verbs and other parts of the predicate.

109. *Paperback*, 740 F. Supp. at 63.

110. Professor Harry W. Lewis of the Harvard University Computer Science Department submitted an affidavit directed to this issue to support Paperback's defense. That the "language" defense was one of Paperback's principal defenses is evidenced by the extensive treatment given to the issue in its pretrial brief. *See Paperback Pretrial Brief, supra* note 10, at 30-43. In the course of the litigation, Lotus seems to have downplayed the language claims, focusing more attention on the "command structure" issue for which it may have been easier to find helpful copyright precedents and on its argument that the user interface as a whole was protectable by copyright.

111. *Paperback*, 740 F. Supp. at 71-73. Earlier sections of the *Paperback* opinion mention machine, assembly, and higher order computer languages. *Id.* at 44-45. There is no mention of these languages in the subsection discussing Paperback's language defense. It is possible that one reason the court was so unsympathetic to Paperback's language defense was that the Lotus commands may have seemed too different from these other kinds of languages to be a comparable phenomenon. If, however, the Lotus macro facility, as a matter of computer science, satisfied the formal definition of "language," the court should have taken the defense more seriously.

defense lawyers for even raising it.¹¹² The court failed to perceive that Paperback's language defense was, in fact, a § 102(b) "system" defense, analysis of which should have been integrated into the body of the court's infringement discussion rather than being tacked onto the end of the opinion in a "postscript" section. In similar fashion, the court failed to perceive the connection between the language defense and Paperback's assertion that copyright protection was unavailable to the Lotus command structure.

Paperback contains two paragraphs describing the macro facility of Lotus 1-2-3 in a subsection describing the Lotus interface in a part of the opinion that precedes the section analyzing the "copyrightability" of various aspects of the Lotus interface. These paragraphs reveal that the court understood that users of the Lotus program could use the Lotus commands to construct macros in order to adapt the program to better serve their needs:

Rather than going step-by-step through the same sequence of commands each time there is a need to perform a particular function, the user may store a sequence of command terms as a "macroinstruction," commonly called a "macro," and then, with one command stroke that invokes the macro, cause the programmed computer to execute the entire sequence of commands.¹¹³

The Lotus commands could, in other words, be used as building blocks for construction of these macros, which is why they could accurately be called elements of a language. After noting that macros could be built not only by combining Lotus command terms into sequences, but also by combining function keys and other aspects of the interface into the sequences, the court went on to say:

Because macros may contain many menu choices, the *exact hierarchy*—or structure, sequence, and organization—of the menu system is a *fundamental part of the functionality of the macros*.¹¹⁴

There are several interesting things about this statement. One is that it directly refers to a "menu system" of Lotus 1-2-3, although not explaining what the court meant by this term or probing its possible

112. The court was critical of Paperback's attorneys for failing to make what it regarded as a coherent statement of the defense, and ultimately made its own statement of the argument underlying this defense. *Paperback*, 740 F. Supp. at 72. The court offered several reasons for regarding the argument as flawed. *Id.* at 72-73. The court thought that the argument depended on "arbitrary definitions of words, adopted for undisclosed reasons," and concluded that this defense was "totally without merit." *Id.* The court chastised the defense lawyers for engaging in a "word game" by raising this defense. *Id.*

113. *Id.* at 64.

114. *Id.* at 65 (emphasis added). See also *id.* at 78 (referring to Lotus' "command facility" and "macrocommand facility," and the availability of "translation devices" to allow 1-2-3 macros to be converted to other programs). The statement quoted in the text was made in a section of the opinion describing the Lotus interface, *id.* at 63-65, and before any discussion of what was protectable expression in the interface.

copyright consequences either in that section or elsewhere. A second is that the statement indicates that the command hierarchy of Lotus 1-2-3 is a "fundamental part" of the "functionality" of the macros, again without an inquiry about the possible copyright consequences of this aspect of its statement. Thirdly, the statement seems to indicate that the command hierarchy is a fundamental part of the Lotus macro system, such that the commands must be in exactly the same hierarchical structure in order for macros constructed in the Lotus language to be executed successfully. And indeed, that is what both Paperback and Borland have asserted in defense of the Lotus lawsuits brought against them.

Because copyright law does not provide protection to "systems" embodied in copyrighted programs, nor to constituent elements of systems, one would have expected the court in *Paperback* to reflect on its own characterization of the macro facility, and to perceive the linkage between it, the language defense, and § 102(b). To the extent that the command hierarchy is a constituent part of the Lotus macro system, it would seem to be outside the bounds of copyright protection under § 102(b). Yet no reference to the role of the command hierarchy in the macro system or to § 102(b) can be found in any of the sections of *Paperback* in which the substantive rulings of the case were made. Neither § 102(b) nor the role of the command hierarchy in the macro system is even mentioned in the part of the opinion discussing the language defense.¹¹⁵

Even apart from the court's own statement about the role of the command hierarchy in the macro facility, Paperback's language defense should have been taken more seriously. A language is, by definition, a formal system consisting of three elements: a vocabulary, a syntax, and semantics.¹¹⁶ There was evidence in the record demonstrating why, as a matter of computer science, the Lotus commands could properly be understood to be elements of a language.¹¹⁷ *Paperback* gives no reasons for its rejection of this evidence.

The court instead gives its own tortured statement of what it found to be an incomprehensible defense¹¹⁸ and challenged Paperback to find precedents to show that languages were uncopyrightable.¹¹⁹ From Paperback's failure to find any such precedents, the court seems to have

115. *Paperback*, 740 F. Supp. at 71-73.

116. See INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS ("IEEE"), STANDARD DICTIONARY OF ELECTRICAL AND ELECTRONIC TERMS 478 (3d ed. 1984). See generally Richard H. Stern, *On Copyright in Computer Languages*, 17 RUTGERS COMPUTER & TECH. L.J. 321 (1991).

117. See *supra* note 110. Moreover, Lotus itself had referred to 1-2-3's menu and macrocommand language as protectable elements of the Lotus interface. See *supra* note 20 and accompanying text.

118. *Paperback*, 740 F. Supp. at 71-72.

119. *Id.* at 72.

inferred that the defense had no merit. The court might instead have insisted that Lotus affirmatively prove that languages are copyrightable, or might at least have recognized that Lotus was raising a novel question for it to decide.

Although Paperback may not have found them, there are, in fact, some copyright precedents to support the view that languages are, in fact, not protectable by copyright law even when embodied in the texts of copyrighted works. The "shorthand system" cases, like the *Paperback* case, involve claims to language components used in the practice of the plaintiffs' systems.¹²⁰ The courts in these cases have, with due nods to *Baker v. Selden*, denied plaintiffs the protection they sought from copyright law. None of these cases is discussed in the subsection on the language defense.¹²¹ Nor does the court mention statements by a number of commentators who have opined that computer languages should be regarded as unprotectable by copyright law.¹²² The court's dismissive

120. See, e.g., *Brief English Sys.*, 48 F.2d 555 (finding no copyright infringement where similarities between the plaintiff's and defendant's works were attributable to their being about the same shorthand system (citing *Baker v. Selden*, 101 U.S. 99)); *Griggs*, 49 F. 15 (same). See also *Signo Trading Int'l, Inc. v. Gordon*, 535 F. Supp. 362 (N.D. Cal. 1981) (translation system not protectable by copyright). But see *Nikanov v. Simon & Schuster, Inc.*, 246 F.2d 501 (2d Cir. 1957) (finding infringement of a chart for studying the Russian alphabet).

121. This part of the *Paperback* opinion makes a passing reference to the "coined words" of *Reiss v. National Quotation Bureau, Inc.*, 276 F. 717 (S.D.N.Y. 1921), but does not discuss the case. *Reiss* was an uncharacteristically terse opinion written by then District Judge Learned Hand in which the court upheld the validity of a copyright in a compilation of coined words intended to enable purchasers of the book to encode their communications to other persons via cable. It was, in short, a book consisting of a possible vocabulary without syntax or semantics. *Brief English Sys.*, 48 F.2d 555, decided ten years after *Reiss* and by the Court of Appeals for the Second Circuit, seems a more apposite precedent, given its more linguistic character.

Compilations have long been troublesome for copyright law, and the temptation to protect them on account of the work that was required to prepare them has proved very strong over the years, as demonstrated by *Reiss* and the long line of "sweat of the brow" cases recently rejected as erroneous interpretations of copyright law in *Feist*, 111 S. Ct. 1282, 1292-95. Even so, copyright does have a long history of protecting compilations. See generally Jane C. Ginsburg, *Creation and Commercial Value: Copyright Protection of Works of Information*, 90 COLUM. L. REV. 1865 (1990).

122. Commentators expressed this view before the *Paperback* opinion issued. See, e.g., John P. Sumner, *The Patent/Copyright Interface: Patent Protection for the Structure of Code*, 30 JURIMETRICS J. 107, 112 (1989); Leo J. Raskind, *The Uncertain Case For Special Legislation Protecting Computer Software*, 47 U. PITT. L. REV. 1131, 1174 (1986); Richard H. Stern, *The Bundle of Rights Suited To New Technology*, 47 U. PITT. L. REV. 1229, 1239 n.64 (1986); Steven R. England, Note, *Idea, Process, or Protected Expression?: Determining the Scope of Copyright Protection of the Structure of Computer Programs*, 88 MICH. L. REV. 866 (1990). This Note was cited in *Paperback*, 740 F. Supp. at 53. It asserts that the *Synercom* decision was correct because the input formats for Synercom's structural analysis program were a language: "Thought of in this way, *Synercom* was an easy case, for there can be no more protection for input formats than for the English language itself." *Id.* at 882 n.82. Commentators have expressed the view that computer languages are not protectable by copyright after

treatment of the language defense was improper as a matter of copyright law.

C. The "Compatibility" Defense

A review of the court's discussion of Paperback's "compatibility" defense suggests that it too should either have been integrated with the "language-as-system" defense or given more serious treatment as a "merger" defense.¹²³ Paperback argued that in order to develop a commercially viable spreadsheet program, it was "necessary" for its program to be "compatible" with Lotus because of user dependence on the Lotus macro facility. Copying the Lotus command hierarchy was said to be necessary to achieve this compatibility. Hence, argued Paperback, this was an instance in which "idea/expression merger" should be found, as it had been in *Synercom*.¹²⁴

Paperback pointed out that the macro facility of the Lotus program allows users with complex computational needs to create "libraries" of macros that allow rapid single stroke execution of the sequences necessary to accomplish these tasks. Whole books have been written to advise users on how to construct macros for specific kinds of functions for Lotus 1-2-3.¹²⁵ After investing considerable time and energy in the creation of macros, users will naturally want to continue to be able to use these macros, and perhaps to share them with others with whom they may be working and who may or may not have a Lotus program on their computers.¹²⁶

the *Paperback* decision. See, e.g., *Legal Protection of Screen Displays*, *supra* note 14, at 283; and Lowry, *supra* note 14, at 1293.

123. Discussion of Paperback's compatibility defense can be found in *Paperback*, 740 F. Supp. at 69 and 77-79.

124. *Synercom*, 462 F. Supp. 1003 (input formats for structural analysis program inseparable from "idea" and hence unprotectable by copyright law).

125. See, e.g., DAVID P. EWING, 1-2-3 MACRO LIBRARY (3d ed. 1990).

126. Like the "compatibility" defense, Paperback's "standardization" defense aimed at injecting the interests of users of spreadsheet programs into the court's copyright analysis. As with the "compatibility" defense, the court rejected the "standardization" defense, and indeed, the court treated these two defenses as intertwined. *Paperback*, 740 F. Supp. at 77-79.

It is beyond the scope of this article to deal at length with the "standardization" defense. Other commentators have dealt with standardization defenses in computer program copyright cases at greater length. See, e.g., Karjala, *supra* note 33, at 35; *Copyright Protection for Application Programs*, *supra* note 6, at 1045; *Legal Protection of Screen Displays*, *supra* note 14, at 283; and Lewis, *supra* note 14, at 689. Economists have argued that copyright law should be applied to computer program user interfaces so as to promote standardization. See, e.g., Joseph Farrell, *Standardization and Intellectual Property*, 30 *JURIMETRICS J.* 35, 47-48 (1989); *Copyright Protection for Application Programs*, *supra* note 6, at 1045.

The court in *Paperback* was surely wrong to say that there was no copyright precedent to support recognition of a standardization defense. 740 F. Supp. at 79. A number of computer program copyright cases have regarded elements of user interfaces as

"Compatibility"¹²⁷ with the Lotus program, in essence, means that users with macro libraries can continue to enjoy the fruits of their own labor by allowing them to port over to another spreadsheet program the macros they have constructed using Lotus 1-2-3. As the court's description of the Lotus macro facility reveals, the exact same hierarchy of commands as 1-2-3 must exist in another program for macros built in the 1-2-3 system to be executed there. If, from the users' standpoint, the Lotus macro facility is a system on which users depend so heavily that they won't use a spreadsheet program that doesn't have this facility,

unprotectable for reasons consistent with a standardization defense: some because the elements had become conventional to programs of the sort the case involved, *see, e.g.,* *Telemarketing Resources v. Symantec Corp.*, 12 U.S.P.Q.2d (BNA) 1991, 1995 (N.D. Cal. 1989); some out of concern for users who otherwise would have to be retrained, *see, e.g.,* *Synercom*, 462 F. Supp. 1003, 1013; and some because market factors required commonality in user interfaces, *see, e.g.,* *Plains Cotton*, 807 F.2d 1256. *See also* *Kepner-Tregoe*, 203 U.S.P.Q. (BNA) at 132 (discussing how market factors can narrow the range of available expressions). In the context of traditional kinds of literary works (novels and plays), the *scenes a faire* doctrine is a comparable defense. *See Paperback*, 740 F. Supp. at 59 (recognizing the *scenes a faire* doctrine).

What may have made *Paperback's* argument so difficult for the court to accept was that it was an argument that virtually all of the Lotus interface had become a standard. Intellectual property scholars who reached consensus on many user interface issues at the LaST Frontier Conference were unable to reach consensus on what if any weight should be given to standardization concerns in analyzing copyright infringement claims involving user interfaces. *LaST Frontier Report, supra* note 6, at 28, 31.

127. "Compatibility" has been a heatedly debated computer program copyright issue both in the United States and abroad. The issue arises both as to internal interfaces of computer programs and as to user interfaces of programs. From the standpoint of the technical community, the compatibility issues raised by both are much the same, even though copyright lawyers tend to treat them as somewhat more distinguishable. *See, e.g.,* *LaST Frontier Report, supra* note 6, at 21-22, 26-33.

Some think that copyright law should be interpreted so that "interfaces" would be "ideas" and only the code implementing them should be considered copyrightable "expression." Under this view, if one firm copies the interface of another firm (at least nonfanciful aspects of it) in order to make a compatible product, no copyright infringement should be found. *See, e.g.,* *Karjala, supra* note 33, at 33; Michael A. Jacobs, *Copyright and Compatibility*, 30 JURIMETRICS J. 91 (1989). Others regard interfaces as valuable "nonliteral" elements of copyrighted programs, the copying of which should be treated as an appropriation of "expression." There is, in this view, no "right" under copyright law to make a "compatible" product. *See, e.g.,* William T. Lake, John H. Harwood, & Thomas Olson, *Tampering With Fundamentals: A Critique of Proposed Changes in EC Software Protection*, 6 COMPUTER L. 1 (Dec. 1989). *See also* NRC REPORT, *supra* note 17, at 67-69 (discussion of opposing views on copyright protection for interfaces).

The recently adopted European Directive on copyright protection for computer programs recognizes that interfaces may be unprotectable "ideas" of computer programs, and allows such interfaces as are necessary to achieve interoperability to be copied without copyright liability. *See* Council Of The European Communities Directive On The Protection Of Computer Programs, reproduced at 42 Pat., Trademark & Copyright J. (BNA) 109 (May 23, 1991). The caselaw in the United States is somewhat more mixed on this question. *See* cases discussed in the articles cited earlier in this note. The court in *Paperback* must have been aware of the larger debate over the "compatibility" issue, yet the opinion does not refer to this debate or to the caselaw that addresses the issue.

Paperback's compatibility defense would seem to present serious copyright issues.

The court's first response to Paperback's compatibility defense was to point out that some spreadsheet developers had attained commercial viability without copying the command structure of the Lotus interface, and hence Paperback had not proven the necessity of copying.¹²⁸ Yet the opinion goes on to suggest that if Paperback had copied the Lotus commands in a more indirect or inefficient manner—as by creating a help facility to inform users what VP-Planner command was equivalent to each Lotus command, or having a macrocommand conversion facility, such as Microsoft's Excel program had—this might have been an acceptable way to achieve compatibility.¹²⁹

By identifying only two ways to achieve compatibility—both of which would have involved some copying from the Lotus program, albeit having a different mode of presentation—the court seemed to forget that it had previously recognized that the existence of only a small number of ways to do something would satisfy the “necessity” test for “idea/expression merger” purposes.¹³⁰ The court had, for example, found “merger” as to some features of the Lotus interface, such as the use of the “/” to invoke the command menus and the rotated “L” grid, despite the fact that there were programs on the market that used different means than these.¹³¹ If there were only two ways, apart from that chosen by Paperback, to achieve compatibility with the Lotus program and both alternatives involved significant copying of the Lotus commands, perhaps the command structure was a good candidate for “idea/expression merger.”

An additional factor that might have supported the “merger” argument was the inefficiency from the user's standpoint in having to call up a help screen each time one wished to identify what VP-Planner commands were equivalent to what Lotus commands. This would seem to require difference for difference's sake, rather than because of some expressive quality in the command terms and their arrangement.¹³² From a competitor's standpoint, having to develop a macro conversion facility to achieve compatibility also might be more inefficient than just presenting the Lotus commands as Paperback did. The Supreme Court recently ruled that competitors were not required to engage in inefficient

128. *Paperback*, 740 F. Supp. at 69.

129. *Id.*

130. *Id.* at 61.

131. *Id.* at 66.

132. See *Kepner-Tregoe*, 203 U.S.P.Q. (BNA) 124 (difference for difference's sake not necessary).

copying when traditional principles of federal intellectual property law would regard the copied aspect of the work as unprotectable.¹³³

How unwilling the court was to consider "merger" when a commercially valuable aspect of the Lotus interface was at stake is best revealed by this statement:

[E]ven if VP-Planner otherwise would have been a commercial failure, and even if no other technological ways of achieving macro and menu compatibility existed, the desire to achieve "compatibility" or "standardization" cannot override the rights of authors to a limited monopoly in the expression embodied in their intellectual "work."¹³⁴

This would seem to reflect a willingness to let Lotus enjoy a complete monopoly in the electronic spreadsheet market, a result hardly in keeping with CONTU's assurances that copyright protection for programs would not lead to monopolization of the market for software products or deter entry of competitors.¹³⁵

Paperback's treatment of the "compatibility" defense, like its treatment of the "language" defense, was unsatisfactory as a matter of copyright law. The two defenses were strands of a § 102(b) defense pertaining to the macro facility of 1-2-3, even though the court failed to perceive this. While the macro facility of 1-2-3 may be a highly useful aspect of the Lotus program—one that might well be patentable under today's standards for computer program-related inventions¹³⁶—if it is, as the court's description seems to indicate, a "system," it should be deemed to be outside the scope of copyright protection. To the extent the command structure is an essential component of the macro facility, it too may be outside the scope of copyright. Only if the court determined that there was "expression" in the Lotus interface, over and above the role of significant components of it in the macro system, could the court, consistent with traditional principles of copyright law, properly find infringement in the *Paperback* case.

133. *Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141 (1989).

134. *Paperback*, 740 F. Supp. at 69.

135. See CONTU REPORT, *supra* note 5, at 23-24.

136. Although the caselaw on the patentability of computer program-related inventions is somewhat unclear, the U.S. Patent and Trademark Office has been taking a broad view of the patentability of such inventions. The Lotus macro facility would seem to qualify for patent protection under recently issued guidelines. See P.T.O. Report on Patentable Subject Matter: Mathematical Algorithms and Computer Programs, 38 Pat., Trademark, & Copyright J. (BNA) 563, 569-71 (1989). See also Donald S. Chisum, *The Patentability of Algorithms*, 47 U. PITT. L. REV. 959 (1986); cf. Pamela Samuelson, Benson Revisited: *The Case Against Patent Protection for Algorithms and Other Computer Program-Related Inventions*, 39 EMORY L.J. 1025 (1990).

V. WHAT WAS "EXPRESSIVE" ABOUT THE LOTUS INTERFACE?

Determining what in a copyrighted work is "idea" and what is "expression" can be among the most difficult conceptual tasks faced by federal judges. For many kinds of works, such as novels and dramatic plays, there are at least numerous precedents through which a judge can search to find comparable situations to serve as a basis for making a judgment on the matter before him or her. In some cases, however, there is very little apart from general principles of copyright law to give a court guidance about how a particular case should be resolved.

Judge Keeton perceived *Paperback* to be such a case. The court found nothing in the statute,¹³⁷ the legislative history or the CONTU Report that gave more than indirect guidance on the issues.¹³⁸ The court seemed also to think that there were no prior cases that presented anything more than general similarities to the idea/expression problem the court found in *Paperback*.¹³⁹ The court regarded itself as left only with general principles

137. Notwithstanding the court's statements early in *Paperback* about the starting place of any analysis being the statutory language itself, the court only mentions the statutory definition of "computer program" in a background section of the opinion, 740 F. Supp. at 50, and pays very little attention to § 102(b). The statutory definition of computer program more clearly supports Paperback's position in the litigation than Lotus', as does the text of § 102(b) and the caselaw underlying it.

138. *Id.* (CONTU did not directly address the issue presented in *Paperback*). The opinion indicates that the court was aware of the differences of opinion among CONTU Commissioners and staff about CONTU's views as to whether nonliteral elements of programs would be protected by copyright law. *Id.* The opinion does not contain any reference to the legislative history of the 1980 software amendments. The court does refer in the legal background section to some statements from the legislative history of the 1976 Act concerning § 102(b), *id.* at 49, but thereafter pays very little attention to them, even though the text of 102(b) and the legislative history concerning it were directly relevant to the controversy.

There is only one place in *Paperback* in which the court makes clear use of the legislative history of the 1976 Act. In rejecting Paperback's standardization defense, the court referred to statements made by a witness at one of the legislative hearings preceding enactment of the 1976 Act. This witness had warned that copyright protection for computer programs might have disastrous consequences for standardization in that field. *Id.* at 76. Because Congress decided to protect computer programs despite such warnings, the court regarded Paperback's standardization argument to be contrary to Congressional intent. This statement, however, was made at the same hearing at which another witness, Professor Miller, warned of dire consequences from protecting computer programs by copyright law unless Congress adopted what became § 102(b) of the 1976 Act. *See supra* note 4. Given that Congress adopted § 102(b) in response to the concerns stated at this hearing, it may be that Congress thought § 102(b) could be used to address standardization concerns as well.

139. Although the *Paperback* opinion contains some sections in which prior computer program copyright cases are either briefly summarized or quoted parenthetically, *see, e.g., Paperback*, 740 F. Supp. at 55, there is remarkably little analysis of prior cases in the substantive sections of the opinion analyzing the "copyrightability" of the Lotus interface and Paperback's copying of what the court found to be copyrightable elements of the Lotus interface. Occasional references are made to other cases, but only at a very general level. *See, e.g., id.* at 65 (brief reference to *Nichols*); *id.* at 66 (citation to *Morrissey*); *id.* at 67

of copyright law and overall Congressional objectives concerning the protection of computer programs with which to resolve the *Lotus v. Paperback* dispute.¹⁴⁰

This section will show that there were, in fact, a number of copyright cases and principles to which the court could—and should—have looked for guidance in resolving the *Lotus v. Paperback* dispute. In addition, this section will point out how little explanation *Paperback* offers concerning the court's rationale for finding the Lotus interface, or certain components of it such as the Lotus command structure, to be "expressive" in a copyright sense.

Notwithstanding *Paperback's* lengthy abstract discussions of the idea/expression distinction, and notwithstanding the court's willingness to explain why it regarded certain features of the Lotus interface, such as the use of "+" to represent addition, as unprotectable features of the interface,¹⁴¹ the court does not explain its theory about the expressiveness of Lotus command terms such as "worksheet," "range," and the like, or about the expressiveness to be found in the ordering of "range" after "worksheet" in the menu structure.¹⁴² Indeed, the only comment the court made about why commands were ordered as they were in the Lotus interface casts doubt on the view that the arrangement was for expressive purposes, for the opinion notes that the command terms were "presented in order of predicted frequency of use rather than alphabetically."¹⁴³ This suggests the ordering was for functional purposes.¹⁴⁴

(brief reference to *Whelan*); *id.* at 68 (brief reference to *Midway/Bandai*). The only prior computer program case which is discussed in some depth was *Softklone*, 659 F.2d 449, whose holding that computer program menu screens were separate works from the program, was rejected in a section of the opinion discussing *Paperback's* subject matter jurisdiction defense. *Paperback*, 740 F. Supp. at 80-81. Even the *Whelan* decision whose test for infringement heavily influenced the court's analysis of the *Paperback* case (see *supra* Section III) is not much discussed in the opinion.

140. The court discusses what it considered to be relevant general principles of copyright law at 740 F. Supp. at 51-52, 58-62 and relevant Congressional objectives and policies at 52-53, 73-79.

141. 740 F. Supp. at 66-67.

142. The second line of the Lotus and Paperback command menu displays was known as a "long prompt." *Id.* at 64. As a user moves the cursor along the first line of the menu, thereby highlighting different first line commands, the long prompt line would display different information for each highlighted command. Some long prompts were explanations of highlighted command terms. Other long prompts displayed the next array of command choices that would be available to the user if the user cared to invoke them. *Id.* The explanatory long prompts were more clearly "expressive" in character than were long prompts that displayed further menus of command choices. Yet, *Paperback* does not differentiate between the explanatory long prompts and submenu long prompts in assessing the expressiveness of the Lotus interface. The court does, however, observe that *Paperback's* explanatory long prompts were different from Lotus'. *Id.* at 70.

143. *Paperback*, 740 F. Supp. at 67.

144. See Copyright Professors Amicus Brief, *supra* note 10, at 9-10 (indicating that arranging commands in order of predicted frequency would be an arrangement for functional purposes, not expressive purposes).

Nor was there any inquiry concerning whether there were functional reasons for grouping certain commands together, or putting some in certain levels of the hierarchy; nor about whether there might have been other functional factors constraining the design of the command structure; nor about what elements of the command structure might, in fact, not have been "original" to Lotus.¹⁴⁵ The court relies heavily on the fact that Paperback could have done things differently to support the conclusion that the Lotus command structure was "expressive."¹⁴⁶ That something can be done differently may be relevant to an "expressiveness" inquiry, but on its own, it is insufficient to demonstrate the presence of "original expression," as the "blank forms" line of cases discussed *infra* illustrates. This line of cases is among the copyright precedents and principles that the court in *Paperback* should have examined and discussed in assessing the expressiveness of various aspects of the Lotus interface.

A. Copyright Cases and Principles That *Paperback* Should Have Discussed

1. THE BLANK FORMS CASES

Over the years, there have been many copyright cases in which copyright protection has been asserted for "blank forms," that is, forms designed for the recording of information of particular sorts. In these cases, judges have generally examined the forms quite closely to determine what if any expressiveness they contain. If the forms include explanatory material as an integral part of the form, the courts will generally find sufficient "expression" to support a copyright in the

145. Although the court recognizes that the use of "/" to invoke command menus was actually original to Dan Bricklin, a co-developer of the Visicalc program which was the first successful electronic spreadsheet program, the court disposes of Lotus' claim to the "/" on merger grounds rather than on the ground that it was not original to Lotus. *Paperback*, 740 F. Supp. at 66. Although Lotus later acquired the copyright in Bricklin's Visicalc program, at the time Lotus 1-2-3 was developed, this feature of Visicalc was copied by the developers of Lotus 1-2-3. See Affidavit of Daniel S. Bricklin at 22, Lotus Dev. Corp. v. Paperback Software Int'l (CA No. 87-0076-K) (June 28, 1990). The developers of Lotus 1-2-3 copied a number of other elements of the Visicalc user interface as well. *Id.* at 34-36. "In most cases, Lotus 1-2-3 uses the same [command] terms as Visicalc . . ." *Id.* at 34. See also Christopher Barr, *From Visicalc to 1-2-3*, PC MAG. (May 26, 1987) (showing how Lotus built on the command structure of Visicalc).

146. *Paperback*, 740 F. Supp. at 67-68. Although the court recognized that some command terms in the Lotus interface were "obvious or merge[d] with the idea," the court stated that this did "not preclude copyrightability for the command structure as a whole." *Id.* at 67. Without quarreling with this statement, it is still a fair question to ask what was expressive about the command structure.

form.¹⁴⁷ When the only text in the forms consists of a set of terse instructions or words merely identifying the categories of information to be elicited when the form is used, the courts will generally find that there is insufficient "original expression" to support copyright protection for the form.¹⁴⁸

Even though it may require some intellectual effort to decide which categories of information should appear on a form and how best to arrange the categories, and even though there may be more than a few ways to do these things, the courts still require more from a form designer before the work can be considered an "original work of authorship" within the meaning of the copyright statute.¹⁴⁹

Those who design command-driven user interfaces such as Lotus 1-2-3, like those who design blank forms, generally aim to maximize system efficiency and ease of use.¹⁵⁰ They will choose command names indicating the function the term represents.¹⁵¹ When a program will have

147. See, e.g., *Beardsley*, 253 F.2d 702 (pamphlet containing forms with explanatory material held copyrightable).

148. See, e.g., *Bibbero*, 893 F.2d 1104 (medical billing forms ruled uncopyrightable for lack of original expression); *John H. Harland Co. v. Clarke Checks, Inc.*, 711 F.2d 966 (11th Cir. 1983) (denying copyright protection to checkbook format); *Janus Mktg. Communications, Inc. v. Doubleday & Co.*, 569 F. Supp. 76 (S.D.N.Y. 1981) (daily activity charts ruled uncopyrightable). See also *Safeguard Business Sys. v. Reynolds & Reynolds Co.*, 14 U.S.P.Q.2d (BNA) 1829, 1832 (E.D. Pa. 1990) ("The Safeguard day sheets are more innovative and sophisticated than the ledger pages in *Baker v. Selden*, and they do convey a certain amount of information. These forms include certain visual guides to where some numbers should be recorded, but they are not sufficiently informative to be subject to copyright."), *aff'd*, 919 F.2d 136 (3rd Cir. 1990). These cases are among the many that trace the rule against copyright protection for "blank forms" to *Baker v. Selden*. As shown *supra* in Section IV-A, the court in *Paperback* perceived *Baker v. Selden* to be a case only about the unprotectability of abstract ideas.

149. See, e.g., *Bibbero*, 893 F.2d 1104 (despite a considerable amount of printing on a medical form and the fact that the information could be arranged differently, the court found no copyrightable expression). *Bibbero* acknowledged that the cases interpreting the blank forms rule "do not yield a consistent line of reasoning." *Id.* at 1107. It distinguished one of the cases on which the plaintiff relied, and stated its disagreement with the ruling in another. *Id.* The court noted that the Copyright Office had recently restudied the blank forms regulation, 37 C.F.R. § 202.1(c). Despite arguments made by blank forms suppliers about their need for copyright protection, the Office found no persuasive argument for repealing this regulation, and reaffirmed the continuing importance of *Baker v. Selden* as authority for the regulation. *Bibbero*, 893 F.2d at 1107. The blank form suppliers were most likely relying on the "sweat of the brow" cases which tested copyrightability by the hard work involved in compiling facts. The "sweat of the brow" cases were, however, recently spurned by the Supreme Court in *Feist*, 111 S. Ct. 1282. In *Feist*, as in *Bibbero*, the Court took seriously the requirement that there be something "expressive" to support copyright protection for the work.

150. See Bill Curtis, *Engineering Computer "Look and Feel": User Interface Technology and Human Factors Engineering*, 30 JURIMETRICS J. 51, 74 (1989) ("The importance of aesthetics relative to other user interfaces increases with the importance of playfulness and decreases with the importance of productivity.").

151. See, e.g., Gary Perlman, *Natural Artificial Languages: Low Level Processes*, 20 INT'L J. MAN-MACHINE STUD. 373 (1984) (discussing choices of mnemonic names for commands).

more than a few commands, designers will tend to limit the number of command terms that are displayed at one time so as not to overwhelm and confuse users with choices.¹⁵² This necessitates the creation of some kind of hierarchy of commands (with those of a more general character typically being made available higher up in the menu of choices) and the grouping in submenus of commands with related functions.¹⁵³ This requires intellectual effort, but it is a kind of intellectual effort that resembles the designing of forms or of human-machine interfaces that are outside the bounds of copyright protection.¹⁵⁴ Yet *Paperback* takes no note of the similarities between "blank forms" and the command-driven Lotus interface; nor does it discuss reasons why the court might have regarded these precedents as inapposite.

2. ASHTON-TATE V. ROSS

Nor did *Paperback* take notice of a California trial court ruling that the command structure for the user interface of a spreadsheet program was insufficiently expressive to be protectable by copyright law. The Ninth Circuit Court of Appeals has affirmed this decision in *Ashton-Tate Corp. v. Ross*.¹⁵⁵ This ruling is directly contrary to *Paperback*.

The case arose out of an unsuccessful collaboration between Ross and a colleague for development of a spreadsheet program for the Macintosh computer. Ross's job was to develop the "engine" for the program, and his colleague's to design the user interface. In the process of developing the engine, Ross wrote out a list of commands that he thought should be included in the user interface, grouped in certain arrangements to represent the various menus the program might have. After Ross and his colleague had a falling out, the colleague went to work for Ashton-Tate, a software development firm, where he worked on a Macintosh spreadsheet program project.¹⁵⁶ The Ashton-Tate product

152. See, e.g., APPLYING COGNITIVE PSYCHOLOGY TO USER INTERFACE DESIGN 268-69 (Margaret Gardner & Bruce Christie eds., 1987) (guidelines for screen design and organization).

153. *Id.*

154. See *infra* note 173 for a discussion of the kinds of human-machine interfaces that are not protectable by copyright law because of the "useful article" doctrine.

155. 728 F. Supp. 597 (N.D. Cal. 1989), *aff'd* 916 F.2d 516 (9th Cir. 1990).

156. There are a couple of interesting ironies about the *Ashton-Tate v. Ross* case. One is that in 1988 Ashton-Tate charged Fox Software with copyright infringement for copying the command structure of the user interface of its popular data base program known as "dBase." (The complaint in that case was modeled after that which Lotus filed against Paperback.) It is difficult to distinguish the claims made by Ashton-Tate against Fox from the claims Ross was making against Ashton-Tate. Thus, Ashton-Tate found itself, in two different litigations, on both sides of the issue as to whether the command structure of a user interface is protectable by copyright law. A second irony is that Ashton-Tate has recently been acquired by another software development firm, Borland International. Borland is a defendant in a similar lawsuit brought by Lotus Development Corp. By virtue of its ownership of Ashton-Tate, Borland is now in litigation on both sides of the

deriving from this project had a user interface in which, Ross alleged, "[n]ot only are the individual commands identical to those of Full Impact, [but] the order in which they are displayed and the menus in which they are contained are identical to the command set of Full Impact."¹⁵⁷

The District Court ruled that Ross's "list of commands is only an idea that is not protected under federal law."¹⁵⁸ On appeal, Ross argued that in a number of decisions, the ordering and arrangement of user interface commands had been protected by copyright law, and emphasized, as those cases had, the large number of different arrangements that were possible as a basis for asserting the arrangement was expressive.¹⁵⁹

The Ninth Circuit affirmed the District Court ruling on the unprotectability of Ross's command hierarchy with approval of the lower court's reasoning.¹⁶⁰ There was, in the appellate court's view, not even a triable issue of fact about whether there was "expressiveness" in this set of user interface commands. The commands were simply the names of functions that the program was capable of performing grouped in a way to promote efficiency in the utilization of the program. It may require intellectual effort to identify what functions the program should perform,

same issue. Because of concerns about the market power Borland would have in the database market if it owned copyrights in both dBase and its own database product and could exclude competitors like Fox from offering commercially viable substitute programs, the Justice Department conditioned its approval of Borland's acquisition of Ashton-Tate on its seeking a prompt resolution of the two user interface copyright lawsuits in a manner that will not give Borland undue market power.

157. See Borland's Redacted Memorandum of Law Regarding the Phasing of the Case at 51 (CA No. 90-11662-K) (June 7, 1991) [hereinafter Borland Brief] (quoting Ross's Brief in Opposition to Ashton-Tate's Motion for Summary Judgment at 14). Following page 51 of the Borland brief is a photocopy of the handwritten list Ross had developed.

158. *Ashton Tate v. Ross*, 728 F. Supp. at 602. The district court stated:

The document given to Wigginton is only a list of labels for user commands, many of which are common commands that were already available on other software programs. There is nothing innovative or novel about the labels that Ross proposed Wigginton use for the program or the order in which they are listed on the document. The single sheet of paper does not contain any source code. The document clearly falls short of the threshold separating ideas from expressions Ross merely told Wigginton what tasks he believed the interface should allow the user to perform.

Id. After saying that the list of commands was only an idea that was not protected by federal law, the court cited to 17 U.S.C. § 102(b). 728 F. Supp. at 602. See also NRC REPORT, *supra* note 17, at 54 (expressing the doubts of some software developers that a distinction between idea and expression can be made in program user interfaces).

159. Borland Brief, *supra* note 157, at 52. The cases include: *Manufacturers Technologies*, 706 F. Supp. 984 (arrangement of items for user interface for cost estimating software held protectable by copyright because of number of alternative ways to arrange the commands); *Softklone*, 659 F. Supp. 449 (grouping and arrangement of command terms in menu screen for communications software held protectable by copyright because of large number of arrangements possible); *Broderbund*, 648 F. Supp. 1127 (arrangement of items on menu screens of a printing program held protectable by copyright because of the possibility of using different arrangements).

160. *Ashton-Tate v. Ross*, 916 F.2d at 521-22.

and to group the commands to facilitate efficient accomplishment of these tasks, but that does not make the arrangement of commands "expressive" in the way they must be for copyright protection to attach. *Paperback* did not even cite the trial court ruling in the *Ross* case, let alone grapple with its contrary ruling. The Ninth Circuit's affirmance of the ruling gives further weight to the trial court's decision in *Ross*.¹⁶¹

3. "THIN" PROTECTION FOR FUNCTIONAL WRITINGS

Among the other traditional principles of copyright law that the court in *Paperback* did not—but should have—employed in constructing its framework for analysis of the copyright issues in *Paperback* was that which recognizes that the scope of a copyright—that is, the breadth of protection provided to a work by copyright law and how far down the hierarchy of abstractions it is appropriate to draw the line between idea and expression—tends to vary according to the nature of the work under consideration. Over the years, courts have come to perceive that there are differing levels of "expressive" content in different kinds of works.

Fanciful or artistic works are generally regarded as enjoying a broad scope of copyright protection because of their predominantly expressive character.¹⁶² Factual works generally have a narrower scope of protection, for in order to further the constitutional purpose of copyright of promoting the growth and dissemination of knowledge, the facts, theories, and other discoveries such works contain are considered outside the scope of the copyright.¹⁶³ Because of this, there is generally less expressive content to be found in factual works than in artistic or fanciful works. An even narrower scope of copyright protection is available for functional writings, such as rulebooks, forms, manuals for operating power plants, engineering drawings, and the like.¹⁶⁴ In general, only

161. Nor is *Ashton-Tate v. Ross* mentioned in Judge Keeton's Memorandum and Order denying cross-motions for summary judgment in the *Lotus v. Borland* case, although *Borland* brought this decision to the court's attention. See *Borland Order, supra* note 16.

162. Novels, dramatic plays, and cartoons are examples of works generally enjoying such a broad scope of protection. See, e.g., *LaST Frontier Report, supra* note 6, at 18.

163. Biographies, histories, scientific reports, and fact compilations are among the works that enjoy this "thinner" protection under copyright law. *Id.* See also *Feist*, 111 S. Ct. at 1289 (indicating that copyright protection for fact compilations is "thin").

164. Elsewhere the author has distinguished between the truly functional character of computer programs and the kinds of "functional writings" mentioned in the text. *CONTU Revisited, supra* note 5, at 727-49. Manuals for operating power plants explain how the plant should be operated; they do not in themselves operate the plant. The wording used to explain the plant operations is the copyrightable "expression" in the manual. The details of plant operations described in the manual are among the work's "ideas." The only "function" of the manual is to convey information, a kind of function that does not disqualify a work from copyright protection. This is in contrast to a computer program written to control the plant's operations; it actually controls the functioning of the plant. The inherently functional nature of programs is what make them so different from traditional categories of copyrightable works.

exact or near-exact copying of such works will be infringing, for the content of these kinds of works tends to be predominantly functional.¹⁶⁵ Under the principles of *Baker v. Selden* and its progeny, this functional content is outside the scope of copyright protection.¹⁶⁶ Only if and to the extent such works contain some “expressive” content is copyright protection available to their authors.

Although user interfaces of computer programs can be fanciful or artistic in character—videogames being perhaps the clearest example—many are more functional in character. Some are too functional to be protectable by copyright.¹⁶⁷ That this should be so is not surprising in view of the fact that computer programs themselves are properly regarded as functional writings,¹⁶⁸ and the role of user interfaces is to provide users with access to program functionalities.¹⁶⁹

Although *Paperback* repeatedly cites copyright cases involving novels, dramatic plays, and fabric designs (that is, artistic or fanciful work cases),¹⁷⁰ it is clear that the court did not regard the Lotus interface as an artistic or fanciful aspect of the program. Indeed, the court agreed with *Paperback* that the Lotus interface was functional.¹⁷¹ Yet the court seems

165. *LaST Frontier Report*, *supra* note 6, at 18-19.

166. *See supra* note 81.

167. One example of this might be the digital display panels of gas pumps. *See LaST Frontier Report*, *supra* note 6, at 27.

168. *Id.* at 19.

169. *See, e.g.*, Curtis, *supra* note 150, at 51.

170. *Paperback*, 740 F. Supp. at 51-52 (citing eight artistic and fanciful work cases for the proposition that nonliteral elements of such works can be protected by copyright law); *id.* at 54 (concluding that protecting nonliteral elements of copyrighted computer programs was “consistent with the treatment of other kinds of intellectual works—specifically, with the treatment of nonliteral elements of expression in musical, dramatic, and motion picture works, and works of literature”); *id.* at 60 (citing artistic or fanciful work cases in support of use of the “patterns of abstraction” test and other standard principles of copyright law); *id.* at 70 (comparing the similarities between the Lotus and *Paperback* interfaces to those in a case involving fabric designs).

171. *Id.* at 54-58. The court states: “Lotus 1-2-3 is surely useful.” *Id.* at 57. The court compares the usefulness of computer programs to that of dictionaries, directories, and maps to illustrate that just because something is useful doesn’t necessarily mean it isn’t copyrightable. *Id.* at 58. This is an inappropriate comparison because dictionaries, directories, and maps are not considered to be “useful” in a copyright sense because their sole function is to convey information or portray an appearance. *See CONTU Revisited*, *supra* note 5, at 727-49. Computer programs are useful because they can be executed in machines in order to perform functional tasks that might otherwise be done in special purpose hardware.

It is clear that by enacting the provisions admitting computer programs to the copyright realm that Congress changed somewhat the copyright rule against the protection of technological processes, a rule for which *Baker v. Selden* might well be cited. The question is how much change did Congress intend. By enacting § 102(b) and explicitly stating that only the “expression” of the programmer, and not the methods, processes, and the like that might be embodied in programs, were to be protected, it would seem that Congress intended to make only minimal changes to the principles of *Baker v. Selden*.

to have found Paperback's arguments about the proper copyright consequences of this functionality to be both confusing and unacceptable.

B. *Paperback's Unwillingness To Accept the Proper Copyright Consequences of The Functionality of Computer Programs And User Interfaces*

Only one subsection of the *Paperback* opinion discusses the functionality of the Lotus interface and the possible copyright consequences of it.¹⁷² In this subsection, the court indicates that Paperback had made a number of "functionality" defenses. The only one the court addressed was that which likened the Lotus interface to other human-machine interfaces that were unprotectable by copyright law.¹⁷³

172. *Paperback*, 740 F. Supp. at 54-58.

173. Paperback's "useful article" defense might be stated in this manner: the Lotus 1-2-3 interface is a human-machine interface; human-machine interfaces have traditionally been proper subject matter for patent—not copyright—protection; traditional copyright law would reject human-machine interfaces from its domain under the "useful article" doctrine; and because there was, in the Lotus interface, no separable "artistic" or "expressive" aspect that could be protected by Lotus' copyright in the program, the Lotus interface failed to satisfy the conditions permitting copyright protection for some aspects of "useful articles." Every aspect of the Lotus interface is directed to achievement of spreadsheet functionality, just as were the columns and headings of Selden's ledger sheets.

In support of this defense, Paperback relied principally on *Synercom*, 462 F. Supp. 1003. In *Synercom*, the court had analogized the input formats for Synercom's statistical analysis program to the unprotectability of the "H" design for automobile gearshifts. Even though particular drawings of this gearshift design might be copyrighted, that would not make the H pattern itself protectable by copyright law such that its subsequent embodiment in an automobile would infringe the copyright in the drawing. Like the gearshift pattern, the input formats were an interface to a machine. The court in *Synercom* found no expression in these formats that was "separable" from the idea they embodied.

It is somewhat surprising that the court in *Paperback* did not reject the "useful article" defense as inapplicable because the program was registered as a "literary work." Some would say that the "useful article" doctrine only applies to pictorial, sculptural, or graphic works. See *Harper House, Inc. v. Thomas Nelson, Inc.*, 889 F.2d 197 (9th Cir. 1989) (stating that the "useful article" doctrine does not apply to textual elements of copyrighted works, although ruling that some aspects of the Harper House organizers were unprotectable because of their utilitarian character). The court in *Paperback*, however, seems to accept that the doctrine had some relevance in computer program cases—an aspect of its ruling quite consistent with *Baker v. Selden*—because it states its understanding of the doctrine more broadly than construction of the statutory provision might suggest: "those elements of a useful article that can exist independently of the utilitarian aspects of the article are potentially copyrightable because those elements are elements of *expression* that can be distinguished from the utilitarian functions of the article." *Paperback*, 740 F. Supp. at 52 (emphasis in the original). Yet the court does not identify what separable expressive elements exist in the Lotus interface.

The subsection on functionality issues in *Paperback* does not display awareness that the "useful article" rule can be traced to *Baker v. Selden*. The subsection cites to only one "useful article" case, which is cited for the proposition that a copyrighted work does not lose copyright status when subsequently put to functional use. *Id.* at 58 (citing *Brandir Int'l Inc. v. Cascade*, 834 F.2d 1142 (2d Cir. 1987)). It is odd that *Paperback* relied on this case because in it, the Second Circuit ruled that a slightly modified version of the plaintiff's sculpture was unprotectable by copyright because changes had been made to the

In parallel to its treatment of Paperback's language defense, the court criticized Paperback's lawyers for failing to make a comprehensible statement of this defense, and after making several of its own statements of the defense, the court rejected it as meritless and based on a "word game."¹⁷⁴

Curiously, the subsection on Paperback's functionality defenses makes no reference to § 102(b), *Baker v Selden*, its progeny, or any of the cases in which the courts have recognized that the scope of copyright protection for functional writings is quite "thin."¹⁷⁵ Through a misconstruction of the "central proposition" of *Synercom*,¹⁷⁶ the court in *Paperback* converted the functionality defense into a "uncopyrightability

sculpture in order to make it more functional, thus causing the work to become an unprotectable "useful article." See *Brandir Int'l, Inc. v. Cascade Pacific Lumber Co.*, 834 F.2d 1142 (2d Cir. 1987).

174. See *Paperback*, 740 F. Supp. at 56, 71-73. The court made its own statement of the defense in three different forms. *Id.* at 56-57.

175. The court treats Paperback's argument that the scope of protection for computer programs should be narrow as if it were a "policy argument," and consigned discussion of it to the "postscript" section of the opinion. *Paperback*, 740 F. Supp. at 77-79. Conceiving of the argument in this way allowed the court to consider it as an argument better addressed to Congress than to the courts which were bound to follow the law as it was. The court also regarded this argument as contrary to Congressional objectives of providing incentives to software innovators.

The "narrow scope for functional writing" principle should instead have been integrated into the body of the court's infringement analysis, for it is a well-established principle of copyright law which applied to the *Lotus v. Paperback* dispute just as clearly as it would to any other functional writing case. *LaST Frontier Report*, *supra* note 6, at 18-19. The CONTU Report and legislative history relevant to the scope of copyright protection for computer programs reflect Congressional intent that standard principles of copyright law of this sort were to be applied in computer program cases. See CONTU REPORT, *supra* note 5; *supra* note 4 and accompanying text.

176. *Paperback*, 740 F. Supp. at 55, regarded that the "central proposition" of *Synercom* was that nonliteral sequencing should always be treated as a circumstance in which idea and expression have merged. This is not the case, for in a footnote, the court in *Synercom*, 462 F. Supp. at 1013 n.5, indicated that in a proper case, nonliteral elements of computer programs might be protectable by copyright. In the usual case, said the court, "sequence, choice, and arrangement have only *stylistic significance*, rather than constituting as they would here the essence of the expression." *Id.* at 1014 (emphasis added).

Had the court in *Paperback* had a proper appreciation of *Baker v. Selden*, it would have realized why the court in *Synercom* ruled that the manner in which Synercom had formatted data for input to its structural analysis program for engineering projects was unprotectable by copyright law. There were, as the court in *Synercom* noted, more than three million ways to order the data for input into the structural analysis program. *Id.* at 1012. That did not, however, mean that there were three million ways to order the data that would be sound from an engineering standpoint. If the data were ordered in accordance with a method Synercom had devised, the ordering of the data would very likely be inextricably interconnected with this method. Under *Baker v. Selden*, that would make the ordering of the data a constituent element of the work's "idea." This appears to be the basis of the court's ruling in *Synercom*.

of nonliteral elements" defense which the court found easy to reject by citations to *Whelan* and its progeny.¹⁷⁷

Close examination of the court's discussion of the functionality issue reveals the heart of the court's concerns with a defense of this sort:

If, in a context, such as that of *Synercom* or of this case, an idea and its expression were taken to be inseparable and the expression therefore not copyrightable, copyright law would never, as a practical matter, provide computer programs with protection as substantial as Congress has mandated—protection designed to extend to original elements of expression however embodied.

I credit the testimony of expert witnesses that the bulk of the creative work is in the conceptualization of a computer program and its user interface, rather than in its encoding, and that creating a suitable user interface is a more difficult intellectual task, requiring greater creativity, originality, and insight, than converting the user interface design into instructions to the machine.

Defendants' contentions would attribute to the statute a purpose to protect only a narrowly defined segment of the creative development of computer programs, and to preclude from protection even more significant creative elements of the process.¹⁷⁸

Even though agreeing with Paperback that the Lotus interface was functional, the court insisted that:

[i]t does not follow that when an intellectual work achieves the feat of being useful as well as expressive and original, the moment of creative triumph is also a moment of devastating financial loss—because the triumph destroys copyrightability of all the expressive elements that would have been protected if only they had not contributed so much to the public interest by helping to make some article useful.¹⁷⁹

177. *Paperback*, 740 F. Supp. at 55. After citing a number of computer program cases that had accepted copyright protection for the "nonliteral elements" of programs, *id.*, the court acknowledged that *Softklone*, 659 F. Supp. 449, and *Plains Cotton*, 807 F.2d 1256, had taken a somewhat different view. *Paperback* does not mention that both had cited approvingly to *Synercom*, as had *E.F. Johnson v. Uniden*, 623 F. Supp. 1485, 1497 (D. Minn. 1985); *SAS Inst. v. S & H Computer Sys.*, 605 F. Supp. 816, 826 (M.D. Tenn 1985); and *Kepner-Tregoe*, 203 U.S.P.Q. (BNA) 124, 133. Thereafter, *Paperback* asserts that the *Synercom* input formats were "quite different" from the nonliteral elements of Lotus 1-2-3, although without saying how or why. 740 F. Supp. at 55.

178. *Paperback*, 740 F. Supp. at 56 (citations omitted). To clarify my analysis of the court's concerns, I have separated in the text these three statements. In *Paperback*, they appear as consecutive sentences in one paragraph of the opinion.

179. *Id.* at 57. Similar statements to that quoted in the text are found in the same section:

To hold [that a work was uncopyrightable because it was associated in the marketplace with a high degree of usefulness] would be to deny copyright protection to the most original and least obvious products of the creative mind merely because the marketplace accepts them as distinctively 'functional.' Such a rule would grant copyright protection for only those products that fall far short of being the best available." Such a rule "would offer incentives to market only the second, or third, or tenth best, and to hold back the best for fear that it is too good for copyrightability.

Id. at 58.

Following these statements, the court's analysis shifts to the idea/expression distinction as interpreted in *Whelan*,¹⁸⁰ and no further mention is made about the functionality of computer programs, user interfaces, or any particular aspects of them or the copyright consequences of their functionality.

These statements in *Paperback* reflect some fundamental misunderstandings of copyright law and principles. It is, for example, inappropriate to say that user interfaces should be protected by copyright law because the bulk of the creativity they embody resides in the "conceptualization" of them. The text of § 102(b) indicates that copyright does not protect "concepts" or "conceptualizations", no matter how creative or original they are.¹⁸¹ The most creative thing about Selden's book was undoubtedly the bookkeeping system explained in it, not the prose he used to describe it. Yet the Court nonetheless ruled that the scope of Selden's copyright was limited to his explanation of the system.¹⁸²

Nor is it proper to test whether an aspect of a copyrighted work is protectable by measuring how much hard work went into either creating the idea or implementing it in some concrete form. The Supreme Court's recent *Feist* decision demonstrates that "sweat of the brow" does not automatically signify the presence of "original expression" protectable by copyright law.¹⁸³ That creativity at the conceptual level does not always indicate that copyrightable expressiveness will be present in all aspects of the written implementation of the concept is shown by *Baker v. Selden*.¹⁸⁴

Near the end of *Paperback*, where the standardization defense was discussed, the court expressed similar concerns:

By arguing that 1-2-3 was so innovative that it occupied the field and set a *de facto* industry standard, and that, therefore, defendants were free to copy plaintiff's expression, defendants have flipped copyright on its head. Copyright protection would be perverse if it only protected mundane increments while leaving unprotected as part of the public domain those advancements that are more strikingly innovative.

Id. at 79. *But see supra* note 100 (discussion of the irrelevance of the novelty or nonobviousness of a work, or specific aspects of it, in determining the availability of copyright protection for it).

180. The functionality subsection concludes with this statement which shows how the court shifts away from functionality and into idea/expression:

[A] court, in determining whether a particular element is copyrightable, must not allow one statutory mandate—that functionality or usefulness is not itself a basis for copyrightability—to absorb and destroy another statutory mandate—that elements of expression are copyrightable. Elements of expression, even if embodied in useful articles, are copyrightable if capable of identification and recognition independently of the functional ideas that make the article useful. This mandate may be viewed as a corollary of the central distinction of copyright law between idea and expression

Paperback, 740 F. Supp. at 58.

181. 17 U.S.C. § 102(b) (1988), quoted *supra* in the text accompanying note 3.

182. *Baker*, 101 U.S. at 105.

183. *Id.* at 102; *Feist*, 111 S. Ct. at 1292-95.

184. *Baker*, 101 U.S. at 107 (ledger sheets not protectable by copyright law).

The "otherwise not enough protection" argument is also not a proper copyright argument.¹⁸⁵ Had such an argument been made in *Baker v. Selden*, the Court's likely response would have been "that's what patents are for."¹⁸⁶ Although there is some uncertainty at present about the patentability of computer program-related inventions, user interface patents are issuing with some frequency nowadays. The Lotus interface, or at least some elements of it, might well be eligible for a patent.¹⁸⁷ But even if patent protection was unavailable for certain valuable aspects of the Lotus interface, the "otherwise not enough protection" argument may more properly be construed as an argument for some *sui generis* protection for user interface features such as command hierarchies.¹⁸⁸

Although the court in *Paperback* did not accept the idea that achieving a optimally useful user interface for a computer program could result in a "devastating" loss of protection,¹⁸⁹ this result is consistent with traditional principles of copyright law. In a report on the application of copyright principles to computer programs, ten intellectual property scholars reached a consensus that

copyright should not protect aspects of an interface that optimizes, in a way for which there is no viable substitute, such design goals as rapid execution, accuracy of results, error reduction, number and speed of keystroke functions, or time, effort, or cost of becoming skilled at using the program. Such functionally optimal aspects of an interface should not be protected regardless of whether the original designer consciously employed systematic design analysis aimed at optimization or simply discovered an optimal interface by intuition.¹⁹⁰

185. See *Feist*, 111 S. Ct. at 1289-90. The strongest argument for "bending" the originality requirement of copyright law to allow "sweat of the brow" protection for compilations was that without copyright protection, there would be inadequate incentives to invest in the socially desirable activity of compiling information. See Ginsburg, *supra* note 121, at 1899. Yet, the Supreme Court in *Feist* expressly rejected this rationale for recognizing copyright protection for these kinds of works. See *Feist*, 111 S. Ct. at 1295.

186. *Baker*, 101 U.S. at 102.

187. In litigation with Lotus, Borland has argued that because Lotus had sought patent protection for a similar command structure to that of 1-2-3, Lotus has recognized that command structures were patentable rather than copyrightable subject matter. The court has rejected this as inconsistent with *Mazer*, 347 U.S. 201. Borland Order, *supra* note 16, at 27-29. For a critique of the court's reasoning on this issue, see *supra* notes 81-82.

188. See, e.g., *Legal Protection of Screen Displays*, *supra* note 14, at 355; Abramson, *supra* note 14, at 9-10.

189. *Paperback*, 740 F. Supp. at 57. Although there are places in *Paperback* where it might seem that the court regarded the Lotus interface as an optimally functional (see, e.g., *id.* at 57-58, 79), there was no finding on this point. It is not asserted here that the Lotus 1-2-3 user interface was functionally optimal. The point is rather that the court in *Paperback* was unable to accept the idea that a functionally optimal interface might be unprotected by copyright law despite the fact that it would be consistent with traditional principles of copyright law to hold that a functionally optimal interface is unprotectable by copyright.

190. *LaST Frontier Report*, *supra* note 6, at 28.

An optimal computer program user interface would, in these scholars' views, be an instance of "idea/expression merger."¹⁹¹ The conferees did not expect it would be easy to establish a "functional optimality" defense, but regarded it as consistent with copyright principles to recognize it.¹⁹²

That copyright law does not protect creative concepts, hard work, optimally efficient expressions, or other valuable elements of works failing to satisfy copyright standards may, on occasion, seem to lead to unfair results. But as the Supreme Court recently observed:

It may seem unfair that much of the fruit of a compiler's labor may be used by others without compensation. As Justice Brennan has correctly observed, however, this is not "some unforeseen byproduct of a statutory scheme." It is, rather, "the essence of copyright", and a constitutional requirement. The primary objective of copyright is not to reward the labor of authors, but "[t]o promote the Progress of Science and useful Arts." Art. I, sec. 8, cl. 8 To this end, copyright assures authors the right to their original expression, but encourages others to build freely upon the ideas and information [or other uncopyrightable elements] conveyed in a work.¹⁹³

The limiting principles of copyright law reflected in the text of § 102(b) are also not unintended byproducts of the law, but of its very essence.

Although the functionality of the Lotus program and some aspects of its user interface means that the work will have a narrower scope of copyright protection than more fanciful works would have, there is no question but that a computer program copyright can be infringed if expressive aspects of the work are copied.

C. Two Kinds of Expressiveness Inquiries That *Paperback* Might Have Made

Thus far, this section has mainly criticized *Paperback* for its inadequate analysis of the "expressiveness" of the Lotus 1-2-3 interface and for its failure to consider a number of copyright precedents and principles. This subsection will present two ways that the court might

191. *Id.* at 27-28.

192. *Id.* at 28. The "moment of achievement as moment of loss" argument is also clearly inconsistent with *Baker v. Selden*. The moment of Selden's crowning achievement was the moment of devastating loss, for the Supreme Court ruled that by publishing his book, Selden had dedicated the useful knowledge in the book to the public domain (unless the system was patented). *Baker*, 101 U.S. at 104. Baker was free to copy the most important and valuable elements of the book because they were constituent elements of the useful system described in it. That the elements could be said to be "original" and "expressive of the system," that they were made up of lines on paper and arrangements of words, did not change the Court's thinking, either about their utility or about the inextricable interconnection of idea and expression in the ledger sheets.

193. *Feist*, 111 S. Ct. at 1289-90 (citation omitted).

have analyzed the expressiveness problem in *Paperback*, either of which would have been more consistent with traditional principles of copyright law than the one the court employed.

Two analytic paths seem necessary because *Paperback* does not seem to be consistent about whether it conceived of the Lotus interface as a "literal" or "nonliteral" element of the program, or the case as involving "literal" or "nonliteral" copying.¹⁹⁴ In many places in the opinion, the court seems to have accepted Paperback's characterization of the Lotus interface as a nonliteral element of the program. Indeed, much of the opinion discusses at length the protectability of nonliteral elements of programs.¹⁹⁵ Yet, the court also seems to rely on near verbatim copying when ruling that Paperback infringed Lotus' copyright.¹⁹⁶

This subsection will first discuss how an expressiveness inquiry might have proceeded in *Paperback* had the court consistently conceived of the user interface as a nonliteral element of the Lotus program and the case as one involving nonliteral copying. It will then discuss how the case might have been analyzed if the court had consistently conceived of the user interface as a literal element of a program and the case as one involving literal copying.

1. PAPERBACK AS A "NONLITERAL COPYING" CASE

Copyright law regards "literal copying" as the reproduction of the whole or a substantial portion of the text of a copyrighted work. Copyright statute defines "computer program" as "a set of statements or instructions to be used directly or indirectly in a computer to bring about a certain result."¹⁹⁷ Thus, the reproduction of the whole or a substantial portion of the source or object code of a program involves "literal copying."

The user interface of a computer program is not among the set of statements or instructions constituting the program. It is among the "results" that can be brought about when a computer executes the program instructions.¹⁹⁸ Neither the statutory definition of computer

194. *Paperback* is not alone in having a confused conception of the relationship between computer programs and user interfaces, or as some courts have perceived the issue, between programs and the screen displays they produce. See *infra* Appendix.

195. See, e.g., *Paperback*, 740 F. Supp. at 50-53.

196. *Id.* at 70 (observing that VP-Planner uses the same command tree as 1-2-3 and stating that the two works were strikingly similar, so much so that users could be confused about which program was being operated).

197. 17 U.S.C. § 101 (definition of "computer program").

198. GOLDSTEIN, *supra* note 47, § 2.16. The unusual nature of computer programs is such that not only is the user interface of a program among the results of executing the program instructions, but it is also the means by which a user can cause the program to bring about additional results (such as printing a copy of a chart or graph that the user of the spreadsheet program might have created for a report he or she needed for a meeting the next morning).

program nor the legislative history of the provision indicates that the "results" achieved when program instructions are processed in the computer are protectable by copyright law. One reason to regard a user interface as a "nonliteral" element of the program is that one can read the entire source code of the program and not find the user interface there as a literal part of the text.

This is not to say that there is nothing in the text of a program from which one could discern things about the user interface. But the user interface is embodied in the program text as an abstraction. This is why it is appropriate to conceive of a user interface as a nonliteral element of the program. Lawyers will describe a case as involving "nonliteral copying" when more abstract elements of the work than the text have been copied. The classic example is the copying of plot elements from a dramatic play. In a proper case, the copying of a detailed sequence of events within the play can give rise to copyright liability, even though all of the lines of dialogue in the defendant's play might be different from those in the plaintiff's play. Under Judge Hand's "patterns of abstractions" test, some nonliteral elements of a work, however, are too abstract or at too high a level of generality to be protectable by copyright law.

The abstractness of a user interface such as Lotus 1-2-3 may not be readily apparent to those who have not developed computer programs. The abstract character of command names displayed in a menu of commands for a spreadsheet program's user interface can be understood by considering that each command stands at the peak of the hierarchy of abstractions for the code that will implement that particular function. For example, assume that command "move" was associated with certain lines of the program source code. These instructions would be part of the "literal text" of the program. A detailed line-by-line summary of this sequence of instructions would be a structural abstraction for those lines of code. They could, therefore, be accurately described as a "nonliteral" element of the program. Even more abstract (that is, less detailed) representations of this sequence might also be made; these too would be nonliteral in nature. The most abstract representation of the function for that segment of the program would be the command name that would appear in the user interface. In this way of understanding the command name, it is a "nonliteral" element of the program, but one of a much more abstract character than those that might represent the underlying structure of the program.¹⁹⁹

So if one were constructing a pattern of abstractions for a spreadsheet program, one would have to say that the commands for its user interface would be among the most abstract elements of the

199. See Alfred Z. Spector, *Software, Interface, and Implementation*, 30 JURIMETRICS J. 79, 86 (1989) (a computer scientist's discussion of the abstractness of user interfaces).

program.²⁰⁰ The copying of a command, or even a set of commands, is the copying of a far more abstract element of a program than a line-by-line synopsis of the source code of a program. Lotus was not claiming that Paperback had copied the source or object code of its spreadsheet program. Nor was it claiming that Paperback had copied the detailed internal "SSO" of the Lotus program. Lotus' main complaint was that Paperback had copied the command structure of the user interface of its program.

If one conceives of a command structure as a nonliteral element of the program which identifies the functions that the program can perform, it is understandable that it would be regarded, as it is in the Ninth Circuit, as the copying of a list of ideas which is not actionable under copyright law.²⁰¹ Treating the command structure as an "idea" is also consistent with Hand's "pattern of abstractions" test which treats higher level generalities as "ideas."²⁰² In addition, this result would be

200. Although the first letter of the command term might be an even more abstract representation than the word itself, it has become standard practice in user interface design to represent commands by names rather than by one-letter representations because the mnemonics of the names aid users to remember with which function they are associated. See Perlman, *supra* note 151, at 373.

201. See *supra* notes 158-61 and accompanying text.

202. Another sign of how abstract the Lotus interface is, and how little Lotus has treated the 1-2-3 command structure as part of the program's expressive authorship, is the large number of books written about Lotus 1-2-3. These books reproduce the Lotus commands and their arrangements, and go to great lengths to explain how the commands can be used to accomplish certain tasks. There are more than two hundred listings in the current issue of Books in Print having "Lotus 1-2-3" in the title, among them: BILL KLING, *THE ABC'S OF LOTUS 1-2-3* (3d ed. 1991); Ira Krakow, *LOTUS 1-2-3: SELF TAUGHT* (1989); QUE CORP., *USING 1-2-3* (1987); ALAN SIMPSON & PAUL LICHTMAN, *THE FIRST BOOK OF LOTUS 1-2-3, RELEASE 2.3* (H.W. Sams & Co. 2d ed. 1991); MARK M. WILLIAMS & NELDA M. RINCKENBERGER, *EXPERT ADVISOR 1-2-3, RELEASE 3.0* (1990); and JEFF WOODWARD, *TEACH YOURSELF LOTUS 1-2-3, RELEASE 2.2* (1990).

If the Lotus command structure was truly "expressive" in a copyright sense, it would seem unnecessary for there to be so many books with so many hundreds of pages of text to explain how to use the commands, and navigate the structure, to accomplish different kinds of spreadsheet functions. This in itself suggests that the Lotus command structure is part of a "system" the program's developers had devised for performing a set of spreadsheet functions, even apart from the role of the command structure in the macrocommand facility. Whole chapters of the books listed above are given over to discussion of specific commands. See, e.g., KLING, *supra* note 202, ch. 9 (lessons on moving, inserting, and deleting in 1-2-3).

Lotus, who against Paperback has asserted that reproducing these aspects of its interface is copyright infringement, has not sued the authors of these books, even though these authors have reproduced many more of the Lotus commands and their arrangement than Paperback which reproduced the Lotus command words only once per program. See, e.g., QUE CORP., *supra* note 202, at 496-97 (reproducing Lotus screen displays) and WILLIAMS & RINCKENBERGER, *supra* note 202, at app. A (showing representations of Lotus menu screens). If Lotus sued the authors of these books for copyright infringement because they reproduced Lotus' commands, command structure, and mode of presenting the commands, the book authors would surely defend such a lawsuit by asserting that they were merely explaining the Lotus spreadsheet system to users. Lotus is, of course,

consistent with the copyright cases giving a narrow scope of copyright protection to functional writings, of which the Lotus spreadsheet program would be one.

2. PAPERBACK AS A "LITERAL COPYING" CASE

One can also, however, conceive of the user interface of a program as an aspect of the work is capable of having expressive elements that can be literally copied. Consider, for example, that a user interface may present (and often does) textual explanations of program functions or colorful pictorial images that if printed in a book would clearly be protectable by copyright law. If one software developer copies the exact explanatory text or pictorial images from another firm's user interface, there might well be the kind of literal copying that would be actionable as copyright infringement.²⁰³

Although Judge Keeton has characterized *Paperback* as a case in which "without dispute, the 1-2-3 user interface as a whole was copied,"²⁰⁴ this is not really so. Consider the differences *Paperback* identifies between the Lotus and VP-Planner user interfaces: VP-Planner had different opening screen displays than Lotus 1-2-3. VP-Planner's help screens were also organized differently than Lotus' and contained different explanatory materials. VP-Planner's screens were generally wider than Lotus'; VP-Planner allowed users to hide certain columns of data in ways that the Lotus program did not permit. The menu bar of VP-Planner initially appeared at the bottom of the screen, whereas the menu bar of Lotus 1-2-3 was at the top of the screen (although users of VP-Planner could move its menu bar to the top of the screen if they preferred to have it there). *Paperback's* menu of commands also generally listed "help" as the first command in the set. For some submenus, VP-Planner had some additional commands relating to the data base capability VP-Planner provided that 1-2-3 did not have. VP-Planner also used somewhat different wording for explanatory long prompts.²⁰⁵

There are clearly some aspects of the Lotus 1-2-3 user interface that are "expressive" in a copyright sense. The text of the opening screens, the

unlikely to sue these authors. Precisely because the 1-2-3 interface is so unexpressive (in a copyright sense), Lotus benefits from the efforts of authors whose books explain to users how to implement various spreadsheet functions by interacting with the Lotus interface. Lotus seems to be more concerned about protecting itself from competition in the electronic spreadsheet market than in protecting the command structure more generally.

203. Even if the whole of a highly expressive user interface was copied, it is improper to regard the case as though the whole of the copyrighted work had been copied. At most, such a case should be described as a "fragmented literal similarity" case if the program itself has not been copied. See NIMMER ON COPYRIGHT, *supra* note 81, at § 13.03 [A][2].

204. Borland Order, *supra* note 16, at 4.

205. *Paperback*, 740 F. Supp. at 70.

explanatory text in the on-line help facility, and the explanatory long prompts would all seem to satisfy copyright standards for originality of expression.²⁰⁶ Paperback, however, did not copy these aspects of the Lotus interface, which is why this article has questioned the *Paperback* ruling.

The court identifies only four aspects of the Lotus user interface as having been copied by Paperback: (1) the command hierarchy of 1-2-3, (2) the mode 1-2-3 used to present the command hierarchy on the screen (that is, a two-line moving cursor menu displayed at the top of the screen), (3) the rotated "L" spreadsheet grid, and (4) the use of the "/" key to invoke the menu of commands.²⁰⁷ Even leaving aside the serious questions raised earlier in this article concerning whether the command hierarchy is unprotectable as a constituent part of Lotus' macro system, the blank forms cases and *Ashton-Tate v. Ross* cast doubt on Lotus' claim there is sufficient "expressiveness" in the Lotus command hierarchy for copyright infringement to be found based on the copying of it alone.²⁰⁸ Because the court regarded the other three things copied by Paperback to be unprotectable "ideas," it is questionable whether a court following traditional principles of copyright law could be persuaded that merely combining four unprotectable ideas of this sort into a user interface would convert the interface into an "expressive" compilation.²⁰⁹

While the author has questioned whether Paperback copied expressive elements of the Lotus interface, it may be that upon appropriate detailed findings and analysis, the court might have found that Paperback infringed the Lotus copyright. The most clearly objectionable thing about VP-Planner was that it was a "clone."²¹⁰ Although the court did not speak of VP-Planner as a clone, Lotus offered evidence in the case to show that it was.²¹¹ The court was clearly impressed by the fact that users could move the VP-Planner menu bar from the bottom of the screen to the top, and because some of the VP-

206. The scope of copyright protection afforded to these expressive aspects would likely be quite narrow in line with the "narrow scope for functional writing" rule discussed *supra* in subsection V-A. See, e.g., *Kepner-Tregoe*, 203 U.S.P.Q. (BNA) at 134 (minor changes in wording necessary to avoid infringement in functional writing case because of the unprotectability of most of the content).

207. *Paperback*, 740 F. Supp. at 65-70.

208. This issue is presented in Lotus' copyright infringement suit against Borland International.

209. See *Brown Bag*, 960 F.2d 1465.

210. As the name of the defendant alone might suggest, *Softklone*, 659 F. Supp. 449, also involved copyright infringement claims against the producer of a clone of a popular software product.

211. Interestingly, *Paperback* never refers to VP-Planner as a "clone," even though Lotus complained of this to the court. One of Lotus' expert witnesses offered a definition of "clones" of software products which the Paperback product may have satisfied. See Affidavit of Bernard Galler para. 91, *Lotus Dev. Corp. v. Paperback Software Int'l* (CA No. 87-0076-K).

Planner screens displayed an array of commands identical to Lotus', "a user could easily think 1-2-3 rather than VP-Planner was the program in use."²¹² Although this statement seems to reflect a more trademark-like than traditional copyright analysis of the case,²¹³ had the court ruled against Paperback because VP-Planner was a "clone" and had the court defined "clone" with precision, it might have developed a persuasive rationale for interpreting copyright law to make clones illegal. There was some exact copying in *Paperback*, and exact or near-exact copying of aspects of a functional writing can be a copyright infringement. A ruling of this sort in the *Paperback* case might not only have been reconciled with traditional principles of copyright law, it could also have provided significant guidance to the software industry about what aspects of user interfaces could properly be protected by copyright law and why.

VI. CONCLUSION

Whether an aspect of a copyrighted work will be protected by copyright law should be tested by long-standing principles of copyright law which require that the aspect be "expressive." The court in *Paperback* did not offer a convincing explanation of what was expressive about the aspects of the Lotus interface on which the finding of infringement was based. In particular, it neglected to consider the implications of its own statements which indicated that an important element of the Lotus interface, namely, the Lotus command structure, was a constituent element of the Lotus macro system.

A user interface is among the "results" generated when program code is executed in a computer. Some program results, such as highly fanciful videogame graphics, may have sufficient "expressive" content that copyright will and should protect them, but a user interface (or other program result) should not be automatically categorized as "expression" merely because it is a result, merely because it is valuable, or merely because hard work or creativity was required to bring it into being.

212. *Paperback*, 740 F. Supp. at 70.

213. That is, it seems to view the problem the case presented as though Paperback had copied the trade dress of 1-2-3, and infringement should be found because the two works were confusingly similar. Trade dress theory for protecting the "look and feel" of computer programs has been suggested by some commentators. See, e.g., Richard A. Beutel, *Trade Dress Protection For the "Look and Feel" of Software: A New Source of Proprietary Rights Protection for the Software Industry?*, 5 *COMPUTER L.* 1 (Oct. 1988).

One of the grounds on which Borland has sought to distinguish its dispute with Lotus from the Paperback dispute is that no one could mistake its Lotus-compatible alternative interface for the Lotus interface because of some distinctive characteristics of the Borland screens and their presentations of the commands. Borland Brief, *supra* note 157, at 11.

"Results" of computer programs will often be functional in nature and beyond the scope of copyright protection.²¹⁴

Although insisting on the necessity to follow the "mandates" of Congress, the court in *Paperback* failed to do so. The CONTU Report makes clear that the Commission expected the courts to look to *Baker v. Selden*, other functional writing cases, and § 102(b) in interpreting copyright law and applying it to computer programs.²¹⁵ CONTU's assurances to Congress that the principles embodied in these sources would yield a proper balance of the interests of program authors, competitors, and the public are consistent with the views that led Congress to make § 102(b) a part of the statute a few years before.

The overbroad ruling in *Paperback* continues rather than resolves the controversy about the protectability of user interfaces by copyright law. It is unfortunate that only by many more years of litigation can the software industry get definitive guidance on these important issues.

214. A recent article reports that advances in computer modelling and tools for analysis of data from materials research labs have led to significant advances in the development of materials such as "extra-tough steel . . . for bearings in space shuttles." Otis Port, *The New Alchemy*, *Bus. Wk.*, July 29, 1992, at 48. These new materials may be the "results" of processing programs in computers, but it would be improper to consider them derivative works within the scope of the programmer's copyright. See generally Pamela Samuelson, *Allocating Ownership Rights in Computer-Generated Works*, 47 *U. PITT. L. REV.* 1185 (1986).

215. CONTU REPORT, *supra* note 5, at 18-23.

APPENDIX

On The Relationship Between Computer Programs and Their User Interfaces and Copyright Law's Confused Conception of It

Few issues of computer program copyright law have confused the courts and the U.S. Copyright Office more than attempting to grasp the relationship between a computer program and its user interface. To enable readers to understand the potential significance of the *Paperback* ruling that "user interfaces" are "copyrightable" parts of computer programs, it may be useful to review how the matter had previously been dealt with by the courts and the Copyright Office.

The story starts with the Copyright Office decision in the early 1980's to begin registering videogame programs as audiovisual works.²¹⁶ Somewhat later, the Office began to issue separate registration certificates for the videogame programs.²¹⁷ Videogame caselaw then began to distinguish between program and audiovisual copyrights, for in some cases, a defendant would be found to have infringed the audiovisual but not the program copyright, in other cases to have infringed the program copyright but not the audiovisual copyright, and sometimes both would be infringed.²¹⁸ Registration practices and caselaw of this sort seemed to suggest that a firm needed one copyright to cover the program, and a second for whatever aspects of the program might be displayed on the screen.

Whelan was the first nonvideogame computer program copyright case in which user interface similarities became an issue. The trial court in *Whelan* relied heavily on similarities in the screen displays produced by the plaintiff's and defendant's programs as a basis for concluding that *Whelan*'s copyright had been infringed.²¹⁹

On appeal, Jaslow pointed out that *Whelan* was not charging infringement based on screen display similarities. Rather, her claim was that Jaslow had copied aspects of the underlying program. Jaslow noted that very differently structured programs could produce substantially similar or identical screen displays, and hence, the trial judge had erred in relying on screen display similarities as the basis for finding copyright infringement as to the underlying program.²²⁰

The Third Circuit agreed with Jaslow's argument, but only to a point. The court agreed that relying solely on screen display similarities

216. See, e.g., *Stern Elec., Inc. v. Kaufman*, 669 F.2d 852 (2d Cir. 1982).

217. See, e.g., *Williams Elec., Inc. v. Artic Int'l, Inc.*, 685 F.2d 870 (3d Cir. 1982).

218. See, e.g., *Williams Elec.*, 685 F.2d 870; *M. Kramer Mfg. Co. v. Andrews*, 783 F.2d 421 (4th Cir. 1986); and *Midway Mfg. Co. v. Strohon*, 564 F. Supp. 741 (N.D. Ill. 1983).

219. See *Whelan*, 609 F. Supp. at 1322.

220. See *Whelan*, 797 F.2d at 1242-45.

to prove infringement as to structural elements of the underlying program would be error, but decided it was not error to consider screen similarities as some evidence of copying of underlying program elements. Because there was other evidence in the record that the court regarded as supporting Whelan's claim of copying of underlying structural elements of the program, the appellate court affirmed the infringement ruling.

Broderbund was the next nonvideogame software copyright case in which user interface/screen display similarities were discussed.²²¹ In *Broderbund*, the infringement claim was based exclusively on screen display similarities, specifically, the choice and arrangement of command terms on a series of menu screens for a printing program. Although the court was somewhat equivocal about whether *Broderbund* had an audiovisual or a program copyright or both, it found comfort in the *Whelan* decision which it interpreted as a screen display similarity case. The court in *Broderbund* used the *Whelan* test for software copyright infringement. This allowed the court to sidestep the issue of what kind of copyright it was dealing with.

Softklone, like *Broderbund*, involved claims of infringement based solely on user interface/screen display similarities, that is, in the arrangement of command terms on menu screens.²²² The judge in *Softklone* rightly pointed out that the court in *Broderbund* had misinterpreted *Whelan* by characterizing it as a screen display similarity case. Taking more seriously than had the appellate court in *Whelan* the point that different programs could produce the same screen displays, and substantially similar programs could produce different screen displays, the court in *Softklone* ruled that the program and the user interface were separate works requiring separate copyrights, a result consistent with the videogame cases. Fortunately for the plaintiff, it had obtained a separate copyright for its main menu screen as a compilation of terms. The court found infringement because the defendant had arranged the command terms in the same way as the plaintiff on one portion of the menu screen, and because the defendant had also used the same highlighting and capitalization of the first two letters of the command terms as had the plaintiff.²²³

Not surprisingly, the *Softklone* decision, insofar as it ruled that separate copyrights were necessary to cover user interface elements of programs, made some software developers quite nervous. Soon thereafter, the Copyright Office initiated an inquiry about the separate

221. 648 F. Supp. 1127.

222. 659 F. Supp. 449.

223. Interestingly, the court ruled that it was not an infringement to have the same set of command terms as another program, but only to arrange them in the same way when they could be arranged differently. *Id.* at 460.

registration issue.²²⁴ Although the Office held hearings at which witnesses discussed reasons that separate registrations of programs and screen displays might be desirable, the Office decided against separate registrations.²²⁵ Current Copyright Office policy is that if the predominant character of a program is audiovisual (such as a videogame), the program should be registered as an audiovisual work. If not, it should be registered as a literary work. Regardless of which registration form is used, the Office considers the program and its screen displays to be one work.²²⁶

This, then, was the state of the law on this issue when *Paperback* was decided. *Paperback* relied on *Softklone* to support its contention that the Lotus interface was unprotected by the copyright Lotus had registered for the program. Lotus, of course, thought that the Copyright Office "one work" policy statement reflected the proper legal approach. Although some aspects of the prior user interface caselaw supported Lotus' position, none of the prior cases seems to have been completely suitable to its purposes. Lotus seems to have decided to take a bolder and more direct approach to litigating its copyright infringement claim against *Paperback*, seeking protection not for the screen displays 1-2-3 generated (the issue as to which the separate registration controversy had arisen), but rather for its "user interface" as an important part of the program.

The more conventional path for the court to have taken in *Paperback* would have been to compare the screen displays of the two programs and to have regarded the screen displays as literal parts of the program under the Copyright Office's "one work" theory. The screen displays then might have been protected from copying by a competitor for reasons given in *Broderbund* and *Softklone*. (For the sake of this discussion, I will leave aside the § 102(b) problem with protecting aspects of the Lotus interface and the conflict between *Broderbund* and *Ross*). The reason prior caselaw had focused attention on similarities in screen displays was because the aspects of user interfaces that are most readily analyzable as copyright problems are those that involve the display of words and symbols on computer screens.²²⁷ More abstract elements of user interfaces, such as the pairing of particular functions to particular keys on

224. See Notice of Inquiry, 52 Fed. Reg. 28,311 (1987).

225. This may have been more as a matter of administrative convenience (e.g., it would minimize the number of forms the Office would have to process) than because the Office had definitively resolved the copyright dilemma about the proper characterization of the relationship between computer programs and user interfaces. See *Hearings Before U.S. Copyright Office on Registration and Deposit of Computer Screen Displays* (Sept. 9-10, 1987).

226. The Office has left to the courts the task of deciding what elements of programs are protectable by copyright law. Notice of Registration Decision: Registration and Deposit of Computer Screen Displays, 53 Fed. Reg. 21,817 (1988).

227. See, e.g., *Whelan*, 797 F.2d 1222; *Manufacturers Technologies*, 706 F. Supp. 984; *Broderbund*, 648 F. Supp. 1127.

the computer keyboard, have generally been viewed as outside the copyright realm.²²⁸ By abjuring the prior caselaw's focus on "screen displays" and embracing the copyrightability of "user interfaces,"²²⁹ *Paperback* may have opened the door to a considerable broadening of the scope of copyright protection for user interfaces.²³⁰

Although the court in *Paperback* does not offer its own definition of "user interface,"²³¹ it quotes Lotus' description of its user interface as including "such elements as 'the menus (and their structure and organization), the long prompts, the screens on which they appear, the function key assignments, [and] the macro commands and language.'"²³² *Paperback* does not explicitly say that function key assignments are protectable by copyright law, but given some of the expansive language in the opinion, it would be consistent with the approach in *Paperback* to say that they were.²³³

228. See, e.g., *Manufacturers Technologies*, 706 F. Supp. 984 (similarities in navigational elements of the user interface ruled not protectable by copyright); *Symantec*, 12 U.S.P.Q.2d (BNA) 1991 (rejecting claims of copyright infringement for similarities in the pairing of certain keys to certain functions).

229. *Paperback*, 740 F. Supp. at 79-80 (infringement said not to be based on screen display similarities, but upon similarities in user interfaces). *Paperback* makes a point of distinguishing its ruling in this respect from the prior user interface cases, particularly *Softklone*. *Id.* The decision to conceptualize the user interface as a protectable element of the Lotus program may help to explain why there is so little discussion of or reference to the other user interface/screen display cases in the *Paperback* opinion.

230. Had the court not found the Lotus interface to be a "copyrightable" element of the Lotus program, *Paperback* indicates that the defendant might still not have won the case as a whole. The second phase of the trial would have determined whether Paperback copied copyrightable elements from the source or object code of the Lotus program. See *Paperback*, 740 F. Supp. at 42. This reflects a view of the relationship between the program and the user interface consistent with that in the *Whelan* case (wherein user interface similarities might be considered as some evidence of copying the underlying structure of the program).

231. A recent decision by Judge Keeton in the *Lotus v. Borland* case suggests that he is still confused about what a user interface is. The opinion refers to *Paperback* as a case in which "without dispute, the user interface as a whole was copied." *Borland Order*, *supra* note 16, at 4. As Section V-C *supra* has pointed out, this was not really true.

Further evidence of the court's confusion about what a "user interface as a whole" is can be seen from the court's recent statement that a reasonable trier of fact could find on disputed facts that Borland took the Lotus user interface as a whole. *Id.* at 5. In fact, it would be impossible for a reasonable trier of fact to find that Borland had copied the whole of the Lotus user interface. What Borland copied from the Lotus interface was the 1-2-3 command hierarchy which is used in Quattro Pro's 1-2-3 emulation interface. This is an important component of the Lotus interface but not the whole of it.

232. *Paperback*, 740 F. Supp. at 63 (emphasis added).

233. Because function key assignments are more specific than the general purpose or function of the program, the court's test for copyrightability would treat them as presumptively expressive. If there are more than a small number of ways to assign the function keys (as would be likely with a user interface like Lotus'), this would make them conclusively expressive. The only question then would be whether they were a substantial component of the program, and to use *Paperback's* reasoning, if the defendant bothered to copy them, they must be substantial parts of the program. See *supra* Section III-C.

The court in *Paperback* deserves some praise for redirecting the copyright discourse on this subject away from a discussion of the protectability of "screen displays" and toward the protectability of "user interfaces." The latter phrase is the accepted term in the technical community. Copyright law should describe computer programs and user interfaces in a technically appropriate manner.²³⁴

At the same time, one can question *Paperback's* insistence that a "user interface as a whole" is copyrightable.²³⁵ Although some computer program user interfaces may consist principally of text and graphics, other user interfaces may consist of devices such as joy sticks, power gloves, and/or dials and switches.²³⁶ These user interface elements are too functional to be protectable by copyright law.²³⁷

As for the issue of how to conceive of the relationship between a computer program and a user interface, it will generally suffice to do as the Copyright Office has recommended: to treat programs and their user interfaces as one work (if indeed they are so), and in the event someone copies parts of a program or user interface, to apply traditional principles of copyright law to determine whether what has been copied is "expressive" in a copyright sense.

That it is appropriate to consider computer programs and their user interfaces as "one work" and to apply copyright law only to "expressive" aspects of them can be illustrated with an example of another kind of machine and its user interface. Consider, for example, the relationship between the internal working parts of a wristwatch machine and its user interface. The wristwatch—which consumers tend to consider in an integrated way as a watch, rather than as two things, a machine and its interface—often has a user interface consisting of a face with numbers on it and two hands fixed at the center of the face.²³⁸ These aspects of the watch's user interface present a visual appearance. They also display information in an efficient manner (which we refer to as "telling" us "the time"). Another part of the user interface of the watch is the externally visible device with which one can wind and set the watch to the proper hour. This controls the functioning of the internal working parts, rather than displaying information.

234. See, e.g., *Altai*, 755 F. Supp. at 559-60 (rejecting certain aspects of *Whelan*, 797 F.2d 1222, as technically incoherent as well as at odds with copyright doctrine).

235. Not all computer programs have user interfaces. Some interface only with other programs or with computer hardware.

236. See, e.g., Donald A. Norman, *Turn Signals Are The Facial Expressions of Automobiles* 59-71 (1992).

237. They may, however, be patentable.

238. As with computer programs and their user interfaces, it is possible for a watch with the same user interface as another to have different internal working parts, and for a watch with the same internal working parts to have a different user interface. In this sense, there is no necessary relationship between these two aspects of the watch.

Some parts of the user interface of a watch may be expressive in a traditional copyright sense; some may not. If one puts, for example, a picture on the face of a watch (Mickey Mouse, for example), the picture may be protectable by copyright law as an original expression. Some parts of the user interface of a watch, although conveying information or displaying an appearance, will be unprotectable by copyright law because they are conventional (i.e., standard) elements of watches (for example, the long "hand" indicating minutes, and the shorter "hand" hours). Other parts of a watch user interface, however, such as the device one uses to set the watch to the proper time, are too functional to be protectable by copyright law.

Similar distinctions can be drawn between expressive and unexpressive aspects of computer program user interfaces. *Paperback* is to be commended for conceiving of computer screen displays as part of computer program user interfaces, but criticized for its failure to apply traditional principles of copyright law when judging the protectability of particular features of user interfaces. Congress did not intend for courts to remake copyright law to render all valuable aspects of computer programs protectable by copyright law. Other user interface cases have recognized that traditional principles of copyright law are to be applied in computer program cases,²³⁹ including the principles embodied in the limiting principles of § 102(b). It is their example, not *Paperback's*, that should be followed.

239. *Brown Bag*, 960 F.2d 1465.

Article

NEW TELECOMMUNICATIONS TECHNOLOGIES AND REGULATION: THE CASE OF PERSONAL COMMUNICATIONS SERVICES

ALEXANDER C. LARSON
TERRENCE J. SCHROEPFER[†]

Table of Contents

I.	INTRODUCTION	272
II.	NEW TECHNOLOGIES	273
	A. Second Generation Cordless Telephones	274
	B. Personal Communications Networks	275
III.	IMPLICATIONS FOR EXISTING SUBSTITUTE SERVICES	276
IV.	AN ANALYTIC FRAMEWORK FOR DISCUSSING THE REGULATION OF PCS	278
	A. Definition of the Market After Service Introduction	279
	B. Competition Within the Market Will Be Possible	281
	C. Service Introduction and Ease of Entry	286
	D. The Effect of Existing Substitutes on Market Power	298
	E. The Relationship of Firms in the Market for Essential Inputs	300
	F. Issues of Radio Spectrum	304
V.	ANALYSIS	306
	A. CT-2	307
	B. PCN	307
	C. How to Determine Who Should Provide PCS	309

© 1992 Alexander C. Larson and Terrence J. Schroepfer

[†] Both of the authors are economists in the Revenues and Public Affairs Department of Southwestern Bell Telephone Company. The opinions expressed in this paper are the thoughts of the authors and do not represent the opinions, policies, or business plans of Southwestern Bell Corporation or any of its subsidiaries.

The authors would like to thank Richard Simnett and Kenneth Train for their expert reviews of the manuscript in progress. The authors also wish to thank the participants at the Research Seminar on Topics in Regulatory Economics and Policy held at Rutgers University on May 1, 1992 for their helpful suggestions. Finally, special thanks go to Lynn Sauer and Marvin Thomason, who supported this research at Southwestern Bell Telephone Company.

D. PCS Should be Supplied via Multiple Providers	310
E. The Pervasive Regulatory Concern of Predatory Pricing	311
VI. CONCLUSION	313

I. INTRODUCTION

In 1990, the Federal Communications Commission (FCC) began investigating whether a portion of the radio spectrum should be allocated for new wireless telecommunications services made possible by evolving advanced technologies.¹ In addition to asking what part of the spectrum should be allocated to these new wireless services, called Personal Communications Services (PCS), the Commission sought comments regarding the number of providers that should be authorized and the regulatory structure best suited for these services. The FCC also requested comments on how the Commission should move current spectrum users to other portions of the electromagnetic spectrum in order to provide these services.

At present, it is unclear whether and to what degree these new telecommunications technologies should be regulated. Any regulatory scheme will have to take into account the effects PCS will have on existing telecommunications markets. Rational public policy demands that regulation be based on sound economic principles so that new advanced technologies are not halted or forestalled by too much reliance on the regulatory status quo. The emergence of wireless technologies such as PCS may require regulators to make a significant break with past practices if the timely and efficient diffusion of new technology is to be encouraged in the future.

The purpose of this article is to provide an analytic framework for determining the regulatory method best suited to meet the public policy goals of these new telecommunications services. It is not meant to serve as a guide or checklist for formal state or federal regulatory proceedings, nor is it intended to provide a list of evidentiary standards to be used to determine if a service should be subject to public utility regulation. Instead, it provides a conceptual discussion as to which considerations are important, and which are not, when determining whether new services that advanced technologies make possible should be regulated. The ensuing conceptual discussion is based on modern regulatory and antitrust economics.

This article concludes that services with the proposed capabilities of PCS do not require any increased regulation of telecommunications.

1. *In re* Amendment of the Commission's Rules to Establish New Personal Communications Services (F.C.C. 1990) (GEN Docket No. 90-314) (released on June 28, 1990).

Because PCS would be part of a large market that includes voice and data communication, PCS would not necessarily change any of the critical factors in this market and would not necessarily need to be regulated. An examination of possible entry barriers, expected market demand characteristics, essential facilities issues, predatory pricing concerns, and spectrum allocation issues leads to the conclusion that the introduction of PCS will not require additional regulation. Regulation of personal communications services would be similar to that observed with today's cellular service. Further, the spectrum allocation for PCS should be limited to an amount sufficient to foster competition among providers of this service.

Section II of this article describes the new technologies currently being examined by the FCC. Section III discusses the implications of PCS on the current telecommunications network. Section IV examines the economic criteria that must be considered in determining whether PCS should be regulated. Section V applies these criteria to the new technologies.

II. NEW TECHNOLOGIES

Personal communications is a set of services that allows a customer to control the origination and termination of a call without regard to an individual's geographic location or telephone service provider. Although the FCC implies that this new capability requires the construction of a separate telecommunications network, PCS can also be provided to a large extent in today's wireline (i.e., the traditional telephone system) network. By using a personal telephone number (PTN), an individual can tell the wired network his identity, where calls should be delivered, what calls to accept, what services or features the user wants, when to interrupt the user, and how to signal the user when an important call arrives.

Although these advanced features can be offered on the landline network, the local exchange carriers (LECs) cannot *currently* offer one of the key features of PCS. By being tied to the wired network, PCSs cannot offer the complete freedom of some alternative technologies that permit the user to communicate with a wireless device.² The implied purpose of the FCC's inquiry is to establish rules for personal communications which will provide all the features of the wireline network along with the added benefit of portability.

2. LECs can provide some wireless services, such as BETRS (Basis Exchange Telecommunications Radio Service), cellular service via separate subsidiary, and some radio paging services. These products, however, do not offer the all the features of PCS.

A. Second Generation Cordless Telephones

The first generation of cordless telephones (CT-1) available today uses analog technology and is restricted to a single location referred to as a base station. These products have a spectrum allocation in the 46–49 MHz band and have a range of 100 meters. Typically the customer places a base station (i.e., a receiver) inside a home and has the convenience of wireless telephone service in and around the house by using a cordless handset. While the performance quality of these units is limited, there are now about 30 million cordless telephones in the U.S.³ Clearly, consumers desire telecommunications services that are not limited by a telephone line.

CT-2 describes the proposed second generation of cordless telephones that, unlike its predecessor, can access multiple base stations up to a range of 100 meters.⁴ Using digital technology, CT-2 allows users to place calls through a network of base stations located in such places as airports, shopping centers, and gas stations. When a CT-2 user is in range of a base station, the subscriber enters his or her personal identification number (PIN) and the call is then carried across the same public switched network used for ordinary telephone calls. At regular intervals, the service provider collects the calling information by a central computer and bills it directly to the user's home or business. CT-2 also allows a user to continue his or her phone conversation while moving away from the original receiving base station. As long as a subscriber is within range of any base station, CT-2 permits the same sort of "handoff" capability currently available only with cellular service.

Unlike the current form of cordless telephone, CT-2 cannot receive calls. Reception of incoming calls is not possible with CT-2 because the network is not capable of tracking the called party while moving from location to location. To overcome this limitation, some CT-2 applicants have proposed the inclusion of a display pager within the handset.⁵ A CT-2 user would receive a digitized paging message indicating a number to call whenever someone attempts to call the wireless subscriber.

CT-2 technology is currently being tested in the United Kingdom. Early in 1989 the British Department of Trade and Industry granted licenses to four groups of operators⁶ to provide CT-2 (sometimes referred

3. *Personal Wireless Communications: The Metropolitan Alternatives*, INSIGHT, DEC. 1991, at 47.

4. *Personal Communications: The Emergence of the Consumer Mobile Communications Market*, YANKEEVISION, June 1990 at 10 [hereinafter *Emergence*].

5. See, e.g., Application for Experimental Radio Station Construction Permit and License by American Personal Communications, Inc. (F.C.C. 1990) (File No. 1321-EX-PL-90) (filed on November 29, 1989).

6. These four consortia are: 1) Phonpoint (British Telecom, NYNEX, France Telecom, STC, and Deutsche Bundespost Telekom); 2) ZonePhone (Ferranti); 3) Mercury Callpoint

to as Telepoint in Britain). By stipulating that a carrier use a common air interface (CAI), the British government assured that any CT-2 handset can interconnect with any provider of Telepoint service.⁷ Although only 5,000 subscribers are claimed by the three vendors currently providing CT-2 service,⁸ most vendors expect Telepoint to eventually establish itself as an inexpensive alternative to cellular or public telephones.⁹

B. Personal Communications Networks

Personal Communications Networks (PCN)¹⁰ use many of the features of CT-2 technology to provide tetherless two-way communications. As with CT-2, PCNs use a wallet-sized, digital cordless telephone to offer communication services. Combining an intelligent network architecture with state-of-the-art modulation techniques, PCNs will offer voice, data, and image delivery from low-power wireless terminals. Among the new features advertised by the proponents of this technology are: medical imaging from an accident site, automatic amplification of any PCN handset for a hearing-impaired subscriber, or even locating a lost child who is carrying a PCN terminal.¹¹

As with the cellular telephone system, PCN calls are seamlessly handed off from one cell to the next as the subscriber moves about the network. By using microcells (such as in every floor of an office building or located at regular intervals along a residential subdivision), PCN provides substantially greater calling capacity than is currently possible with today's cellular architecture. PCN signals are transmitted digitally along the network to provide greater call security, more reliable transmission of information, and higher quality. Because this technology uses a higher frequency and lower power than traditional cellular telephones, PCN does not allow communications from a moving car. Mobile communications with PCN will be limited only to pedestrian movement.

(Mercury, Motorola, and Shaye); and 4) BYPS (Barclay's Bank, Philips, and Shell). *Emergence*, *supra* note 4, at 11.

7. In the U.K., CT-2 with the Common Air Interface does not provide for call hand-off. Incoming calls are possible if the subscriber registers his/her terminal at a base station and stays within the coverage region of the base station.

8. *Emergence*, *supra* note 4, at 10.

9. The last CT-2 operator in the U.K. recently ceased operations. Phonepoint, after constructing roughly 3,000 base stations in Britain, had only 800 subscribers when it closed its operations in October 1991. *COMM. DAILY*, Oct. 23, 1991, at 9.

10. PCN is sometimes referred to as CT-3. In order to avoid any confusion, the authors of this Article will use CT-2 to refer to the wireless microcell technology which has only out-going call capability. PCN will refer to the microcell technology which permits both in-coming and out-going call capability. PCS will refer to all Personal Communications Services, including CT-2 and PCN.

11. See, e.g., *In re* Petition of PCN America, Inc. (F.C.C 1989) (RM-7175) (filed on November 7, 1989), at 29.

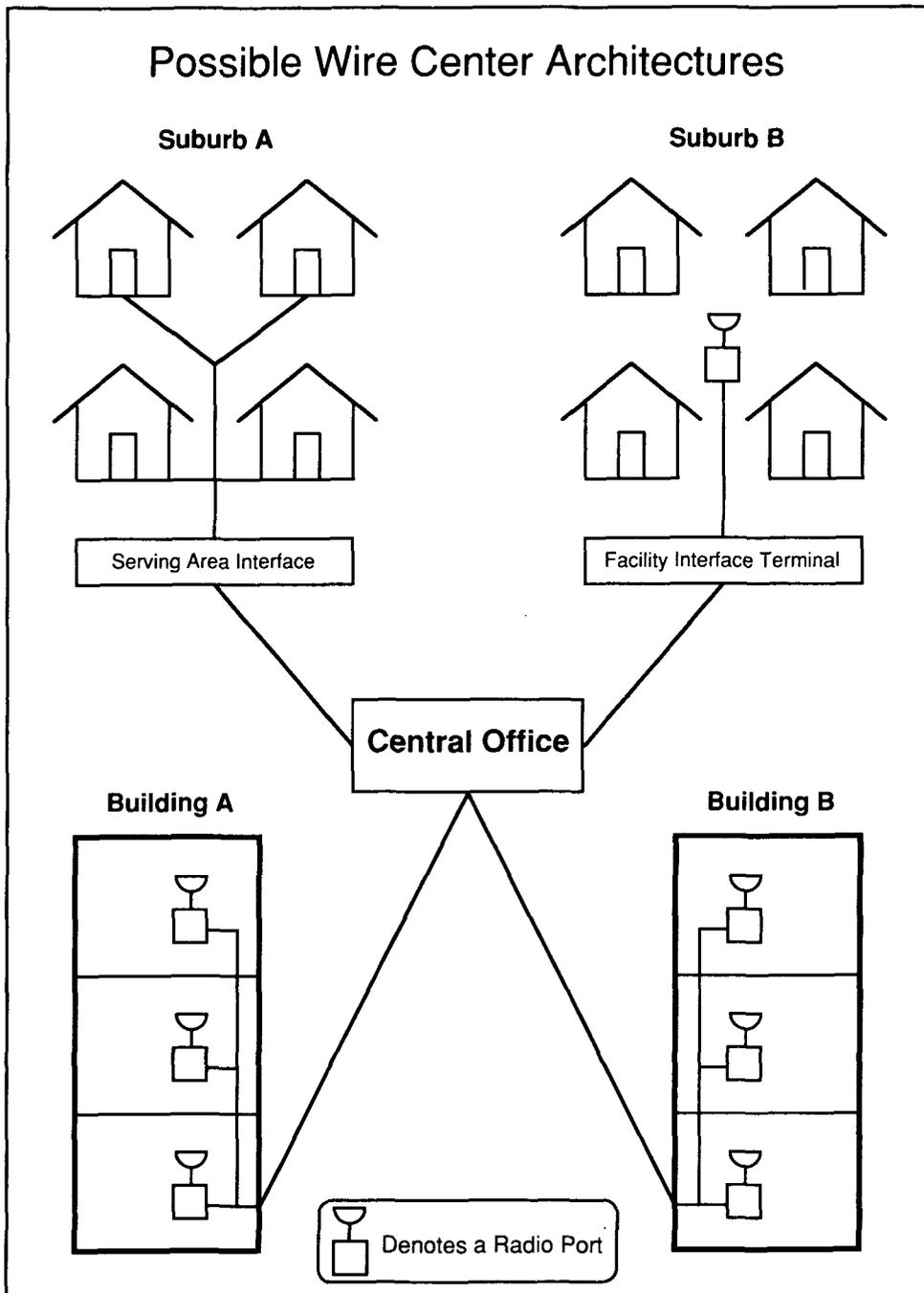
One of the attractions of PCN is the ability to contact an individual anywhere on the network as long as that subscriber is within range of a PCN radio port. With a "smart card," which the user inserts into the wireless handset, he is able to signal to the network that he is available to place or receive calls. An individual could contact his spouse at work or at home without knowing their exact location, for example, simply by dialing their spouse's personal telephone number. Under this type of system a telephone number has evolved from designating a physical location to identifying an individual.

III. IMPLICATIONS FOR EXISTING SUBSTITUTE SERVICES

The following diagram shows how these wireless technologies may exist within the current telephone network. While the F.C.C. might require a PCS provider to construct a network separate from the existing landline system, personal communications could also be provided on the current telephone network.¹² As can be seen from the following diagram, a residential area could be served by a tethered network (Suburb A) and/or a wireless system (Suburb B). Under this scenario different service providers (i.e., the traditional telephone and wireless operators) use the Local Exchange Carrier (LEC) switch to offer telecommunications.

It may also be possible to offer wired and wireless business communications within the existing network. A structure could have telephone service from a traditional wired network (Building A) or a wireless architecture (Building B). The key point from this illustration is that a wireless communications operator might be able to offer service without the expense of constructing a large infrastructure. With very little capital investment (i.e., a radio port), a PCS provider may be able to quickly enter (or exit) a market whenever it seems profitable.

12. A requirement that PCN providers build a wholly different network, of course, may forfeit any joint economies in production that may be present. The Commission has expressed a general interest in preserving such joint economies where they exist. *See, e.g., In re Separation of Costs of Regulated Telephone Service from Costs of Nonregulated Activities*, Report and Order, 2 F.C.C.R. 1298, at para. 111 (1987) [hereinafter "Joint Cost Order"].



As can be seen from the previous section, CT-2 and PCN offer many features currently offered by the present telecommunications system as well as several new options. Competition from such services could have

a significant impact on the existing telephone system. CT-2 will probably first appear in locations that generate large volumes of traffic—the same areas that generate a large portion of the revenue from traditional pay telephone service. This could reduce income from traditional pay service, a source of revenue that currently helps to lower rates charged for ordinary local service.¹³

In addition to causing the possible loss of revenue from public telephones, PCN will also compete directly with local telephone service. As witnessed by the dramatic growth in cordless telephones, consumers desire portability. PCN networks, which will probably first appear in large buildings, will eventually expand to serve most business districts and selected residential areas. As with CT-2 competition with public telephone service, PCNs can be expected to initially serve those areas that generate the most profit for the provider.¹⁴

Traditional cellular operators will also experience competition from these new personal communications networks. Although PCS is technically unable to provide wireless communications from moving vehicles, these new systems offer potentially more capacity and smaller handsets than the current form of cellular service. Thus, PCS represents a viable option to traditional wired and wireless communication.¹⁵

IV. AN ANALYTIC FRAMEWORK FOR DISCUSSING THE REGULATION OF PCS

This section uses a systematic set of questions to determine whether the introduction of PCS should lead to regulation. Based on a decision tree put forth by Ronald Braeutigam, this section addresses such topics as market definition, ease of entry considerations, market demand characteristics, and essential facilities concerns.¹⁶

13. The rates for basic local exchange service, or "plain old telephone service" (POTS), are regulated at the state level by the various state public utility commissions. Generally, the regulation of these rates is a part of standard rate of return regulation which puts legal limits on the rate of return a telephone company may earn on its rate base. Basic local exchange service is often priced via *residual pricing*, which means that whatever residual revenue requirement exists after all other services have been priced will be recovered via rates for basic local exchange service. This has traditionally meant that other services "benefited" basic local exchange service.

14. Some market research studies have shown that a long-term potential market of about half of the local exchange subscribers exist for PCN. For example, Joanne Fraser asserts that, "30% to 40% of U.S. households will subscribe to PCS within ten years from the time the service is licensed, assuming it costs \$40. or less per month per line." See JOANNE FRASER, SRI INT'L, *PERSONAL COMMUNICATIONS SYSTEMS IN THE UNITED STATES* 5 (1991); Comments of BellSouth Corporation, (F.C.C. 1990) (GEN. Docket No. 90-314) (filed on October 1, 1990), at 7.

15. Cellular providers may be able to provide most of the features on PCS by switching from analog technology and placing more transmitters in their networks.

16. Ronald R. Braeutigam, *Optimal Policies for Natural Monopolies*, in 2 HANDBOOK OF INDUSTRIAL ORGANIZATION 1289, 1290 (Richard Schmalensee & Robert D. Willig eds., 1989).

A. Definition of the Market After Service Introduction

Without reliable quantitative measurements of the cost and demand curves for a market, the first step in determining the appropriate form of regulation for PCS after its introduction is to qualitatively define the resulting market *using economically relevant criteria*. The basic question is: what will comprise the relevant telecommunications market after the introduction of a new technology service? This is normally a first step in any exercise where regulatory or antitrust issues are relevant.¹⁷ Because it is markets, not necessarily just firms or services, that should be the subject of economic regulation, this first question is a necessary precursor to the more germane one: After the new service is introduced, should the market that results be regulated in some way?

Since a great deal of information has not yet been determined regarding how wireless communications services such as CT-2 and PCN will be provided in the United States, a market definition exercise can only be performed in a cursory fashion. Technically, PCS does not yet exist in the U.S., so it is not possible to engage in the formal market definition exercise used pervasively in the courts. However, a simple market definition is nonetheless useful since it sheds a great deal of light on how policymakers could structure analyses of markets that may change due to the introduction of new services like PCS. This article does not recommend that regulatory proceedings emulate the protracted debates of market definitions performed by the courts. Since such discussions would merely serve to make regulation an extremely slow-moving process, a brief conceptual analysis of market definition issues is necessary to prevent public policy from going astray in the regulation of markets that are affected by new service introduction.

Although it seems to be a simple concept, market definition has been a battleground in both legal and economic circles. As noted by the American Bar Association:

While a broad market tends to minimize the competition between firms that already compete, it can also have the effect of finding firms making different products to be competitors. Narrow markets, conversely, can result in high market shares for those found to be competitors in such a market, but they can also create a situation

17. Several courts have either stated or implied that market definition is a necessary element. William Blumenthal, *Three Vexing Issues Under the Essential Facilities Doctrine: ATM Networks as Illustration*, 58 ANTITRUST L.J. 855, 856 (1990). Blumenthal cites these four cases: *Consul, Ltd. v. Transco Energy Co.*, 805 F.2d 490, 493-94 & n.11 (4th Cir. 1986), *cert. denied*, 481 U.S. 1050 (1987); *Laurel Sand & Gravel, Inc. v. CSX Transportation, Inc.*, 704 F. Supp. 1309, 1323 (D. Md. 1989), *aff'd*, 924 F.2d 539 (4th Cir. 1991), *cert. denied*, 112 S. Ct. 64 (1991); *City of Chanute, Kan. v. Williams Natural Gas Co.*, 678 F. Supp. 1517, 1531-32 (D. Kan. 1988), *aff'd*, 955 F.2d 641 (10th Cir. 1992); *cf. United States v. Realty Multi-List, Inc.*, 629 F.2d 1351, 1372 & n.39 (5th Cir. 1980).

whereby firms making closely related products are not deemed to be in competition.¹⁸

Economic regulation should be applied to markets, not necessarily just to firms or specific services. Given this framework, the question becomes: What *market* would require regulation if PCS were introduced? To answer this question, one needs to have an idea of what the relevant market would look like after the introduction of the services in question.

Four paradigms used in merger analysis attempt to identify a market as a group of products (and corresponding geographic area):

- (1) within which cross-elasticity of demand (and perhaps of supply) is high, or (2) which has historically been insulated in the sense that little flows in or out or (3) within which prices tend toward equality or (4) within which a hypothetical monopolist would be able to raise prices profitably.¹⁹

Technically, a market definition has both a product dimension and a geographic dimension, although at this point it is not really possible to address the geographic dimension for PCS.

The fourth paradigm listed above is useful when attempting to define the potential market that would exist if PCS were introduced. In essence, this method examines what would happen if a hypothetical grouping of firms (assumed to comprise collectively the "market") serving their various customers were to increase prices in unison by a certain percentage for a given period of time. If so many buyers would shift to alternatives that this grouping of firms acting as a monopolist would find the increase unprofitable, then this arrangement of firms and corresponding products is too narrow to constitute a "market." The analysis would need to be repeated with an expanded grouping of firms and/or products until the hypothetical analysis identifies a cluster of firms and products for which such price increases are likely to be profitable.²⁰ This process identifies a market dimension, outside of which (1) products are not likely to be substitutes for those inside the market, and (2) the ability of outside firms to supply the market is negligible.

Applying this analysis to PCS, assume that the geographic dimension is held constant because there are no existing suppliers whose behavior can be observed. If PCS were added to telecommunications as it now exists, what "market" would such new services be a part of if the analysis outlined above were performed? Stated another way, if *all the firms* that offer cellular services, traditional landline services at tariffed

18. ABA ANTITRUST SECTION, ANTITRUST LAW DEVELOPMENTS 150 (2d ed. 1984). *See also* ABA ANTITRUST SECTION, MONOGRAPH NO. 12, HORIZONTAL MERGERS: LAW AND POLICY 62 (1986) (market definition has been characterized as "an analytical construct enabling us to compensate for our inability to measure market power directly").

19. ABA ANTITRUST SECTION, MONOGRAPH NO. 12, HORIZONTAL MERGERS: LAW AND POLICY 89-90 (1986).

20. *Id.* at 105-106.

prices, coin telephone services, an assortment of data services, and PCS were to raise their prices all at once (acting as a hypothetical "monopolist") to some transitory level, could they expect to increase their profits? The answer is probably yes.

As a check on this admittedly simplistic approach, one can ask what would happen if this hypothetical consortium of firms did not supply basic local exchange service. The increase in prices in this scenario would probably not be profitable because users of other services could simply switch to the basic local service. Similarly, suppose PCS were deleted from the hypothetical service grouping. Again, the hypothetical consortium of firms probably could not profit from the increase because users would quickly switch to PCS. The only way the consortium could profit would be if basic local exchange service, certain data services, public telephones, cellular service, and PCS were included simultaneously in the hypothetical service grouping, which therefore constitutes the "market," at least from the product and firm dimension.

Thus, to keep the conceptual discussion about the market definition as focused as possible, PCS should be evaluated in the context of the market defined above. Rather than focusing narrowly on the "market" for PCS or landline communications, it should be recognized that such services will be one of many options consumers can use to transmit their voice, image, or data. The question of how PCS, in isolation, should be regulated is too limiting. The relevant question is how PCS affects the need for regulation of the market of which it will be a part. As can be seen from the preceding section, PCS will not only affect "traditional" telephone services, but will also be limited by the existing communications alternatives. The "market" under consideration should therefore include the LECs, cellular providers, alternative network vendors, and other sellers of communications technologies that compete for voice/data traffic.

B. Competition Within the Market Will Be Possible

Once a conceptual definition of the market has been determined, analysis should focus on the economic issue of whether competition within the market will be possible after PCS is introduced. The outcome of this investigation will define what type of regulation is appropriate for PCS by seeking to determine if the market can sustain a single producer in a natural monopoly, or a small number of producers of minimum efficient scale (i.e., those that can take advantage of all available economies of scale) in a natural oligopoly. Generally, this is not decided by the number of firms wishing to enter the market, but rather by the cost characteristics of the firms that could service the market. Thus, the analysis should next determine the underlying cost structure likely for

firms that serve the market which includes PCS. This, admittedly, is a technical question.

To discuss a new telecommunications technology, and the regulation of the services it makes possible, it is necessary to acknowledge the role of costs in optimal market structure. For the most part, market structure is determined by the interactions between the determinants of *firm size* and the *size of the market*. Firm size depends on the cost conditions of the firms which serve the market. The size of the market is determined by market demand conditions. The interaction of these two determinants places bounds on the structure of the industry.²¹

Given technological cost conditions and market demand conditions, a market is structurally competitive if a "large" number of firms servicing the market leads to a division of output that yields the lowest possible total industry costs. At the opposite extreme, a structural natural monopoly exists if having only one firm service the market yields the lowest possible total industry costs. In between these two extremes, it is possible that only an oligopoly can lead to total industry cost minimization.

The most basic economic rationale for the regulation of the prices of a multi-product firm is the extreme of natural monopoly. The definition of natural monopoly, stated simply, is a firm with a cost function that is said to be "subadditive," allowing it to produce its service at costs lower than any other firm or collection of firms.²² If the cost condition of subadditivity prevails, then a market consisting of only a single provider is the most efficient industry structure. This alone is not objectionable from a public policy standpoint because this type of industry structure is the most efficient available. The public policy concern is that such single firm supply can result in monopolistic pricing. The role of regulation is to permit the most efficient industry structure while prices are maintained at a level necessary to simulate the economic outcome of a competitive market, if competition were feasible. Thus, a natural monopoly may require regulation of some type, such as price-level constraints combined with entry restrictions.

Three other economic concepts are useful to this discussion: industry configuration, a feasible industry configuration, and an efficient industry configuration. An *industry configuration* is the number of firms, and the associated levels of sales for each firm, such that all the firms, in total, would supply market demand at the prevailing prices. If there is

21. John C. Panzar, *Technological Determinants of Firm and Industry Structure*, in 1 HANDBOOK OF INDUSTRIAL ORGANIZATION 3, 33 (Richard Schmalensee & Robert D. Willig eds., 1989). See also KENNETH E. TRAIN, OPTIMAL REGULATION: THE ECONOMIC THEORY OF NATURAL MONOPOLY 5-8 (1991).

22. SANFORD V. BERG & JOHN TSCHIRHART, NATURAL MONOPOLY REGULATION: PRINCIPLES AND PRACTICE 21 (1988).

just one firm that supplies all the market demand for a given product, that industry configuration is monopolistic. For example, if there are 100 firms each of which supplies a correspondingly small share of the market, the industry configuration is competitive.²³

An industry configuration is termed *feasible* if the firms involved in the industry can at least break even. An industry configuration is termed *efficient* if that configuration supplies the output the market demands at minimum cost.²⁴

The concept of industry configuration is then used to determine minimum efficient scale. Essentially, *minimum efficient scale* (MES) is the smallest level of output at which the average cost per unit of production is minimized. The relationship of MES to the overall industry demand curve defines the best market structure for a given industry. For example, if there were one firm for which MES coincided with total market demand, and that firm supplies this market demand at least cost, then the most efficient industry configuration is natural monopoly, for no collection of two or more firms could supply the industry at lower cost. Alternately, if there were 100 firms, all of which exhibit MES of just 1% of total industry demand, and these firms collectively supply the industry at least cost, then the most efficient industry configuration is a competitive market. It is possible that industry demand could be satisfied most efficiently by one large firm with a relatively large MES, in combination with several smaller firms whose efficiencies are exhausted at much smaller levels of output.

There are several reasons why the concept of MES is necessary to determine whether regulation is needed for high technology telecommunications services such as PCS. First, it is not inevitable that increasing the number of sellers of personal communications will automatically lead to earnest competition on the merits. If the most efficient industry configuration requires far fewer firms, there may be little point in fostering open entry policies.²⁵ Although a policy designed to increase the number of PCS suppliers for its own sake might lead to more choices between suppliers, and price decreases for some, but not all, customers, such a policy could not decrease total industry costs. Policies designed to foster large numbers of PCS suppliers (in the interests of increased consumer choices and the low prices that competition yields)

23. Panzar, *supra* note 21, at 33–38.

24. *Id.*

25. One could legitimately ask how open entry policies can really harm anything, since it is quite possible the market would “sort itself out,” with the most efficient firms surviving. If, however, the most efficient firms in the industry are limited in downward pricing flexibility, have common carrier obligations, and have incurred large sunk costs attributable to regulatory obligations, then allowing entry may do more harm than good. This is the case of an *unsustainable* monopoly.

should only be pursued if they can lead to a reduction in total industry costs.

Similarly, if one or more "large" market participants exhibit natural monopoly characteristics (as sole supplier or acting in combination), then such suppliers should not be precluded from supplying the market. This is the cost characteristic that makes efficient industry supply possible. Concerns about monopolistic pricing can be addressed through regulation if necessary. Entry restrictions on *efficient* suppliers, however, are a strictly inefficient method of ensuring that competition within the market can take place.²⁶ Without efficient market participants, the low consumer prices that "competition" is expected to yield will not materialize

Strictly speaking, there is no reliable evidentiary standard that determines whether a firm is a natural monopoly. The true test of natural monopoly is whether, at a given output level, a sole supplier's costs are subadditive, meaning that at the given output level, the natural monopolist can supply the industry at lower cost than any other combination of firms.²⁷ It is not enough to examine cost characteristics such as scale economies or scope economies, because for a multi-product firm, the existence of both scale economies and scope economies still does not merit a conclusion of subadditivity. In fact, the cost conditions of a natural monopoly are sufficiently complicated that no regulatory agency can ever be certain that the firm it is charged with regulating is a true natural monopoly.

Thus, determining if subadditivity is likely to be present, in theory, entails examining the cost function of the PCS providers, though in reality such analysis cannot be expected to yield a reliable indication of whether or not a natural monopoly is present. Therefore, a formal examination of the cost characteristics of firms supplying PCS cannot be recommended, due to the significant costs of such studies and their inability to provide policy makers with a useable determination of whether a firm supplying PCS exhibits the technical cost characteristics of a natural monopoly.²⁸

26. Restricting the entry of a firm that exhibits economically efficient ability to supply PCS, simply because that firm is "large" or feared to be "dominant," is economically inefficient public policy because it prevents the cost effectiveness of such firms from yielding lower prices to consumers. If the efficient industry configuration truly was natural monopoly, for example, then precluding entry by the natural monopolist in preference to a "large" number of firms that will all "compete" with each other is inefficient, for it leads to total industry supply costs that exceed those of the natural monopolist. Hence, such a public policy could not lead to the lowest prices to consumers.

27. The cost condition of subadditivity as a determinant of natural monopoly was first proposed by William J. Baumol in lieu of simple analysis of scale economies. William J. Baumol, *On the Proper Cost Tests for Natural Monopoly in a Multiproduct Industry*, 67 AM. ECON. REV. 809 (1977).

28. Several studies have been performed regarding telecommunications cost characteristics. In addition to being costly and complicated, these studies typically require

One key piece of information on the profitability of firms in the cellular services market may provide some insight to this discussion about natural monopolies. Cellular technology is similar to the proposed PCS technologies now being tested in trials in several markets. According to Standard and Poor's, on average a cellular company with just a 1% customer penetration (which is virtually the same as market share) can be profitable.²⁹ While observation certainly is not a measure of subadditivity, it sheds light on what the efficient industry structure may look like. Standard and Poor's analysis shows that the minimum viable scale (MVS) for a cellular company is likely to be quite small, just 1% of the market. MVS is simply the total sales at a given price that a new entrant would need to achieve to earn an acceptable profit. If MES is also low,³⁰ one could reasonably expect the PCS industry, which is likely to be very similar to the cellular telephone industry, to be best served by policies fostering competition.³¹

The above arguments suggest that the automatic regulation of PCS simply because some firms supplying PCS may be termed "large" (or may supply PCS by way of vertical integration with other services, such as the cable companies or the LECs) should be avoided. Unfortunately, present regulatory policy ignores considerations of costs and industry structure. For example, in federal regulation of long distance services,

a large number of simplifying assumptions to make the problem tenable. The results of these studies have been mixed as to whether subadditivity is generally present, though most conclude that companies such as AT&T or Bell Canada have scale economies. Out of necessity, most of these studies aggregate a telephone company's many outputs into just two or three categories, such as local service or long distance. An important survey of these studies is presented in M. A. Fuss, *A Survey of Recent Results in the Analysis of Production Conditions in Telecommunications*, in *ECONOMIC ANALYSIS OF TELECOMMUNICATIONS: THEORY AND APPLICATIONS* 3-26 (Léon Courville, Alain de Fontenay & Rodney Dobell eds., 1983). A more recent survey may be found in Ferenc Kiss & Bernard Lefebvre, *Econometric Models of Telecommunications Firms: A Survey*, 38 *REVUE ECONOMIQUE* 307 (1987). See also David S. Evans & James J. Heckman, *Multiproduct Cost Function Estimates and Natural Monopoly Tests for the Bell System*, in *BREAKING UP BELL: ESSAYS IN INDUSTRIAL ORGANIZATION AND REGULATION* 253 (David S. Evans ed., 1983); WILLIAM W. SHARKEY, *THE THEORY OF NATURAL MONOPOLY* 197-205 (1982); JAMES C. BONBRIGHT ET AL., *PRINCIPLES OF PUBLIC UTILITY RATES* 602-606 (1988); Panzar, *supra* note 21, at 51-55; Lars Röller, *Proper Quadratic Cost Functions with an Application to the Bell System*, 72 *REV. ECON. & STAT.* 202 (1990).

29. Rosemary Avellis-Abrams, *A RATING CRITERIA FOR THE HIGH-RISK CELLULAR INDUSTRY*, STANDARD & POOR'S CREDIT REVIEW: TELECOMMUNICATIONS, Jun. 24, 1991, at 4.

30. If MVS for cellular is low, then MES (Minimum Efficient Scale) is also quite likely to be low.

31. AT&T contends that since the technology and economics of radio-based services differ from those of the landline network, a natural monopoly will not result in the provision of mobile services. Unlike landline wires that are dedicated and may be idle most of the time, radio waves are a shared resource. The embedded costs are therefore smaller for radio services and the economies of scale may be exhausted sooner for providers of these services. *AT&T Response to Comments and Objections Relating to the Proposed LATA Configurations* at 26-27, *United States v. Western Electric Co., Inc.* (D.D.C.) (Civil Action No. 82-0192) (Nov. 23, 1982).

entry has been deregulated, but pricing has not, resulting in an asymmetric regulatory regime that places greater regulatory oversight on incumbent telephone companies than on new entrants.³² The "Catch-22" of this situation is that pricing has not been deregulated because regulators fear that the incumbent telephone companies are natural monopolies; yet the only way to find out if such companies are natural monopolies is to deregulate their pricing and see what industry structure results after competition has taken place for a time.³³

Given the above discussion of costs and industry structure, and the low MVS observed in the cellular market, it is probably safe to assume that the development and offering of PCS will not preclude competition within the market of which it will be a part. Regulators should not fall into the trap of blindly regulating the market so as to create another Catch-22 situation.

C. Service Introduction and Ease of Entry

The most important analysis for regulatory issues emanating from PCS is likely to focus on ease of entry. Generally, if there are significant entry barriers to a market, a *de facto* monopoly may exist, which would result in the ability of a firm to exert market power. Entry barriers are a necessary condition for market power, as they allow a firm to block or deter other firms from entering the market if prices are raised above competitive levels. Thus, an examination of ease of entry is likely to be important for a number of reasons, most compelling of which is that if barriers are present, they may require regulation. Determining whether regulation is necessary depends on several other considerations as well, including the state of the market at the point when entry barriers are raised and the demand side of the market. The key underlying question is whether entry barriers exist, and if so, whether these barriers allow the maintenance or exercise of market power. Absent considerations of market power, entry barriers in and of themselves are not relevant to public policy.

In the analysis of PCS regulatory issues, the ease of entry issue may be considered by some to be subordinate to larger or more substantive issues. The concept is not often talked about in major dockets before the FCC,³⁴ and the true economic value of such analysis appears largely unrealized in such proceedings. In antitrust, however, entry barrier analysis is considered a powerful tool in merger cases and in predatory

32. See generally ANDREW D. LIPMAN, TELECOM DEREGULATION (1987).

33. Alfred E. Kahn & William B. Shew, *Current Issues in Telecommunications Regulation: Pricing*, 4 YALE J. ON REG. 191, 191-193 (1987).

34. A notable exception to this is the recent order on interstate long distance competition. *In re Competition in the Interstate Interexchange Marketplace*, Report and Order, 6 F.C.C.R. 5880 (1991).

pricing cases. The courts and the Federal Trade Commission have made the examination of entry barriers a fundamental and potentially dispositive step in the evaluation of mergers, and ease of entry can also dispose of monopolization cases under Section 2 of the Sherman Act, and rule of reason cases under Section 1.³⁵ In addition, most of the existing state statutes designate ease of entry as an important criterion in determining whether a telecommunications service is "subject to significant competition."³⁶ Thus, if prospective suppliers of PCS have "ease of entry" into the market, this would have important ramifications for the regulatory handling of such services. Analysis of ease of entry to the PCS market requires consideration of the costs associated with spectrum reallocation, the possible need for alteration of the business practices within the existing telephone system, the sunk costs of entry for new providers, issues of scale and scope economies, and access to so-called "essential facilities."³⁷

1. DEFINITION OF AN ENTRY BARRIER

The courts have offered little guidance on what is, or is not, an entry barrier. Those courts that have wisely chosen to give considerable weight to the criterion of entry barriers have not always adhered to sound economic principles.³⁸ To add to the confusion, the economics literature

35. Janusz A. Ordovery & Daniel M. Wall, *Proving Entry Barriers: A Practical Guide to the Economics of New Entry*, 2 ANTITRUST 12, 12 (1988) ("Economics was the basis of cost-based tests for detecting predatory pricing. Now there is a growing consensus that such cases should be dismissed at the threshold if the structure of the market, especially ease of entry, makes it impossible to predate successfully."). Several court decisions have held that predatory pricing cannot take place unless entry barriers are present. See *C.A.T. Indus. Disposal, Inc. v. Browning-Ferris, Inc.*, 884 F.2d 209, 211 (5th Cir. 1989); *Rebel Oil Co., and Auto Flite Oil Co. v. Atlantic-Richfield Co.*, 133 F.R.D. 41, 44 (D. Nev. 1990); *C.A.T. Indus. Disposal, Inc. v. Browning-Ferris, Inc.*, 704 F. Supp. 120, 121 (W.D. Tex. 1989), *aff'd*, 884 F.2d 209 (5th Cir. 1989); *McGahee v. Northern Propane Gas Co.*, 658 F. Supp. 189, 194-195 (N.D. Ga. 1987), *rev'd*, 858 F.2d 1487 (11th Cir. 1988), *cert. denied*, 490 U.S. 1084 (1989).

36. See, e.g., COLO. REV. STAT. ANN. §§ 40-15-207, 40-15-305 (West 1990); MICH. COMP. LAWS ANN. § 484.103b (West Supp. 1991); MINN. STAT. ANN. 237.59 (West Supp. 1991); OR. REV. STAT. §§ 759.202, 759.030 (Supp. 1989); UTAH CODE ANN. § 54-8b-3 (Supp. 1991); WASH. REV. CODE ANN. § 80.36.320 (West 1991); W. VA. CODE § 24-2-3c (Supp. 1991); WIS. STAT. ANN. § 196.195 (West Supp. 1990).

37. Neither the courts nor the economics literature has produced either a technical definition, or a consensus as to what an essential facility is. As a working definition, however, this Article will define it here as a productive input that a firm provides to its own competitors, and from which it potentially could withhold access so as to inflict antitrust damages on its rivals. It almost goes without saying that virtually every aspect of this working definition is open to interpretation.

38. For example, in ruling on entry barriers in antitrust cases, the courts have often failed to recognize the distinction between sunk costs and fungible costs, a distinction discussed in more detail in Section IV-C-2-c. This was evident in one antitrust case involving the telecommunications industry: in its decision in *Southern Pac. Comm. v. AT&T Co.*, 740 F.2d 980, 1002 (D.C. Cir. 1984), *cert. denied*, 470 U.S. 1005 (1985), the court ruled that the need for large capital outlays and lengthy construction programs, and the

offers an embarrassment of riches on the subject of entry barriers.³⁹ Economists over the last 35 years have disagreed on the true definition of

need to overcome brand preference constituted barriers to entry for purposes of determining whether AT&T had monopoly power under sections 2 and 15 of the Sherman Act. This, however, is economically specious reasoning, as the distinction between sunk costs and fungible costs has been ignored. It is generally accepted that merely "high" capital costs for entering an industry are not, in and of themselves, considered an entry barrier, for the key consideration is whether prospective entrants can draw on a capital market that enables them to purchase entry capital (no matter how "high" the costs). To illustrate, note the experience of MCI several years ago when entering the long distance market after the FCC's *Specialized Common Carriers* order in 1971 made wide scale entry lawful. One could easily make a prima facie case that at that time, MCI faced significant entry barriers, yet in 1972, MCI raised \$33 million in an initial public offering and obtained a \$64 million line of credit to commence construction of its nationwide network—the largest start-up financing in Wall Street history. Roger Parloff, *How MCI's Lawyers Invented a Market*, AM. LAW., Nov. 1990, at 44, 46. See also *In re Establishment of Policies and Procedures for Consideration of Application to Provide Specialized Common Carrier Services in the Domestic Public Point-to-Point Microwave Radio Service and Proposed Amendments to Parts 21, 43, and 61 of the Commission's Rules, First Report and Order*, 29 F.C.C.2d 870 (1971) (establishing an overall policy concerning new entry to the private line market by what were designated as "specialized common carriers" and ruling that the local exchange carriers must, upon request, permit these carriers to interconnect with their facilities).

For examples of economic requirements or conditions the courts have considered as entry barriers, see *California v. American Stores Co.*, 872 F.2d 837, 843 (9th Cir. 1989) (citing amount of capital necessary to become competitor in market, availability of capital, availability of technological advancements, number and size of firms already operating in marketplace, and structure and nature of industry), *rev'd*, 495 U.S. 271 (1990); *McGahee v. Northern Propane Gas Company*, 858 F.2d 1487, 1495 n.11 (11th Cir. 1988) (citing trade secrets, patent, licenses, capital outlays required to start a new business, existence of excess capacity by existing sellers, pricing elasticity, and difficulties which buyers may have in changing suppliers), *cert. denied*, 490 U.S. 1084 (1989); *Kelco Disposal, Inc. v. Browning-Ferris Indus. of Vt., Inc.*, 845 F.2d 404, 408 (2d Cir. 1988) (citing cost of entering the market and high minimum viable scale combined with low absolute level of profits for prospective entrants), *aff'd*, 492 U.S. 257 (1989); *Phototron Corp. v. Eastman Kodak Co.*, 842 F.2d 95, 100 (5th Cir.) (citing advertising), *cert. denied*, 486 U.S. 1023 (1988); *Allen-Myland, Inc. v. International Business Machines Corp.*, 693 F. Supp. 262, 279 n.35 (C.D. Pa. 1988) (citing level of employee skill required for firm to be in a market successfully); *Consolidated Gas Co. of Fla., Inc. v. City Gas Co. of Fla.*, 665 F. Supp. 1493, 1520 (S.D. Fla. 1987) (citing the costs and delays imposed by the regulatory process), *vacated*, 111 S. Ct. 1300 (1991); *Laidlaw Acquisition Corp. v. Mayflower Group, Inc.*, 636 F. Supp. 1513, 1520 (S.D. Ind. 1986) (citing insurance costs, lengths of contracts, high capitalization costs, performance bond requirement, experience requirements, and other bid specification requirements).

39. See, e.g., Ioannis N. Kessides, *Advertising, Sunk Costs, and Barriers to Entry*, 68 REV. ECON. & STAT. 84 (1986); John T. Wenders, *Excess Capacity as a Barrier to Entry*, 19 J. INDUS. ECON. 14 (1971); William J. Baumol & Robert D. Willig, *Fixed Costs, Sunk Costs, Entry Barriers and Sustainability of Monopoly*, 96 Q.J. ECON. 405 (1981); Richard Schmalensee, *Brand Loyalty and Barriers to Entry*, 40 S. ECON. J. 579 (1974); A. Michael Spence, *Notes on Advertising, Economies of Scale, and Entry Barriers*, 95 Q.J. ECON. 493 (1980); Yale Brozen, *Is Advertising a Barrier to Entry?*, in ADVERTISING AND SOCIETY 79 (1974); Harold Demsetz, *Accounting for Advertising as a Barrier to Entry*, 52 J. BUS. 345 (1979); Richard Schmalensee, *Economies of Scale and Barriers to Entry*, 89 J. POL. ECON. 1228 (1981); and Philippe Aghion & Patrick Bolton, *Contracts as Barriers to Entry*, 77 AM. ECON. REV. 388 (1987).

barriers to entry, but all definitions focus on cost differentials between incumbent firms in the market and prospective entrants.

The first work in this area was completed in 1956 by Joe Bain, who specified three types of entry barriers: absolute cost advantages of incumbent firms, economies of scale, and product differentiation advantages of incumbent firms. In general, Bain defined an entry barrier as anything which in the long run allows an incumbent firm to charge supracompetitive prices without inducing new entry.⁴⁰

The next important definition of entry barriers was provided by George Stigler in 1968. Stigler took a more narrow view of entry barriers by arguing that the definition should center on only those factors that give the incumbent firm a long-term differential in production costs. The important definition of entry barriers given by Stigler holds that a barrier to entry into a market is a cost of production for an entrant that is not incurred by already established firms.⁴¹ Stigler and the "Chicago School," then, argue that the only barriers which antitrust law should consider are advantages of incumbency which result in long-term cost differentials in production costs. These advantages allow the incumbent firm to raise prices above marginal costs without attracting entrants to the market. The classic Stiglerian entry barrier consists of absolute cost and demand advantages enjoyed by the incumbent firm.⁴²

Christian Von Weizsäcker developed a more modern and economically refined view of entry barriers. His model has a Stiglerian basis, but considers the concept of economic welfare and the effects entry barriers can have on it. "A barrier to entry is a cost of producing which must be borne by a firm which seeks to enter an industry but is not borne by firms already in the industry and which implies a distortion in the allocation of resources from the social point of view."⁴³ The von Weizsäcker definition of entry barriers is, essentially, a production cost borne by entrants, but not by incumbents, which results in social welfare losses.

Practically applied, this definition indicates that not every requirement of producing, distributing, or marketing a product that imposes differential costs on entrants should properly be considered an entry barrier. One need only consider those requirements that impose differentially higher costs on entrants, given that all cost factors would otherwise be equated between incumbent and entrant.⁴⁴ For example, a

40. JOE S. BAIN, *BARRIERS TO NEW COMPETITION* (1956).

41. GEORGE J. STIGLER, *THE ORGANIZATION OF INDUSTRY* 67 (1968).

42. Ordober & Wall, *supra* note 35, at 12.

43. Christian von Weizsäcker, *A Welfare Analysis of Barriers to Entry*, 11 *BELL J. ECON.* 399, 400 (1980).

44. Robin C. Landis & Ronald S. Rolfe, *Market Conduct Under Section 2: When Is It Anticompetitive?*, in *ANTITRUST AND REGULATION: ESSAYS IN MEMORY OF JOHN J. MCGOWAN* 135 (Franklin M. Fisher ed., 1985).

firm that develops a cost-reducing innovation not available to entrants may appear to enjoy an entry barrier. Indeed, in the standard Bainsian analysis of entry barriers, it would. Yet because cost reductions can benefit consumer welfare (in the form of lower prices), engaging in cost-reducing innovation does not necessarily raise entry barriers in the von Weizsäcker framework.⁴⁵

The entry barrier analytic framework of von Weizsäcker is important to public policy applications for two reasons. First, von Weizsäcker's rigorous mathematical economics approach shows that barriers to entry, as defined by Stigler, cannot always be shown (as a mathematical theorem) to lead to economic inefficiencies. Given this, he suggests two ways to handle the concept of entry barriers: either stick to the Stiglerian definition and be careful not to draw any welfare or policy conclusions from it, or revise the definition, as von Weizsäcker preferred, to require the existence of certain inefficiencies as an attribute of entry barriers.

Second, von Weizsäcker shows that Bainsian entry barriers do not always conform to his revised definition (which incorporates welfare effects). Essentially, the Bainsian and Stiglerian entry barrier definitions assume that entry barriers will lead to economically inefficient markets. However, the definition derived by von Weizsäcker implicitly performs a more penetrating analysis by showing that some economic conditions formerly considered entry barriers (and hence automatically assumed to lead to allocative distortions or other economic inefficiencies) are not always inefficient when welfare effects are examined. For these reasons, this article employs von Weizsäcker's definition of entry barrier and recognizes the role of sunk costs in analyzing entry barriers. This approach has important implications for discussing entry barriers such as capital requirements, and scale and scope economies.

2. POTENTIAL BARRIERS TO ENTRY

This section discusses spectrum allocation, numbering plan constraints, and sunk costs in the context of ease of entry. It also discusses capital costs and scope economies as areas of interest to policy makers, even though the von Weizsäcker definition combined with a recognition of sunk costs does not include them as true entry barriers. The overall conclusion is that there are likely to be minimal or no entry barriers requiring regulation of PCS.

45. *Id.* at 143-144 n.1.

a) *Spectrum Allocation*

As with most new radio services, spectrum allocation is the key factor in determining the conditions for offering wireless telecommunications service. Since 1934, the FCC has had responsibility for regulating the use of radio spectrum.⁴⁶ Although the Commission is not empowered by the Communications Act of 1934 to enforce either the Clayton Act or the Sherman Antitrust Act⁴⁷ and may even ignore the policies embodied within these Acts,⁴⁸ the FCC and the industry may approach the analysis of PCS, and the resulting spectrum allocation decision, with largely the same conceptual market definition methodology used by the courts in resolving anticompetitive complaints.

The FCC is empowered to regulate who can use a given frequency allocation, the purpose of this allocation, and the engineering conditions of the applicant's use. In the context of PCS and entry barriers, the key questions are, (1) whether the need to allocate spectrum to these services will somehow create a long term cost differential between some set of incumbent firms and prospective new entrants, and (2) whether this long term cost differential will injure the competitive process or allow the maintenance of market power for some firm or set of firms. Stated another way, the question is whether spectrum constraints, if they exist, will create what are known as "first mover advantages" for early entrants to the market, and then preclude entry by other efficient firms.⁴⁹

The desired frequency allocation for PCN appears to center on the 1.7-2.3 GHz range. Although this portion of the spectrum seems to be technically suitable for wireless telecommunications, it is already in use by meteorological satellites, fixed radio services, mobile communications and space research.⁵⁰ Further complicating the use of this spectrum is that certain portions of this allocation are controlled solely by the FCC, others are controlled solely by the National Telecommunications and Information Agency (NTIA), and still others are jointly controlled by the

46. The Communications Act of 1934 (codified as amended at 47 U.S.C. § 303 (1988)) [hereinafter "the Act"]. It is important to note that the Commission only has control over one-half of the spectrum available for use within the United States. Section 305 of the Act exempts from the FCC's jurisdiction all "radio stations belonging to and operated by the United States." 47 U.S.C. § 305 (1988). The allocation of spectrum between governmental bodies is controlled by the National Telecommunications and Information Administration (NTIA), a division of the Department of Commerce. Because of this dual jurisdiction, it has been pointed out that "[a]t least in part, the scarcity of frequency space for commercial broadcasting is man-made and its dimensions are initially defined by the Executive Office of the White House." HARVEY L. ZUCKMAN ET AL., *MASS COMMUNICATIONS LAW* 367 (1983).

47. *United States v. Radio Corp. of Am.*, 358 U.S. 334, 344 (1959).

48. *Federal Communications Comm'n v. RCA Communications, Inc.*, 346 U.S. (1953).

49. If early entrants to a market are able to avoid costs that later entrants must incur, then first mover advantages are said to have accrued to the early entrants. Stated another way, the later entrants face entry barriers to the market.

50. NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION, U.S. DEP'T OF COMMERCE, *UNITED STATES FREQUENCY ALLOCATIONS: THE RADIO SPECTRUM* (1987).

FCC and NTIA.⁵¹ Potential PCN providers and the FCC will also have to address the issue of how this technology will coexist with current users of the spectrum. The FCC, for example, may determine that it is possible for this service to be offered in the same frequency with existing users, although this may entail greater cost than would occur if the spectrum was assigned solely for wireless applications.

Alternatively, the FCC may determine that PCN should operate in a spectrum set aside primarily for tetherless communications. If this spectrum is determined to be the 1.7-2.3 GHz range currently under discussion within the industry, the existing users of the spectrum will expect to be compensated for moving to another radio frequency. Although cost estimates for relocating existing spectrum users are not currently available,⁵² it should be noted that for Southwestern Bell alone this process would entail buying new radio equipment for approximately 145 fixed-point microwave towers. The question the FCC would then have to grapple with is who should pay for the expenses associated with the start-up of PCS, including the cost of moving existing users to another frequency.

Despite these concerns, it appears that so long as costs, and hence prices to consumers, can be reduced through a competitive framework for PCS suppliers, there is enough available spectrum to allow the provision of PCS. The desired allocation for PCS centers on the 1.7-2.3 GHz range, although recent research has concluded that only 170 MHz of this 600 MHz range is necessary to provide PCS for the *entire* world population. Moreover, by using a technology known as Code Division Multiple Access (CDMA), PCS providers can largely use the same frequency allocation to offer wireless service.⁵³ Although a slight increase in spectrum allocation is necessary to accommodate more providers, it appears that the Commission can allocate enough spectrum using CDMA technology so that any provider can theoretically serve the entire market. It appears that the FCC could reallocate at least 170 MHz to PCS and then authorize several providers who would then be regulated by competitive

51. The NTIA has recently noted that 59.5 percent of the more desirable spectrum (i.e. below 30 GHz) is controlled by the FCC and the NTIA. Of the remainder, 7.5 percent is controlled exclusively by the NTIA while 33 percent is under the authority of the FCC. See memorandum from Janice Obuchowski, *National Telecommunications and Information Administration Comprehensive Policy Review of Use and Management of the Radio Frequency Spectrum*, at 9-5 (Dep't of Com.) (Billing Code 3510-60) (released on Dec. 4, 1989).

52. Not only are cost estimates not available for reallocating the users within this radio band, the FCC also asks in the PCN notice how many users are currently in this range. *In re* Amendment of the Commission's Rules to Establish New Personal Communications Services, 5 F.C.C.R. 3995 (1990), at 11.

53. For a more detailed discussion of CDMA, see MARVIN K. SIMON, JIM K. OMURA, ROBERT A. SCHOLTZ & BARRY K. LEVITT, 3 SPREAD SPECTRUM COMMUNICATIONS (1985); GEORGE CALHOUN, DIGITAL CELLULAR RADIO (1988).

forces. Hence, spectrum constraints will not create a "window of opportunity," beyond which prospective entrants will face entry barriers.

b) Telephone System Constraints

In addition to the difficulties associated with allocating frequency space for PCS, the creation of a wireless network compatible with the landline network would also force both the local and interexchange carriers to reconfigure their systems. One of the key features of CT-2 or PCN is telephone number portability. Because of the nature of these wireless networks, customers will be able to transmit or receive calls from a single network address regardless of their physical location. Changes will therefore be necessary in numbering, routing, and billing of calls to provide these capabilities within the present and future telephone network.

The concept of making a telephone number portable when it is associated with a fixed location is a contradiction. All telephone numbers within the United States currently fall under the geographically based North American Numbering Plan (NANP).⁵⁴ Under the NANP, a telephone number is divided into three distinct portions to denote a desired location:

<u>Numbering Plan Area (NPA)</u>	<u>Office Code</u>	<u>Line Number</u>
NXX	NXX	XXXX

Where:

N is any number from 2 through 9; and

X is any number from 0 through 9.

Both the NPA (which represents a large geographic division) and the office code (which denotes a central office inside a NPA) refer to a specific location within the telephone network. The telephone system is currently designed to determine the correct transmission, signaling, routing, billing, and operations associated with each call by using the NANP number.

The advent of portable telephone service, which is not linked to a specific location, creates significant expense for both the wired and wireless telephone networks. For example, virtually all billing within today's telephone network is designed around the assumption that the

54. For a more detailed discussion of the telephone numbering plan, see BELL COMMUNICATIONS RESEARCH, NOTES ON THE BOC INTRA-LATA NETWORKS-1986, § 3 (TR-NPL-000275). See also AT&T BELL LABS, ENGINEERING AND OPERATIONS IN THE BELL SYSTEM, (2d ed. 1983). Please note that the NPA example of NXX will go into effect on July 1, 1995. With this planned conversion to interchangeable NPAs, the number of possible area codes will increase from 152 to 792.

NPA-NXX combination or the NXX determines the location of a serving central office. The cost of a call is calculated by the distance between the originating and terminating central office. When a portable network is established, telephone numbers based upon the NANP guidelines lose their ability to be used in billing.

Routing also becomes a problem with wireless networks. The network must be capable of sending a call to the NPA in which the PCN receiver is currently located rather than the area code that is traditionally associated with that number. Both the local exchange companies and the interexchange carriers will have to modify their switches to route a call correctly either originating or terminating at a PCN device. Therefore, the formation of PCNs will force the landline network to incur additional expense and investment to successfully link with the personal communications networks. The FCC will have to determine whether the PCN providers, the landline operators, or some other entity will incur the cost of reconfiguring the current telecommunications system.

In the context of PCS and entry barriers, one concern is that PCS suppliers might quickly exhaust the available quantity of telephone numbers, creating an entry barrier for prospective entrants relative to those firms entering the market before number exhaustion. Numbering constraints will not be an entry barrier to PCS suppliers in the future, however, for the conversion to interchangeable NPAs in 1995 is expected to lead to a more than sevenfold increase in possible ten-digit telephone numbers.⁵⁵ While it is expected that a change in the numbering plan (e.g., an increase in the number of digits or change in the switching logic within the network) will also add to the expense of offering personal communications services, this cost is not one that will be borne solely by new entrants, indicating that there are no entry barrier problems with the NANP or potential numbering constraints.⁵⁶

c) *Sunk Costs of Entry*

This section discusses the role of sunk costs in the pragmatic use of the entry barrier concept when analyzing market power. A sunk cost is a cost that is unavoidable in the short or "intermediate" run, even if there is

55. Beginning in 1995, the NANP will have a new 792-area code capacity (versus the 152-code capacity now available), which will be capable of handling more than 6.2 billion phone numbers. This should be adequate until at least halfway through the 21st century. Thus, PCS will not contribute to the exhaustion of the NANP capacity, nor will numbering constraints be an entry barrier.

56. It should be noted that the United States Telephone Association (USTA) asserts that the current numbering plan can accommodate personal communications services. *Comments of the United States Telephone Association, In re Amendment of the Commission's Rules to Establish the New Personal Communications Services* (F.C.C. 1990) (GEN Docket No. 90-314) (release date Oct. 1, 1990).

a complete cessation of output.⁵⁷ A recognition of the importance of sunk costs has much influence on what is (and what is *not*) considered an entry barrier.

Some production costs imposed on entrants are likely to be non-recoverable, market-specific costs that are sunk when incurred. The prospective entrant must incur sunk costs to become an established firm, and so some economists have considered sunk costs as an entry barrier.⁵⁸ In the analysis of Baumol and Willig, for example, sunk costs are viewed by prospective entrants as incremental to the decision to enter the market. The lower sunk costs are projected to be, the more likely a firm is to enter a new market. These costs are therefore an incremental cost (with correspondingly incremental risk) which must be recovered with post-entry revenues by entrants. The incumbent firm also must cover its own sunk costs to yield a good financial performance for its stockholders, but these costs are not considered when assessing its prospective business decisions, since by definition sunk costs cannot be avoided anyway.

This article considers sunk costs to be relevant to the question of entry barriers, but does not consider just any non-zero amount of sunk costs to be an entry barrier, as the pure theory of costless entry put forth by Baumol, Panzar, and Willig would require. It stands to reason that most American industries require at least some sunk costs to be incurred by new entrants, and so the theory of costless entry is not usually applicable. As William Shepherd has pointed out:

virtually all production requires specific assets which cannot be transferred or sold costlessly. This applies to physical equipment, advertising, R & D, expert skills, and the other commitments needed to establish entry. Fixed and sunk costs commonly overlap and are sizable. Zero sunk cost is therefore a doubtful, counterfactual assumption for a general theory.⁵⁹

Instead, if capital costs are required for entry, and a "high" proportion of these are sunk costs for entrants, then entry barriers could exist. This dovetailing of the concepts of sunk costs and entry barriers is not inconsistent with the von Weizsäcker definition of entry barriers.

The key issue then is whether prospective suppliers for a given telecommunications market are required to incur significant sunk costs to enter the market. Sunk costs that are high in proportion to other costs can create significant asymmetries between incumbent firms and new

57. See WILLIAM J. BAUMOL ET AL., *CONTESTABLE MARKETS AND THE THEORY OF INDUSTRY STRUCTURE* 280 (1983).

58. William J. Baumol & Robert D. Willig, *Fixed Cost, Sunk Cost, Entry Barriers and Sustainability of Monopoly*, 95 Q.J. ECON. 405 (1981). See also BAUMOL ET AL., *supra* note 57, at 290-92.

59. William G. Shepherd, "Contestability" vs. Competition, 74 AM. ECON. REV. 572, 581-84 (1984). See also A. Michael Spence, *Contestable Markets and the Theory of Industry Structure: A Review Article*, 21 J. ECON. LIT. 981, 986-7 (1983).

entrants. The high proportions of sunk costs are no longer part of the forward-looking expenses of the incumbent firm, whereas the prospective entrant, in deciding whether to enter the market, must consider it an outlay. The salvage value of sunk investment is zero, or in any case below its initial cost. Therefore, the new entrant must be certain that the expected revenue from entering the market will more than offset the risk of losing the unrecoverable fraction of investment that sunk costs represent.⁶⁰

Hence if new entrants must incur "large" proportions of sunk costs to enter the market, entry barriers may exist that require some form of regulation. The issue then becomes whether the high proportions of sunk costs translates into unreasonable market power for one or more firms in the prospective market.

Although no standards or equipment have been firmly established for providing PCS, it is expected that a network similar to the current cellular architecture will be necessary for these services. This network will consist of hand-held terminals linked by radios and antennas to a switch that will have access to computers providing operations support. As with the cellular system, personal communications services will be provided within defined geographic regions known as "cell sites." Even though these new wireless technologies will cost significantly less per cell site than traditional cellular because of lower power use and greater frequency reuse, these qualities also result in a significantly greater need for radio ports. To provide PCN service for an area currently served by cellular, for example, it has been estimated that a PCS wireless network would require a one to two fold increase in the number of cell locations.

These new wireless technologies use equipment that can be redeployed for other applications. Computers can obviously be used in industries other than communications, while switches may be moved to provide traditional wired or cellular communications. Likewise, radios and antennas may be modified for use in other frequencies, although this redesign would probably cost more than just buying the appropriate equipment. If a Common Air Interface is adopted in the United States as in the United Kingdom, then the hand-held devices used for PCN will also be salvageable because these sets may be used by other PCN providers with no modification. Thus, it appears that a relatively minor proportion of the major equipment used by these new types of wireless communications will require sunk investment.⁶¹

60. ALEXIS JACQUEMIN, *THE NEW INDUSTRIAL ORGANIZATION* 100-101 (1987).

61. While this section has discussed sunk costs as entry barriers, it should not be confused with the concept of high levels of capital costs as an entry barrier. The absolute dollar amount of investment required to enter a market says little about entry conditions, as does the absolute dollar amount of sunk costs. See Ordovery & Wall, *supra* note 35, at 16-17. As stated in Landis' and Rolfe's analysis,

d) *Scope Economies and Cost Advantages*

The final issue to be considered in connection with entry barriers is the existence of scope economies, that is, the cost savings that may result from having a variety of related products produced by a single firm rather than by a multiplicity of firms. For example, it is expected that scope economies could exist for the LECs in providing PCN. This may also be true for cable companies choosing to enter this area of telecommunications. This means that there may be firms operating in this market in the future that are extremely cost efficient in providing wireless communications due to their concurrent involvement in industries using similar technology. This could stimulate infrastructure development, encourage the diffusion of advanced technologies, and benefit consumers in the long run.

The key question is whether scope economies are an entry barrier. Under the von Weizsäcker definition of entry barriers, the answer to this question is "no." Those clinging to the Bainsian view of the world may consider scope economies *prima facie* entry barriers, even though Bain himself never discussed them.⁶² The classic Stiglerian entry barrier is an absolute cost and demand advantage enjoyed by the incumbent firm, which could stem from better access to scarce resources, ownership of a patent, or even advantageous standing under government regulation. The Stiglerian entry barrier appears to be absent from the market for wireless communications, even though scope economies may be present. This does not mean that scope economies somehow conform to the Stiglerian view. Productive efficiencies derived from scope economies do not constitute entry barriers, even if such efficiencies make it challenging for entrants to compete with incumbents.⁶³

High capital requirements . . . do not, by themselves, constitute entry barriers. By definition, an entry barrier exists when would-be entrants face higher costs than incumbent firms. Incumbent firms may have had to meet the same (or higher) capital requirements as would-be entrants. Would-be entrants may, in fact, be able to enter more cheaply if technological change has lowered the capital requirements. Unless the cost of capital of would-be entrants is higher than that of the incumbent firm, the capital requirements do not impose differential costs and hence do not raise entry barriers. A correct comparison of capital costs would also take into account differences in risk among the borrowers. Differences in capital costs that merely reflect differences in riskiness are wholly consistent with perfect capital markets and hence ought not to be viewed as barriers to entry.

Landis & Rolfe, *supra* note 44, at 135.

62. The term "economies of scope" was first introduced in 1975, so Bain never considered scope economies in his work on entry barriers. See John C. Panzar, *Technological Determinants of Firm and Industry Structure*, in 1 HANDBOOK OF INDUSTRIAL ORGANIZATION 16 n.11 (Richard Schmalensee & Robert D. Willig eds., 1989).

63. Even if incumbent firms enjoyed absolute cost advantages that precluded entry, regulation would not be justified if the cost advantage was due to productive efficiency. DANIEL F. SPULBER, REGULATION AND MARKETS 42 (1989). "[A] barrier to entry only exists when an incumbent firm can *refrain* from competing without inducing entry." FRANKLIN M. FISHER, JOHN J. MCGOWAN & J.E. GREENWOOD, FOLDED, SPINDLED, AND MUTILATED: ECONOMIC ANALYSIS AND U.S. vs. IBM 165 (1983) (emphasis in original). With regard to

Both incumbent companies, such as LECs and cellular companies, and new entrants would be starting largely on a level playing field. All such firms would have to make capital investment to provide wireless communications, but as discussed earlier, minimum viable scale (MVS) is not expected to be high. If MVS is high, then economic cost conditions such as scale and scope economies are often considered entry barriers. However, if MVS for PCS mirrors what has been observed for cellular service, which is similar technically to PCS, MVS is likely to be quite low for new entrants to the PCS market. In other words, potential entrants will not have to garner high levels of market share before profits can be made.

Thus, scale or scope economies in and of themselves are not entry barriers. While scale or scope economies, combined with high MVS and the requirement that new entrants incur substantial proportions of sunk costs, may be a formidable barrier to entry, it is the sunk costs themselves that are the entry barrier. The scale and scope economies merely exacerbate the sunk cost requirement, and are otherwise irrelevant.⁶⁴

D. The Effect of Existing Substitutes on Market Power

Even if the provision of wireless communications alone were determined to have significant barriers to entry, leading to a natural monopoly, these concerns may be overcome by the demand side of the market. The existing substitutes to PCN may be priced so low as to make it impossible for any provider of PCN to set prices in excess of competitive levels for significant periods of time. Given that flat rate basic local exchange service can be purchased for \$10–\$14 per month with unlimited usage, coin telephone service is usually \$0.25 per call, and cellular mobile services are arguably competitive, it is highly unlikely that wireless communications providers would be able to set rates at amounts

scope economies as a cost advantage for an incumbent firm, the reason that such efficiencies are not entry barriers is probably best explained generically by Fisher, McGowan, and Greenwood:

Not all "advantages" possessed by an incumbent result in barriers to entry. In order to be a barrier the "advantage" must be one that cannot be reproduced by an entrant with effort or expenditure comparable to that expended by the incumbent. Thus, not everything that makes entry by a new firm costly or beyond the reach of some or even many firms constitutes a barrier to entry. The fact that entry into a business requires some investment of money, time, skills, and other intangibles may make entry difficult, but does not mean that there are barriers.

Id. at 165–166. Further, note that in the von Weizsäcker framework for entry barriers, scope economies may enhance consumer welfare. von Weizsäcker, *supra* note 43.

64. The validity of sunk costs (or large proportions thereof) as an entry barrier is what makes Bainsian entry barriers like scale economies (and their cousin, scope economies) a moot issue. If MVS is relatively high due to the existence of scale or scope economies, entry barriers may be present if entrants must incur significant amounts of sunk costs to surmount the high MVS. The key point is that it is the sunk costs that create the reluctance of new entrants, not the scale or scope economies (or resulting high MVS).

exceeding "just and reasonable" levels.⁶⁵ Market power is defined as the ability of a firm (or group of firms) to raise prices above competitive levels for a significant period of time, without inducing new entry or expansion by existing competitors. In other words, market power is the ability of a firm or group of firms acting jointly to raise prices above the competitive level without losing so many sales that the price increase is unprofitable and must be rescinded.⁶⁶

The market definition has a large bearing on determining the level of market power for wireless communications. By placing economics-based bounds on the market to be analyzed, a distinction is made about what products will be influenced by the introduction of a new service. Using the admittedly cursory market definition outlined in this article, it appears that traditional telephone and cellular service will have a cross-elastic effect with services like CT-2 or PCN, although as of this writing no one knows the nature or magnitude of that cross-elasticity. For example, a price increase for PCN should result in a migration of some PCN subscribers to either cellular or standard landline telephone service.

If consumers view services like CT-2 or PCN as merely discretionary services, then this impact will probably be large enough to mute the ability of the wireless communications provider to increase prices above just and reasonable levels. It is possible that many of the potential customers for PCN will consider it a discretionary service. This assessment of services like CT-2 or PCN, combined with the availability of low priced substitutes, is likely to lead to a relatively high price elasticity for PCN and other wireless communications services.⁶⁷ Given this expectation, there is little to be gained by regulating the prices of services like CT-2 or PCN, since providers of these services should have limited ability to exercise market power in selling these services. Further, if PCS proves to be a discretionary service, the traditional questions of economic regulation are moot because there is little public interest to

65. A BellSouth spokesman stated that regarding CT-2, the alternative to pay phone service that is now being tested in market trials, "we're finding it may not be a great business because of our excellent pay phone system in the U.S." *RHC Strategies Discussed: Foreign Cellular Growth Seen Mushrooming, but Doubts Raised on CT-2*, 11 COMM. DAILY 6 (Jan. 22, 1991).

66. See William M. Landes & Richard A. Posner, *Market Power in Antitrust Cases*, 94 HARV. L. REV. 937 (1981); see also ABA ANTITRUST SECTION, MONOGRAPH NO. 12, HORIZONTAL MERGERS: LAW AND POLICY (1986).

67. As of this writing, at least one CT-2 company has proposed rates that will be 80% below cellular rates. American Cordless Technologies (ACT) announced plans to offer rates in New York that are 80% below Nynex's cellular rates, and that in fact are comparable to coin telephone rates. The price of 32 CT-2 calls (at 2.5 minutes each) would be \$11.20, compared to 40 coin telephone calls for \$10.00. The addition of paging service makes CT-2 a better deal than coin service, for the pay phone paging option is priced at \$22.50 versus \$7.50 for CT-2. Cellular service would cost customers \$57.60 for 32 calls (at 2.5 minutes each), plus a \$35.00 monthly access charge. *CT-2 Company Proposes Rates That Will Be 80% Below Cellular*, COMM. DAILY, Jan. 29, 1991, at 4.

protect. Regulation is not warranted unless consumers are paying prices above just and reasonable levels for important services "vested in the public interest" that they cannot get elsewhere.

E. The Relationship of Firms in the Market for Essential Inputs

The final economic question to be addressed is whether prospective competitors will require "essential" facilities from other market participants. If the answer is no, then policy makers can move on to the spectrum allocation questions. If the answer is yes, several questions must be addressed. Regarding essential facilities, regulation has been complex, and judicial decisions leave many "gray areas."

Before asking whether the provision of PCS will require the use of an "essential" facility, this term must be defined. The definition is not simple since it overlaps the ease of entry issue, and as Phillip Areeda points out, the essential facilities doctrine "is less a doctrine than an epithet, indicating some exception to the right to keep one's creations to oneself, but not telling us what those exceptions are."⁶⁸ Indeed, Areeda points out that although the so-called "essential facilities doctrine" is a pervasive topic in deregulation, most Supreme Court cases invoked in support of this doctrine do not speak of it and can be explained without reference to it.⁶⁹

It is generally true that,

[u]nder the doctrine of 'essential facilities,' most courts would impose a duty to deal upon a monopolist in two circumstances: (1) where a single monopolist who competes with the facility user in other markets unilaterally controls the facility; (2) where a monopolistic consortium of firms who are competitors jointly controls the facility.⁷⁰

Under the essential facilities doctrine, a monopolist that denies a competitor access to an input considered to be an essential facility violates section 2 of the Sherman Act.⁷¹ Essential facilities are those for which lack of access would impede their users' ability to gain access to a market.⁷² From the economic perspective, one can generalize that essential facilities must have three salient characteristics: (1) it must be unique; (2) it must be centrally located in the users' path of production;

68. Phillip Areeda, *Essential Facilities: An Epithet in Need of Limiting Principles*, 58 ANTITRUST L.J. 841, 841 (1990).

69. *Id.* at 841. Areeda points out *United States v. Griffith*, 334 U.S. 100 (1948), *Otter Tail Power Co. v. United States*, 410 U.S. 366 (1973), and, *Aspen Skiing Co. v. Aspen Highlands Skiing Corp.*, 472 U.S. 585 (1985) as cases frequently cited in support of the essential facilities doctrine, but which do not use the terminology "essential facilities." *Id.* at 847.

70. David J. Gerber, Note, *Rethinking the Monopolist's Duty to Deal: A Legal and Economic Critique of the Doctrine of "Essential Facilities"*, 74 VA. L. REV. 1069 (1988) (citations omitted).

71. Gregory J. Werden, *The Law and Economics of the Essential Facility Doctrine*, 32 ST. LOUIS U. L.J. 433, 433 (1987).

72. Gerber, *supra* note 70, at 1072.

and (3) it must be essential to the users' business.⁷³ From a legal perspective, "legal findings that facilities are 'essential' typically turn on how badly refusals to deal harm competitors and competition."⁷⁴

The "MCI test" is the most significant means of determining whether market entrants require access to "essential facilities." This test emanates from the Seventh Circuit's decision in *MCI Communications v. American Telephone & Telegraph Co.*⁷⁵ The opinion in this case set forth a relatively clear set of conditions for the application of the essential facilities doctrine, fortunately, and has its basis in the telecommunications industry. As delineated by William Tye, the relevant criteria from this case for making "essential facilities" available generally to competitors are:

1. Control of the facility by a monopolist or a group of competitors with monopoly power.
2. The foreclosed competitor's inability practically or reasonably to duplicate the facility or its economic function.
3. The denial of the use of the facility or the imposition of restrictive terms ... with the consequence of substantial harm to competition in a relevant market in which the monopolist competes (or would be forced to compete with the plaintiff(s) absent the practice).
4. The absence of a "valid business reason."⁷⁶

Admittedly, the first two items of the "MCI test" require as rigorous a market definition as possible for the input suspected of being "essential," and at this stage in the development of the technology required to provide PCS, this is not yet possible. The first item requires an assessment of monopoly power, which in itself requires a reliable market definition for the productive inputs being examined as potentially "essential." The second is simply another way of asking if there are substitutes for the service, which again requires the same rigorous market definition regarding the facility.⁷⁷

73. Gerber, *supra* note 70, at 1073. Another condition was also cited by Gerber: the facility must remain unique while its output is widely distributed, which is to say that in all markets, the facility must be unique. This Article views this condition as being a part of the first condition. See also Daniel E. Troy, Note, *Unclogging the Bottleneck: A New Essential Facility Doctrine*, 83 COLUM. L. REV. 441, 463 (1983) (the definition of an essential facility requires that three requirements be met: (1) the facility is necessary for entry into a market; (2) the duplication of the facility is beyond the standard cost of entry into the foreclosed market; (3) without access to the facility, the plaintiff cannot commercially exist).

74. Gerber, *supra* note 70, at 1075.

75. 708 F.2d 1081 (7th Cir. 1983), *cert. denied*, 464 U.S. 891 (1983); Werden, *supra* note 71, at 445.

76. William B. Tye, *Competitive Access: A Comparative Industry Approach to the Essential Facility Doctrine*, 8 ENERGY L.J. 337, 346 (1987). See also Blumenthal, *supra* note 17, at 857-858.

77. Blumenthal, *supra* note 17, at 858.

Despite these problems the "MCI test" can still be applied to PCS to provide some insight on the essential facilities issues. The question is whether some suppliers of PCS will require essential facilities from other competing suppliers as productive inputs. The first element of the "MCI test" (control of the facility by a monopolist) could be governed by traditional Section 2 market definition standards applied to the service in which the firm controlling the facility, and firms potentially subject to exclusion, compete. If the firm controlling the facility may reasonably be characterized as a monopolist under these standards, the analysis would proceed to the second element of the MCI test.

The second element of the MCI test (practicality of duplication) looks at whether or not substitutes are economically impracticable. Alternatives to inputs in the production of wireless communications ought not be merely inconvenient, costly, or troublesome for competitors to obtain; such competitors must be largely precluded from obtaining the needed facility.⁷⁸ Thus, in the MCI case itself, as well as in other telecommunications cases,⁷⁹ courts have determined that establishing a nationwide telephone network is not a "standard" cost of entry for providing telephone service, and have required interconnection with this essential element of the infrastructure. A discussion of the regulation of PCS must therefore ask whether some providers of PCS will need essential productive inputs from other providers.

Applying the first step of the MCI test in cursory fashion, the key technical question is whether the ability to locate radio ports required for transmission of PCS is controlled by a monopolist or a group of competitors with monopoly power. It is unlikely, however, that the location of these ports will be controlled by a monopolist. Although LECs are able to offer these services, they are not the only firms that can. The ability to place radio ports could be offered by other firms employing rights of way, such as the electric utilities or cable companies.

Another input to PCS which may raise questions of essential facilities is access to what is known as an intelligent network. Besides portability, PCS is expected to also offer access to and control of such services as voice mail, call forwarding, call waiting, and other enhanced features. Interconnection to an intelligent network by a PCS provider is therefore considered critical in order to manage these services. Essential facilities concerns may be raised by this issue since the LECs are frequently thought of as being the only owner of an intelligent network.

78. *Id.* at 860. Blumenthal suggests, for antitrust purposes, defining the facility as a market for purposes of merger analysis under section 7, 15 U.S.C. § 18, if alternatives to the facility are inconvenient, costly, or troublesome. *Id.* at 860 n.14.

79. *Mid-Texas Communications Sys., Inc. v. American Tel. & Tel. Co.*, 615 F.2d 1372 (5th Cir.), *cert. denied*, 449 U.S. 912 (1980); *United States v. American Tel. & Tel. Co.*, 524 F. Supp. 1336, 1360 (D.D.C. 1981), *aff'd*, 460 U.S. 1001 (1983).

Yet this is not the case. A consortium composed of an interexchange carrier, a cable company, and a PCS provider could offer personal communications services with minimal interconnection to an LEC's intelligent network. In this case, it is the interexchange carrier providing the network intelligence. Thus, the requirement of an intelligent network as a productive input should not raise issues of essential facilities that presumably only LECs can provide.

At this point in the evolution of PCS it is not at all clear that even step one of the MCI test will be satisfied. For example, cable companies have asserted that the LECs do not have an advantage over them in general, despite the LECs existing infrastructure. The contention is that the LECs can use existing infrastructure for only limited forms of PCN with little roaming capability; advanced PCN requires high-speed circuits unavailable in local telephone company areas, so "this would be a new technology for everyone."⁸⁰ If this is the case, distribution services are not likely to be supplied by a monopolist or a consortium of firms acting as one.

Even if the first step of the MCI test were satisfied, and there is monopoly control over some essential facility, such as a suitable intelligent network, the second step remains to be satisfied: the facility must not be reasonably subject to duplication. This does not appear to be the case. As a key example, the cable companies apparently believe they are capable of duplicating such facilities. This means that the presence of "essential" facilities that could only be provided by the LECs or other firms appears to be absent.

From this point, a discussion of the third element of the MCI test is moot. If there are multiple viable suppliers of network distribution for PCS, including cable companies (which themselves are discussing the possibility of becoming PCS providers), the issue of whether LECs or other suppliers could deny the use of the facility (and in so doing, harm competitors) is not of interest. Thus, at this writing it appears that there is no need to have regulation to handle concerns with essential facilities.⁸¹

80. *PCN Said to Add Issue of Cable Entry into Telephony to Telco-Cable Debate*, COMM. DAILY, Jan. 18, 1991, at 10. See also Edmund L. Andrews, *Cable TV in Phone Challenge*, N.Y. TIMES, Feb. 28, 1991, at C1. ("[T]he cable companies would use their cable networks to tie together scores of low-powered radio towers scattered throughout a town or a city. The towers would resemble those that currently are used for cellular service, but would be far more numerous and capable of receiving the faint signals that small [PCS] telephones transmit.").

81. Regarding regulation of essential facilities, the FCC required open access to certain network facilities in its *Computer Inquiry III Order*. *In re* Amendment of Section 64.702 of the Commission's Rules and Regs. (Third Computer Inquiry), *Report and Order*, 60 Rad. Reg. 2d (P & F) 603 (1986) [hereinafter *Computer Inquiry III Order*]. Enhanced services were ordered subject to what was termed Comparably Efficient Interconnection and eventually Open Network Architecture (ONA). Enhanced services are a computerized form of telecommunications service that allows electronic information to be modified as well as

F. Issues of Radio Spectrum

Beyond questions of essential facilities, the next significant area of discussion regards spectrum and its allocation for PCS. The key question is whether there is enough spectrum available to allow the projected market structure to yield efficient PCS costs and prices to consumers. For example, if MES for PCS is "small" and a competitive market would best serve the public interest, then free and open entry should be encouraged, and public policy should provide a spectrum allocation that fosters this market structure. If the spectrum allocation does not allow a "large" number of firms to compete within the market, care must be exercised to allocate at least the minimum spectrum required for the number of competitors necessary to produce a competitive outcome in terms of prices to consumers. This minimum number of competitors would therefore also have to be determined.

Although the Commission has previously ordered various reallocations and sharing of spectrum in response to new market forces, the possibility of moving existing users of the proposed PCS allocation to other portions of the spectrum is hindered by many financial and technical constraints.⁸² For example, the National Aeronautics and Space Administration (NASA) has stated that the cost of replacing their telecommunications that currently use the proposed PCS allocation will be over \$5.5 billion.⁸³ Further complicating this issue is that many of their space systems cannot be easily altered to use a different portion of the spectrum.⁸⁴ Projects such as the Hubbell Space Telescope would probably have to be abandoned and the space shuttle would have to be grounded indefinitely while enabling technology is developed for the vehicle's communications.⁸⁵

Similar concerns have also been expressed by private users of the proposed spectrum. Union Pacific Railroad, for example, has stated that

transmitted. *Id.* But see *California v. FCC*, 905 F.2d 1217 (9th Cir. 1990) (vacating the FCC's *Computer Inquiry III Order*). For a further discussion of ONA, see Walter Saprnov, *Open Network Architecture (ONA): An Overview*, in *A PRIMER ON TELECOMMUNICATIONS LAW AND REGULATION* (Walter Saprnov ed., rev. ed. June 1990).

82. See, e.g., *In re Further Sharing of the UHF Televisions Band by Private Land Mobile Radio Services*, 101 F.C.C.2d 852 (1985) (allows licensees to unilaterally alter the type of service provided in UHF channels 50-59); *Spectrum for Land Mobile Services*, 19 Rad. Reg. 2d (P & F) 1663 (1970) (reallocating UHF channels 70-83 for use by land mobile communications services); *Land Mobile Spectrum Allocations*, 23 F.C.C.2d 325 (1970) (permitting land mobile communications services to "share" UHF channels 14-20 within fifty miles of the ten largest markets); *Engineering Standards Concerning the Television Broadcast Service*, 41 F.C.C. #148, 154-58 (1952) (allocating channels 14-83 for use by UHF television).

83. *In re Amendment of the Commission's Rules to Establish New Personal Communications Services*, Notice of Inquiry, Comments of National Aeronautics and Space Administration (filed on Oct. 1, 1990) (GEN Docket No. 90-314) (released on June 28, 1990).

84. *Id.*

85. *Id.*

a direct expenditure of \$130 million will be required to modify its microwave systems in the planned PCS band.⁸⁶ This task is further complicated by Union Pacific's estimate that this conversion process would take at least twelve years to complete.⁸⁷

Another issue that needs to be addressed is where in the spectrum the displaced users will be placed so that their communications are technically equivalent to their present system. For example, various public safety organizations, such as the Associated Public-Safety Communications Officers (APCO) and the Los Angeles County Sheriff's Department, have commented that there is no suitable option available for their current microwave systems.⁸⁸ Because of higher frequency propagation characteristics (such as path length and attenuation) and the unavailability of alternative landline links, several users may not be able to use their current communications systems if they are displaced for PCS. In addition to dealing with the issues of compensating current users for the expense and time of converting their communications systems, the Commission will also have to make a value judgment about whether the current or proposed users of spectrum are more important to the nation's telecommunications infrastructure.

As discussed in the section on entry barriers in this article, it appears that so long as the underlying cost characteristics of PCS are conducive to the competitive market structure, there is enough spectrum to allow the provision of PCS if this market structure is fostered through open entry policies. The desired allocation for PCS centers on the 1.7-2.3 GHz range. Recent research has concluded that only 170 MHz is necessary to provide PCS for the entire world population. Using CDMA technology, discussed in section IV-C, PCS providers can largely use the same frequency allocation to offer wireless service. Although it would require a slight increase in spectrum allocation to accommodate more providers, it appears that by reallocating at least 170 MHz to PCS, the Commission can allocate enough spectrum so that any provider can theoretically serve the entire market.

86. *In re* Amendment of the Commission's Rules to Establish New Personal Communications Services, Response of Union Pacific Railroad Company and Missouri Pacific Railroad Company to Notice of Inquiry (filed on Oct. 1, 1990) (GEN Docket No. 90-314) (released on June 28, 1990).

87. *Id.*

88. *In re* Amendment of Section 2.106 of the Commission's rules to allocate Spectrum for a Personal Communications Network, Comments of APCO, (filed on October 1, 1990) (RM-7175); *In re* Amendment of the Commission's Rules to Establish New Personal Communications Services, Comments of the Los Angeles County Sheriff's Department, (filed on October 1, 1990) (GEN Docket No. 90-314) (released on June 28, 1990).

V. ANALYSIS

Economic efficiency is the key criterion in determining how new services made possible by advanced technology should be regulated. Because of the limited nature of the resource necessary for offering these wireless services (i.e., spectrum), the Commission should provide a regulatory framework that ensures that spectrum is used effectively and with a minimum of waste. At the same time, the Commission should avoid any unnecessary regulation in order to foster competition on the merits. Not only should the FCC structure a system in which customers are protected from monopolistic rates (if this protection is likely to be needed), it should provide incentives for the PCS providers to operate in a manner that promotes cost minimization, enhances infrastructure development, and fosters the innovation and diffusion of new services.

As long as industry cost conditions are conducive to policies fostering entry and price competition among numerous suppliers, the ability of such competition to provide these benefits cannot be understated. As pointed out by John Wenders, "[c]ompetition is valued not as an end in itself but because it is the most efficient mechanism yet devised for improving economic efficiency."⁸⁹ Besides promoting price minimization, such competition also increases the incentives to operate efficiently. Rival firms will seek to exploit any advantage over their competitors by reducing price, improving quality, and lowering costs. By allowing a firm to exploit any weakness in its competitor's business, regulators can be assured that customers will receive the lowest possible prices.⁹⁰ Although PCS is a product from a traditionally regulated industry, the FCC should avoid regulation unless the economic characteristics of the market strongly dictate that it is needed.

A. CT-2

It appears that this cordless one-way technology can be offered with no regulation. The conditions surrounding CT-2 do not prevent competition within the market. Based on the discussion above, it seems reasonable to assume that the provision of CT-2 will not lead to a natural monopoly in the voice and data communications market. No firm appears to have a cost advantage in the provision of this service that

89. JOHN T. WENDERS, *THE ECONOMICS OF TELECOMMUNICATIONS: THEORY AND POLICY* 11 (1987).

90. This was stated quite elegantly by Wenders when he wrote that "[i]t is worth pointing out that competition not only promotes cost-based pricing but will promote *minimum* cost-based pricing. Prices will tend to move toward the minimum cost of production *at the margin*, and any firm that does not produce in the most efficient way will be eliminated by the competitive process in the long run. This, of course, lies behind the often stated rule that the role of public policy should be the promotion of competition not the protection of competitors." *Id.* at 204.

would result in natural monopoly, and even if one did, policy makers would probably not have any way of determining its existence until after entry into the market was allowed.

At this point, it appears that the regulation of CT-2 would not serve the public interest. First, no entry barriers are anticipated. Second, the existence of low-priced substitutes will probably mute any market power that entry barriers would produce if they did exist. For example, the regulated price of a call from a public pay telephone (usually 25 cents) dampens the ability of a CT-2 provider to raise the price of his one-way telephone service. Similarly, anyone desiring personal communications services may switch to traditional cellular service if the price of CT-2 were raised above a given rate. Furthermore, no regulation due to essential facilities concerns would be necessary.

Finally, the FCC will need to determine how many providers may offer this service, and where in the spectrum they can offer it.⁹¹ Although this Article offers no proposal on where in the spectrum this product should be offered, it appears that multiple CT-2 providers are possible within the market. By the very nature of this service, the provision of CT-2 requires a minimal investment. Absent any spectrum constraints, any firm with the investment capital could enter this business.

B. PCN

As with CT-2, it appears that PCN can be offered without regulatory control. Except for concerns about the allocation of spectrum, the FCC's regulatory role should be limited to monitoring the performance of the market.

The initial question in this article's analytic framework is whether the introduction of PCN will create a market for telecommunications services that will sustain only one producer of optimum low-cost size. Because every firm will have access to the same technology and may merely need to just interconnect with the local exchange network, we believe that no firm will have a cost advantage in the provision of this service.

In addition, there do not seem to be any barriers to entry for any possible PCN provider. Stripped to its essence, PCN could be provided by merely attaching a radio port to the existing wired network, an investment that would be quite nominal. If competition in a given area leads to income losses, the PCN provider is able move his operations to a

91. It should be noted that the FCC needs to determine under what rules this service should be made available to the public. The Commission may decide that this technology should best be provided under Part 15 rules similar to today's CT-1 service. Designation of CT-2 under Part 15 would mean that this service would be subject to the possibility of interference from other users within the spectrum. Although this is a key issue to CT-2, we do not believe it has a bearing on the thrust of this article.

more profitable area. Further, there appear to be virtually no sunk costs for this technology. Even if policy makers consider sunk costs to be entry barriers, ease of entry and exit are largely assured.

As with CT-2, any possible concerns about market power could be policed largely by the demand side of the market, as prices could not be raised far above those of existing substitutes without substantially affecting demand. Traditional cellular and wired telephone service will reduce the ability of a PCN provider to charge a price above competitive levels for an extended time. Any price increase in PCN can be expected to lead to an increase in cellular and telephone subscribers. In addition, PCN will compete in the same market with standard flat-rate basic local exchange service of the LECs, which is often characterized as being priced below its cost in order to foster the goal of universal service. If this is the case, such low priced basic service should dampen the effect on any PCS supplier's market power.⁹² Finally, this Article concludes that the use of CDMA technology will facilitate a competitive industry structure for PCN.

C. How to Determine Who Should Provide PCS

Because the PCS providers will necessarily displace other users of the radio spectrum, a market mechanism should be established to determine how the spectrum should be reallocated, and consequently to determine who will provide PCS. To compensate the current users of the spectrum and to guarantee the most efficient allocation of resources, this Article proposes that the Commission use auctions to determine which firms will be the providers of PCS. As noted by Evan Kwerel and Alex Felker, spectrum auctions are efficient than lotteries and comparative hearings for which costs and processing time are very high.⁹³ An auction

92. The scrutiny of the courts has not necessarily produced evidence that this is the case. See, e.g., *California v. FCC*, in which the court stated that "We are also unpersuaded by the [FCC's] new-found faith in *Computer III* that political and regulatory forces in the states will exert pressure on the BOCs to 'minimize rural, residential, and small business local exchange rates, even to levels below cost,' thereby 'limit[ing] the BOCs' ability to shift costs to regulated [basic] services." 905 F.2d 1217, 1236 (9th Cir. 1990) (vacating the FCC's *Computer III Order*, which changed the way the FCC would regulate so-called "enhanced services," a computerized form of telecommunications service that allows electronic information to be modified as well as transmitted); *In re Amendment of Section 64.702 of the Commissions Rules and Regs. (Third Computer Inquiry)*, *Report and Order*, 60 Rad. Reg. 2d (P & F) 603 (1986).

93. Evan Kwerel & Alex D. Felker, *Using Auctions to Select FCC Licensees* (Federal Communications Commission, OPP Working Paper Series #16) (1985). Auction mechanisms are also in favor with major policy makers and President Bush as well. *Spectrum Reallocation Legislation Unveiled by Administration*, COMM. DAILY, Mar. 8, 1991, at 1; COMM. DAILY, Mar. 14, 1991, at 6 (discussing the opinions of NTIA Director Janice Obuchowski on spectrum auctions); Kathleen Killete, *Bill: Auction Communications Licenses*, COMM. WEEK, Mar. 18, 1991, at 53; *NTIA Wants "Pragmatic" Spectrum Auction*, COMM. DAILY, Feb. 28, 1991, at 4; *Bush's Economic Advisors Urge Pro-Competitive*

typically costs only 15% of the cost of either hearings or lotteries, while the processing time for an auction is three months, compared to twelve months for a lottery and eighteen months for comparative hearings.⁹⁴

The auction mechanism advocated in this article is a sealed second-bid format.⁹⁵ Each participant in this auction submits a closed bid of the most they are willing to pay for the PCS right. Unlike the traditional sealed bidding process in which the bidder has to estimate both his value for the item and how much his competitors will offer for the contested good, a contestant in a second-bid auction only reveals to the auctioneer how much he is willing to spend for the item. Although the winning bidder may have the highest bid, the actual price paid by the winning bidder is only equal to the second highest bid. Besides providing protection from collusion (i.e., the use of sealed bids) and a reduction in costs associated with bidding (knowledge of competitor's value for the good is not necessary), this auction mechanism also brings one of the advantages of an open auction in which a price is found that only one competitor is willing to pay.⁹⁶ In short, a sealed second-bid auction offers consumer safeguards, cost minimization, and efficient prices.⁹⁷

The auction for the right to sell PCS would have as a minimum price the direct cost of compensating existing users for moving to other portions of the spectrum. If no bidders came forward to offer this minimum price, this would reveal that it would not be economically efficient to offer the new service, at least not in that particular region of the spectrum. Any amount over this compensation price could be retained as a transfer payment from the bidder to the Federal government.

D. PCS Should be Supplied via Multiple Providers

As long as cost conditions are expected to bring reductions in total industry costs by fostering a competitive market structure, the public

Telecommunications Policies, COMM. DAILY, Feb. 14, 1991, at 5; *FCC: PCS Rules Still a Year Away*, TELEPHONY, Nov. 26, 1990, at 14 [hereinafter *PCS Rules*].

94. *PCS Rules*, *supra* note 93, at 17.

95. For a further discussion on this type of auction, see Terrence J. Schroepfer, *Allocating Spectrum Through the Use of Auctions*, 14 HASTINGS COMM. & ENT. L.J. 35, 41-42 (1991). See also William Vickrey, *Counterspeculation, Auctions, and Competitive Sealed Tenders*, 16 J. FIN. 8 (1961); Paul Milgrom, *Auctions and Bidding: A Primer*, 3 J. ECON. PERSPECTIVES 3 (1989).

96. For a comparison of different formats, see Schroepfer, *supra* note 95, at 35.

97. Several recent studies have shown the benefits to consumers of this type of bidding, which is sometimes called "franchise bidding." See Mark A. Zupan, *The Efficacy of Franchise Bidding Schemes in the Case of Cable Television: Some Systematic Evidence*, 32 J. L. & ECON. 401 (1989); Michael A. Crew & Mark A. Zupan, *Franchise Bidding for Public Utilities Revisited*, in COMPETITION AND THE REGULATION OF UTILITIES 173 (Michael A. Crew ed., 1990); Kwerel & Felker, *supra* note 93. But see, Oliver E. Williamson, *Franchise Bidding for Natural Monopolies—in General and with Respect to CATV*, 7 BELL J. ECON. 73 (1976).

interest is best served if multiple participants are allowed to provide PCS. If the rapid deployment of advanced technologies is one of the underlying policy goals of the FCC, then these goals may be furthered by a LEC set-aside which would reserve a portion of spectrum for local exchange carriers to provide PCS. There are other compelling reasons that favor a LEC set-aside. First, PCS offers the LECs the opportunity to expand and enhance service to rural areas, since it promises to be a more cost-effective way of providing access. By providing another means of service, PCS can also be helpful in furthering universal service objectives. The LECs also are well qualified to provide PCS because of their technical expertise, resources, existing distribution networks, and long history of providing telephone service in the United States. As was pointed out above, much of the necessary infrastructure is already in place, enabling PCS to be rapidly deployed by LECs well before the end of the decade.

If the FCC's ultimate policy does not include a LEC set-aside, the LECs should be allowed to participate in any selection process that is used, (e.g., auctions). In any event, the FCC must balance the advantage a large number of firms brings to providing a competitive market with the recognition that each additional market participant forces a slightly higher spectrum allocation with CDMA. Even though this article agrees that more firms in the market increase competition, it is not yet possible to make a judgment regarding the point at which the benefits of an increased number of competitors are outweighed by the increased spectrum demands. From a public welfare perspective, it is not yet clear what the optimal number of competitors is, i.e. the number of competitors that would equate the marginal increase in public welfare (due to competition) with the marginal social cost of spectrum. This article argues that without more information about the benefits and costs of each additional PCS provider, the authors cannot decide the ultimate number of PCN and CT-2 participants.

Certainly, no firm should be precluded from participating in competing for the right to provide PCS simply because it has so-called "deep pockets." This is an argument that is sure to be leveled against the LECs and other large incumbent carriers in telecommunications. Opponents will argue that: Auctions, as a means of determining which firms should provide PCS, favor large firms that have large cash reserves or other considerable financial resources, and disadvantages other efficient providers that lack such financial resources. This reasoning may lead to some very inefficient policies if it is followed. The reasoning is specious for the same reason that high capital costs in and of themselves are not barriers to entry. If efficient capital markets are available to participants choosing to bid on the right to provide PCS, then a firm with "deep pockets" possesses no advantage over other participants. Thus, the FCC should not preclude any bidders for PCS simply because they are

cash rich or financially healthy. Similarly, the FCC should not grant some sort of "handicap" to firms that would find it difficult to raise the financial resources necessary to engage in a spectrum auction. This type of handicapping merely encourages inefficient entry by marginal firms that cannot improve the public interest by being a market participant.⁹⁸

E. The Pervasive Regulatory Concern of Predatory Pricing

This article has not specifically discussed the familiar and oft-heard concern of large, well established industry suppliers cross-subsidizing CT-2 or PCN with revenues from other services (and proposes no explicit regulatory safeguards against this alleged practice). This article's recommendation regarding this concern is to rely wholly on the antitrust laws, primarily on Section 2 of the Sherman Act, or on the applicable state antitrust laws, if necessary. If policy makers wish to encourage the diffusion of advanced technologies like PCS, it is in the public interest to avoid regulation requiring such services to pass potentially onerous cost-based tests designed to prevent predatory pricing. There are several reasons the application of seemingly plausible cost-based predation rules are likely to do more harm than good.⁹⁹

First, it should be recognized that antitrust courts have lately eschewed cost-based tests in favor of more economically advanced approaches to the predation question.¹⁰⁰ Antitrust courts have recognized that a cost-based test imposes an onerous burden of proof on defendants, and is usually unnecessary to determining whether predatory pricing is a viable and rational economic practice. Thus, it would be a mistake to require too much regulatory scrutiny of PCS costs. Such regulations merely make it easy for competitors to forestall the legitimate competitive responses of firms required to produce cost-based tests. If PCS costs are scrutinized before prices can be set or changed flexibly, this process should not take place in an asymmetric fashion where it is applied only to LECs but not to other PCS providers. The best policy for a service like PCS is to have no price floors at all.¹⁰¹

98. See *supra* note 4 and accompanying text.

99. See, Alexander C. Larson & Mark E. Meitzen, *Recent State Legislation for Telecommunications Regulation: Brave New World, or Bad Public Utility Law?*, 14 GEO. MASON U. L. REV. (forthcoming 1992).

100. See *Matsushita Elec. Indus. Co. v. Zenith Radio Corp.*, 475 U.S. 574 (1986); *Cargill Inc. v. Monfort of Colo., Inc.*, 479 U.S. 104 (1986); *A.A. Poultry Farms, Inc. v. Rose Acre Farms, Inc.*, 881 F.2d 1396 (7th Cir. 1989), *cert. denied*, 494 U.S. 1019 (1990).

101. Alexander C. Larson & William E. Kovacic, *Predatory Pricing Safeguards in Telecommunications Regulation: Removing Impediments to Competition*, 35 St. Louis U. L.J. 1 (1990). It is often thought that predatory pricing by an LEC or other large regulated firm goes beyond the simple pricing of services below their costs. A common, though largely anecdotal and economically dubious scenario involves one in which the LEC can hide the cost of developing a service like PCS within its complicated accounting system. The cost of a service like PCS would then be recovered through rate regulation of basic local exchange

This latter point is especially strong for services like PCS. When scope economies exist in the production of services subject to rapidly changing technology (and available to a wide variety of competing firms), it is virtually impossible to distinguish allegations of predatory pricing from lawful responses to competitive pressures. It is best not over-regulate competition in such markets out of fear of price predation, especially when in similar situations such concerns have often been found to lack substance.¹⁰² The lack of entry barriers in the PCS market combined with a high supply capability of firms competing with the LECs should make anticompetitive cross-subsidization economically senseless since it could not be expected to reduce competition in the long run. As long as prices are going down for the services in question, infrastructure development is implicitly encouraged and the diffusion of advanced technology is improved, both resulting in benefits for consumers.¹⁰³

service. This scenario is unrealistic and largely baseless from an economic perspective. First, the trend is for basic local exchange rates to go down in the future, not up. The trend afoot for incentive regulation in the various states usually involves a freeze or cap on basic local exchange rates, making it difficult to orchestrate a predation strategy. *See, e.g., In re Southwestern Bell Telephone Company's Proposal for Network Modernization, Rate Stability and Pricing Regulation a/k/a "TELEKANSAS,"* Docket No. 166,856-U, Order (Feb. 2, 1990). Second, regulatory lag also makes predation strategies rather senseless, since it prevents the regulated firm from recouping the losses it must incur in the markets in which predation allegedly would take place. *See* W. A. Brock & David S. Evans, *Predation: A Critique of the Government's Case in US v. AT&T*, in *BREAKING UP BELL: ESSAYS ON INDUSTRIAL ORGANIZATION AND REGULATION* 55-56 (David S. Evans ed., 1983). Third, it is not true that a regulated firm can incur losses in one market, and make up the difference dollar-for-dollar in another regulated market such as the one for basic local exchange service. While rate of return regulation theoretically makes this possible, regulatory lag and other real world considerations make this quite remote. Under price ceiling regulation, there is only one set of profit-maximizing prices, and this set of prices cannot include prices that are set below the relevant costs. Thus, a predation strategy under price ceiling regulation makes a loss of profits a certainty, and makes recouping of these losses virtually impossible. Fourth, predation under rate of return regulation can only take place if the allowed rate of return exceeds the market rate of return, a rather unlikely occurrence. Janusz A. Ordover & Garth Saloner, *Predation, Monopolization, and Antitrust*, in 1 *HANDBOOK OF INDUSTRIAL ORGANIZATION AND REGULATION* 570-573 (Richard Schmalensee & Robert D. Willig eds., 1989). Fifth, if PCS were to be offered under a LEC's separate subsidiary, the issue of predation through basic local exchange rates is moot, though important scope economies may be lost in the process. Finally, regulated firms are not necessarily exempt from the antitrust laws by virtue of their rates being set by a regulatory agency.

102. *See* the analysis of Wesley S. Liebler, *Whither Predatory Pricing? From Areeda and Turner to Matsushita*, 61 *NOTRE DAME L. REV.* 1052 (1986) (Not a single real predatory pricing case has emerged in the courts from the inception of the Areeda-Turner test in 1975 to the time of the Matsushita case; most alleged cases of predatory pricing brought before the courts could have been disposed of in summary judgment under the standards set in the Matsushita case.)

103. The case of PCS may be a case in which the game-theoretic strand of the predatory pricing literature has something to offer. Basically, the message of the game-theoretic predatory pricing "literature is that it is rational for firms to use past market experience to forecast future market experience, and therefore it is rational for existing firms to price

VI. CONCLUSION

The future telecommunications industry will boast more and more new services made possible by advanced technologies. The rate at which these new advanced technologies and services will be developed is expected to increase. A key question is how to regulate the advanced technology which makes the new services possible. This article asserts that the object of the analysis should be *markets* and not specific firms or services in isolation. Policy makers applying public utility law should focus on how existing markets will be affected by the introduction of a new service, and how this market should be regulated prospectively after the new service becomes a part of it.

This approach ensures the rapid diffusion of advanced technologies and encourages new service development, enhancing the basic telecommunications infrastructure. This process also obviates the unnecessary regulation of new services, and ensures that the overall regulation of the relevant market takes place in integrated fashion, as opposed to piecemeal service-by-service regulation.

This article provides an implicit analytic framework for determining whether and how to regulate new high technology services, and applies it to a service that will emerge later in this decade, personal communications services. The analytic framework requires the analyst to examine the overall market of which a new service would be a part, and consider ease of entry and its implications for market power, demand considerations emanating from substitutes for the new service, essential facilities issues, and other related issues (e.g., spectrum constraints). While this analytic framework does not provide a road map for the

aggressively and take other actions that, even if they are not profitable in their own right, may be profitable when the response of the competitors (exit or delayed or deterred entry) is taken into account.

The game theoretic theories predict that such so-called predatory strategies are most likely to be effective when used by a large competitor against a long sequence of smaller competitors, because the smaller competitors will be less likely to be willing to sustain a fight for market share and because the value of building a reputation is greatest when it is used more often. Consequently, the social consequences of predation are most worrisome in markets with rapid new product introduction. Yet these are the very same markets in which intense market share battles and falling prices might be seen for other reasons." See letter from Paul Milgrom, Director, Stanford Institute for Theoretical Economics, to Alex Larson, (April 17, 1990) (on file with authors).

Thus, it makes no sense to examine predation in such markets (or to use cost-based tests if it is decided to examine predation anyway). Further, it makes no sense to expect a predation safeguard to filter predatory behavior from earnest competition on the merits, or to expect a predation remedy necessarily to have less social costs than the predation itself. See Paul Milgrom & John Roberts, *Informational Asymmetries, Strategic Behavior, and Industrial Organization*, 77 AM. ECON. REV. 184 (Papers and Proceedings) (1987); John Roberts, *Battles for Market Share: Incomplete Information, Aggressive Strategic Pricing, and Competitive Dynamics*, in *ADVANCES IN ECONOMIC THEORY: FIFTH WORLD CONGRESS* 157 (Jean-Michel Grandmont & Charles F. Manski eds., 1987).

regulatory handling of new services, and hence does not provide a specific list of recommended evidentiary standards in support, it does offer a way to examine important underlying regulatory issues and avoid unwise policies. This, of course, is often the primary role of economics in both regulatory and antitrust issues. A failure to employ the principles involved in this implicit framework may lead to overly burdensome regulation of new high technology services and unduly impede the development of such services.

The main conclusion of this article is that PCS should not be regulated. This conclusion is based on the assumption that there are no expected entry barriers into the submarket for PCS (i.e., sunk costs, the North American Numbering Plan, and spectrum allocation do not appear problematic) and that many existing, low priced telecommunications services would provide significant competition for PCS, no matter which firm or firms offer it. It is also contended that issues of essential facilities will probably not require any overt regulatory policies, since no one firm or group of firms is expected to completely control key productive inputs that its own competitors will require.

This article recommends using sealed second-bid auctions for the allocation of radio spectrum to PCS. There appears to be enough spectrum available for PCN and CT-2 competition. Through the use of CDMA technology, the FCC has the ability to authorize multiple PCS providers to use the same frequency to offer their service. Besides setting up a mechanism to compensate current users for moving to other portions of the spectrum, this process will allow the FCC to determine the true value of the spectrum.

However, it is not a foregone conclusion that fostering a large number of vendors of PCS will automatically produce the low prices and high quality levels associated with a truly competitive market structure. Open entry policies do not automatically foster a competitive market result in the sense that total industry costs are automatically minimized. A competitive industry structure is only efficient if the cost characteristics of the firms in that industry dictate that total industry supply costs can be minimized by having several firms supply industry demand. This could reasonably be expected to be the case with PCS. If so, it would be a sound policy to allocate enough spectrum to allow several competitors to service the market. The optimal number of firms depends on the form of

competition that is expected, and the opportunity cost of displaced spectrum.

COMMENT

THE VIEW FROM ON HIGH: SATELLITE REMOTE SENSING TECHNOLOGY AND THE FOURTH AMENDMENT

LISA J. STEELE[†]

Table of Contents

I. INTRODUCTION	318
II. THE HARDWARE: THE SCOPE OF COMMERCIAL SATELLITE IMAGERY	318
III. THE CONSTITUTIONAL PROTECTION AGAINST WARRANTLESS SEARCH: A HISTORICAL OVERVIEW	322
A. The Reasonable Expectation of Privacy	322
B. Curtilage and the Open Fields Doctrine	323
IV. THE NEXT LOGICAL STEP: WARRENTLESS SEARCHES USING SATELLITE IMAGERY	326
A. The Question of Space as a Public Vantage Point	327
B. The Question of Reasonable Anticipation	328
C. The Question of Technology Within Public Use	329
D. Unnatural Senses: Infrared Imaging and Synthetic Aperture Radar	331
V. CONCLUSION	333

You had to live—did live, from habit that became instinct—in the assumption that every sound you made was overheard and, except in darkness, every movement scrutinized.

—George Orwell, 1984

© 1992 Lisa J. Steele

[†] J.D. 1991, Western New England College School of Law; B.A. 1986, Mount Holyoke College. This comment received Third Prize in the 1990 High Technology Law Journal Comment Competition. The competition was sponsored by the law firms of Cooley Godward Castro Huddleson & Tatum; Fenwick & West; Ware & Friedenrich; and Wilson, Sonsini, Goodrich & Rosati, all of Palo Alto, California.

I. INTRODUCTION

In 1984, the United States government placed the sale of images taken by the Landsat satellites in the hands of a commercial company. Two years later, a French company launched its own remote sensing satellite. Then, the Soviet Union joined the market in 1987 offering to sell orbital photographs from its array of satellites. These three vendors constitute a market with far-reaching implications for criminal prosecution and the constitutional right of American citizens to be free from warrantless searches.

The ability of modern satellites to observe subjects has grave implications. The most powerful camera available to civilians, the KFA-1000 aboard the Soviet Resurs F satellite, can resolve details as small as 5 meters across in general and details as small as 1.3 meters across under limited conditions.¹ Some believe military satellites to have a resolution of between 7.17 centimeters and 23.23 centimeters.² If the courts should find civilian reconnaissance satellites equivalent to aircraft for purposes of "open fields" searches under the Fourth Amendment to the United States Constitution, then citizens may properly anticipate that anything done outdoors may constitutionally be viewed by unseen satellites.

This Comment explains the technical aspects of satellite remote sensing, the constitutional sources of the "open fields" exception to the Constitution's warrant requirement, and the likely application of that exception to space-based searches. It concludes with the warning that while satellite remote sensing is unlikely to pose a threat to the public today, technology will make searches that endanger privacy feasible in the future.

II. THE HARDWARE: THE SCOPE OF COMMERCIAL SATELLITE IMAGERY

Since 1986, the United States Supreme Court has permitted the taking of aerial photographs without a search warrant.³ Certain technical distinctions between satellite imagery and aerial photography, however, may have a crucial effect on both the use of satellite images by law enforcement authorities and the admissibility of evidence obtained in warrantless satellite searches.

1. "Vladimir Pankin, senior engineer at Soyuzkarta, the Soviet remote sensing agency, says the KFA-1000 '... is acknowledged worldwide as the camera with the best resolution available in the world.' He suggests that a 2m resolution may be possible under the best atmospheric and lighting conditions. . . . The camera . . . provides a capability for 5m resolution." T. Furniss, *The DC-3 of Space*, FLIGHT INT'L, June 20, 1990 at 36-37.

2. JEFFREY T. RICHELSON, *AMERICA'S SECRET EYES IN SPACE: THE KEYHOLE SPY SATELLITE PROGRAM* 186-87 (1990).

3. *Dow Chem. Co. v. United States ex rel. Adm'r, EPA*, 476 U.S. 227 (1986); *California v. Ciraolo*, 476 U.S. 207 (1986).

The quality of satellite photographs is rapidly approaching that of photographs taken by aerial surveillance cameras. The first high-resolution civilian reconnaissance program, Landsat, was launched in 1972.⁴ Since 1972, several civilian satellite photography companies have developed. Landsat's progeny, Landsats 4 and 5, are managed by a private firm, Eosat, and provide images with 30-meter resolution.⁵ Eosat's primary competitor, the Spot Image Company (Spot), provides images from the French Spot satellites with 10-meter resolution.⁶ The Soviet Union also markets satellite photographs through a government agency, Soyuzkarta, and digital radar images through an American agency. Soyuzkarta's photographs have a resolution of 5 meters. These photographs are taken in orbit and the film is ejected from the satellite to be picked up by an aircraft. The Almaz, another Soviet satellite, uses synthetic aperture radar⁷ and offers a resolution of 10 to 15 meters.⁸

Although these capabilities are impressive, civilian satellites still lag behind military systems. An example of current technology, the Advanced KH-12 espionage satellite, demonstrates the possibility of optical images with 10-centimeter resolution and radar images with 1-meter resolution.⁹ While civilian vendors cannot presently manufacture

4. OFFICE OF TECHNOLOGY ASSESSMENT, U.S. CONGRESS, REMOTE SENSING AND THE PRIVATE SECTOR: ISSUES FOR DISCUSSION—A TECHNICAL MEMORANDUM, 4 (1984) [hereinafter REMOTE SENSING]. Although Landsat came after meteorological satellites, it was the first civilian system with sufficient resolution to threaten privacy rights. For a discussion of the history and capacity of meteorological systems see NATIONAL OCEANIC AND ATMOSPHERIC ADMIN., U.S. DEP'T OF COMMERCE, TIROS—N SERIES DIRECT READOUT SERVICES USERS GUIDE, 1-2 (1982).

5. David T. Lingren, *Commercial Satellites Open Skies*, BULL. OF THE ATOMIC SCIENTISTS, Apr. 1988, at 35. "Meter" or "spatial resolution" in the context of this note refers to the smallest objects that can be clearly distinguished in the image. This term may also describe the "field view" of a "pixel," the smallest element in an electronic image.

The area represented by a pixel varies depending upon the angle between the object and the satellite sensor. A satellite has its optimum resolution directly beneath the sensor—as the angle increases, the resolution deteriorates.

6. See generally Peter D. Zimmerman, *Remote Sensing Satellites, Superpower Relations, and Public Diplomacy*, in COMMERCIAL OBSERVATION SATELLITES AND INTERNATIONAL SECURITY, 33, 33-36 (Michael Krepon et al. eds., 1990) (discussing the history of these two companies and their respective satellites).

7. Synthetic aperture radar uses a radar beam instead of reflected light to produce an image. It can therefore obtain an image through cloud cover. *Soviet Space Agency to Sell Satellite Radar Images*, MICROWAVE SYS. NEWS & COMM. TECH., Mar. 1990, at 2. France allegedly will develop a similar system for the fourth Spot satellite. *French Develop Satellite to Complement the Spot Series*, AVIATION WK. & SPACE TECH., Oct. 23, 1989 at 48.

8. Craig Covault, *Soviets Launch Earth Resources Satellite on Modern Salyut Platform*, AVIATION WK. & SPACE TECH., Apr. 8, 1991, at 21. (The Almaz satellite was launched on March 31, 1991).

⁹ SIPRI, YEARBOOK 1989: WORLD ARMAMENT AND DISARMAMENT 75; see generally RICHELSON, *supra* note 2; Daniel Charles, *Spy Satellites: Entering a New Era*, 243 SCIENCE 1541, 1542 (1989); Jeffrey T. Richelson, *The Future of Space Reconnaissance*, SCI. AM., Jan. 1991, at 38.

and launch satellites with these capabilities, these systems provide an illustration of how far the technology has progressed.

One major difference between satellites and aircraft is that satellites are virtually invisible from the ground. A subject may hear or see an observing aircraft, but cannot casually detect a satellite.¹⁰ This poses a significant advantage for those engaged in covert surveillance, and also makes it difficult to detect invasions of privacy which do not lead to arrest.

Satellites also differ from aircraft in that they must remain in fixed orbits. This restricts both the quantity and availability of their images.¹¹ Remote sensing satellites are generally placed in "sun-synchronous" orbits which allow the satellites to pass over the equator at the same solar time each day.¹² For law enforcement purposes, satellites are most useful for investigating ongoing or past criminal activity such as locating narcotics plantations and illegal pollution.

The few satellites available are in high demand. The Landsat 4 and 5 satellites each pass over a given location once every 16 days.¹³ The Spot satellite repeats its orbit once every 26 days; however, its sensors are mounted in a manner which allows it to "revisit" a location 7 days out of 26 days.¹⁴ Unfortunately, the Soviet Union employs a large number of satellites about which information is not readily available. Therefore, satellite availability is difficult to ascertain.¹⁵ Again, this makes it more difficult to observe a spontaneous event than observe an ongoing event.

Even if a satellite is in position to observe a given target, the weather must be sufficiently clear to allow optical observation. Repeated attempts may be required unless the satellite uses other sensors, such as radar, to observe the target. One sensor which may be employed is an infrared camera, which allows the satellite to distinguish different types

10. A subject can locate a satellite visually during the early evening or pre-dawn hours and can calculate the satellite's orbit. This effort differs significantly from merely glancing skyward or hearing a distant aircraft.

11. Military satellites have small maneuvering engines which allow them to alter their orbits. Civilian satellites do not have this capacity. See, e.g., William J. Broad, *Satellites Keep Watch On The Desert*, N. Y. TIMES, Aug. 28, 1990, at C1, C9.

12. OFFICE OF TECHNOLOGY ASSESSMENT, U.S. CONGRESS, COMMERCIAL NEWSGATHERING FROM SPACE—A TECHNICAL MEMORANDUM 13-15 (1987) [hereinafter COMMERCIAL NEWSGATHERING]. In a "sun-synchronous orbit," the satellite passes over the equator in a polar orbit at the same solar time each day. This allows it to obtain imagery with the sun at a constant elevation relative to the point on the ground being imaged.

13. Due to the curvature of the earth, the closer the subject is to the pole, the more often a given satellite passes over it. Thus Landsat takes 16 days to revisit a subject at the equator and only 8 days to revisit a subject near the poles. COMMERCIAL NEWSGATHERING, *supra* note 12, at 13.

14. *Id.*

15. Soyuzkarta's images came from the Resurs F and O1 satellites and the Kate-140 and MKF-6 cameras operated by the cosmonauts on the Mir space station. *Soviet Earth Observation Gets Less Remote*, SPACE MARKETS, Jan. 1990, at 19-20.

of plants, or between occupied and unoccupied buildings.¹⁶ Infrared sensors aboard aircraft are used today to locate indoor marijuana plantations by the heat of their 1,000 watt "grow lights."¹⁷ Landsat and Spot's multispectral scanners are also being used to detect drug cultivation in foreign countries by their color "signature,"¹⁸ and there is no technical barrier to using this technology in the United States.

Satellite photography is currently being used in some cases involving violations of environmental laws.¹⁹ To date, satellite imagery is used primarily to provide demonstrative evidence of herbicide use, release of pollution from barges, the existence of land and water boundaries including wetlands, and the presence of specific pollutants.²⁰ Satellites are also used to monitor environmental damage. During the Persian Gulf War, satellite imagery was used to monitor the amount of oil spilled into the Gulf. It can likewise be used to monitor spills in American waters.²¹ It does not appear that satellite imagery has been extensively used in investigations of domestic narcotics or environmental crimes.

16. THE MAP CATALOG 123-26 (Joel Makower ed., 1986). Landsat's multispectral scanner system records information in two visible light wavelengths and two infrared wavelengths. The resulting images may be combined into "false color" portraits showing health of vegetation, building density, or even water depth. *Id.*

Longer wavelengths of infrared light produce less distinct imagery because they "see" heat in air masses above the ground as well as thermal sources on the ground. Because of the longer wavelength of infrared light, infrared images have inherently lower resolution than visible light images for a given field of view. Richelson, *supra* note 9 at 39 (infrared wavelengths cannot penetrate water vapor (clouds)).

17. See *United States v. Penny-Feeney*, 773 F. Supp. 220 (D. Haw. 1991); CANNABIS INVESTIGATION SECTION, U.S. DEP'T OF JUSTICE, 1989 DOMESTIC CANNABIS ERADICATION AND SUPPRESSION PROGRAM FINAL REPORT 23 [hereinafter 1989 REPORT]; Jeffrey Miller, *San Diamas Pot Crop Called Part of Growing Trend*, L.A. TIMES, June 22, 1989, § 9, at 1; Jeffrey Miller, *Indoor Pot Plantation Too Hot to Hide*, L.A. TIMES, Apr. 13, 1989, § 9, at 1.

18. William J. Broad, *Charting the Drug Trade from the Skies*, N.Y. TIMES, Oct. 14, 1989, § 1, at 6. An analyst at EOSAT stated that the detection of drugs by color signature might not always prove reliable and that detection of coca plants by this method was easier than detection of marijuana. *Id.*

19. ENVIRONMENTAL MONITORING SYS. LAB., U.S. EPA, REMOTE SENSING IN HAZARDOUS WASTE SITE INVESTIGATIONS AND LITIGATION 337 (rev. 1988) [hereinafter HAZARDOUS WASTE INVESTIGATIONS].

20. A.B.A. & AMERICAN SOC'Y FOR PHOTOGRAMMETRY AND REMOTE SENSING, EARTH OBSERVATION SYSTEMS: LEGAL CONSIDERATIONS FOR THE '90s, 12, 18 (1990) [hereinafter LEGAL CONSIDERATIONS].

21. *Satellite Image Reveals Oil Dumped in Gulf by Iraq*, AVIATION WK. & SPACE TECH., Mar. 4, 1991, at 24; see also HAZARDOUS WASTE INVESTIGATIONS, *supra* note 19. Some suggest that civilian satellites have difficulty detecting and distinguishing between various types and sources of spilled oil. Leonard LeBlanc, *Tracking the Culprit*, OFFSHORE, Jan. 1991, at 7. Spaceborn sensors, however, may detect many other types of water pollution. LEGAL CONSIDERATIONS, *supra* note 20, at 18.

III. THE CONSTITUTIONAL PROTECTION AGAINST WARRENTLESS SEARCH: A HISTORICAL OVERVIEW

Any use of satellites by government agencies to search for evidence of criminal activity must conform to the Fourth Amendment of the United States Constitution which states "The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation" ²² The State may, therefore, seek a warrant from a neutral and detached magistrate in order to lawfully search a person's home and effects. In addition, courts have permitted the State to examine, without a warrant, fields, yards, and other public places. ²³

To determine whether a search as defined by the Fourth Amendment has taken place, the courts generally consider the location of the area searched, the reasonableness of the subject's expectation of privacy in the area, and society's willingness to defend that expectation of privacy. ²⁴

A. The Reasonable Expectation of Privacy

Early cases regarding warrantless searches focused on property concepts of trespass in determining whether a search fell within the Fourth Amendment. A physical penetration of a dwelling or closure rendered the search unconstitutional. If no such penetration occurred, the search was permissible. ²⁵

In 1967, the U.S. Supreme Court changed that rule, setting forth a new standard for review of warrantless searches. In *Katz v. United States*, ²⁶ the court considered whether the Constitution permitted the FBI to place a microphone in a public telephone booth. The Court had to abandon its earlier trespass test because the microphone did not require physical penetration of the telephone booth. To invalidate the search, the Court held the search unconstitutional because the government had "violated the privacy upon which [petitioner] justifiably relied while using the telephone booth." ²⁷ Justice Harlan, in a concurring opinion, suggested that courts henceforth would ask (1) whether the property owner had

22. U.S. CONST. amend. IV.

23. See, e.g., *Hester v. United States*, 265 U.S. 57 (1924).

24. See *Katz v. United States*, 389 U.S. 347, 351-52 (1967).

25. See, e.g., *Silverman v. United States*, 365 U.S. 505 (1961) (use of a "spike" microphone contacting the heating duct servicing the house occupied by the petitioners held unconstitutional); *Hester v. United States*, 265 U.S. 57 (1924) (open fields search held constitutional).

26. 389 U.S. 347 (1967).

27. *Id.* at 353.

demonstrated an actual expectation of privacy and (2) whether society would recognize such an expectation as reasonable.²⁸

The Court has limited this "reasonable expectations" standard in a number of cases involving aerial surveillance. The Court has ruled that since no reasonable expectation of privacy exists in open fields,²⁹ nor for persons in public view,³⁰ no reasonable expectation of privacy exists for subjects in "plain view" of the public airways.³¹

B. Curtilage and the Open Fields Doctrine

An area not closely connected to a residence may be searched without a warrant. In *Hester v. United States*,³² the Court held that "the special protection accorded by the Fourth Amendment to the people in their 'persons, houses, papers, and effects,' is not extended to the open fields." Between 1967 and 1984, some believed that *Katz* had overruled this distinction between searches of the curtilage and of open fields. The Court, however, reaffirmed the *Hester* doctrine in *Oliver v. United States*.³³

In *Oliver*, state narcotics agents investigating a farm entered the lands, passed a locked gate and "No Trespassing" sign, and discovered a marijuana patch. The trial court held that the posted signs and secluded location of the marijuana patch demonstrated a reasonable expectation of privacy and therefore the warrantless search was unconstitutional.³⁴ The Supreme Court reversed, holding that "an individual may not legitimately demand privacy for activities conducted out of doors in fields, except in the area immediately surrounding the home [i.e. the curtilage]."³⁵ Furthermore, the Court reasoned, "open fields do not provide the setting for those intimate activities that the [Fourth] Amendment is intended to shelter from government interference or surveillance. There is no societal interest in protecting the privacy of those activities, such as the cultivation of crops, that occur in open fields. Moreover, as a practical matter, these lands usually are accessible to the public and the police in ways that a home, an office, or commercial structure would not be."³⁶

In three subsequent cases, the Court has expanded the warrantless search doctrine to permit aerial searches of areas within both residential

28. *Id.* at 361 (Harlan, J., concurring).

29. *Oliver v. United States*, 466 U.S. 170, 181, 184 (1984).

30. *United States v. Santana*, 427 U.S. 38, 42 (1976).

31. *See, e.g., Florida v. Riley*, 488 U.S. 445, 449-50 (1989) (plurality opinion); *Dow Chem. Co. v. United States ex rel. Adm'r, EPA*, 476 U.S. 227, 239 (1986); *California v. Ciraolo*, 476 U.S. 207, 212-14 (1986).

32. 265 U.S. 57, 59 (1924).

33. 466 U.S. 170, 178 (1984).

34. *Oliver v. United States*, 466 U.S. 170, 175 (1984).

35. *Id.* at 178.

36. *Id.* at 179.

and industrial curtilage. In *California v. Ciraolo*,³⁷ the Court upheld an aerial search of an enclosed yard adjacent to a residence. In *Dow Chem. Co. v. United States ex rel. Administrator, EPA*,³⁸ the Court upheld the use of a highly sophisticated mapping camera to photograph the interior of an industrial facility. Recently, in *Florida v. Riley*,³⁹ the Court upheld a low altitude search by helicopter of the contents of a greenhouse through missing roof panels.

The Court's first consideration of warrantless aerial searches occurred in 1986. In *California v. Ciraolo*,⁴⁰ police officers flew over the defendant's house in a private airplane at an altitude of 1,000 feet—within the public airways. Although a six-foot-high fence protected the defendant's marijuana patch from ground-level scrutiny, aerial observers could see it clearly. The Court determined that, although the patch was within the curtilage of the defendant's home, it was still vulnerable to observation from a public vantage point. Since "[t]he Fourth Amendment protection of the home has never been extended to require law enforcement officers to shield their eyes when passing by a home on public thoroughfares," the Court held the search constitutional.⁴¹

The same day that *Ciraolo* was announced, the Court expanded its holding to permit a warrantless aerial survey with a high-precision mapping camera. In *Dow Chem. Co. v. United States ex rel. Administrator, EPA*, the EPA had been denied permission to examine a 2,000-acre chemical manufacturing facility.⁴² The agency hired a commercial aerial photographer to photograph the facility from various altitudes. The aircraft remained within navigable airspace at all times.⁴³

The Court recognized that Dow had taken every commercially feasible step to secure its property. Elaborate security, including cameras and motion sensors, had been installed. The photographed area was located within internal portions of the facility in order to conceal it from the public. Dow had even demonstrated concern about aerial surveillance by identifying aircraft making multiple passes over the complex and tracking those aircraft to prevent dissemination of photographs revealing trade secrets.⁴⁴ However, the majority held that even these measures did not constitute sufficient protection.

37. 476 U.S. 207 (1986).

38. 476 U.S. 227 (1986).

39. 488 U.S. 445 (1989) (plurality opinion).

40. 476 U.S. 207, 209, 215 (1986).

41. *Id.* at 213–14.

42. 476 U.S. 227, 229–30 (1986).

43. *Id.* at 229.

44. *Id.* at 241–42 (Powell, J., dissenting). Had a competitor conducted the same search seeking trade secrets, a court might have found it liable in tort. See *Dow Chem.*, 476 U.S. at 232; "State tort law governing unfair competition does not define the limits of the Fourth Amendment." *Id.*; *E.I. DuPont de Nemours v. Christopher*, 431 F.2d 1012 (5th Cir. 1970), *cert. denied*, 400 U.S. 1024 (1971); RESTATEMENT (FIRST) OF TORTS § 757 cmt. b (1939).

The Court declined to establish a doctrine of "industrial curtilage" and held that the state has a greater latitude to conduct warrantless inspections of commercial subjects than of residential subjects.⁴⁵ Additionally, the aircraft remained within the public airways, thus establishing exposure of the area to the public and making the search constitutional.

In *Ciraolo*, the police had relied upon unaided visual observation. In *Dow Chemical*, however, the EPA utilized a sophisticated mapping camera. The Court held that the *Dow Chemical* search did not become invalid because "the EPA was not employing some unique sensory device that, for example, could penetrate the walls of the building and record conversations . . . but rather [had employed] a conventional, albeit precise, commercial camera commonly used in mapmaking."⁴⁶ The Court did place some limits upon the use of technology, suggesting that the use of equipment "not generally available to the public, such as satellite technology, might be constitutionally proscribed absent a warrant."⁴⁷

In its most recent decision involving aerial surveillance, *Florida v. Riley*, the Court expanded the permissible uses of aerial surveillance in law enforcement. The defendant, Riley, resided in a mobile home within 10 to 15 feet of a greenhouse. The greenhouse was covered by roofing panels which were either translucent or opaque. Acting on a tip, police circled the greenhouse twice in a helicopter at an altitude of 400 feet. Two panels, comprising 10% of the roof, were missing. Looking through these gaps, police identified marijuana plants.⁴⁸ The Court held that because the sides and roof of the greenhouse were left partially open, an aerial observer could have seen the marijuana growing in it. Therefore, Riley could not have reasonably expected that the contents of his greenhouse would remain hidden from police using the same methods employed in *Ciraolo*. The fact that the police used a helicopter did not invalidate the search, since helicopters form a routine part of modern travel and knowledge of them existed in Riley's county. Any member of the public could have legally flown over Riley's greenhouse at the same altitude and noticed the marijuana. The police officers did no more than this.⁴⁹

In *Ciraolo*, the Court had ruled that given the prevalence of air travel, there could exist no reasonable expectation of protection of the curtilage from aerial scrutiny. In a concurring opinion in *Riley*, Justice O'Connor wrote that the plurality's opinion relied too heavily upon the police officer's compliance with FAA altitude regulations for

45. *Dow Chem.*, 476 U.S. at 237 (quoting *Donovan v. Dewey*, 452 U.S. 594, 598-99 (1981)).

46. *Id.* at 238.

47. *Id.*

48. *Florida v. Riley*, 488 U.S. 445, 448-49 (1989) (plurality opinion).

49. *Id.* at 451.

helicopters.⁵⁰ She stated, "Public roads, even those less traveled by, are clearly demarked public thoroughfares. Individuals who seek privacy can take precautions tailored to the location of the road, to avoid disclosing private actions to those who pass by." She reasoned that a person could observe the usual air traffic around their home and tailor precautions to meet that risk.⁵¹ It follows, therefore, that any search should conform to the customary altitude and patterns of flight.

IV. THE NEXT LOGICAL STEP: WARRANTLESS SEARCHES USING SATELLITE IMAGERY

The State Department's Bureau of International Narcotics Matters already uses military and civilian satellites to estimate marijuana production overseas.⁵² These satellites can observe remote locations such as Peru's Upper Huallaga Valley without warning drug smugglers of scrutiny by repeated overflights.⁵³ While there is no technical obstacle to the domestic use of military satellites, the Fourth Amendment may bar such use. The general public obviously does not have access to such technology; however, a search warrant would seem to make such use legal. Neither the Foreign Intelligence Surveillance Act, regulating the electronic surveillance of wire and radio communications by American intelligence agencies,⁵⁴ nor the Posse Comitatus Act,⁵⁵ regulating the use of the U.S. armed forces to assist local police officers in carrying out their duties, forbid the military from providing information gleaned from military satellite images to law enforcement agencies.⁵⁶

Military satellite information could affect a defendant in two ways. A military officer could provide an anonymous tip to civilian authorities based on satellite data. Civilian authorities could also request a military satellite search with a warrant and later deny that evidence to the defense on national security grounds.⁵⁷

50. *Id.* at 454 (O'Connor, J., concurring).

51. *Id.*; see also *Dow Chem.* 476 U.S. at 237 n.4 (noting that the Dow plant was near an airport and within the pattern of planes landing and taking off).

52. Broad, *supra* note 18, § 1, at 6.

53. See *id.*

54. 50 U.S.C. §§ 1801-11 (1991); see also *United States v. Spanjol*, 720 F. Supp. 55 (E.D. Pa. 1989) (suspect not entitled to discovery of materials obtained under § 1801 where those materials did not contain any exculpatory information and discovery would compromise intelligence sources and methods); *United States v. Falvey*, 540 F. Supp. 1306 (E.D.N.Y. 1982) (evidence lawfully obtained by the government under § 1801 was admissible in a criminal trial).

55. 18 U.S.C. § 1385 (1991).

56. See *Bissonette v. Haig*, 776 F.2d 1384 (8th Cir. 1985), *aff'd*, 485 U.S. 264 (1988) (allowing aerial photographs and visual search by military personnel).

57. See *United States v. Spanjol*, 720 F. Supp. 55 (E.D. Pa. 1989). Some have alleged that the Central Intelligence Agency routinely provided satellite images to the EPA for use in assessing damage from oil spills, hurricanes and tornados, conducting forest inventories,

The availability of civilian satellite information to the general public seems questionable, but it exists as a potential means for conducting warrantless searches. Courts will thus need to consider in addition whether space constitutes a public vantage point and whether images obtained by civilian satellites are generally available to the public. The use of infrared sensors or synthetic aperture radar images in warrantless searches will also present problems to the courts.

A. The Question of Space as a Public Vantage Point

The *Riley* decision affirmed the constitutionality of warrantless aerial searches where any member of the general public could have occupied the same location as the police officer and could have likewise seen the contraband. The Outer Space Treaty, an early United Nations effort to govern the use of outer space, states that space "shall be the province of all mankind."⁵⁸ Nonetheless, the public obviously may not access outer space⁵⁹ as readily as a public street or open field. Many Americans can afford to purchase airline tickets or charter an aircraft. Physical access to outer space, however, exists only for a select number of scientists and astronauts. Members of the public can request a license to launch their own spacecraft,⁶⁰ but only large corporations or government-supported ventures can presently afford such an investment.

It seems likely that a court will rule that outer space itself does not constitute a public vantage point. However, the light making up any image taken from orbit must have travelled through the public airways. Thus, a court could rule that a search of a subject visible from a non-public vantage point looking through a public vantage point may proceed without a warrant.

In *United States v. Lacey*,⁶¹ twenty-four to thirty members of the Vermont State Police maintained a twenty-four hour surveillance, for a period of three weeks, on a house, barn, and garage from concealed locations on the opposite side of a public highway. The majority held that because the yard was visible from a public highway, the defendants could have no legitimate expectation of privacy while in that open area, no matter where the police officers kept their vigil. By logical extension,

forecasting snow runoff, and early detection of crop disease. RICHELSON, *supra* note 2, at 252.

58. Outer Space Treaty, Jan. 27, 1967, art. I, 18 U.S.T. 2410, 610 U.N.T.S. 205.

59. Because no commonly agreed upon definitions of air space and outer space exist, for the sake of this paper, outer space begins at an altitude of 100 kilometers. For a discussion of the problems in defining this boundary, see S. Neil Hosenball & Jefferson Hofgard, *Delimitation of Air Space and Outer Space: Is a Boundary Needed Now?*, 57 U. COLO. L. REV. 885 (1986).

60. Commercial Space Launch Act, 49 U.S.C. §§ 2601-2623 (1990); see also Land Remote Sensing Act of 1984, 15 U.S.C. §§ 4201-4292 (1990).

61. 669 F.2d 46 (2nd Cir.), cert. denied, 459 U.S. 854 (1982).

viewing from orbit a subject observable from the air should have no effect on the constitutionality of the search.

Judge Newman, writing in concurrence, pointed out the logical consequence of this position. In those cases which uphold police observations based upon a "public exposure" theory, police saw the subject "from precisely the location from which the defendant knew or should have known that he was observable."⁶² Judge Newman further observed:

A person in a back yard reading Karl Marx or sunbathing in the nude is entitled to rely on his or her own sense of whether anyone is at the one point on an adjacent road from which observation is possible. They take the risk of not hearing a car or not otherwise realizing that someone is there.⁶³

This theory sees satellite photography as constitutionally "unfair" because the subject has no chance to notice the satellite's passage with his or her unaided senses and take appropriate cover from its gaze.

Similarly, in the Oregon case of *State v. Ainsworth*,⁶⁴ Judge Deits stated in her dissenting opinion:

Individuals commonly observe aircraft overhead, they are aware that their property and person can be observed from the sky, and they can easily detect the presence of airplanes or helicopters when they are close by. . . . In other words, an individual's knowledge that he is being observed minimizes the seriousness of the intrusion on his privacy because he can take steps to prevent the observation and because the fear of on-going but undetectable scrutiny is not present.⁶⁵

Undetectability, fear of abusive surveillance, and the fundamental unfairness of being watched without an opportunity to notice the watcher distinguish satellite-based surveillance from aerial surveillance. These considerations may prove critical in a Fourth Amendment challenge to the use of warrantless satellite searches.

B. The Question of Reasonable Anticipation

In *Riley*, Justice O'Connor proposed another test for determining the constitutionality of warrantless satellite observation. Justice O'Connor would have the state demonstrate that the aerial search was conducted from an altitude at which the public sometimes travels. More broadly, the state would have to demonstrate that the public does occasionally travel over the subject premises in order to uphold a warrantless aerial search.⁶⁶

62. *Id.* at 57 (Newman, J., concurring).

63. *Id.*

64. 770 P.2d 58 (Or. Ct. App. 1989), *rev'd*, 801 P.2d 749 (Or. 1990).

65. *Id.* at 65-66 (Deits, J., dissenting).

66. *Florida v. Riley*, 488 U.S. 445, 454-55 (1989) (O'Connor, J., concurring).

The application of this test to satellite imaging could take one of two forms: the court could inquire into either the frequency of satellite observation of the subject area, or the frequency of conventional overflights at an altitude from which a comparable observation could have been made. Since a satellite in a polar orbit will eventually pass over the entire Earth, however, an inquiry into the frequency of overflight itself would have no value.

Statistical evidence demonstrating that observations from space are so commonplace that potential subjects of satellite surveillance could reasonably anticipate their occurrence may help support the constitutionality of such a search. Additional support may include estimates, such as those by the Commerce Department, that the annual sales of raw satellite data in 1988 totaled \$25 million per year.⁶⁷ Finally, the searching entity could present statistics regarding scientific and commercial surveillance of the specific region, such as images used in the media, academic studies of geologic structures or forestry areas, or commercial studies of those same structures. Such evidence may well persuade courts that a subject in a frequently surveyed area had a diminished expectation of privacy, whereas a subject in an area that rarely gets imaged might receive greater protection.⁶⁸

A comparison between what an air traveler flying over a subject's property can see and what a satellite can photograph may also assist the court in determining whether a subject had a reasonable expectation of privacy which society is prepared to defend. If Justice O'Connor's test is adopted, then the defense of satellite observation will present no more difficulty than that of aerial observation. A court, however, may wish to consider that if location near an airport or flight path strips away Fourth Amendment protection, many population centers, including most large cities, become open to aerial search.

C. The Question of Technology Within Public Use

In *Dow*, the Court accepted the use of a sophisticated mapping camera with the capacity to discern small pipes within an industrial

67. *Growth, Stability Predicted for Commercial Space Ventures*, AVIATION WK. & SPACE TECH., Mar. 14, 1988, at 108. The Commerce Department further expects that sales of satellite data, interpretation, and enhancement services, could amount to six billion dollars annually by 1998. *Id.*

68. *Cf. United States v. Allen*, 675 F.2d 1373 (9th Cir. 1980) (a person living near military training areas has a lesser expectation of privacy from aerial surveillance), *cert. denied*, 454 U.S. 833 (1981). This, of course, raises the question of whether the subject knew or should have known that he or she lived near a target subjected to frequent academic, administrative, or commercial scrutiny by satellites. In *Allen*, the presence of the military facility was obvious and the defendant certainly had reason to expect the use of sophisticated technology at or near that facility. *Id.*

plant.⁶⁹ The courts have also upheld the use of technology which "materially enhances" or "assists" the natural senses, such as telescopes, binoculars, nightscopes, and cameras.⁷⁰

No standard or threshold, however, has been set to interpret such phrases as "widely available commercially,"⁷¹ "not more sophisticated than [technology] generally available to the public,"⁷² or "conventional, albeit precise, commercial camera commonly used."⁷³ To show general availability, the searcher should need to introduce evidence not only of gross sales, but also of the various uses of satellite imagery, such as media, agriculture, forestry, geology, civil engineering, land-use planning, cartography, coastal-zone management, and environmental monitoring.⁷⁴

A focus upon the wide availability of satellite technology to business and academia may, however, miss the point made by the *Riley* and *Dow* courts. In *Dow*, the technology used by the government consisted of a chartered aircraft with a mapping camera. In *Riley*, the technology consisted of a chartered helicopter. Comparing the price of an airline ticket (approximately \$87 for a short flight),⁷⁵ chartering a private plane or helicopter (\$70 per hour),⁷⁶ or purchasing an aerial photograph (\$450),⁷⁷ to the price of purchasing a satellite image (\$700–\$2,500)⁷⁸ shows a wide gap in affordability. Even if the public knows about the availability of satellite imagery, the price alone arguably places such technology well beyond the reach of the general public.

In addition, the requirements for computer processing and interpretation further increase the price of satellite images. Despite recent advances which simplify computer processing,⁷⁹ image interpretation

69. *Dow Chem. Co. v. United States ex rel. Adm'r, EPA*, 476 U.S. at 238. (EPA's photographs contained vivid detail and resolution. Some of the pictures included equipment, pipes, and power lines as small as 1/2 inch in diameter.)

70. See, e.g., *Allen*, 675 F.2d 1373; *United States v. Moore*, 562 F.2d 106 (1st Cir. 1977), cert. denied, 435 U.S. 926 (1978); *United States v. Solis*, 536 F.2d 880 (9th Cir. 1976); *Dean v. Superior Court*, 110 Cal. Rptr. 585 (Ct. App. 1973).

71. *Allen*, 675 F.2d at 1380.

72. *Id.*

73. *Dow Chem.*, 476 U.S. at 238.

74. REMOTE SENSING, *supra* note 3, at 47–52.

75. American Airlines shuttle from Boston to New York City, one way on a weekday (May 29, 1991).

76. Telephone Interview with Charis Air Corporation of Westfield, Massachusetts (May 29, 1991).

77. Telephone Interview with Robert Foss, James W. Sewall, Inc. of Old Town, Maine (May 30, 1991).

78. Telephone Interview with Kevin Corbley, Press Secretary, Eosat (May 29, 1991); Telephone Interview with Clark Nelson, Director of Corporate Communications, Spot Image Corp. (May 29, 1991).

79. *Satellite Data Adapted for Everyday Users*, N.Y. TIMES, Mar. 12, 1991, at C5. A new technique under development at the Los Alamos National Laboratory would allow

requires experienced personnel and sophisticated software. The general public can hire vendors to process and interpret an image, but this additional cost further decreases the availability of this technology to the general public.

D. Unnatural Senses: Infrared Imaging and Synthetic Aperture Radar

Another difficult question concerns the use of infrared sensors and radar, which have no correspondence to the natural senses. In response to the expanded use of aerial search to detect outdoor narcotics cultivation, many growers have moved their plantations into barns and garages. The Drug Enforcement Agency reported that between 1986 and 1990, the total number of greenhouses seized rose from 1,077 to 1,669.⁸⁰ As a result, the DEA has intensified its research into portable thermal video systems.⁸¹

The courts have examined the use of infrared technology in *United States v. Penny-Feeney*⁸² and in *United States v. Kerr*.⁸³ In *Kerr*, police used an infrared device to examine a shed on the defendant's property. The device revealed that the building was suspiciously well insulated. This and other information suggested to investigators the possible use of the building for indoor marijuana cultivation.⁸⁴ The court held that the warrantless infrared search might have tainted the evidence; however, the search revealed nothing that had not been obtained by independent observation. Therefore, the court declined to express an opinion as to the legality of an infrared inspection.⁸⁵

In *Penny-Feeney*, the police had received several anonymous tips that the defendant sold marijuana. An informant described in detail the defendant's cultivation operation including the physical layout of her

"[d]rug agents [to] look for fields of poppies and coca without needing expensive computers." *Id.*

80. CANNABIS INVESTIGATION SECTION, U.S. DEP'T OF JUSTICE, 1990 DOMESTIC CANNABIS ERADICATION/SUPPRESSION PROGRAM FINAL REPORT 6 [hereinafter 1990 REPORT]; CANNABIS INVESTIGATION SECTION, U.S. DE P'T OF JUSTICE, 1988 DOMESTIC CANNABIS ERADICATION/SUPPRESSION PROGRAM FINAL REPORT 5.

81. The U.S. Department of Justice has stated:

The value of portable thermal video systems to support indoor cannabis growing investigations was successfully demonstrated in over 15 cases during the year. . . . Indoor growing operations use very powerful (1000 watt) grow lights to simulate the sun. A troublesome by-product of these light sources is large amounts of heat. Consequently, the detection of heat in the public right-of-way by thermally viewing the walls, boarded-up windows, or doors is valuable information which can add to other sources of information to establish probable cause that there is illegal cannabis cultivation at a specific location.

1989 REPORT, *supra* note 17, at 23.

In 1990, the same technology was used in numerous locations nationwide to support the issuance of search warrants. 1990 REPORT, *supra* note 80, at 29.

82. 773 F. Supp. 220 (D. Haw. 1991).

83. 876 F.2d 1440 (9th Cir. 1989).

84. *Id.* at 1442.

85. *Id.* at 1443-44.

garden in the garage. The police corroborated the informant's information by flying over the residence in an aircraft equipped with an infrared device (FLIR). Using this device, an officer detected a disproportionate amount of vented heat from the residence. This evidence supported an application for a search warrant which resulted in the seizure of 247 marijuana plants.⁸⁶

In its review of a motion to suppress the evidence, the court first noted that the infrared device functioned in a passive, non-intrusive manner to detect differences between the subject's surface temperature and the surface temperatures of background objects. The court then recognized that indoor marijuana cultivation produces heat as a by-product and that the defendant had made no attempt to impede the heat's escape or assert dominion over it. Therefore, the court reasoned, the device had detected "heat waste" or "abandoned heat" in which the defendant had no legitimate expectation of privacy.⁸⁷ By analogy to the United States Supreme Court's holding in *California v. Greenwood*⁸⁸ that an expectation of privacy for abandoned garbage is not objectively reasonable, the court held that the search was valid because an expectation of privacy of abandoned heat is not objectively reasonable.⁸⁹

The court also looked to other cases in which the Court upheld the use of extra-sensory technology to investigate or follow a defendant.⁹⁰ The court reasoned that the defendant had no more reasonable expectation of privacy in the heat emanating from her garage which was observed by the FLIR than a subject would have in smells emanating from a trailer⁹¹ or suitcase⁹² which were observed by a trained dog.⁹³

The court's reliance on analogizing "waste heat" to garbage and odors seems misplaced. A person who puts their garbage on a curb expects that passersby or garbage collectors may look through the garbage, discovering its contents. A person does not expect any person will be able to look at their home and see waste heat being given off. In cases where devices which enhance human perception have been held valid, such as dog sniff tests, the level of intrusion has been significantly lower than in the case of FLIR devices. The operator of a FLIR device is not simply given a signal that the heat pattern from the source indicates illegal activity. The operator is given information about all heat

86. *Penny-Feeney*, 773 F. Supp. at 222-31.

87. *Id.* at 225-26.

88. 486 U.S. 35 (1987) (warrantless search of garbage bags valid).

89. *Penny-Feeney*, 773 F. Supp. at 237-38.

90. *United States v. Place*, 462 U.S. 696 (1983) (canine sniff test); *United States v. Knotts*, 460 U.S. 276 (1983) (beeper placed in container taken in car); *Smith v. Maryland*, 442 U.S. 735 (1979) (pen register with phone company).

91. *State v. Solis*, 536 F.2d 880 (9th Cir. 1976).

92. *Place*, 462 U.S. 696.

93. *Penny-Feeney*, 773 F. Supp. at 238-39.

emanating from a source, allowing the operator to discover many different types of activity within the walls of that source, not just those which are illegal.

If upheld on appeal, the *Penny-Feeney* decision may permit the warrantless use of satellite technology to sense infrared light emanating from structural walls in the curtilage despite the firm line courts have traditionally drawn at the walls of the home.⁹⁴ An infrared sensor, like a telescope, merely captures light emitted from a structure. Unlike "visible light," however, radiation in the infrared spectrum is detectable through walls. Development in this area of law continues, and this area may be the first to consider the effect of infrared satellite imagery on warrantless searches.

A more difficult question is raised by radar which does not passively interpret information radiated as "waste" from the home, but instead sends a high energy pulse at the subject and examines the reflection. In detecting motor vehicle offenses, for example, the use of radar has long been upheld by the courts. High-resolution radar images, however, have only recently become commercially available. It is unlikely that the public has already ceded its reasonable expectation of privacy in this respect. If infrared detectors become a recognized tool of law enforcement, however, high-resolution radar may follow shortly.

V. CONCLUSION

As society comes to expect ever decreasing privacy in backyards, patios, and decks, it will become impossible for landowners to protect their privacy from satellite surveillance. The courts recognize that one "cannot block off all conceivable aerial views of their outdoor patios and yards without entirely giving up their enjoyment of those areas."⁹⁵ Nor should Americans need to "construct an opaque bubble over [their] land in order to have a reasonable expectation of privacy regarding the activities there in all circumstances."⁹⁶

Budget-conscious law enforcement agencies will note that since satellites have already proved their usefulness in monitoring overseas drug production, training them upon subjects in the United States may result in cost savings by replacing costly aerial sweeps. Determining how

94. *United States v. Kim*, 415 F. Supp. 1252 (D. Haw., 1976) (telescopic observation through apartment windows unconstitutional, telescopic observation of open balcony constitutional); *People v. Arno*, 153 Cal. Rptr. 624 (Ct. App. 1979) (binocular observation of office unconstitutional); see also *Justices Hear Arguments in Aerial Surveillance Cases*, 54 U.S.L.W. 1104 (1986) (California Deputy Attorney General questioned on effect of infrared sensing on *Ciraolo* case).

95. *Florida v. Riley*, 488 U.S. 445, 454 (1989) (O'Connor, J., concurring).

96. *United States v. Allen*, 675 F.2d 1373, 1380 (9th Cir. 1980), cert. denied, 454 U.S. 833 (1981).

far the courts will permit this effort to expand the role of satellite searches requires a careful examination of the aerial search doctrine with due regard for all its implications. This Comment has provided a framework for that examination and a caution against bringing Orwell's vision closer to reality.

COMMENT

HIGH TECHNOLOGY CONSORTIA: A PANACEA FOR AMERICA'S TECHNOLOGICAL COMPETITIVENESS PROBLEMS?

MICHELLE K. LEE[†]

MAVIS K. LEE^{††}

Table of Contents

I. INTRODUCTION	335
II. BACKGROUND ON CONSORTIA IN THE UNITED STATES	338
III. THE EFFECTS OF ANTITRUST LAW ON CONSORTIA	341
A. Criticisms Of the National Cooperative Research Act	341
B. Responses to the Criticisms Of Current Antitrust Law	343
IV. CASE STUDIES: SEMATECH, GENERAL MOTORS AND TOYOTA, AND OTHER COOPERATIVE VENTURES	345
A. The Sematech Experience	345
B. The General Motors and Toyota Experience	348
C. Other Domestic Consortia Experiences	352
D. The Japanese and European Experiences	355
V. ALTERNATIVE APPROACHES TO CONSORTIA FOR DEVELOPING TECHNOLOGIES	358
VI. CONCLUSION	361

I. INTRODUCTION

In the face of increasing competition from abroad and declining innovation at home, the United States is searching for ways to maintain, and in some cases regain, its economic and technological competitiveness.

© 1992 Michelle K. Lee and Mavis K. Lee

[†] J.D. 1992, Stanford Law School; M.S. 1989, Massachusetts Institute of Technology; B.S. 1989, Massachusetts Institute of Technology.

^{††} J.D. 1992, Stanford Law School; M.S. 1989, Massachusetts Institute of Technology; B.S. 1989, Massachusetts Institute of Technology.

The authors would like to thank Professors John H. Barton and William F. Baxter of Stanford Law School as well as Rex O'Neal and Alex Silverman for their assistance in reviewing early drafts of this comment.

U.S. corporations are trying everything from massive investment in university and industry research ventures to the establishment of programs in which American scientists go abroad to learn the techniques and technologies that make certain foreign products successful. Many believe that consortia are a panacea for America's competitiveness problems.¹

The term "consortium" has come to connote a cooperative effort among companies, universities, industries, and/or government, typically aimed at helping the participants maintain their leadership position or gain an edge over their international competitors in a particular industry. Consortia are becoming increasingly common in the United States,² with the current interest stemming largely from fundamental technological and economic changes occurring within the United States and abroad. For example, modern technology has grown rapidly and has become increasingly complex in recent years.³ Many of today's products embody technologies from multiple scientific and engineering disciplines.⁴ As a result, single companies are discovering the advantages of joining forces with other companies to acquire the expertise or to develop the quality products they need to stay competitive in increasingly multi-disciplinary industries.⁵

Also, individual national markets are being integrated into a single worldwide market.⁶ Significant advances in communication and transportation systems now make it impossible to ignore foreign competitors. Approximately seventy percent of the manufacturing done

1. Evelyn Richards, *Consortia: The New Business Cure-All?*, WASH. POST, May 26, 1989, at D10. *But see* Lawrence Fisher, *Need for High Tech Consortiums Stressed*, N.Y. TIMES, Jan. 12, 1989, at D1.

2. *See* JORDAN D. LEWIS, PARTNERSHIP FOR PROFIT: STRUCTURING STRATEGIC ALLIANCES 9 (1990) (between 1979 and 1985 the number of alliances among American, European Community, and Japanese firms grew thirtyfold); *see also* Tandy, *Matsushita Plan Joint Venture*, SAN JOSE MERCURY NEWS, Sept. 26, 1991, at 2C (Tandy and Matsushita plan joint venture to manufacture laptop computers); Udayan Gupta, *How Big Companies are Joining Forces With Little Ones for Mutual Advantages*, WALL ST. J., Feb. 25, 1991, at B1 (strategic alliances on the rise in the computer, biotechnology and pharmaceutical industries); G. Pascal Zachary, *Sun Microsystems and Hewlett-Packard Plan to Jointly Develop Some Software*, WALL ST. J., Feb. 26, 1991, at B7 (Sun Microsystems and Hewlett-Packard plan to jointly develop object-oriented computer software); Rory J. O'Connor, *Here's the Impact of Apple-IBM Deal*, SAN JOSE MERCURY NEWS, Oct. 3, 1991, at 1E (Apple and IBM announce joint venture to create operating system; IBM and Motorola announce joint venture to develop RISC microprocessor chips).

3. LEWIS, *supra* note 2, at 9.

4. Modern automobiles are perhaps the paradigm example—they often utilize the latest inventions from such wide-ranging disciplines as computer-controlled engines, electronic circuitry, aerodynamics, structural support, and acoustics.

5. "IBM is consciously trying to exploit new ideas and new technologies forever, wherever. The world of science and technology is a great deal larger than we can cover by ourselves. The whole race is being run faster now than it ever was." LEWIS, *supra* note 2, at 15 (quoting John Armstrong, IBM's vice president for science and technology).

6. LEWIS, *supra* note 2, at 11-12.

in the U.S. is subject to foreign competition.⁷ It is no longer possible for an American manufacturer to maintain its world market share without improving upon, or at least meeting, any new quality standards that are set by foreign competition. By widening the industrial playing field, the level of competition has escalated.

In light of these technological and economic changes, some observers have charged that American industry is not keeping pace with world competition.⁸ In recent history, the U.S. consumer electronics industry, for example, has faced a series of economic retreats as foreign competition has successfully conquered major portions of the market.⁹ Similarly, the American automobile industry has slipped significantly. Once, U.S. production of cars dwarfed that of the rest of the world; the United States now stands third in production behind Europe and Japan.¹⁰

This comment analyzes the current debate surrounding high technology consortia. It is based upon the Symposium on High Technology Consortia (the "Symposium") held at Stanford University on May 4-5, 1990. The Symposium consisted of panels of leading scholars, practicing attorneys, and businessmen¹¹ who presented their views on consortia. The discussion ranged from the economic and legal implications of cooperative arrangements to the practical realities of joining forces with competitors.¹²

7. LEWIS, *supra* note 2, at 12-13.

8. MICHAEL L. DERTOUZOS, RICHARD K. LESTER, ROBERT M. SOLOW & THE MIT COMMISSION ON INDUSTRIAL PRODUCTIVITY, *MADE IN AMERICA: REGAINING THE PRODUCTIVE EDGE 1* (1989).

9. *Id.* at 12-14.

10. *Id.* at 18-20.

11. Professor John H. Barton of Stanford Law School hosted and moderated the Symposium. Speakers included Claude Barfield of the American Enterprise Institute; William F. Baxter of Stanford Law School; Dennis Cuneo, President for Corporate Planning and Legal Affairs, New United Motors Manufacturers, Inc.; Mark Eaton of Microelectronics and Computer Technology Consortium; Robert Falstad, General Counsel of Sematech; Alphonso Gambardella of Stanford University; Skip Greenfield of Ware and Freidenrich; Erland Heginbotham of the Institute for Defense Analysis; Michael Morris, General Counsel of Sun Microsystems; William A. Maxwell, Vice President of the Computer and Business Electronics Manufacturers' Association; David Mowery of the University of California, Berkeley; Ted Ralston, of the Microelectronics and Computer Technology Consortium; David Teece of the University of California, Berkeley; Ted Vian from Intel Corporation; and Richard Van Atta of the Institute for Defense Analysis.

12. Six panels comprised the Symposium. Panel I examined the economics of cooperation in high technology areas. Panel II focused on the basic legal issues of consortia, including antitrust issues and tax problems. Panel III analyzed the perspectives of firms participating in consortia, including Intel Corporation and Sun Microsystems, Inc. Panel IV examined the experiences of particular consortia and included discussions about the Sematech consortium and the General Motors-Toyota joint venture. Japanese and European consortia were studied in Panel V, and Panel VI concluded with an analysis of alternatives to consortia for developing new technologies. A copy of the Symposium transcript is on files with the authors.

To provide a context in which the current debate surrounding consortia may be understood, Section II examines the evolution of cooperative efforts in the U.S. It begins with a look at the consortia environment prevailing in the 19th century and follows the consortia movement through to the present. Section III analyzes the impact of existing antitrust law on high technology cooperative ventures. In particular, the National Cooperative Research Act of 1984¹³ and the incentives it provides for consortia activity are examined. Given the existence of antitrust obstacles, Section IV considers the experiences of past and current consortia participants to see how they have dealt with antitrust issues and other problems facing consortia participants. In particular, Section IV analyzes the Sematech, General Motors-Toyota, U.S. Memories, Microelectronics and Computer Technology (MCC), and Advanced Computing Environment (ACE) joint ventures in the U.S. as well as the Japanese and European consortia experiences abroad. Section V discusses alternative approaches to acquiring and developing technology, including informal alliances, acquisitions, licensing arrangements, and technology transfers from university research projects. Finally, Section VI concludes that although consortia can help promote technological growth, exclusive reliance on consortia as the solution to U.S. technological competitiveness problems will fall short of achieving its goals.

II. BACKGROUND ON CONSORTIA IN THE UNITED STATES

In the second half of the 19th century and most of the 20th century, general sentiments of distrust toward collaborative alliances among competitors existed in the U.S. The passage of the Sherman Antitrust Act¹⁴ in 1890 and the Clayton Antitrust Act¹⁵ in 1914 reflect this sentiment. Through these Acts, antitrust laws have protected the rights of individual entrepreneurs and restricted the cooperative activities of large corporations.¹⁶

The mid-1970's, however, marked the beginning of a significant change in the attitude toward cooperation in the United States. During this period, the U.S. began to realize that it could not take for granted its previously unquestioned technological and economic leadership position in the global market. Powerful competitors in the Far East and in Europe arose to seriously threaten America's previous dominance.¹⁷ America

13. 15 U.S.C. § 4302 (1988).

14. 15 U.S.C. §§ 1-7 (1988).

15. 15 U.S.C. §§ 12-27 (1988).

16. See Eleanor M. Fox & Lawrence A. Sullivan, *Antitrust-Retrospective and Prospective: Where are We Coming From? Where Are We going?* N.Y.U. L. REV. 936, 954 (1987).

17. DERTOUZOS, *supra* note 8, at 25.

suddenly awoke to the realization that in certain industries, such as the automobile industry,¹⁸ the semiconductor industry,¹⁹ and the consumer electronics industry,²⁰ it had fallen behind. With the threat of increased competition from abroad, there emerged a belief that cooperation among domestic competitors was necessary to help the U.S. regain its international competitiveness, and that relaxing the enforcement of antitrust laws was essential to encourage such cooperation.

The landmark case of *Continental T.V., Inc. v. GTE Sylvania, Inc.*²¹ represented the beginning of the end of strict antitrust enforcement and the start of the movement to help the United States regain its competitiveness through joint ventures.²² During the Reagan Administration the Antitrust Division at the U.S. Department of Justice, under the direction of Assistant Attorney General William F. Baxter, saw relatively few actions against potential antitrust violators²³ and witnessed many more mergers and acquisitions than before.²⁴

The pendulum had fully swung from strict enforcement of antitrust laws and intolerance of cooperative activity from the 1940's through 1970's to minimal enforcement of the antitrust laws and permissiveness with respect to cooperation in the 1980's. Many feel that the time has

18. In 1955, imported cars constituted less than one percent of car sales in the United States. In 1987, this number increased to more than thirty-one percent. The U.S. now has an automobile import deficit of more than \$60 billion. While America was once the top automobile producer in the world, it is now in third place. Among the many explanations for America's loss of dominance in this industry is the inability of U.S. manufacturers to innovate and keep up with modern technology. "The last major innovation that was first installed in an American car was the automatic transmission in the 1940s. Four-wheel steering and four-wheel drive, turbocharging, and antilock braking systems were all first adopted on imported models." *Id.* at 18-19.

19. In less than 10 years, U.S. production of semiconductors has fallen from 60 to 40 percent of the world supply. In the case of dynamic random-access memory (DRAM) chips, foreign manufacturers now possess 75 percent of the world market. *Id.* at 9-11.

20. Radios, televisions, and video recorders are examples of technologies that American companies once dominated which have now been lost to foreign competitors. In 1955, 96 percent of all radios sold in the United States were made in this country, but by 1975 the percentage had dropped to near zero. In the television industry, the sole American company in 1987 was Zenith, with fifteen percent of the market share. *Id.* at 7, 12-13.

21. 433 U.S. 36 (1977).

22. Fox & Sullivan, *supra* note 16, at 944-45.

23. "From 1981 to 1985, the Department [of Justice] brought only two civil and one criminal monopoly cases, compared with eleven civil and three criminal monopoly cases brought from 1976 to 1980. In 1985, the Department brought only two civil restraint-of-trade cases, compared with eighteen in 1976, nineteen in 1977, twenty in 1978, fourteen in 1979, and fifteen in 1980." *Id.* at 947-48 (footnotes omitted).

24. "In 1983, 2523 mergers were consummated, the largest number since 1974. . . . In 1984, there were 2543 mergers, worth \$122.2 billion. . . . In 1985, there were 3001 mergers, which set a twelve-year record and represented an eighteen percent increase over 1984. . . . The number of acquisitions consummated in 1986 increased by twelve percent over 1985, to 3356. . . . Nonetheless, between 1981 and 1985 the Department of Justice challenged only twenty-eight mergers." *Id.* at 948 (citation omitted).

come for the pendulum to swing back towards stricter enforcement.²⁵ The current debate concerning the degree to which antitrust laws should be enforced has taken on added importance to those who believe that cooperation is essential to help the United States catch up and win the high technology race, where the future of the American economy may be at stake.²⁶

Presently, proponents of consortia emphasize that in today's world of increased competition from abroad and rapidly changing technologies, cooperation is necessary to remain competitive.²⁷ They point to the advantages of minimizing the costs of developing new technologies,²⁸ spreading the risks of research and development,²⁹ reducing unnecessary duplication of research effort,³⁰ obtaining immediate access to new technologies, new markets and cheap production sources,³¹ and making otherwise formidable research projects possible.³²

Consortia opponents, on the other hand, contend that overemphasis on consortia as a means of solving U.S. competitiveness problems distracts from the real issues behind America's slipping competitiveness and wastes billions of dollars to no avail.³³ They advocate alternative means of acquiring technology through informal alliances, acquisitions, licensing relations, and university research programs.³⁴ Opponents believe that the potential antitrust violations,³⁵ funding problems,³⁶ and lack of commitment from management and scientists³⁷ that often

25. In 1987, a group of scholars, practicing lawyers, state enforcers, and policy makers led by Ralph Nader and Frederick Furth formed the Antitrust Policy Institute to examine the future role of antitrust laws in the United States. They shared the belief that the federal government had gone too far in its failure to enforce the antitrust laws in the 1980's. Eleanor M. Fox & Robert Pitofsky, *The Antitrust Alternative*, 62 N.Y.U. L. REV. 931, 931 (1987); see also Walter F. Mueller, *The Antitrust Movement in INDUSTRIAL ORGANIZATION, ANTITRUST, AND PUBLIC POLICY* 19, 27-38 (J. Craven ed., 1983) (strongly criticizing the school of thought supporting abolition of the antitrust laws).

26. See Stephen P. Aubin, *The U.S. Memories Fiasco*, AIR FORCE MAG., Apr. 1990, at 88 (For the semiconductor industry alone, "today's \$50 billion international chip industry leverages a \$750 billion global electronics market. Some 2.6 million U.S. jobs depend on that market and thus on secure chip supplies."); see generally DERTOUZOS, *supra* note 8 (on the importance of high technology industries to the United States economy).

27. Janet J. Barron, *Consortia: High-Tech Co-Ops*, BYTE, June 1990, at 269.

28. William A. Maxwell, *Consortia: An Industry Perspective 1* (May 4-5, 1990) (unpublished paper, on file with the authors).

29. *Id.*

30. *Id.*

31. Jonathan B. Levine & John A. Byrne, *Corporate Odd Couples*, BUS. WK., July 21, 1986, at 100.

32. *Id.*

33. *Id.*

34. See *infra* text accompanying notes 141-146.

35. See *infra* text accompanying notes 38-59.

36. See *infra* text accompanying notes 147-153.

37. Levine & Byrne, *supra* note 31, at 100.

accompany consortia make these joint ventures inappropriate vehicles for bolstering U.S. competitiveness.

III. THE EFFECTS OF ANTITRUST LAW ON CONSORTIA

One of the primary considerations facing potential consortia participants is the impact of U.S. antitrust law on the venture. In recent years, as the sentiment towards corporate cooperation has shifted from suspicion to encouragement, antitrust law has drawn heavy criticism. Many believe that antitrust law needlessly inhibits the formation of strategic alliances.³⁸ Recognizing that uncertainties in the old antitrust law and that the potential for treble damage litigation may have discouraged U.S. firms from participating in cooperative research arrangements, Congress enacted the National Cooperative Research Act of 1984 (NCRA).³⁹ The NCRA stipulates that "joint research and development ventures" must not be held illegal per se.⁴⁰ In addition, the NCRA eliminates the availability of treble damages, provided that the parties to the arrangement first register their venture. While the NCRA heads in the direction of creating an environment conducive to cooperation among competitors, critics of antitrust law still find problems with the Act.

A. Criticisms Of the National Cooperative Research Act

The most serious shortcoming of the NCRA is that it only protects pure research activity and commercial activity "reasonably required" for research.⁴¹ As a result, the NCRA fails to provide protection against antitrust enforcement of valuable joint manufacturing and commercialization efforts.⁴² Unfortunately, U.S. competitiveness

38. Thomas M. Jorde & David J. Teece, *Innovation, Cooperation, and Antitrust: Striking the Right Balance*, 4 High Tech. L.J. 1, 3 (1989).

39. S. REP. NO. 98-427, 98th Cong., 2d Sess. 4 (1984), reprinted in 1984 U.S.C.C.A.N. 3105, 3107.

40. 15 U.S.C. § 4302 (1988).

41. Jorde & Teece, *supra* note 38, at 52.

42. In 1989, Congressmen Boucher and Campbell introduced a bill before the House which would extend protection from antitrust violation to commercialization and manufacturing joint ventures. The bill proposes the enactment of the "National Cooperative Innovation and Commercialization Act of 1989" (hereinafter NCICA). H. R. 1024, 101st Cong., 1st Sess. (1989). Like the NCRA, the NCICA stipulates that no cooperative arrangement covered by the NCICA shall be deemed illegal per se under the antitrust laws. In addition, the NCICA requires that the parties entering into a cooperative agreement file a written application simultaneously with the Attorney General of the U.S., the Secretary of Commerce, and the Federal Trade Commission. The application must disclose (1) the identities of the parties, (2) the nature and objectives of the arrangement, (3) the current market shares in all relevant markets of all parties, (4) the estimated or predicted market share, (5) the basis for estimation or prediction, (6) the estimated concentration of all relevant markets, and (7) the anticipated duration of the arrangement. *Id.* § 4(a)(A)-(F).

problems stem more from weaknesses in manufacturing and commercialization than from problems in research.⁴³ For example, in the electronics industry, the major scientific advances, including the semiconductor chip and the video recorder, were American inventions.⁴⁴ Yet the U.S. failed to capture these product markets as a result of its lack of attention to manufacturing and commercialization.⁴⁵ In light of these circumstances, the NCRA's protection of research consortia alone seems particularly misplaced.

Another troublesome aspect of the NCRA is the lack of guidance it offers to potential consortia participants. The Committee on Science and Technology in Congress has stated that "very little official guidance exists as to what constitutes a lawfully structured joint [research and development] venture or what conduct will ultimately be considered lawful by the courts."⁴⁶ The rule of reason standard as outlined in NCRA states that

the conduct of any person in making or performing a contract to carry out a joint research and development venture shall not be deemed illegal per se, and that such ventures should instead be judged on the basis of [their] *reasonableness*, taking into account *all relevant factors* affecting competition. . . .⁴⁷

Critics of the NCRA argue that this language is vague and leaves substantial uncertainties concerning the requirements that must be met in order to avoid an antitrust violation. Under the rule of reason standard, "[t]he ultimate question remains of such broad scope and generality that little predictive guidance is possible. The ultimate legal result continues

While the bill has not yet been adopted by Congress, the NCICA goes a long way toward filling some of the gaps left by the NCRA. However, some questions still remain as to whether adoption of the NCICA will more readily encourage harmful cartel behavior by creating an environment so conducive to cooperation. The farther the parties move from pure research collaborations and the closer they move toward commercialization and marketing, the greater the risk of price fixing and other anticompetitive behaviors. . . . If the joint venture involves scientists getting together to perform pure research, the risk of cartel-like behavior at the sales and marketing level is slight. However, as the joint venture moves from basic research to advanced development, marketing and commercialization, the risk of antitrust violation increases significantly.

Professor William Baxter, Stanford Law School, Lecture (Oct. 15, 1991). Therefore, by creating an environment favorable to manufacturing and commercialization joint ventures, the NCICA runs the risk of fostering price-fixing and other anticompetitive behavior.

43. DERTOUZOS, *supra* note 8, at 9.

44. *Livermore Lab: What's Ahead?*, SAN FRANCISCO CHRON., Sept. 4, 1991, at A18.

45. The statistics are revealing: U.S. firms devote only one-third of their total research and development expenditures to improving their manufacturing processes, while the other two-thirds is allocated to the research and development of new ideas. DERTOUZOS, *supra* note 8, at 72.

46. *Japanese Technological Advances and Possible U.S. Responses Using Research Joint Ventures: Hearings Before the Subcomm. on Investigations and Oversight and the Subcomm. on Science, Research and Technology of the H. R. Comm. on Science and Technology*, 98th Cong., 1st Sess. 23-24 (1983) (statement of John Lacey, Executive Vice President for Technology and Planning, Control Data Corporation).

47. 15 U.S.C. § 4302 (1988) (emphasis added).

to turn on judicial characterization of a complex factual transaction, a situation that leads to uncertainty and costly proceedings."⁴⁸ Even the case law applying the NCRA rule of reason analysis appears to be highly fact-specific and somewhat uncertain.⁴⁹ For potential consortia participants, it seems inevitable that this uncertainty will translate into hesitation to enter into joint ventures.⁵⁰

In short, critics of the NCRA advance two major objections to the Act. First, that it protects only cooperative research efforts, excluding manufacturing and commercialization consortia. And second, the rule of reason standard offers only vague guidelines, thereby discouraging, or at least not encouraging, cooperative ventures.

B. Responses to the Criticisms Of Current Antitrust Law

In defense of the current antitrust law, many observers point out that antitrust laws have often been unjustly blamed for the failures of consortia. Parties reluctant to join a cooperative venture or individuals looking for an easy explanation for the declining competitiveness of U.S. technology industries often point to U.S. antitrust laws as a convenient scapegoat. William F. Baxter, Professor at Stanford Law School, offers the following explanation:

It's difficult to put together [research and development] consortia. . . . You have to turn over your carefully guarded secrets to someone else. . . . [I]f you are talking about a collaboration between four or five companies who do not have prior relationships, [and] if they are horizontal competitors, . . . there is a great deal of distrust. . . . [E]ach is saying. . . . "I bet [they] don't really turn over the best of their work. . . . So we won't give them the best of ours either."⁵¹

48. Jorde & Teece, *supra* note 38, at 40 n.100 (citing J. Bordley, *Joint Ventures and Antitrust Policy*, 95 Harv. L. Rev. 1523, 1536 (1982); see also *Assam Drug Co. v. Miller Brewing Co.*, 798 F.2d 311, 315 (8th Cir. 1986) ("The rule of reason . . . is a vacuous standard and as such it provides little concrete direction for evaluating the competitive effects of a challenged restraint.").

49. The decisions in principal cases seem to depend greatly on the particular set of facts involved. Compare *Chicago Bd. of Trade v. United States*, 246 U.S. 231 (1918) (declining to find a grain price fixing practice illegal because it improved market conditions) with *National Collegiate Athletic Ass'n v. Board of Regents of the Univ. of Okla.*, 468 U.S. 85 (1984) (the NCAA's restriction of television broadcasts of member institutions was an unreasonable restraint upon the operation of the free market because it raised prices and reduced output).

50. *Japanese Technological Advances and Possible U.S. Responses Using Research Joint Ventures: Hearings Before the Subcomm. on Investigations and Oversight and the Subcomm. on Science, Research and Technology of the H. R. Comm. on Science and Technology*, *supra* note 46 ("Even though research consortia are typically completely lawful, the uncertainties in the interpretation and application of U.S. antitrust laws are a major obstacle to pooling resources in research and development.").

51. William F. Baxter, Address at the Symposium on High Technology Consortia (May 4-5, 1990) (transcript on file with the authors).

To avoid revealing this distrust, one company is very likely to say to the other, "[our company would] love to participate [with your company in the consortia effort], but our general counsel tells us the antitrust laws raise too high a risk."⁵² Antitrust law can therefore serve as a convenient scapegoat to avoid accusations of mistrust.⁵³

In addition, Professor Baxter argues that antitrust law is not as vague or indefinite as its critics claim. The Department of Justice considers several concrete factors in applying the rule of reason standard to potential antitrust violators.⁵⁴ First, the Antitrust Division evaluates the concentration of the relevant industry. In order to measure market concentration, one must define the relevant market. The NCRA legislative history states the "relevant market" includes all firms that "have the ability and incentive . . . to undertake [research and development] comparable to that of the joint venture in question."⁵⁵ As a rule of thumb, if the Herfindahl Index⁵⁶ for each relevant market that is likely to be affected is below 1000, the Justice Department will approve the joint venture. However, as the concentration index gets larger, the chances of antitrust violation increase. In such a case, approval becomes less likely. When the index reaches 1800 to 2000, obtaining approval becomes difficult.⁵⁷

A second concrete factor considered in applying the rule of reason standard is where the cooperative project lies on the spectrum between research and production. The closer the project lies to basic research, the less likely the Justice Department will find an antitrust violation. The risk of collusion among competitors is much less significant when the cooperative project involves scientists doing basic research in laboratories since they are typically removed from the pricing decisions made by the marketing and sales people.⁵⁸

Finally, the effect of the cooperation is also considered in applying the rule of reason standard. Where cooperating parties can achieve significant efficiencies or economies of scale, the Antitrust Division is more inclined to rule in favor of a joint venture since its behavior will be found "reasonable" under the NCRA "rule of reason" standard. For example, in the case of the Sematech semiconductor consortium,⁵⁹

52. *Id.*

53. *Id.*

54. *Id.*

55. HOUSE COMM. ON NATIONAL COOPERATIVE RESEARCH ACT OF 1984, H.R. REP. NO. 98-1004, 98th Cong., 1st Sess. 4, 1984 U.S.C.C.A.N. 3105, 3134.

56. The Herfindahl index indicates the degree of concentration or participation in a particular market. For a description of how the Herfindahl Index is computed, see RICHARD A. POSNER & FRANK H. EASTERBOOK, ANTITRUST CASES, ECONOMIC NOTES AND OTHER MATERIALS 462-463 (2d ed. 1981).

57. Baxter, *supra* note 51.

58. *Id.*

59. See *infra* text accompanying notes 65-79.

fourteen participating companies pooled their resources to build a semiconductor chip fabrication facility costing over \$300 million. The efficiencies were significant because the construction costs were spread across fourteen members and the unit cost of operating the facility decreased as the number of users increased.

IV. CASE STUDIES: SEMATECH, GENERAL MOTORS AND TOYOTA, AND OTHER COOPERATIVE VENTURES

Since the passage of the NCRA in 1983, over 150 consortia have been formed in the United States.⁶⁰ The most notable of these are Sematech, U.S. Memories, and the General Motors-Toyota joint venture. Despite immense amounts of funding,⁶¹ considerable support from participants, government, and the public,⁶² all three ventures experienced significant problems.⁶³ After a rocky start, the Sematech and the G.M.-Toyota ventures appear to have recovered, but U.S. Memories was never able to get off the ground.⁶⁴ The trials and tribulations of these and other cooperative ventures, including consortia movement in Japan and in Europe, are examined in this section.

A. The Sematech Experience

1. BACKGROUND OF SEMATECH

Beginning in 1984, Japanese semiconductor manufacturers began exporting large quantities of semiconductor chips into the United States, sometimes selling the chips at less than cost, thereby flooding the American chip market.⁶⁵ Many American companies were unable to

60. Chris Sivula, *Trying to Cooperate in Order to Compete*, TECH. REV., Feb.-Mar. 1991, at 13.

61. See Daniel J. Lyons, *Failing Semiconductor Industry Bodes Poorly for U.S. PC Makers*, PC WK., Feb. 19, 1990, at 127 (U.S. Memories had a \$500 million budget); see also *Study Sees Sematech As Success So Far; Report Urges Caution On Consortium Idea*, WASH. POST, May 9, 1989, at B1 (Sematech receives \$100 million in government assistance annually in addition to corporate grants).

62. Barron, *supra* note 27, at 269.

63. *Id.*; see also *infra* text accompanying notes 147-53 (concerning Sematech's funding problems).

64. Barron, *supra* note 27, at 269.

65. Although the demand for electronics and computer chips declined in the mid-eighties, Japan continued to export large quantities of chips into the United States and sell them at less than their fair value. This caused the price of semiconductor chips to plummet. For example, the price of EPROM (erasable programmable read only memory) chips fell 75 percent in 1984 and 1985. 256K DRAMs (dynamic random access memory) sold for one-tenth of their 1984 price in 1985, and the price of 64K DRAM chips fell 25 percent in the first three months of 1988 after being constant for approximately a year before the decline. Harry First, *Structural Antitrust Rules and International Competition: the Case of Distressed Industries*, N.Y.U. L. REV., 1054, 1093 (1987).

compete⁶⁶ and consequently dropped out of the market for memory products.⁶⁷ In 1986 alone, the U.S. semiconductor industry lost \$1 billion in sales.⁶⁸ Japan lost \$4 billion in 1986 by selling semiconductors below cost, but they remained in the market.⁶⁹ By 1987, Japan had acquired the largest market share of semiconductors in the world.⁷⁰ This caused a great deal of concern within the American defense establishment because most military systems rely heavily upon sophisticated electronics. Through a series of trade complaints filed with the U.S. Trade Representative, certain semiconductor trade associations brought their claims of unfair trade practices to the attention of the U.S. government in the hopes of gaining governmental assistance.⁷¹

The result was Sematech (Semiconductor Manufacturing Technology Initiative), a cooperative effort of fourteen leading American semiconductor companies and the U.S. government.⁷² Sematech's goal is to help restore American leadership in semiconductor manufacturing.⁷³ Since its founding in 1987, Sematech has sought to develop new semiconductor manufacturing techniques, establish stronger relationships between equipment and materials suppliers on the one hand and semiconductor manufacturers on the other hand, and plan long-term strategy for the industry as a whole. The U.S. government

66. *Id.*

67. In October of 1985, Mostek, a former leading producer of 16K DRAMs, stopped manufacturing 16K DRAMs. Shortly thereafter, National Semiconductor, Intel, and Motorola discontinued their production of 256K DRAMs. National Semiconductor and Intel also discontinued production of 64K DRAMs. *See id.* at 1092 n.178 (citing JAPAN L. LETTER, Nov.-Dec. 1985, at 26-27).

68. *Id.* at 1054.

69. Robert Falstad, Address at the Symposium on High Technology Consortia (May 4-5, 1990)(transcript on file with the authors).

70. DERTOUZOS, *supra* note 8, at 9 (the top three merchant semiconductor manufacturers are NEC, Toshiba, and Hitachi).

71. First, *supra* note 65, at 1094.

On June 14, 1985, the U.S. Semiconductor Industry Association (SIA) filed a complaint with the U.S. Trade Representative alleging unfair trade practices under section 301 of the Trade Act of 1974. . . . Ten days later, Micron Technology, a U.S. producer specializing in memory chips, filed an antidumping complaint under section 732(a) of the Tariff Act of 1930, alleging that 64K DRAMs were being sold in the U.S. at less than fair value. At the end of September 1985, the Reagan Administration filed an antidumping suit, primarily concentrating on the 256K DRAM chip. . . . At the beginning of October, three U.S. semiconductor firms filed a third antidumping suit, against the eight Japanese EPROM manufacturers.

Id. (footnotes omitted).

72. The fourteen members include: Advanced Micro Devices, AT&T, Digital Equipment Corporation, Harris Corporation, Hewlett-Packard Company, Intel, IBM, LSI Logic, Micro Technology, Motorola, National Semiconductor, NCR, Rockwell International, and Texas Instruments.

73. *See* Barron, *supra* note 27, at 269. This task has become much more difficult since 1987. There has been a rapid and steady erosion among American suppliers of equipment and materials that are necessary for semiconductor manufacturing. Since 1980, the Japanese have made 162 different investments in various parts of the U.S. electronics industry. Eighty-six of those investments (more than half) are in the areas of semiconductor materials, manufacturing equipment, and semiconductor companies themselves. Falstad, *supra* note 69.

provides just under half of Sematech's operating funds in the form of grants, and the participating firms provide the rest.⁷⁴ Although Sematech's fourteen members comprise over eighty percent of the total semiconductor manufacturing capacity in the United States, they constitute only a minority of the world market share.⁷⁵

2. FACTORS LEADING TO SUCCESS

There were several factors unique to the Sematech experience that allowed Sematech to operate more successfully than other ventures.⁷⁶ First, many of the industry's leaders, including IBM Corp., National Semiconductor Corp., and Hewlett-Packard Co., participated in the venture. Second, experts who believed semiconductors hold the key to U.S. economic and military strength, supported and helped organize the consortium.⁷⁷ Third, national security seemed to be at stake; thus, elements of fear and urgency served as motivating factors.⁷⁸ Fourth, the participants had a set of research problems common to all members. Finally, the collaboration was far enough removed from commercialization that firms could cooperate in the laboratory while still being able to compete in the marketplace.⁷⁹

B. The General Motors and Toyota Experience

In 1982, the number one automobile manufacturer in the world combined forces with the number three manufacturer in an effort to produce a new subcompact automobile.⁸⁰ The resulting joint venture provides an example of how participants in an alliance can overcome the legal, organizational, and funding obstacles typically confronting a joint venture. In this section, we examine how the unlikely venture between General Motors and Toyota came about, the factors motivating each side

74. Falstad, *supra* note 69.

75. *Id.*

76. See *infra* text accompanying notes 102-04 (for discussion of U.S. Memories—a less successful consortia experience).

77. Falstad, *supra* note 69.

78. DERTOUZOS, *supra* note 8, at 10 (“[The Sematech] effort is being conducted under cover of national defense . . .”). But the motivating force of the national security interest has drawbacks as well. “What the military often wants in a semiconductor chip (unsurpassed performance under conditions of conflict) is not what civilian industry needs (reliability and low cost).” *Id.* See also *infra* text accompanying notes 147-53 (concerning Sematech's funding difficulties).

79. Ironically, while research-oriented consortia tend to avoid antitrust violations more easily than product-oriented ventures, it is in the production and commercialization of products that the U.S. needs to regain its strength. The U.S. has long been an excellent incubator of ideas; however, past experience indicates that once these ideas are developed in American laboratories, foreign competitors beat the U.S. firms to the market with cheaper and better products. See *supra* text accompanying notes 41-45.

80. *Is What's Good for G.M.-Toyota Good for U.S.?*, 15 NAT'L J. 2696 (Dec. 31, 1983).

to enter into the agreement, some of the difficulties encountered during the negotiations, the results of the negotiations, the degree of success of the joint venture, and caveats about consortia in general.

1. BACKGROUND BEHIND THE JOINT VENTURE

In January of 1979, 850,000 unsold Japanese cars had accumulated in the United States.⁸¹ When an oil shortage arose in 1979, gasoline prices skyrocketed and the demand for smaller, more fuel-efficient cars followed.⁸²

[From] 1979-1980 the imports of Japanese cars . . . reached twenty-two percent for the nation as a whole and fifty percent for the state of California. The Big Three simply lacked the product offerings in the small car categories to compete. Chrysler was saved from bankruptcy by the federal government. Ford was on the brink, and G.M. had lost money for the first time in six decades. In the spring of 1980, 300,000 auto workers were on lay-off, and the Big Three were forced to shut down a number of plants . . . including the Fremont plant [in northern California].⁸³

General Motors had several motives for entering into a joint venture with Toyota. First, G.M. wanted an additional subcompact vehicle at a competitive price. At that time, G.M.'s major entry in the subcompact field was the Chevette, an outdated car for which G.M. was losing \$400 on every car sold. A new small car model program would have cost G.M. \$2-3 billion, and there was no prospect of a favorable return. Due to productivity management practices and differences in exchange rates and wages, the Japanese version of the same car would have a cost advantage of between \$1,550 and \$2,200 per car.⁸⁴ Second, G.M. felt that a joint venture with Toyota would give it a first-hand look at Toyota's production technology, design technology, efficient management systems, and general methods of operation. G.M. also hoped that a revitalized Fremont, California plant, which was suffering from low productivity and poor quality, would serve as a model for other G.M. plants.

81. James Cook, *A Tiger by the Tail*, FORBES, Apr. 13, 1981, at 119.

82. *Id.*

83. Dennis Cuneo, Address at the Symposium on High Technology Consortia (Mar. 4-5, 1990) (Dennis Cuneo is the President of Corporate Planning and Legal Affairs at New United Motors Manufacturers, Inc. (NUMMI) and was a lead negotiator of the G.M.-Toyota joint venture); see also Tom O'Halloran, *Congress Will Act If We Don't on Auto Imports*, U.S. NEWS & WORLD REP., Mar. 30, 1981, at 25; Christopher Byron, *How Japan Does It: The World's Toughest Competitor Stirs A U.S. Trade Storm*, TIME, Mar. 30, 1981, at 54; James K. Glassman & John T. Hompe, *The Iacocca Mystique: Would You Buy a New Car From This Man?*, THE NEW REPUBLIC, July 16, 1984, at 20.

84. Jack A. Seamonds, *U.S. Giving Up On Making Small Cars?*, U.S. NEWS & WORLD REP., Dec. 19, 1983, at 56.

Toyota, on the other hand, was being pressured both by its own government and the U.S. government to invest in the United States. Believing that a manufacturing presence in the U.S. would eventually have to be established, Toyota felt that a joint venture with a leading U.S. company was a good start. Toyota was also concerned that its systems of labor relations, management, and procurement might not work in the United States. By establishing a joint venture with G.M., Toyota could take advantage of G.M.'s expertise in dealing with American labor suppliers in a regulatory system with which Toyota was not accustomed. Finally, an agreement with G.M. would enable Toyota to increase its U.S. market share since it was constrained by the voluntary restraint agreement⁸⁵ on the number of cars it could export from Japan to the United States. Against this background negotiations between G.M. and Toyota began.

2. DIFFICULTIES ENCOUNTERED IN THE NEGOTIATIONS

When the reports of the joint venture negotiations between G.M. and Toyota first reached the press in 1982, the venture was greeted with skepticism, criticism, and above all, a great deal of scrutiny.⁸⁶ After all, in 1982 G.M. was the leading industrial company in the world with a forty-five percent market share in the United States. The fact that General Motors was now turning to Toyota to learn how to build cars in the U.S. caused a good deal of controversy when first announced. Chrysler immediately announced its opposition,⁸⁷ and Lee Iacocca went on a very public lobbying campaign against the joint venture.⁸⁸ Iacocca thought that the venture between G.M. and Toyota was bad for America, and he accused G.M. of selling out to the Japanese at the expense of 300,000 American jobs.⁸⁹ As a result of Iacocca's criticism, the Federal Trade

85. See Clyde H. Farnsworth, *Tokyo's Car Curbs Hailed in U.S., But Japanese Makers Are Angered*, N.Y. TIMES, May 2, 1981, § 1, at 1 (discussing three-year agreement limiting auto exports from Japan to the U.S.).

86. See FTC's Proposed Consent Order on G.M.-Toyota Joint Venture, 46 [Jan.-June] Antitrust & Trade Reg. Rep. (BNA) No. 1146, at 42 (Jan. 5, 1984); General Motors Corp. and Toyota Motors Corp., 49 Fed. Reg. 18,289, at 18,293 (1984) (Pertschuk, Comm'r, dissenting); G.M./Toyota Joint Venture, 48 Fed. Reg. 57,246, at 57,257 (1983) (Bailey, Comm'r, dissenting).

87. *Chrysler Launches § 7 Attack on G.M.-Toyota Joint Venture*, 46 [Jan. - June] Antitrust & Trade Reg. Rep. (BNA) No. 1148, at 124 (Jan. 19, 1984).

88. Douglas Williams, *NUMMI: What's all the fuss about?*, 164 AUTOMOTIVE INDUSTRIES 69 (Oct. 1984) ("Iacocca pulled out all the stops and marshalled all of Chrysler's resources to blow NUMMI out of existence. The battle was waged first before the Federal Trade Commission and is now underway in federal court.")

89. Cuneo, *supra* note 83; see also *Chrysler Launches § 7 Attack on G.M.-Toyota Joint Venture*, 46 [Jan.-June] Antitrust & Trade Reg. Rep. (BNA) No. 1148, at 124 (Jan. 19, 1984); *Chemical Makers Eye "Foreign" Cars With U.S. Parts*, CHEMICAL WK., Dec. 5, 1984, at 10 (The G.M.-Toyota joint venture will "hurt American part suppliers and destroy American jobs."); Richard Corrigan, *A Separate Peace*, 16 NAT'L J. 426 (Mar. 3, 1984) ("G.M. and

Commission immediately opened an investigation that lasted fifteen months.⁹⁰

The presence of the United Automobile Workers also presented serious problems. The Fremont plant was a U.A.W. plant, and Toyota was at one point reluctant to deal with the U.A.W. In response, the U.A.W. threatened that if G.M. and Toyota tried to open the plant without the U.A.W., the workers would boycott and riot. This confrontation between the powerful U.A.W. and G.M.-Toyota had the potential to frustrate the entire joint venture.⁹¹

In addition to the general skepticism and the problems with the U.A.W., there were antitrust concerns. Toyota and G.M. had over fifty percent of the market share in the United States. Just before the negotiations for the joint venture began, Professor William Baxter, who was at that time in charge of the Antitrust Division of the Justice Department, voiced his concerns regarding the venture's ability to survive antitrust scrutiny. As a result, G.M. and Toyota consulted antitrust counsel and the FTC at every negotiation. This was especially important since product plans and pricing terms needed to be discussed at the negotiations.⁹²

Perhaps one of the biggest obstacles faced by G.M. and Toyota was simply the companies' unfamiliarity with one another. The dynamics of the negotiations were such that Toyota and G.M. had virtually no business dealings with one another before the venture, and the negotiators who sat on opposite sides of the table did not even speak the same language. They came from different countries and radically different corporate cultures, and yet they had to wade through this unfamiliarity and negotiate a very complicated deal. Issues such as the division of responsibility, the level of production, the capital structure of the venture, and the allocation of intellectual property rights had to be resolved.⁹³

After weeks of negotiations and a few near deadlocks, G.M. and Toyota finally arrived at an agreement acceptable to both parties as well

Toyota say the venture will lead to 11,000 new jobs nationally, . . . but Chrysler Corp. chairman Lee A. Iacocca and other critics assert that it will force the rest of the industry into additional tie-ins with foreign companies for cars and parts, leading to job losses of far greater magnitude."); *FTC's Proposed Consent Order on G.M.-Toyota Joint Venture*, 46 [Jan.-June] *Antitrust & Trade Reg. Rep.* (BNA) No. 1146, at 42 (Jan. 5, 1984).

90. Dennis Cuneo, Address at the Symposium on High Technology Consortia (May 4-5, 1990).

91. *Id.*

92. *Id.*

93. *Id.*

as the U.A.W., the FTC,⁹⁴ and the Justice Department.⁹⁵ The FTC agreed to a production limit of 250,000 vehicles per year.⁹⁶ Toyota was to occupy the chief executive spot and be responsible for the day-to-day management. However, there would also be a cadre of G.M. managers to help with the start-up. With this setup, the G.M. managers could learn the Japanese management practices and eventually grow their own management within the joint venture over a period of a couple of years. Finally, the FTC prohibited G.M. and Toyota from communicating about a host of items that were listed in the agreement. For a period of time, the two parties were required to keep logs of their discussions every time they met. The FTC then audited these records to check for compliance.⁹⁷

3. HAS THE VENTURE BEEN SUCCESSFUL?

With certain caveats, the joint venture between G.M. and Toyota has been a success.⁹⁸ It has provided G.M. with a high quality car and has increased productivity at the Fremont plant. It has given G.M. first-hand insights into Toyota's technology and efficient management practices. On Toyota's side, Toyota has gained a manufacturing foothold in the U.S. at half the cost of its Japanese competitors who established their own plants. G.M. has also introduced Toyota to the American suppliers who were most likely to meet the strict quality and cost standards of Toyota. In addition, G.M. has advised Toyota on effective ways to establish good labor relationships with the U.A.W.

While both sides gained a great deal from the venture, they also encountered some problems. The demand for smaller cars declined with gasoline prices in 1984. As a result, G.M. found itself facing a glutted subcompact market and G.M. has not been very successful at selling its subcompact cars. In addition, G.M. found that although the Toyota Corolla and the Geo Prism (one of the cars manufactured at the Fremont plant) are basically the same car, the Toyota Corolla commands a premium of about \$1,000 in the marketplace. As Dennis Cuneo has stated,

Japanese [manufacturers] now have the brand name. You put a Chevy label on a car, and consumers automatically discount it. . . . It's probably the same reason you go into Safeway and . . . pay a dollar more for a six-pack of Coca-Cola as opposed to Safeway Cola. They are probably generically the same chemicals in those bottles, but there are

94. See *FTC Accepts Consent Order Restricting G.M.-Toyota Joint Venture to Produce Cars*, 46 [Jan.-June] Antitrust and Trade Reg. Rep. (BNA) No. 1146, at 4 (Jan. 5, 1984).

95. See *Antitrust Division Supports Dismissal of Chrysler's Attack on G.M.-Toyota Venture*, 46 [Jan.-June] Antitrust & Trade Reg. Rep. (BNA) No. 1151, at 227 (Feb. 9, 1984); see also *Antitrust Division Claims Chrysler Lacks Standing to Challenge G.M.-Toyota Venture*, 46 [Jan.-June] Antitrust & Trade Reg. Rep. (BNA) No. 1152, at 265 (Feb. 16, 1984).

96. *Is What's Good for G.M.-Toyota Good for U.S.?*, 15 NAT'L J. 2696 (Dec. 31, 1983).

97. Cuneo, *supra* note 83.

98. *Id.*

different things that you attribute to the Coca-Cola [for which] you are willing to pay [extra].⁹⁹

4. CAVEATS REGARDING JOINT VENTURES

It is difficult to make generalizations about whether joint ventures or consortia are beneficial or workable. Much depends upon the motivation and needs of the participants and the competitive situation of the entities involved. As a general rule, as the number of participants increases and the scope of the project broadens, the operation of the joint venture becomes more difficult to maintain.¹⁰⁰ For G.M. and Toyota, the venture was limited to the production of a particular kind and a particular quantity of automobiles.

In addition, commitment and support from upper-level management is important. One of the main reasons for the success of the G.M.-Toyota joint venture was that it had very strong support from upper level management:

[T]o the chairmen of both companies, Roger Smith and Agi Toyota, this venture was their baby. . . . [T]hey placed very senior people on the negotiating team with direct instructions, "You are to make a deal." The negotiators from both sides did their homework. They tried to anticipate the cultural differences, and they really made some efforts to overcome these differences. The key negotiators, because of instructions from their chairmen, were very highly motivated to make a deal.¹⁰¹

Finally, the extent of collaboration within the industry also plays an important role in the likelihood of the alliance's success. It appears that cooperation that does not involve the entire industry is best. For example, the reasonably successful G.M.-Toyota joint venture involved only two of the five major automobile manufacturers. Thus, even though G.M. and Toyota collaborated on the production of an automobile, they still faced stiff competition from Honda, Ford and Chrysler. The consortium might have been less successful for participants and less beneficial for society if the collaboration involved all the major automobile manufacturers.

C. Other Domestic Consortia Experiences

Many domestic cooperative ventures have not been as successful as the Sematech consortium and the G.M.-Toyota joint venture. For

99. *Id.*

100. *Id.*

101. *Id.*; see also William Maxwell, Address at the Symposium on High Technology Consortia (May 4-5, 1990) ("[I]n order to work, . . . the participants [must] have commitment from the highest level. The CEO or someone at the top level management must recognize and reward their top researchers who go off and do consortia work.") (William Maxwell is the Vice President for International Affairs at Computer Business and Electronics Manufacturers' Association (CBEMA), a computer industry trade association).

example, the set of circumstances that contributed to Sematech's early success were not present in the U.S. Memories venture. U.S. Memories was established to help the United States regain its competitive edge in the global market for dynamic random access memory (DRAM) chips. This \$500 million, production-oriented consortium consisted of leading industry players: Advanced Micro Devices, Inc., Digital Equipment Corp., Hewlett-Packard Co., IBM Corp., Intel Corp., LSI Logic Corp., and National Semiconductor Corp. Despite substantial funding and strong industry support, U.S. Memories fell apart due to poor timing in entering the DRAM market. As the consortium was forming, the cost of DRAMs plummeted while the supply grew rapidly.¹⁰² By the time it was ready to bring its chips to the market, it was too late. Mr. Ted Vian of Intel Corporation offered the following explanation: "[With U.S. Memories], we were out of sync . . . with the marketplace as it existed at that time, and as a consequence, [U.S. Memories] was not . . . a viable business entity."¹⁰³ The issue of timing is especially important with modern high technology products, which typically have short product life cycles.¹⁰⁴ In such cases, it is imperative for the venture to turn good ideas into marketable products quickly.

The Microelectronics and Computer Technology Corporation (MCC) provides another example of a domestic consortium of questionable success. Founded in 1982 and consisting of fifty-six¹⁰⁵ corporate participants, it was the U.S.'s response to Japan's "Fifth Generation" computing effort.¹⁰⁶ Since its founding, however, it has failed to provide its member companies with significant returns on their investment. While corporate sponsors pay approximately \$55 million each year to participate in MCC, MCC has only transferred "rather esoteric technologies"¹⁰⁷ to its member companies. Some attribute MCC's relatively modest success thus far to poor communication between the scientists at the consortium and the member companies sponsoring their work and to unrealistic time horizons for the research projects. Craig

102. See Aubin, *supra* note 26.

103. Ted Vian, Address at the Symposium on High Technology Consortia (May 4-5, 1990).

104. Maxwell, *supra* note 28, at 1 ("Increasingly short product life cycles mean that return on these huge investments must be realized over only a few years, before the technologies become obsolete.").

105. Evelyn Richards, *Chief Sees New Aim for MCC: Consortium Pushed to be Businesslike*, SAN JOSE MERCURY NEWS, May 5, 1991, at E1.

106. Edward A. Feigenbaum & Pamela McCorduck, THE FIFTH GENERATION 222-24 (1983).

107. Richards, *supra* note 105, at E1 ("MCC hasn't come close to fulfilling early expectations. While MCC officials can produce a list of 150 rather esoteric technologies transferred to member companies, including NCR Corp., Digital Equipment Corp., and Control Data Corp., they concede it is far too lean a return on the \$372 million funnelled into MCC to date.").

Fields, former director of the Defense Advanced Research Projects Agency (DARPA) at the Pentagon and current head of MCC, has urged MCC to set aside its lofty visions of boosting long-term U.S. competitiveness and concentrate instead on more short-term, precise goals.¹⁰⁸

Finally, the Advanced Computing Environment (ACE) initiative, founded in 1991 by a group of computer manufacturers and software publishers, illustrates yet another strategic alliance that has recently run into difficulties. ACE's objective is to create a broadly supported, standards-based, open computing environment based upon MIPS Computer Systems' RISC-based computing systems.¹⁰⁹ The consortium discovered that a joint venture involving too many players with diverse interests is difficult to manage and operate. ACE is composed of twenty companies, including Compaq Computer Corp., Control Data Corp., Digital Equipment Corp., Microsoft Corp., MIPS Computer Systems, Inc., NEC Corp., Prime Computer, Inc., Pyramid Technology Corp., Tandem Computers, Inc., Wang Laboratories, Inc., and Zenith Data Systems. Of these twenty companies, some specialize in software development, some in hardware. Some concentrate on UNIX-based systems, some on VMS-based systems, and others on DOS-based systems. As a result, some believe that the consortium's composition of too many members with frequently competing agendas has proven unwieldy.¹¹⁰ Although it may be too soon to tell, some fear that ACE may ultimately find itself too fractured to succeed in creating a standard computing environment.¹¹¹

The experiences of U.S. Memories, MCC and ACE illustrate that companies should proceed with caution in establishing cooperative ventures. "We should avoid the urge to get caught up in 'consortia-mania' too quickly in the face of some early successes."¹¹²

108. *Id.* ("Fields began the revamping of MCC by restating its purpose. He has set aside lofty visions of boosting long-term competitiveness, a goal he said is far too complex and amorphous. . . . Many MCC scientists and researchers . . . say the new emphasis on setting precise goals and timetables for turning technologies over to companies brings a welcome sense of purpose to their work.").

109. ACE: Advanced Computing Environment (published by MIPS Computer Systems, Inc.) (on file with the authors).

110. John Markoff, *Talking Deals: A Computer Plan Runs Into Trouble*, N.Y. TIMES, Oct. 17, 1991, at C2.

111. *Id.* ("[T]he consortium is likely to find itself ultimately fractured among six incompatible operating systems. The attempt to impose uniformity on a group of companies with very different agendas has failed.")

112. See Lawrence Fisher, *Need for High Tech Consortia Stressed*, N.Y. TIMES, Jan. 12, 1989, at D1.

D. The Japanese and European Experiences

Because American consortia are relatively recent phenomena, few case studies are available.¹¹³ The Japanese and Europeans, on the other hand, have had considerably more experience with consortia. In the years following World War II, Japan has developed the most cooperative industrial environment of any industrial country.¹¹⁴ Several European countries have also utilized consortia for new product development.¹¹⁵

Japan has hundreds of cooperative ventures that range from private alliances to university-based consortia and from government-sponsored joint projects to international cooperative efforts.¹¹⁶ The Japanese have formed consortia in areas ranging from computer aided software engineering tools¹¹⁷ and biotechnology¹¹⁸ to computer operating systems¹¹⁹ and software development systems.¹²⁰ The government in Japan has taken an active role in supporting consortia in these areas and others to encourage risk-taking, to accelerate innovation, and to create new markets for emerging areas of technology.¹²¹ The government promotes consortia activity through several means: by issuing conditional loans to consortia, which are repaid only if they are successful at developing the particular technology,¹²² by providing considerable tax benefits to participating companies of joint ventures, and by relaxing the enforcement of antitrust laws.

Professors Jorde and Teece have described how this myriad of cooperative ventures, involving government and universities, competitors and allies, and public companies and private ones, emerged in Japan:

With governmental encouragement, and with Japan's Ministry of Trade and Industry (MITI) as a catalyst, the industrial establishment has worked cooperatively to identify promising industrial technologies and avenues for development. This process has not involved MITI

113. See *supra* text accompanying notes 14-26 on the history of consortia in the U.S.

114. See *infra* text accompanying notes 116-23.

115. See *infra* text accompanying notes 124-31.

116. Mark Eaton, Address at the Symposium on High Technology Consortia (May 4-5, 1990).

117. *Id.* (Mitsui CASE (computer aided software engineering) tools, for example).

118. *Id.*

119. *Id.*

120. *Id.*

121. *Id.*

122. Jorde & Teece, *supra* note 38, at 29 (Such loans usually come with a variable interest rate that depends upon the degree of success of the consortium. Professors Jorde and Teece described this form of consortia funding: "In 1983, a new system of public financing was established exclusively to support joint R&D [in Japan]. . . . [F]our-fifths of Japanese government loans are [now] extended to joint projects. . . . [T]he Japanese government subsidy system is disproportionately generous to joint research projects." (quoting R. Samuels, Research Collaboration in Japan (MIT-Japan Science and Technology Program, Working Paper No. 87-02, 1987)).

"picking winners," but businessmen selecting the most likely candidates for global industrial expansion. Once a consensus emerges among businesses and between business and government, public agencies entice and sometimes cajole firms to engage in cooperative strategies. These tactics often include cooperative research and development associations whose goal is to catch up with, or to improve upon, the existing state of industrial technologies. Once the technology is mastered, Japanese firms will then often invest in it with the object of becoming the world cost leader. At this stage, strong competition will emerge to complement earlier cooperation.¹²³

The European consortia experience, while not as extensive as Japan's experience, also offers valuable lessons. European consortia tend to be more narrowly targeted at specific industries.¹²⁴ Artificial intelligence,¹²⁵ aviation,¹²⁶ nuclear power,¹²⁷ and telecommunications¹²⁸ are a few of the target areas of European cooperative ventures. The most notable consortia include the European Strategic Programme for Research and Development in Information Technology (ESPRIT),¹²⁹ Research and Development in Advanced Communications Technologies for Europe (RACE),¹³⁰ and the European Research Cooperation Agency (EUREKA).¹³¹

The Europeans and Japanese have learned through their experiences with cooperative ventures the importance of effective evaluative mechanisms that are built into the game plan of the consortium in order to monitor more easily the consortium's progress. Built-in evaluative mechanisms not only serve to remind the participants of the goals they are striving to achieve, but also to enable the participants

123. Jorde & Teece, *supra* note 38, at 27.

124. Ted Ralston, Address at the Symposium on High Technology Consortia (Mar. 4-5, 1990).

125. *Id.* (ECRC, the European Computer-Industry Center, is a private consortium consisting of participants from Western Europe that focuses on knowledge-based expert systems research).

126. Jorde & Teece, *supra* note 38, at 31 (discussing the consortia environment in Great Britain).

127. *Id.*

128. *Id.* at 33 (discussing RACE); see also Ralston, *supra* note 124.

129. ESPRIT was established to reverse the trend of Europe's increasing reliance on imported technology in the area of information systems. Formed in 1983 by the European Economic Community and private industry, its focus is on research and development related to advanced microelectronics, data and knowledge processing, and office and factory automation. Jorde & Teece, *supra* note 38, at 33; see also Ralston, *supra* note 124.

130. Jorde & Teece, *supra* note 38, at 33; see also Ralston, *supra* note 124. RACE was set up to enable the European Community to gain technological superiority in the area of communication systems. It is made up of roughly 100 separate projects. Eaton, *supra* note 116.

131. Jorde & Teece, *supra* note 38, at 33; see also Ralston, *supra* note 124 (describing EUREKA as a consortium of approximately 297 projects doing research in telecommunications, robotics, biotechnology, energy, new materials, and the environment).

and onlookers to monitor the progress of the consortium. Without such hooks, it is difficult for sponsors to know if the consortium is succeeding, and hence whether subsequent rounds of funding should be provided.¹³²

In addition, the Japanese and European antitrust treatment of consortia provide an interesting basis of comparison with the treatment in the United States.¹³³ In Japan, there are "safe harbors," in which the government relaxes the antitrust laws for joint ventures whose participants control less than twenty to twenty-five percent of the market.¹³⁴ Typically, consortia participants get an informal advance "clearance" from the Ministry of Trade and Industry to pursue their cooperative work.¹³⁵ This is similar to the G.M.-Toyota joint venture's efforts to keep the Department of Justice fully informed of its cooperative activities and to get initial approval of the consortium from the government.¹³⁶ In addition, under Japanese law, private antitrust actions are extremely rare, and when they arise, plaintiffs are limited to single damages.¹³⁷ In the European Community, joint production ventures are eligible for automatic exemptions from antitrust laws if the participating firms control less than twenty percent of the market.¹³⁸ Ventures that cannot obtain this automatic exemption are eligible for individual exemptions that also provide absolute antitrust immunity.¹³⁹

Thus, as illustrated by the experiences of Sematech, U.S. Memories, and the G.M.-Toyota cooperative ventures in the United States, as well as the European and Japanese consortia experiences abroad, in order to establish a successful consortium, it helps to have (1) participation and support from the industry's leading firms, (2) a common set of goals or problems shared by all participants, (3) an exceptionally strong motivation to succeed, such as protecting national security, (4) well-defined goals that are not too broad and that do not involve too many participants, (5) the support of upper level management, and (6) flexible antitrust laws. In addition, proper timing is essential.¹⁴⁰ These are, of course, only a few of the many factors that may increase the likelihood of a consortium's success. No "laundry list" of factors can adequately describe all the elements necessary for a successful consortium—the mere existence of these principal elements does not guarantee success. These

132. Ralston, *supra* note 124.

133. See *supra* text accompanying notes 38-59 (concerning the antitrust environment in the United States).

134. See *supra* Maxwell note 28.

135. *Id.*

136. See *supra* text accompanying note 92.

137. Maxwell, *supra* note 28, at 5.

138. *Id.*

139. *Id.*

140. See *supra* text accompanying notes 102-04.

elements must also coalesce in such a way that competitors will work together successfully toward common goals.

V. ALTERNATIVE APPROACHES TO CONSORTIA FOR DEVELOPING TECHNOLOGIES

Aside from forming a consortium, a firm can choose to acquire or develop new technologies through one of several approaches, including informal alliances, acquisitions, licensing agreements, investments in other companies, and government or corporate-funded university research programs. Each of these approaches is sketched below along with a brief discussion of some of the advantages and disadvantages. The best approach or combination of approaches depends upon the resources of the firm, the nature of the innovation process, the nature of the technology, and the willingness of the firm to assume risk.

Informal alliances are probably the most widely used means of sharing technologies among companies. Every time scientists from different companies get together for lunch or at conferences to discuss their current projects, they are using informal alliances to exchange ideas. This approach to acquiring ideas is desirable when the risks are small because of the low transaction costs involved and the flexibility in structuring the nature of the exchange and the type of know-how. On the other hand, informal alliances become problematic if the stakes become too high. For example, companies that allow their employees to acquire technologies through informal alliances run the risk of losing proprietary or confidential information to competitors. They also run the risk of being accused of misappropriating the proprietary information of their competitors.

In licensing arrangements, one company typically contracts to purchase needed technology from another company. This one-way transfer of technology is a relatively simple way to acquire new technologies with minimal transaction costs. In addition, licensing agreements are advantageous because the purchasing company's risk is limited to the amount of consideration paid. However, the transfer of technological know-how in licensing agreements is limited to the extent to which it can be embodied in a contract.¹⁴¹

For a firm seeking to branch out into an entirely new area of technology, acquiring an entire firm that is already an established player in the desired area often is the best approach. To the purchaser, a successful acquisition can provide a trained work force, an established research and development agenda, existing manufacturing plants, and an existing foothold in the marketplace. However, along with these benefits,

141. David Mowery, Address at the Symposium on High Technology Consortia (Mar. 4-5, 1990).

acquisitions can bring difficulties in managing a new company, integrating different firm cultures, and eliminating duplicative positions that result from the merger.

Government-sponsored university research programs provide another alternative to consortia.¹⁴² The National Science Foundation (NSF) and the Defense Advanced Research Projects Agency (DARPA), both of which provide substantial funding to university engineering and computer science programs,¹⁴³ have proven quite successful in the past.¹⁴⁴ Ideas developed through these programs are often transferred to the private sector for further development and commercialization. For example, many of Silicon Valley's successful companies—including Sun Microsystems, MIPS Computer Systems, and Silicon Graphics—are based upon products originally developed from NSF or DARPA research funds at Stanford University.

Corporate-sponsored university research programs have also been successful in developing new technologies. In 1987, corporate expenditures on university research totaled approximately \$670 million.¹⁴⁵ Corporate-funded research has the advantage of tailoring the use of local funds to local concerns. For example, much of the corporate-sponsored research at the University of Michigan is aimed at reviving and modernizing the automobile industry in the area. And at Columbia University, business-university joint projects tend to involve the health care industry.¹⁴⁶ Unlike federally-funded research, corporate-sponsored research avoids the political opposition that arises when federal money subsidizes a geographically limited industry. Politicians from the Midwest, for example, often oppose the use of federal funds to build up the semiconductor industry in Silicon Valley, while elected officials from California frequently object to the use of federal funds to support the farming industry in the Midwest or the timber industry in the Northwest.

Companies looking to enter a joint alliance to acquire or develop new technologies should consider carefully the wide range of alternatives

142. See Wayne Biddle, *Corporations on Campus*, SCIENCE, July 24, 1987.

143. DARPA funds approximately seventy percent of all academic computer science research. At some universities DARPA funding is as high as eighty to ninety percent. Interview with Professor Michael Dertouzos, Director of M.I.T.'s Laboratory for Computer Science and co-author of *MADE IN AMERICA: REGAINING THE PRODUCTIVE EDGE*, *supra* note 8, in Cambridge, Mass. (Feb. 1988). Approximately \$10 billion is given to universities throughout the U.S. for basic research each year. Most of this funding is from government sources. Lewis, *supra* note 2, at 194.

144. See Michael Dertouzos, *DARPA and U.S. Technological Future*, BULL. OF THE ATOMIC SCIENTISTS, Mar. 1985, at 62 (DARPA research funds are responsible for technologies such as time-sharing computing systems, packet networks, Lisp Machines, artificial intelligence, multiprocessors, and distributed systems. "These activities, along with the microprocessor chip and the personal computer (not funded by DARPA), constitute the bulk, if not all of today's brightest [commercial] prospects in the field of information technology.").

145. *Id.*

146. *Id.*

to federally-funded domestic consortia. Corporate-sponsored research programs, informal alliances, cross-licensing agreements, and a myriad of other non-federally funded programs provide unique advantages because they do not carry with them the strings of government control.

The Sematech consortium illustrates how dependence on government funds can influence the direction of a venture. Sematech started out as a private consortium consisting of various firms from the semiconductor industry. After some initial difficulties pulling the consortium together, its members decided to seek government assistance. They made a pitch to the government that the survival of the semiconductor industry was inextricably linked to the maintenance of a strong national defense and therefore necessitated government involvement.¹⁴⁷ "They used the national security basis as a way of galvanizing the industry and galvanizing the interests in order to make it happen."¹⁴⁸ After successfully lobbying the government for help and receiving \$100 million in assistance, Sematech was ready to proceed.

Although many of its members may not have realized it at the time, in soliciting the government's help, Sematech may have opened a Pandora's Box. Immediate tensions were created concerning its purpose and direction.¹⁴⁹ The government was not content to participate as merely one of the many member firms. It wanted the consortium to address broader problems that related to the defense needs of the country.¹⁵⁰ Some participants felt that the government was trying to force Sematech to "overspecify, overcommit, and get too much on paper too soon."

What you had was a cooperation without trust. . . . Sematech looked upon the government as a meddler, and inept in terms of giving guidance to a commercial industry. The government looked upon [Sematech] as a bunch of guys that wanted to go to the cashier's booth at the Pentagon, take \$100 million and then run with it.¹⁵¹

Sematech and the Department of Defense debated extensively on a number of important issues. First, there was uncertainty as to who owned the consortium's facilities and what would become of them when the cooperative venture ended. The Department of Defense felt that since it was putting up \$100 million, it ought to own the facilities. Second, the Department of Defense wanted Sematech to focus on programs to ameliorate foreign dependence on equipment, materials, and

147. See DERTOUZOS, *supra* note 8, at 10.

148. Richard Van Atta, Address at the Symposium on High Technology Consortia (Mar. 4-5, 1990).

149. *Id.*

150. Professor Michael Dertouzos of MIT has explained how defense-motivated government funding affects the research direction of scientists. "Congress looks for research projects that have shorter-term objectives with clear military applications before providing funding." Interview with Michael Dertouzos, *supra* note 143.

151. Van Atta, *supra* note 148.

components. After all, the Department of Defense was concerned with national security and it felt that such heavy dependence on foreign products was dangerous. Eventually, Sematech changed its original game plan to accommodate the Department of Defense's requests. Finally, the Department of Defense felt it was important to focus more on long-term goals to help the United States regain its competitiveness. This request faced resistance from some of the company participants who felt that such overly ambitious plans would lead to the demise of the consortium. They felt it was more important for Sematech to clearly define a few concrete and reasonable goals as a first step, rather than to try to solve the entirety of American competitiveness problems at once.

As the Sematech experience illustrates, federally-funded domestic consortia may not be the best way to help a struggling industry. With government money comes government control.¹⁵² Unfortunately, the government's defense interests do not always coincide with the civilian participants' commercial interests. In the semiconductor industry, for example, much of the technology has dual applications—both military and civilian. However, the industry participants' objectives of manufacturing high quantities of chips at low costs for commercial applications will seldom coincide with the government's goals of manufacturing a few high-quality chips for military applications, whatever the price.¹⁵³ Thus, under certain circumstances, alternative means of acquiring new technologies may provide more satisfactory results.

VI. CONCLUSION

In today's world of rapid technological change and increased global competition, consortia can provide an attractive means of spurring growth and revitalizing an ailing industry. Collaboration provides a logical way for companies facing common competitors to develop new technologies, enter new markets, and share the costs of high-risk research and development projects more effectively than they could working individually. While problems such as potential antitrust violations exist, they are not insurmountable. The National Cooperation Research Act of 1984 and the National Cooperative Innovation and Commercialization Act of 1989, which seek to provide an environment conducive to collaboration, represent steps in the right direction. But if policy makers rely on consortia as a panacea for solving America's competitiveness problems, they will be disappointed.

Through the course of the Symposium and the research and writing of this Comment, we were struck by the emphasis placed upon consortia

152. See DERTOUZOS, *supra* note 8, at 10.

153. See *id.* at 13.

as the primary, or even sole means of curing America's competitiveness problems. This focus on research consortia seems particularly misplaced in light of the fact that much of America's competitiveness problems stem from weaknesses in production and commercialization of products, not from inadequacies in research. Exclusive reliance on consortia can lead to the exclusion of other, equally attractive, alternatives, including cross-licensing agreements, informal alliances, acquisitions, and joint industry-university research programs. In searching for a way to promote technological growth in a region, policy makers should examine the particular characteristics of the industries involved. The nature of the technology, the size of the relevant companies, the resources at local universities, and the makeup of the local economy are all relevant considerations.

There can be no quick or easy way to solve competitiveness problems that have evolved over decades. Simply pumping millions of dollars into consortia activity and gathering together groups of top scientists and managers will not, by itself, restore the United States to a position of preeminence. The problems are more deeply rooted. We must address and find solutions to a wide range of interrelated problems, including the budget deficit, and its effects on the cost of capital, our troubled educational system,¹⁵⁴ our difficulty in achieving effective commercialization,¹⁵⁵ and a myriad of other social and economic problems. If the United States is to regain and sustain its competitiveness in the twenty-first century, it cannot rely exclusively on consortia. It must address these issues alongside the consortia debate.

154. Many believe that our educational system inadequately prepares entrants for our workforce. See *How U.S. leaders view our efforts at competing*, SAN JOSE MERCURY NEWS, Mar. 24, 1991, at E1 ("We must make major improvements in our elementary and secondary education systems if we want to remain the world's leading economy, regardless of what the Japanese or anyone else does. Our education system is one of the great Achilles' heels of the American economy when one looks out over the next two or three decades." (quoting Michael Boskin, former professor of economics at Stanford University and currently chairman of the Council of Economic Advisors)).

155. See *supra* text accompanying notes 41-50.

COMMENT

PRODUCT LIABILITY BARRIERS TO THE COMMERCIALIZATION OF BIOTECHNOLOGY: IMPROVING THE COMPETITIVENESS OF THE U.S. BIOTECHNOLOGY INDUSTRY

MICHAEL D. STOVSKY[†]

Table of Contents

I.	INTRODUCTION.....	363
II.	THE U.S. STRICT PRODUCT LIABILITY SYSTEM.....	365
	A. Switch from Negligence to Strict Product Liability.....	366
	B. Elements of Strict Product Liability.....	366
	C. The Erosion of the "State of the Art" Defense to Strict Liability.	368
	D. The "Unavoidably Unsafe Product" Defense.....	371
	E. Policy Behind Strict Liability.....	472
III.	PRODUCT LIABILITY'S EXCESSIVE COSTS AS A BARRIER TO ENTRY.....	372
	A. Direct and Indirect Costs.....	372
	B. Insurance Costs and "Temporal Stress".....	377
IV.	CONCLUSION.....	379

I. INTRODUCTION

During the next decade, the biotechnology¹ industry will assume increasing international significance. It offers vast social and economic potential to nations which grant their high-technology sectors freedom to

© 1992 Michael D. Stovsky

[†] J.D. 1991, University of Pennsylvania; B.A. 1986, Northwestern University. This comment is dedicated to my parents, Robert and Alyce Stovsky.

1. Biotechnology has been defined as the "intentional manipulation of living organisms, through a research-based program, in order to achieve a useful end product." James T. O'Reilly, *Biotechnology Meets Products Liability: Problems Beyond the State of the Art*, 24 HOUS. L. REV. 451, 452 n.2 (1987) (citing IVER COOPER, *BIOTECHNOLOGY AND THE LAW* (1985)); see also Jeffrey N. Gibbs & Jonathan S. Kahan, *Federal Regulation of Food and Food Additive Biotechnology*, 38 ADMIN. L. REV. 1 (1986); Edward L. Korwek, *FDA Regulation of Biotechnology as a New Method of Manufacture*, 37 FOOD DRUG COSM. L.J. 289, 291 (1982).

compete in world markets.² Genetically improved food materials, purer vaccines, or simpler and more accurate diagnostic products, for example, may provide social benefits unavailable using conventional production techniques but within the reach of biotechnology.³ Economic rewards will likely accrue to nations leading development in this crucial field if, as expected, biotechnology products can be manufactured more cheaply, with greater purity, in larger quantities, and with less pollution and energy consumption than their conventional counterparts.⁴

The United States officially recognizes the importance of biotechnology and supports its development.⁵ Despite official posture and though the United States has played a leading role in biotechnological innovation and development, its competitive advantage in high technology innovation and commercialization over its

2. "As commercial biotechnology enters the 1990's, there are uncertainties, of course—but there are also many certainties. It is certain that biotechnology is fundamental. The exploration and manipulation of life structures and processes at the molecular level, and the application of the knowledge gained, represents a genuine revolution for society at large, a revolution just beginning to unfold . . . the new biotechnology creates a vastly greater range of possibility and a very different pace. This industry is necessary and permanent A second certainty is that an array of powerfully innovative products will be introduced in the early 1990's by the larger segments of industry—therapeutics, diagnostics, agriculture, instrumentation—and perhaps by smaller segments such as bioremediation. The wave of technology development in the 1970's and 80's will be followed by a wave of product introductions in the '90's." G. STEVEN BURRILL WITH THE ERNST & YOUNG HIGH TECHNOLOGY GROUP, *BIOTECH 90: INTO THE NEXT DECADE*, at i (1989). [hereinafter *BIOTECH 90*].

3. OFFICE OF TECHNOLOGY ASSESSMENT, U.S. CONGRESS, *COMMERCIAL BIOTECHNOLOGY: AN INTERNATIONAL ANALYSIS* 6-7 (1984).

The potential benefits of this new technology are immense. Scientists can introduce genes from human or other animal cells into bacteria to obtain the production, on a commercial scale, of products coded by the human or animal genes. For example, recombinant DNA could very well be the future of the pharmaceutical industry. Using recombinant techniques, researchers are developing therapeutic drugs such as human insulin, growth hormone and interferon. Scientists are using the technology to develop improved processes in making antibiotics. This technique holds great promise for cures for tay-sacks [sic] and sickle cell anemia along with vaccines for influenza and hepatitis.

Genetic engineering techniques are not limited in their application to medicine. The U.S. Department of Scientific and Industrial Research is currently working on a genetically engineered microorganism for the fixation of nitrogen, essential in agriculture, which will lead to a direct reduction in dependence on fertilizer. Genetic recombinations also have wide applications in the chemical and energy industries. For example, researchers have created ethylene oxide and yeast bacteria, which may enable producers of gasohol to eliminate the distillation process. The list of possible applications goes on. In years to come scientists and industry analysts expect the market to be flooded with everything from bioengineered microorganisms that can mine copper and gobble up oil spills to a specialized cancer therapy that will deliver treatment only to the affected cells. Scientists may be able to develop organisms to assist in the disposal of industrial waste and to degrade metals and other materials.

Walter L. Williams, Jr., *Transnational Aspects of Biotechnology*, 19 *LAW/TECHNOLOGY* 3, 9-10 (1986) (citations omitted).

4. INT'L TRADE ADMIN., U.S. DEP'T OF COMMERCE, *HIGH TECHNOLOGY INDUSTRIES: PROFILES AND OUTLOOKS—BIOTECHNOLOGY* 47 (1984) [hereinafter *PROFILES*].

5. Coordinated Framework for Regulation of Biotechnology, 51 *Fed. Reg.* 23,302 (1986).

international trading partners has eroded in recent years.⁶ Product liability law in the United States has played a major role in this erosion and represents a particularly severe barrier to innovation and commercial growth within the biotechnology industry.⁷ Product liability law plays a large role in determining the extent to which U.S. biotechnology firms successfully commercialize biotechnology.

Although various statutory and administrative barriers to the commercialization of biotechnology products pervade the U.S. biotechnology industry,⁸ this comment argues that product liability law poses a grave risk to our biotechnology industry. U.S. product liability law bars entry into product markets and affects domestic biotechnology firms more harshly than firms in other industries.⁹ As a result, socially valuable products never reach the market. Therefore, on balance, policy underlying the general application of product liability is inconsistent with its application to the biotechnology industry. The law should be modified. This comment recommends changes designed to make the product liability system more favorable to U.S. biotechnology firms, without ignoring the needs of injured consumers.

II. THE U.S. STRICT PRODUCT LIABILITY SYSTEM

Before showing how the U.S. system impedes firms, it is necessary to understand the history and content of U.S. product liability law. The following section reviews current U.S. product liability law as it relates to biotechnology and shows that the law applies severely to biotechnology products and firms.

6. Joel Dreyfuss, *Getting High Tech Back on Track*, FORTUNE, Jan. 1, 1990, at 76.

7. PROFILES, *supra* note 4, at 71.

8. *Id.* at 70. The U.S. Department of Commerce recognizes the concerns of the biotechnology industry with regard to such regulatory barriers. For example, the Food and Drug Administration's ("FDA") regulatory process for approval of a new pharmaceutical drug includes: (1) the discovery phase; (2) the preclinical phase; (3) the phase of demonstration of clinical safety and efficacy; (4) the new drug application (NDA); and (5) the marketing phase. The entire process is estimated to cost \$74 million on average and take 7 to 10 years to complete. *Id.* at 70. The Department of Commerce has additionally documented that the extensive regulatory process in the United States has forced firms to carry out the development of new pharmaceutical products in countries where the approval processes are less stringent. According to one study, U.S. firms spent more than \$220 million in research and development funds overseas in 1978. *Id.* at 71.

9. U.S. product liability law refers to the body of statutory, administrative and case law from which manufacturer liability is derived for defective design, manufacture or warning relating to marketed products. *See, e.g.,* Greenman v. Yuba Power Prods., 377 P.2d 897 (Cal. 1962); Escola v. Coca-Cola Bottling Co., 150 P.2d 436 (Cal. 1944); Brown v. Superior Court, 751 P.2d 470 (Cal. 1988), *cert. denied*, 485 U.S. 942 (1988); Hurley v. Lederle Lab., 851 F.2d 1536 (5th Cir. 1988) (failure to warn); Petty v. United States, 740 F.2d 1428 (8th Cir. 1984) (failure to warn); Reyes v. Wyeth Lab., 498 F.2d 1264 (5th Cir. 1974), *cert. denied*, 419 U.S. 1096 (1974); Feldman v. Lederle Lab., 460 A.2d 203 (N.J. Super. Ct. App. Div. 1983), *rev'd on other grounds*, 479 A.2d 374 (N.J. 1984) (failure to warn).

A. Switch from Negligence to Strict Product Liability

The concept of strict liability assumed centrality in U.S. product liability law during the early 1960's, when it replaced negligence as the predominant theory of recovery for product related injuries. Under the negligence standard, companies were obligated to exercise reasonable care in designing and manufacturing products and in providing product warnings. The shift to strict liability has changed the focus of courts and juries from concern with the care utilized by manufacturers to an examination of whether products themselves are defective. The focus now centers on the quality of product manufacture and design, and the adequacy of the manufacturer's warnings.¹⁰

Justice Roger Traynor's landmark decision in *Greenman v. Yuba Power Products*¹¹ first recognized the application of the strict liability standard in the area of tort law:

Strict liability has usually been based on the theory of an express or implied warranty running from the manufacturer to the plaintiff, [i] the abandonment of the requirement of a contract between them, [ii] the recognition that the liability is not assumed by agreement but imposed by law, [iii] and the refusal to permit the manufacturer to define the scope of its own responsibility for defective products make clear that the liability is not one governed by the law of contract warranties but by the law of strict liability in tort.¹²

Plaintiffs must show that a defect in product design or manufacture unknown to them rendered the product unreasonably dangerous and caused injury.¹³

B. Elements of Strict Product Liability

Nearly all states have adopted a theory of strict product liability based on the Restatement (Second) of Torts, section 402A ("Section 402A").¹⁴ However, product liability's doctrinal particularities depend

10. See, *infra*, notes 11-13 and accompanying text.

11. 377 P.2d 897 (Cal. 1963); see also *Escola v. Coca-Cola Bottling Co.*, 150 P.2d 436, 440-41 (Cal. 1944).

12. *Greenman*, 377 P.2d at 901.

However intermittently such injuries may occur and however haphazardly they may strike, the risk of their occurrence is a constant risk and a general one. Against such a risk there should be general and constant protection and the manufacturer is best situated to afford such protection. *Escola*, 150 P.2d at 441 (Traynor, J., concurring) (justifying the strict theory of products liability).

13. *Greenman*, 377 P.2d at 901. The elements of product liability under commonly accepted U.S. tort law remain: (1) the existence of a defect, (2) causation of injury to the user, and (3) the presence of the defect at the time the product left the control of the manufacturer. Stephan J. Leacock, *A General Conspectus of American Law on Product Liability*, J. BUS. L., May 1991, at 273, 276 n.21.

14. RESTATEMENT (SECOND) OF TORTS § 402A (1965).

Section 402A. Special Liability of Seller of Product for Physical Harm to User or Consumer.

upon state common law. Much of the uncertainty surrounding product liability suits stems from inconsistency between state product liability laws.

Despite inconsistency, courts agree that in order for strict liability to apply under Section 402A, products must be "in a defective condition unreasonably dangerous to the user or consumer."¹⁵ State courts tend to define "defective" broadly and flexibly, thus enhancing the protection afforded product users.¹⁶ They view a defective product as one that is flawed in either manufacture, design or in the sufficiency of the warnings given as to its use.¹⁷ In determining whether liability attaches to a defective product, state courts apply one of two distinct tests: (1) a risk-utility test,¹⁸ or (2) a consumer expectations test.¹⁹

The risk-utility analysis attempts to balance society's interests in the product and the protection of consumers by requiring reasonable safety in product design. This analysis forces inquiry into whether the risk of injury outweighs the social utility of the product in question. Where risk exceeds utility, a product is deemed "unreasonably dangerous." Such analysis recognizes a "valid" social interest in product innovation and competitiveness in biotechnology manufacturing industries.²⁰

Under the consumer expectations test, the critical issue is the degree of safety that the reasonable consumer should expect when using the particular product in the manner intended by the manufacturer. The

(1) One who sells any product in a defective condition unreasonably dangerous to the user or consumer or to his property is subject to liability for physical harm thereby caused to the ultimate user or consumer, or to his property, if

(a) the seller is engaged in the business of selling such product, and

(b) it is expected to and does reach the user or consumer without substantial change in the condition in which it is sold.

(2) The rule stated in Subsection (1) applies although

(a) the seller has exercised all possible care in the preparation and sale of his product, and

(b) the user or consumer has not bought the product from or entered into any contractual relation with the seller.

Section 402A has been adopted by all states except Michigan, North Carolina, Virginia, Wyoming, and West Virginia. Leacock, *supra* note 13, at 273 n.2. Of course, negligence is also a basis for manufacturer's liability and it is often used as an alternative basis for products liability. See, e.g., McNeal v. Hi-lo Powered Scaffolding, Inc., 836 F.2d 637, 638 (D.C. Cir. 1988); Toner v. Lederle Labs., 828 F.2d 510 (9th Cir. 1987), *cert. denied*, 485 U.S. 942 (1988).

15. RESTATEMENT (SECOND) OF TORTS § 402A (1965).

16. "[T]he consumer of . . . products is entitled to the maximum of protection at the hands of someone, and the proper persons to afford it are those who market the products." RESTATEMENT (SECOND) OF TORTS § 402A cmt. c (1965). See also Ransome v. Wisconsin Elec. Power Co., 275 N.W.2d 641 (Wis. 1979).

17. See Page Keeton, *Product Liability and the Meaning of Defect*, 5 ST. MARY'S L.J. 30, 33-34 (1973); John W. Wade, *On Product "Design Defects" and Their Actionability*, 33 VAND. L. REV. 551, 551 (1980).

18. See *Suter v. San Angelo Foundry & Mach. Co.*, 406 A.2d 140, 151 (1979).

19. See *Ransome*, 275 N.W.2d at 648.

20. Leacock, *supra* note 13, at 275.

consumer expectations test utilizes an objective standard and represents a concern for the expectations of the reasonably prudent consumer in the context and circumstances of the use of the particular product.

The imposition of liability by the courts can occur under either the risk-utility or consumer expectation analyses²¹ irrespective of proof that the manufacturer used reasonable care in the design, manufacture or sale of the product in question.²²

The shift of focus away from manufacturer conduct to product condition, embodied in the change from a negligence standard to strict liability standard, makes it easier for plaintiffs to sue manufacturers successfully.²³ This shift in focus should concern biotechnology manufacturers, who are made highly susceptible to the uncertainties of litigation and its related costs. This increased vulnerability to litigation costs is relatively unmitigated due to the erosion of previously effective defenses to strict liability which has accompanied the rise of this doctrine in U.S. courts.

C. The Erosion of the "State of the Art" Defense to Strict Liability

The U.S. system of product liability provides few defenses for manufacturers.²⁴ The most viable of those defenses—the state of the art defense, which "requires a demonstration that the technology available for the manufacture of a safer finished product with [the] same characteristics was not feasible"²⁵—is particularly difficult to establish in cases involving biotechnology. This is true for three reasons.

First, judicial decisions narrowly interpret the "state of the art" defense.²⁶ In *Sturm, Ruger & Co. v. Day*, an Alaska court held that "state-

21. *Id.* In the American tort system, the judge decides the question of which test should be applied. The jury, however, weighs the risks and decides whether the marketing was acceptable in terms of risks and benefits or consumer expectations.

22. *Kerns v. Engelke*, 369 N.E.2d 1284, 1289 (Ill. App. Ct. 1977), *aff'd in part, rev'd in part*, 390 N.E.2d 859 (Ill. 1979). *See also Williams v. Detroit Edison Co.*, 234 N.W.2d 702, 707 (Mich. Ct. App. 1975).

23. Peter Huber, *The Force of Technology*, FORBES, July 13, 1987, at 56, 64 [hereinafter *Force of Technology*].

24. These include contributory negligence, assumption of the risk, consumer product misuse, and the "state of the art" defense. George L. Priest, *The Current Insurance Crisis and Modern Tort Law*, 96 YALE L.J. 1521, 1535-36 (1987); Gary C. Robb, *A Practical Approach to Use of State of the Art Evidence in Strict Products Liability Cases*, 77 NW. U. L. REV. 1 (1977).

25. O'Reilly, *supra* note 1, at 459. *See also* 1 LOUIS FRUMER & MELVIN FRIEDMAN, PRODUCTS LIABILITY § 2.26(8)(a) (The majority of U.S. courts measure liability against the state of the art at the time of marketing of the drug or diagnostic product in question.) *See Olson v. Artic Enter.*, 349 F. Supp. 761, 765 (D.N.D. 1972).

26. Principal weakening of the "state of the art" defense has come at the state court level through restrictions on manufacturers' ability to rebut the defectiveness of a product. *See, e.g., Sturm, Ruger & Co. v. Day*, 594 P.2d 38, 43-44 (Alaska 1979), *modified*, 615 P.2d 621 (Alaska 1980), *cert. denied*, 454 U.S. 894 (1980); *Cunningham v. MacNeal Memorial Hosp.*,

of-the-art" refers to customary, industry practice.²⁷ As a result, the *Sturm* court found that "[i]n cases predicated upon strict liability, evidence of industry standards has even less probative value [than in negligence actions]."²⁸ Thus the *Sturm* court disallowed use of the state-of-the-art defense.²⁹ In *Cunningham v. MacNeal Memorial Hospital*, the Illinois Supreme Court rejected the argument that blood products then in use complied with the state-of-the-art in terms of safety from hepatitis contamination. The Court stated that "[t]o allow a defense to strict liability on the ground that there is no way, either practical or theoretical, for a defendant to ascertain the existence of impurities ... would emasculate the doctrine ... and signal a return to a negligence theory."³⁰ In *O'Brien v. Muskin Corp.*, the New Jersey Supreme Court, while recognizing the value of evidence as to the state-of-the-art in determining product defect and in applying a risk-utility analysis, held that the defense is not absolute.³¹ Further, in *Beshada v. Johns Manville*, the New Jersey Supreme Court expressly disallowed the state-of-the-art defense to the issue of failure to warn.³²

Second, courts and juries rejecting the "state-of-the-art" defense have done so partly due to so-called "technology-phobia," the fear of unascertainable harm resulting from new technologies beyond common knowledge.³³ Effective use of experts can diminish the effects of "technology-phobia"³⁴ by increasing jurors' understanding of biotechnology. However,

266 N.E.2d 897, 902-04 (Ill. 1970); *O'Brien v. Muskin Corp.*, 463 A.2d 298, 306 (N.J. 1983); *Beshada v. Johns-Manville Prods. Corp.*, 447 A.2d 539, 548 (N.J. 1982).

27. *Sturm*, 594 P.2d at 44.

28. *Id.* at 45.

29. *Id.* (allowing evidence of the state-of-the-art as one factor in determining product defectiveness). See also *Gelsumino v. E.W. Bliss Co.*, 295 N.E.2d 110, 113 (Ill. App. Ct. 1973); *Olson v. A. W. Chesterton Co.*, 256 N.W.2d 530, 540 (N.D. 1977); *Collins v. Ridge Tool Co.*, 520 F.2d 591 (7th Cir. 1975); Jerry J. Phillips, *The Standard for Determining Defectiveness in Products Liability*, 46 U. CIN. L. REV. 101, 115 (1977); Sidmey Z. Karasik, *State of the Art or Science, Is it a Defense to Products Liability?*, 60 ILL. B.J. 348 (1972); Robert Traynor, *The Ways and Meanings of Defective Products and Strict Liability*, 32 TENN. L. REV. 363, 367, 370 (1965).

30. *Cunningham*, 266 N.E.2d at 902.

31. *O'Brien*, 463 A.2d at 305.

32. *Beshada*, 447 A.2d at 546.

33. O'Reilly, *supra* note 1, at 477. See also Peter Huber, *Safety and the Second Best: The Hazards of Public Risk Management in the Courts*, 85 COLUM. L. REV. 277, 281 (1985) [hereinafter *Safety and the Second Best*] (indicating that the layperson's aversion to public risks is shared by research in and industrial use of recombinant DNA as perhaps the most significant public risk-creating technology). Barry R. Furrow, *Governing Science: Public Risks and Private Remedies*, 131 U. PA. L. REV. 1403, 1404-06 (1983). See also Milton Katz, *The Function of Tort Liability in Technology Assessment*, 38 U. CIN. L. REV. 587, 588-91 (1969).

34. See Michael Traynor & Brian C. Cunningham, *Emerging Product Liability Issues in Biotechnology*, 3 HIGH TECH. L.J. 149 (1988); O'Reilly, *supra* note 1 at 477-78. One commentator has noted:

[j]urors ... are not experts on technology or its risks. When jurors are asked to categorize technologies (as distinct from their inventors or managers) as good, bad or ugly, the answers follow a predictable pattern. Age, familiarity and ubiquity are the most potent legitimizing forces known to the modern liability system. The inexperienced juror is predisposed to spot "defects" in technologies that are unfamiliar or adventuresome.³⁵

The disposition of lay juries against technology highlights an inherent irony in U.S. product liability law.³⁶ Lay juries and judges without high technology expertise, rather than expert regulators who understand the risks and benefits of biotechnological innovation, have the final decision-making capacity in terms of product liability.³⁷

A third reason for difficulty exists even where jurors understand the technology. Evidence suggests that, while standards of care are well settled in many industries,

[q]uite the opposite will appear true in connection with new and innovative technologies. A new technology whose use culminates in a specific, identifiable harm will almost always appear to the courts to be a technology that should and easily could have been avoided. Tort liability is thus likely to replicate the bias against new technology that so typifies prospective risk regulation in the courts.³⁸

Without a settled standard of care, even where the FDA approves products,³⁹ lay juries may treat biotechnology products more harshly than conventional products for purposes of tort liability.

As a result of these three factors, the judicial environment is at-odds with the biotechnology industry in the sense that it is relatively reluctant to allow the "state of the art" defense in cases involving high technology-based products. The comparative unavailability of the "state of the art"

Our nation's bloated tort system is tough on small businesses . . . which can't afford costly lawsuits. What's even worse, the system, in conjunction with the bureaucracy, is beginning to strangle development and marketing of new technology. This could well be the greatest of all dangers to American competitiveness and to our standard of living . . . Old technologies bear regulatory and judicial burdens, too, but the newer ones are handicapped. That's because the old is innocent until proven guilty, while the new is guilty until proven innocent. The difference is important when the trial—whether in superior court or at the FDA—costs millions of dollars . . . We—the very society that always wanted the latest—have developed a bias against the new.

Force of Technology, *supra* note 23, at 56.

35. *Force of Technology*, *supra* note 23, at 64.

36. What is acceptable proof of safety under FDA law may be proof of an unreasonably dangerous product under the tort law. The solution may be legislation which recognizes the equality of tort law's risk-utility equation and the regulatory findings of acceptable risk and which therefore makes the FDA decision presumptively acceptable as an exception from liability. O'Reilly, *supra* note 1, at 483 (specifying that FDA approval documentation can actually be used as a basis for finding liability in court).

37. *Force of Technology*, *supra* note 23, at 64.

38. *Safety and the Second Best*, *supra* note 33, at 319 n.147.

39. Coordinated Framework for Regulation of Biotechnology, 51 Fed. Reg. 23,302, at 23,310 (1986).

defense makes biotechnology manufacturers more vulnerable than conventional manufacturers of similar products in product liability suits. Effective defenses like the "state of the art" defense simply do not apply as they do for conventionally prepared products. As a result, biotechnology manufacturers face liability which is more absolute than strict in character.

D. The "Unavoidably Unsafe Product" Defense

One way to circumvent effects of the erosion of the state of the art defense would be to apply the "unavoidably unsafe product" exception to strict liability, found in comment k to Section 402A of the Restatement (Second) of Torts, to biotechnology products.⁴⁰ Under comment k, a product found to be unavoidably unsafe in design but "properly prepared" escapes strict liability.⁴¹ Comment k recognizes that some products serve a useful social purpose which justifies their marketing regardless of the harm attending their use.

Application of the unavoidably unsafe products exception to biotechnology products would preclude imposition of product liability absent a showing of manufacturer negligence.⁴² With few biotechnology products currently approved for consumer use, it is not yet clear whether courts will give biotechnology products the protection conferred by this exception. Furthermore, the exception has been narrowly construed and currently applies only to products needed to control diseases or to meet other urgent social needs.⁴³ Many biotechnological products will probably not be labelled "unavoidably unsafe" because they have safer, though less efficacious,⁴⁴ conventional counterparts. The potentially harmful effects of these biotechnology products would therefore, fail to meet the comment k standard as this harm could be labelled "avoidable." Finally, the "unavoidably unsafe" categorization may be challenged where the benefits resulting from choosing an innovative method of

40. RESTATEMENT (SECOND) OF TORTS § 402A cmt. k (1965).

41. *Id.* (If a product is properly prepared and accompanied by adequate directions for use and warnings as to potential harm resulting from use, then the product is excepted from the definition of "unreasonably dangerous" under 402A. A sufficient level of purity under FDA standards would arguably satisfy the "properly prepared" standard. *Id.*)

42. Application of the unavoidably unsafe product exception does not preclude claims against manufacturers based on a negligence theory. See, e.g., *Toner v. Lederle Lab.*, 828 F.2d 510 (9th Cir. 1987), *cert. denied*, 485 U.S. 942 (1988).

43. RESTATEMENT (SECOND) OF TORTS § 402A cmt. k (1965). Comment k specifically mentions the rabies vaccine as an example of an unavoidably unsafe product which, though unavoidably dangerous, is justifiably marketed and used. *Id.*

44. Traynor & Cunningham, *supra* note 34, at 160-62 (citing Richard A. Lerner, *Synthetic Vaccines*, SCI. AM., Feb. 1983, at 66); JAMES D. WATSON, JOHN TOOZE & DAVID T. KURTZ, *RECOMBINANT DNA—A SHORT COURSE* (1983).

manufacture in lieu of a conventional method do not outweigh the risk of injury to the public.⁴⁵

E. Policy Behind Strict Liability

Courts, in developing the strict product liability doctrine, recognized the potentially harsh results of passing injury costs on to manufacturers.⁴⁶ They rationalized however that manufacturers would pass such costs on to consumers of their products, effectively spreading the costs over the consuming public. The courts reasoned that strict product liability (1) creates incentives for manufacturers to produce safe products; and (2) induces manufacturers to provide a form of "social insurance."⁴⁷ Manufacturers are harmed to the extent that they cannot pass the costs of insuring on to the consumers in the form of increased prices. Despite judicial rationale, I shall argue that neither of these two policy goals are accomplished when strict product liability is applied to biotechnology products. Rather, strict liability creates an environment in which the imposition of manufacturer-based "social insurance" places a uniquely stifling burden on most biotechnology firms.

III. PRODUCT LIABILITY'S EXCESSIVE COSTS AS A BARRIER TO ENTRY

A. Direct and Indirect Costs

Strict product liability imposes significant direct and indirect operating costs on biotechnology companies.⁴⁸ Direct costs are those costs which are closely related to a company's expenditures for product-related litigation, the payment of claims or awards, and product-specific insurance premiums. Indirect costs include general and administrative expenses associated with compliance with product liability-related duties (e.g., costs associated with discovery in litigation).⁴⁹

45. Debra E. Dahl, Comment, *Strict Product Liability for Injuries Caused by Recombinant DNA Bacteria*, 22 SANTA CLARA L. REV. 117, 145-46 (1982).

46. *Brown v. Superior Court*, 751 P.2d 470 (Cal. 1988).

47. Alan Schwartz, *Proposals for Products Liability Reform: A Theoretical Synthesis*, 97 YALE L.J. 353, 368 (1988) [hereinafter *Products Liability Reform*].

48. See Philip M. Boffey, *Vaccine Liability Threatens Supplies*, N.Y. TIMES, June 26, 1984, at C1.

49. E. Patrick McGuire, *The Impact of Product Liability*, in CONFERENCE BOARD RESEARCH REPORT NO. 908, 17-20 (1988). Merrell-Dow Pharmaceutical produced a drug, Bendectin, which was alleged to be the cause of birth defects in children born to women using the drug. The company has been sued many times and has won each suit except four which are currently on appeal. Bendectin sales were discontinued due to the exorbitant cost of defending against product liability claims. Merrell-Dow claims to have spent \$18 million defending Bendectin though the product produced just \$20 million in revenues per year. The company maintains that more than 12,000 doctors protested the discontinuation of

In addition, litigation burdens company officers with additional responsibilities.⁵⁰ Significant delays result when time best devoted to product development is spent avoiding litigation.⁵¹ Both direct and indirect costs of product liability hurt biotechnology producers disproportionately because, as shown below, biotechnology firms are less able to defray these costs than are conventional manufacturers.

One of the foremost obstacles faced by firms attempting to market biotechnological products is the cost of insuring their products against product liability claims. Product liability insurance costs in the United States have risen dramatically to keep up with increased legal claims.⁵² From 1980 to 1988, the number of product liability suits had increased by 813%.⁵³ From 1974 to 1986, the average jury verdict in product liability cases had increased from \$400,000 to over \$1.8 million.⁵⁴

Dramatically increased premiums for product liability insurance are forcing some manufacturers out of business.⁵⁵ These costs significantly attenuate the viability and competitiveness of smaller and more financially fragile U.S. biotechnology companies.⁵⁶ Eighteen percent of all biotechnology companies rate the cost of product liability insurance as the most important problem facing their firms.⁵⁷ This figure will likely

Bendectin sales because of its usefulness. *Merrell-Dow senior management was repeatedly asked to testify in Bendectin cases. Id.* at 3.

50. *Id.* at 3.

51. *Id.* at 10 (citing the testimony of John B. Curcio, CEO of Mack Trucks Inc., delivered to the House Education and Labor Subcommittee on Commerce, Consumer Protection and Competitiveness, May 5, 1987).

52. INTERAGENCY TASK FORCE ON PRODUCT LIABILITY, U.S. DEP'T. OF COMMERCE, FINAL REPORT (1978); "In 1984 alone, \$9.8 million of manufacturers' litigation costs were not reimbursed by insurance, and by that time, plaintiffs had requested over \$3.5 billion in damages." Evan L. Rosenfeld, *The Strict Products Liability Crisis and Beyond: Is There Hope for an Aids Vaccine?*, 313 JURIMETRICS J. 187, 196 (1991).

53. Mary Beth Neraas, Comment, *The National Childhood Vaccine Injury Act of 1986: A Solution to the Vaccine Liability Crisis?*, 63 WASH. L. REV. 149, 151 (1988) (citing rise in suits from 24 to 150 in 1985).

54. *Id.*

55. Anita Johnson, *Products Liability "Reform": A Hazard to Consumers*, 56 N.C. L. REV. 677, 678 (1978).

56. Victor E. Schwartz, *Proposed Remedies for the American Problem: U.S. Governmental Activity*, 29 MERCER L. REV. 437, 440 (1978) [hereinafter *Proposed Remedies*] (indicating that the problem of the increased cost of products liability insurance is more severe for smaller firms). Products liability costs to industry (liability insurance and litigation costs) are recognized as one significant reason for the withdrawal of manufacturers from vaccine development. PROFILES, *supra* note 4, at 71 (citing HIGH TECH, Apr. 1983, at 64 and N.Y. TIMES, June 26, 1984, at C1).

57. G. STEVEN BURRILL & KENNETH B. LEE, BIOTECH 91: A CHANGING ENVIRONMENT 21 (1990) [hereinafter BIOTECH 91]. By company size, 4% of the large firms, 16% of mid-size firms and 20% of small firms rated product liability insurance costs as their most important concern. *Id.* By market segment, 17% of suppliers, 9% of ag-bio firms, 19% of therapeutic drug manufacturers and 22% of diagnostic manufacturers rate insurance costs as their most significant concern. *Id.* at 22.

rise to 25% during the next five years.⁵⁸ Companies are holding back product introductions, restricting the use of certain products, or even withdrawing from markets in order to avoid costs imposed by the U.S. product liability system.⁵⁹

The current product liability system in the United States restricts the ability of our biotechnology companies to compete internationally due to the added costs and misallocation of resources to which it leads. Surveys show one-half of responding chief executives believe that the product liability system significantly impacts the ability of U.S. firms, in general, to compete in world markets.⁶⁰

Foreign advantages in the development and sale of biotechnology in world markets derive, in part, from the relatively lower costs imposed on foreign producers by their respective product liability systems. Most significant among the disparities are the substantially lower insurance costs facing foreign manufacturers.⁶¹

Product liability insurance costs are substantially lower in foreign jurisdictions . . . foreign competitors often have product liability insurance costs that are 20 to 50 times lower than their U.S.-based competitors. Following the run-up in product liability insurance costs during 1985 and 1986, this competitive advantage may have increased even further.⁶²

Insurance costs are excessive in the biotechnology industry because judicial treatment of biotechnology products is uncertain and potentially very harsh. Uncertainty arises from the fact that the U.S. biotechnology industry has not yet been tested in terms of product liability lawsuits, probably due to the relatively small number of commercially viable biotechnology products marketed to date.⁶³

While courts see manufacturers as large economic institutions able to spread risks through the purchase of insurance and by passing on costs through higher prices to consumers, insurance is not always available. The viability of insurance is based on the predictability of risk, without which it becomes extremely difficult to underwrite risks. Large, unknown exposure causes insurers to withdraw entirely from the market. Thus, the judicial presumption that insurance is the "answer" is incorrect, as insurance companies are not more eager to lose their

58. *Id.* at 25.

59. Stephen D. Sugarman, *Doing Away with Tort Law*, 73 CAL. L. REV. 555, 582 (1985).

60. McGuire, *supra* note 49, at 3.

61. While it is true that foreign biotechnology producers must comply with U.S. law when marketing products in the United States, these producers do not confront the cost barriers to the development of biotechnology at home which product liability law has imposed on U.S. manufacturers. *Id.* at 4.

62. *Id.*

63. Currently, the FDA has approved only human growth hormone (treatment of dwarfism), insulin (treatment of diabetes), interferons and other lymphokines (treatment of immune deficiencies), monoclonal antibodies (treatment of cancer), and tissue plasminogen activator (treatment of myocardial infarction).

shirts to unpredictably generous injuries than are . . . manufacturers themselves.⁶⁴

Without on-point precedent applying strict product liability to biotechnology products, biotech firms must analogize from the litigation experience of related industries in order to predict judicial treatment of their products. Biotechnology manufacturers can derive no comfort from the experience of related industries, such as the vaccine industry. From the experience of the vaccine industry, which admittedly does not precisely address treatment of biotechnology products under strict liability theory,⁶⁵ it appears that biotechnology products will be subject to strict liability and its attendant repercussions.⁶⁶

Producers of vaccines have been hard hit by the unavailability of insurance coverage and increasing premiums.⁶⁷ For example, Wyeth Laboratories, a major manufacturer of whooping cough vaccine, recently withdrew from the market for that vaccine. Wyeth's withdrawal contributed to a potentially serious national DPT vaccine shortage and was precipitated by skyrocketing and unpredictable tort liability arising from lawsuits by victims of what are probably unavoidable side-effects of the vaccine.⁶⁸

Product liability costs have been cited as one of the most important reasons for the withdrawal of manufacturers from vaccine production.⁶⁹

64. Rosenfeld, *supra* note 52, at 195-96 (citing Robert G. Berger, *The Impact of Tort Law Development on Insurance: the Availability/Affordability Crisis and its Potential Solutions*, 37 AM. U. L. REV. 285, 300 (1988); *Safety and the Second Best*, *supra* note 33).

65. O'Reilly, *supra* note 1, at 474 n. 86.

66. Traynor & Cunningham, *supra* note 34 at 154:

The special relevance . . . to biotechnology is that biotech pharmaceutical companies are more likely than conventional pharmaceutical companies to confront these [cost] issues because biotechnology promises treatment of important diseases that conventional technologies have thus far not been able to address. Any technology that can produce important new therapies would confront these issues. Biotechnology just happens to be more capable of producing these therapies.

67. See, e.g., *Parke-Davis & Co. v. Stromsodt*, 411 F.2d 1390, 1392 (8th Cir. 1969) (\$500,000 award); *Tinnerholm v. Parke, Davis & Co.*, 411 F.2d 48, 50 (2d Cir. 1969) (\$651,758 award); *Sterling Drug, Inc. v. Yarrow*, 408 F.2d 978, 980 (8th Cir. 1969) (\$180,000 award). Under the Swine Flu Vaccination alone, 4,000 claims totalling \$2.95 billion have been filed. Of these 4,000 claims, \$1.91 billion have been denied, \$115 million (for a total of \$6.24 million) were settled before litigation and \$241 million (for a total of \$22 million) were settled only after litigation was initiated.

68. See *Davis v. Wyeth Labs., Inc.*, 399 F.2d 121, 129 (9th Cir. 1968); See also Stuart Taylor, *Product Liability: The New Morass*, N.Y. TIMES, Mar. 10, 1985, § 3, at 1. A report by the American Medical Association indicated that, in actuality, only 1 in 312,500 doses of whooping cough vaccine causes brain damage, 1 in 1,000,000 doses of measles vaccine causes brain damage, and 1 in 3.2 million doses of polio vaccine causes paralysis, mostly due to unvaccinated adults coming into contact with vaccinated children. *Safety and the Second Best*, *supra* note 33, at 285 n.35 (citing Philip M. Boffey, *Vaccine Liability Threatens Supplies*, N.Y. TIMES, June 26, 1984, at C1).

69. One commentator has stated:

[C]hildhood vaccine products liability cases have radically altered the vaccine market, as many manufacturers have simply been forced to discontinue production. As of 1984, only Merck,

The uncertain threat of strict liability strongly deters development of biotechnology products, like vaccines, which have a small but ineradicable probability of harm.⁷⁰

The threat of enormous and unpredictable liability continues to weigh heavily in our decisions relating to the development of new products and to improvements to existing ones. This is particularly significant in pharmaceuticals and other high-technology health-care products. In cases involving these products jurors are left free to second-guess the weight of impartial scientific opinion and the Food and Drug Administration, to find manufacturers at fault, and to award multi-million-dollar verdicts. As a result, valuable products whose potential profitability is outweighed by the risk of enormous liability never see the light of day.⁷¹

Even when manufacturers are not forced out of the industry by increasing insurance costs, continued judicial and governmental treatment may thoroughly stifle "development, mass-production, and distribution of new, safer vaccines."⁷² If the experience of the conventional vaccine industry represents an indication of the effects of strict product liability law, biotechnology producers will find it very difficult to take precautions against future liability and must continue to spend substantial resources to over-protect.⁷³

Our product liability system creates significant cost impediments to biotechnology innovation and product development. These impediments

Sharp & Dohne continued to produce the measles, mumps, and rubella (MMR) vaccine, and only Lederle and Connaught produced the polio and DPT vaccines . . . a government interagency task force estimated that one out of every six manufacturers had eliminated at least one product line as a result of liability concerns . . . [s]imilarly, in 1978, manufacturers refused to market an already developed influenza vaccine due to liability fears.

Rosenfeld, *supra* note 52, at 196-97 (citing *Vaccine Injury Compensation, 1984: Hearings on H.R. 556 Before the Subcomm. on Health and the Environment, 98th Cong., 2d Sess. 140, at 86-87 (1984)*; Richard Wilkinson, *Who Benefits from Product Tort Reform? You Do*, 60 HOSPITALS 86 (1986); Diane B. Lawrence, *Strict Liability, Computer Software, and Medicine: Public Policy at the Crossroads*, 23 TORT & INS. L.J. (1987)).

70. BIOTECH 90, *supra* note 2, at 92.

71. McGuire, *supra* note 49, at 18.

72. *Safety and the Second Best*, *supra* note 33, at 289.

There is no suggestion that Wyeth's whooping cough vaccine was more dangerous than any other United States manufacturer's. Wyeth and the others have simply encountered too much regulation in the courts. They have repeatedly been held liable for complications arising from the vaccine's use, and adequate insurance has become difficult to obtain. As a result, a manufacturer that increases national wealth ten-fold for every dollar of its product, one whose product contributes to saving hundreds of lives every year, has been forced by the tort system to abandon its product. There is every reason to fear that foolishness of this order, driven by the myopia of the judicial system, will continue.

Id.

73. McGuire, *supra* note 49, at 18.

[A] number of chief executives say that fear of liability has had a chilling effect on their companies' entire research effort While the evidence for the overall impact of liability on innovation is largely anecdotal, and there is no definitive measure of the dampening effect that fears of liability litigation may have on invention, testimony from various researchers as well as from executives supports the existence of such an impact.

Id.

derive in part from a lack of legal precedent applying strict product liability rules to biotechnology products. Increased insurance costs, decreased market share, and adverse effects on reputations for quality and reliability result from these impediments. Most importantly, capital and management resources are inefficiently diverted away from innovative research and product development projects. Biotechnology companies are, therefore, forced to utilize resources to protect against the possibility of claims, based upon fears derived from the experience of related industries such as the conventional vaccine industry, the bases of which are unforeseeable at the time of product development and sale.

B. Insurance Costs and "Temporal Stress"

Product liability insurance costs create barriers for U.S. biotechnology producers at the early stages of product development. The timing of these costs places a "temporal stress" on domestic biotechnology producers not experienced by foreign manufacturers and hinders entry into foreign and domestic markets thereby creating a limited market share and inability to spread costs.⁷⁴ Similar barriers do not confront foreign competitors.

As a result of significantly higher up-front insurance costs, U.S. producers of biotechnology products are at a distinct disadvantage in terms of the penetration of international markets. U.S. firms that may eventually seek to enter foreign product markets must still bear these up-front costs when manufacturing products domestically and face this additional layer of costs, which is not imposed upon foreign firms until much later in the commercialization process if and when they market their products in the U.S., before marketing can begin. Because most U.S. biotechnology companies market products primarily in domestic markets and have domestic principal places of business, they are subject to suit, and must therefore insure against the risk of suit, under U.S. product liability law. Although it appears that foreign manufacturers should be affected by the high costs of strict product liability which accompany the sale of products in the U.S. market, and its attendant litigation risks, and that U.S. biotechnology firms should expect to benefit from the reduced costs associated with the sale of products abroad, thus producing no net disadvantage to U.S. firms, this result is illusory. Foreign firms actually derive a significant competitive advantage over their U.S. counterparts due to the timing of the imposition of product liability costs with respect to firm maturity and financial viability.

U.S. biotechnology producers face the exorbitant costs of strict product liability now, at a time when most of these manufacturers are still considered to be small, financially immature, start-up companies without

74. See *infra* text accompanying notes 75-78.

established consumer bases. As a result, U.S. biotechnology manufacturers are precluded from developing *domestically*, the size and financial strength necessary to export products into foreign markets with more favorable and less costly product liability systems. By contrast, foreign biotechnology products are typically manufactured by larger, financially mature pharmaceutical firms with already-established international consumer bases that have developed under less costly domestic product liability systems. In short, when foreign firms seek to export biotechnology products to the U.S. market, they face the costs of U.S. strict product liability law from established positions characterized by the ability to meet these costs through cost-spreading and the reduction of already substantial profit margins.

In order to meet the increased direct and indirect costs associated with product liability, firms generally: (1) pass the costs on to consumers; (2) absorb the costs and reduce gross profit margins; or (3) choose a mix of consumer price increases and cost absorption.⁷⁵ However, most biotechnology firms cannot respond to increasing costs in this manner. Although long-term market potential for biotechnology products in all market segments is good,⁷⁶ small and mid-size biotechnology companies with limited market share cannot pass costs on to consumers in the short run by raising prices, or effectively absorb costs. Such firms risk short-term financial hardship as a result.⁷⁷ This is largely because (1) limited market share makes it impossible to pass costs on to a consumer base, and (2) absorbing the costs would reduce income statement profit margins, where they exist, which are used as a sign of fiscal health by firms seeking to raise growth capital. Moreover, reducing profit margins by absorbing the increased costs of product liability is not even feasible for most biotechnology companies, which are struggling to become profitable.⁷⁸ Most biotechnology companies cannot reduce profit margins to absorb product liability costs because they have yet to build such margins.⁷⁹

That most U.S. biotechnology firms must confront the costs of strict product liability at a time early in their development as financially viable enterprises is a significant difference between U.S. and foreign biotechnology manufacturers. This temporal distinction between the point in time, in terms of company development and financial viability,

75. McGuire, *supra* note 49, at 10.

76. BIOTECH 91, *supra* note 57, at 31.

77. *Proposed Remedies*, *supra* note 56, at 440.

78. In 1990, only 23% of all biotechnology companies were profitable. BIOTECH 91, *supra* note 57, at 78 (indicating that 31% of large firms, 28% of mid-size firms and 8% of small firms were profitable in 1990). For 1991, only 21% of all biotechnology firms were expected to be profitable. *Id.* (indicating that 23% of large firms, 24% of mid-size firms and 10% of small firms expected to be profitable in 1991).

79. Craig Torres, *Biotech Stocks are Bouncing Back*, WALL ST. J., July 20, 1992, at C1.

that product liability costs are imposed upon U.S. biotechnology firms and the point at which these costs are imposed upon foreign manufacturers is one major factor underlying the declining competitive advantage of U.S. biotechnology firms in relation to their foreign counterparts; and explains the illusion of no net disadvantage to U.S. biotechnology firms, mentioned above, resulting from the seeming offset of high domestic product liability costs and low foreign product liability costs. Changes must be made in the application of strict liability to biotechnology products in order to alleviate this early "temporal stress" upon U.S. biotechnology producers

IV. CONCLUSION

When one considers (1) the excessive costs imposed upon manufacturers, (2) the lack of legal precedent applying product liability law to biotechnology products and its resultant uncertainties, (3) the experience of the vaccine industry, and (4) the inability of biotechnology producers to meet product liability costs through cost spreading and/or the reduction of profit margins, the public policy goals of strict product liability are not served with respect to biotechnology.

Although the stated policy goals of strict product liability are the development of safer products and the provision of manufacturer-based social insurance, the excessive costs associated with strict product liability neither provide biotechnology manufacturers with incentives to develop safer products nor induce manufacturers to provide social insurance against the potential for harm from product use. Strict liability either impedes new product development or forces drastic price increases. Since the business of biotechnology firms is new product development—specifically, the development of products which are more effective and potentially safer than conventionally produced products—biotechnology manufacturers are placed in a "catch-22" by our system of strict product liability. As shown above, the excessive costs of a system designed to stimulate safety actually prohibit the development of new products which are potentially safer than their conventional counterparts. In essence, this is a barrier to entry. Further, most biotechnology firms do not yet have consumer bases or profit margins which make effective cost-spreading possible.⁸⁰ As a result, rather than achieving safer products and ensuring compensation for injured parties via cost-spreading, strict liability leaves many biotechnology firms unable to accomplish either

80. Other manufacturing industries, comprised of firms which do not have large consumer bases, may also be unable to effectively spread the costs of strict liability. Viable arguments against the continued application of strict liability to firms within other such industries, showing that well-defined policies underlying strict liability are not applicable to such industries, can be posed. This comment merely opposes application of strict liability to biotechnology firms.

objective.⁸¹ Because socially valuable products are lost to the market, the primary rationales for imposing strict liability break down with respect to biotechnology.

However, while many commentators and legislators now call for a drastic overhaul of the entire U.S. tort system, this comment espouses no such measures. Rather, this comment recommends industry-specific change in the application of U.S. product liability law that would improve the environment for the commercialization of biotechnology and help to restore the United States' competitive advantage in this critical industry.

First, the financial and competitive success of our biotechnology industry would be markedly enhanced through the discontinued use of the theory of strict product liability, as applied to causes of action involving biotechnology products, and the institution of a biotechnology-specific negligence standard. The establishment of a biotechnology-specific negligence standard in U.S. product liability law would provide a measurably greater level of protection for domestic biotechnology firms. Such a standard would have the effect of alleviating liability risks and the direct and indirect costs stemming from liability risks because, under this fault-based standard, liability would be significantly more difficult to establish than under strict liability. While any prediction as to whether such a proposal would find favor with legislators would be highly speculative, given the significant exposure that international competitiveness and tort reform has received recently, a statutory "exception" from strict tort liability for this nation's biotechnology producers seems to be a realistic proposal from both an economic and a political perspective.

Alternatively, a strengthening of the state-of-the-art defense and increased application of the "unavoidably unsafe" product defense⁸² to strict liability would provide biotechnology manufacturers with a measure of protection against the harsh results of strict liability. These defenses are necessary if biotechnology firms are to find any sort of relief from the burdens of liability fears and the costs related to protecting against the possibility of strict liability. In fact, the use of the unavoidably unsafe product defense may effectively reinstate a negligence standard.⁸³

81. See *Products Liability Reform*, *supra* note 47, at 370-74.

82. In *Brown v. Superior Court*, 751 P.2d 470, 477 (Cal. 1988), the California Supreme Court held that "... a drug manufacturer's liability for a defectively designed drug should not be measured by the standards of strict liability ... because of the public interest in the development, availability, and reasonable price of drugs, the appropriate test for determining responsibility is the test stated in comment k."

83. "[t]here is a general consensus that, although it [comment k] purports to explain the strict liability doctrine, in fact the principle it states is based on negligence." *Id.* at 475. Although *Brown* did not involve biotechnology products, Traynor and Cunningham suggest that the policy underlying the decision applies to biotechnology products as well as to conventional drugs. Traynor & Cunningham, *supra* note 34, at 167-72 (citing the *Brown* court's rejection of the risk-benefit analysis, case-by-case judicial determinations

For individual biotechnology producers and the U.S. biotechnology industry as a whole, the effect of such reforms will allow: (1) reduced liability-related direct and indirect costs due to diminished liability fears during innovation and development, (2) relatively uninhibited innovation and product development due to enhanced predictability in terms of the effects of product liability law on new and innovative products, and (3) ultimately, a substantially increased ability of U.S. biotechnology firms to compete in world markets due the diminution of the temporal stress created by excessive up-front costs. Until industry-specific reforms are made in U.S. product liability law in a conscious attempt to enhance the U.S. competitive advantage in biotechnology, product liability will continue to "loom as a disincentive of the innovation . . . which biotechnology's methods have promised to consumers."⁸⁴

and the consumer expectation test—all of which are inherent to strict product liability; and calling for the application of the *Brown* standard to biotechnology products).

84. O'Reilly, *supra* note 1, at 486.

CASE UPDATE

The *Case Update* is a survey of recent state and federal court decisions that significantly relate to high technology. Cases are included either because they introduce new substantive law in areas which are important to a technology practice, or because they illustrate a new application of other areas of law to technology. The cases are organized below under appropriate headings. As many of the cases are quite complex or ongoing, the decisions reported herein are not necessarily final dispositions. This issue's *Case Update* covers cases decided from January through August, 1991.

Table of Contents

CIVIL PROCEDURE	383
COPYRIGHT	385
EVIDENCE	386
MEDICINE	387
PATENT.....	390
TRADE/ANTITRUST.....	393

CIVIL PROCEDURE

Amendment to § 1391(c) of the Venue Chapter Redefines the Term "Resides" in § 1400(b); Venue is Proper in Any Judicial District Where a Corporation is Subject to Personal Jurisdiction.

VE Holding Corp. v. Johnson Gas Appliance Co., 917 F.2d 1574 (Fed. Cir. 1990), *cert. denied*, 111 S. Ct. 1315 (1991).

Plaintiff VE Holding filed a civil action for patent infringement in the District Court of the Northern District of California. Defendant Johnson Gas Appliance moved to dismiss for improper venue, because it was an Iowa corporation with no regular and established place of business in the Northern District of California. Plaintiff argued that the 1988 amendment to 28 U.S.C. § 1391(c) redefined the term "resides" as it is used in 28 U.S.C. § 1400 (b). Under the new definition, venue for a corporation in a patent infringement action is proper in any judicial district where it is subject to personal jurisdiction. The district court rejected this argument and granted the defendant's motion to dismiss.

The Court of Appeals for the Federal Circuit reversed, holding that Congress by its amendment of § 1391(c) did mean to change the definition of the term "resides" as it is used in § 1400(b). The court came to this conclusion even though Congress had not given any clear

indication of whether it intended to change the scope of venue in § 1400(b). The court found support for its holding in the first sentence of amended § 1391(c), which states “[f]or purposes of venue under this chapter” a corporation resides in any judicial district where it is subject to personal jurisdiction. The phrase “this chapter” refers to Chapter 87 of title 28 that encompasses §§ 1391-1412, and therefore includes § 1400(b). Thus, the court argued that Congress was aware that the amendment of § 1391(c) would affect § 1400(b).

Additionally, the appellate court argued that there was no reason for venue in patent infringement actions to be different from venue in other civil cases. The court rejected the defendant’s use of *Fourco Glass Co. v. Transmirra Prods. Corp.*, 353 U.S. 222 (1957) which held that the meaning of the terms used in § 1400(b) were not to be altered or supplemented by other provisions found in the venue statutes. The court argued that *Fourco Glass* was no longer applicable because it was decided before the 1988 amendment to § 1391(c). The Supreme Court denied certiorari.

FDA Regulation That Allowed Parties to Withdraw Information that was Not Exempt From Disclosure Under FOIA Held Invalid.

Teich v. Food and Drug Admin., 751 F. Supp. 243 (D.D.C. 1990).

Plaintiff Teich made a Freedom of Information Act (“FOIA”) request for information on silicone gel breast implants submitted to the Food and Drug Administration (“FDA”) by Dow-Corning. The requested information consisted of animal studies and a summary of consumer complaints. Dow-Corning contended that the FDA was not allowed to disclose the information because it was submitted to the FDA pursuant to the agency’s presubmission review regulation, 21 C.F.R. § 20.44.

The regulation provides that information submitted to the FDA is to be held “confidentially and separately,” and specifically states the information “is not received as part of FDA’s files.” If the FDA concludes that some or all of the information cannot be protected under one of the exemptions of the FOIA, the party can withdraw the information. If withdrawn, no copies or summaries of the information are retained by the FDA.

The district court rejected Dow-Corning’s reliance on the FDA’s presubmission review regulation, holding the regulation was invalid because it violated the FOIA. The FOIA requires disclosure of records when properly requested, unless they are specifically exempt under one of the nine FOIA exemptions. Agencies cannot construe the language of the FOIA or pass regulations to frustrate the goal of providing public access to all nonexempt information received by an agency. The court maintained that invalidating the FDA’s regulation may impair voluntary

cooperation, but the FDA can and should use compulsion to obtain necessary information.

COPYRIGHTS

Course Readers No Longer Considered Fair Use.

Basic Books, Inc. v. Kinko's Graphics Corp. 758 F. Supp. 1522 (S.D.N.Y. 1991).

Various book publishers brought suit alleging copyright infringement against Kinko's, a national chain of photocopying centers that was sold college "course anthologies" or "course readers" to students based on lists of copyrighted sources from professors. In defense, Kinko's claimed fair use under the 1976 Copyright Act, 17 U.S.C. §§ 101-119.

The district court analyzed four factors:

1. *The purpose and character of the use.*

Kinko's argued that its selling of anthologies was educational and thus a fair use. But the court held that Kinko's exploited the copyrighted material without paying the customary price of permission from the publishers. The court stated that financial gain did not preclude Kinko's from establishing fair use, but that here Kinko's intended to supplant the copyright holders' commercially valuable rights.

2. *The nature of the copyrighted work.*

Kinko's, in its favor, copied factual works which have greater public value than non-factual works and need less copyright protection.

3. *The amount and substantiality of the portion used.*

The court inferred that the excerpts put into the course readers were critical parts of the copied works since the fact that the professors had them included indicated they were the most important parts. This inference, combined with the fact the excerpts were often entire chapters, led the court to state that the amount copied was "grossly out of line with accepted fair use principles." 758 F. Supp. at 1534.

4. *The effect of the use upon the potential market.*

This factor must be weighed most heavily. A fair use defense can be negated by showing that if the use became widespread, it would adversely affect the potential market for the copyrighted work. Here, Kinko's admitted to having 200 stores nationwide that serve hundreds of colleges and thousands of students, thus adversely affecting the potential market for the works. Further, the students' purchase of the course readers obviates their need to purchase the full text, directly affecting the income to the copyright holders.

Since three out of the four factors, including the most important one, weighed against Kinko's, the court held for the publishers.

EVIDENCE

FBI DNA Profiling Results Held Admissible Under Relevancy Test.

United States v. Jakobetz 747 F. Supp. 250 (D. Vt. 1990).

The United States District Court for the District of Vermont held that DNA profiling evidence was admissible to prove the identity of a defendant charged with kidnapping. Following the relevancy test advanced in *United States v. Williams*, 583 F.2d 1194 (2d Cir.), cert. denied, 439 U.S. 1117 (1978), the court concluded that DNA profiling was a reliable scientific technique that was properly applied and that the probative value outweighed the risk of prejudice.

The court found the testimony indicated the techniques were properly applied in this case. Furthermore, FBI and other expert witnesses convinced the court that there were sufficient fail-safe measures to minimize the possibility of a false positive and to underestimate the significance of a match, thus resolving doubt in the benefit of defendant. Sample degradation or failure to adhere to protocols would result in inconclusive results or a false negative. Protocols were designed to disallow marginal data. The statistical methods used by the FBI were found to be overly stringent and therefore would likely account for racial substructures not otherwise accommodated in the data.

Inadequate Statistical Support Blocks DNA Profiling Evidence.

Commonwealth v. Curnin, 565 N.E.2d 440 (Mass. 1991).

Defendant, convicted of the rape of a child and other offenses, appealed on grounds that the admitted DNA profiling evidence was prejudicial and therefore constituted reversible error. The Massachusetts Supreme Judicial Court found that the prosecution did not introduce sufficient evidence to support the testing company's conclusion that defendant's DNA profile occurs one in 59 million times for his racial group. Indeed, the prosecution's expert witness admitted some of the assumptions made to determine population statistics were subject to uncertainty. The defense emphasized the possibility of racial subgroupings not accounted for by the testing company. The court concluded there was no demonstrated general acceptance of, or inherent rationality in, the methods used by the testing company to determine the chance of a matching profile, and therefore the evidence was improperly admitted.

MEDICINE

Administration of Non-Approved Drugs to Active Duty Military Personnel Ruled Military Decision Not Subject to Judicial Review.

Doe. v. Sullivan, 938 F.2d 1370 (D.C. Cir. 1991).

Plaintiffs brought suit to enjoin the Department of Defense from administering drugs, which had not been approved by the Food and Drug Administration ("FDA") for human use, to military personnel in Saudi Arabia and Iraq to protect them from chemical and biological warfare agents. The District Court for the District of Columbia dismissed the suit.

On appeal, the D.C. Circuit Court of Appeals held that the FDA rule, which permitted exemptions for the informed consent requirements normally in effect when administering non-approved drugs in specific situations involving combat, was within the agency's discretion. The Court also held that a decision to use non-approved drugs in time of war was a non-justiciable military decision.

Drug Manufacturers Exempt From Strict Liability for Design Defects in Utah.

Grundberg v. UpJohn Co., 813 P.2d 89 (Utah 1991).

Plaintiff filed a civil action against UpJohn Co. in U.S. District Court. Plaintiff had killed her mother and attributed it to UpJohn's failure to adequately warn her about the drug Halcion's side effects and a defect in its design. UpJohn moved for summary judgment, arguing that Halcion falls under the category "unavoidably unsafe" and thus Upjohn cannot be held strictly liable.

The case was sent to the Supreme Court of Utah to determine whether Utah adhered to the "unavoidably unsafe products" exception of strict products liability from the Restatement (Second) of Torts ("comment k").

The Utah Supreme Court adhered to comment k, holding that "unavoidably unsafe" drugs are immune from strict liability claims for design defects. The court also held that all prescription drugs approved by the Food and Drug Administration are "unavoidably unsafe" in design. The court based this decision on the risk of side effects inherent in all drugs.

The supreme court cited the public policy goal of available affordable drugs and reasoned that holding manufacturers liable for strict liability for design defects would make drug manufacturers hesitant to introduce new products.

Manufacturer of HIV-Contaminated Blood Product Not Strictly Liable for Recipient's Resulting AIDS.

Rogers v. Miles Lab., 802 P.2d 1346 (Wash. 1991).

A U.S. District Court in Washington certified to the state Supreme Court the question of whether strict liability for blood products applied to manufacturers not covered by the Washington blood shield statute. The statute grants immunity from civil liability, but is limited to manufacturers who do not compensate donors.

The supreme court held that absence of statutory immunity does not impose strict liability per se, but liability exists in accordance with the common law. Applying comment k of the Restatement (Second) of Torts which concerns unavoidably unsafe products, the court limited manufacturer liability to cases of negligence or failure to provide adequate warning.

Modified Market Share Alternate Theory of Liability for DES Claims Adopted by Florida.

Conley v. Boyle Drug Co., 570 So. 2d 275, (Fla. 1990).

Plaintiff had been exposed to diethylstilbestrol ("DES") in utero. At the age of twenty-one, she underwent a hysterectomy for cancer of the uterus. She brought suit against eleven defendants who manufactured DES, alleging a link between her cancer and her mother's ingestion of the drug.

On appeal, the Supreme Court of Florida remanded, holding that a modified market share alternate theory of liability should be applied to DES cases. The theory 1) allows defendants to exculpate themselves by demonstrating that they were not members of the market at the time of the drug's manufacture, 2) requires the market to be as narrowly drawn as the evidence will permit, and 3) does not permit joint and several liability. The Court also held that the defendants over whom personal jurisdiction could not be established should be dismissed from the suit.

The Validity and Necessity of a Non-Standard Diagnostic Procedure (Thermography) Must Be Determined In View of the Medical Condition of Each Patient.

Sabatier v. State Farm Mutual Life Ins. Co., 592 A.2d 1098 (Md. Ct. App. 1991).

Plaintiff, a physician, sued for fees allegedly payable for his performance of thermography while caring for the defendant's insureds. The trial court ruled that the *Frye-Reed* test for admissibility of scientific evidence in a criminal trial, which requires "the underlying principle to have gained general acceptance in the particular field in which it

belongs," should apply. On that basis, the trial court found for the insurer.

The Maryland Court of Appeals remanded, ruling that this is too stringent a standard where the statute only requires that medical care provided by licensed physician be "reasonable" and "necessary." Instead of determining if thermography is fundamentally and generally valid, the trial court should have determined whether it is necessary in view of the medical condition of the individuals for whom reimbursement is at issue.

Third Generation DES Liability Not Allowed Under New York Law.

Enright by Enright v. Eli Lilly & Co., 570 N.E.2d 198 (N.Y. 1991).

Plaintiffs Karen Enright, an infant with birth defects, and her parents brought an action to recover damages from manufacturers of diethylstilbestrol ("DES"). Plaintiffs claimed that the Karen's injuries were caused by her premature birth, which resulted from damage to her mother's reproductive system caused by the mother's in utero exposure to DES. Defendants moved for summary judgment contending that claims of a pre-conception tort presented no cognizable cause of action.

The trial court granted the defendants' motion, relying principally on *Albala v. City of New York*, 429 N.E.2d 786 (N.Y. 1981). The *Albala* court held that there was no cause of action for a child deformed due to an injury to the mother's uterus caused by medical malpractice during surgery performed four years before the child's birth.

On appeal, the appellate division agreed that *Albala* foreclosed a cause of action for a pre-conception tort based upon negligence. However, the court held that a strict products liability cause of action was justified because of the policy concerns surrounding DES cases. The court of appeals reversed, holding that strict products liability of manufacturers of DES does not extend to third generation plaintiffs, but was limited to those who ingested the drug or were exposed to it in utero.

The court stated the public interest in providing a remedy for third generation plaintiffs injured by DES was no stronger than the interest in providing a remedy for those injured by medical malpractice, as in *Albala*. The court also stated that limiting liability would not impair any of the deterrence purposes of strict products liability. Thus, it found no reason why a cause of action should be extended in DES cases when not available in other contexts.

PATENTS

Best Mode Enablement of Genetically-Engineered Subject Matter Does Not Require a Deposit of the Material.

Amgen v. Chugai Pharmaceutical Co., 927 F.2d 1200 (Fed. Cir. 1991).

Chugai, a licensee of Genetics Institute, appealed from a determination by the district court that Amgen's patent for the human hormone erythropoietin ("EPO") was not invalid under 35 U.S.C. § 112 (relating to enablement of the best mode of practice) or 35 U.S.C. § 102(g) (relating to prior invention).

The Court of Appeals for the Federal Circuit answered a question of first impression regarding the best mode requirement for genetically-engineered material. As long as the best mode has been disclosed and adequately enabled, failure to deposit biological material representative of the best mode will not invalidate the patent under 35 U.S.C. § 112. The court agreed with the district court's finding that there was sufficient information for one skilled in the art to prepare the patent material from known materials and the procedures described in the specification.

The court also held that when the DNA sequence of a gene is unknown, conception does not occur until reduction to practice. Amgen's patent was not invalidated by the work of Dr. Fritsch of Genetics Institute toward isolating the gene for the human hormone erythropoietin and possible means for its isolation. Conception did not occur because he did not know the sequence of the gene and thus could not distinguish it from other materials, nor did he know if his method for obtaining it was viable.

Drawings Alone May Be Sufficient to Meet the "Written Description" Requirement of 35 U.S.C. § 112.

Vas-Cath Inc. v. Mahurkar, 935 F.2d 1555 (Fed. Cir. 1991).

Plaintiff Vas-Cath filed a suit seeking declaratory judgment that its dual-lumen hemodialysis catheters did not infringe defendant's patents. In March, 1982, the defendant filed a U.S. design application, no. 356,081 ('081), which was later abandoned. At that time, the defendant also filed a Canadian Industrial Design application. This application contained the same drawings as the '081 design application plus some additional textual description. A Canadian patent issued on this application in August, 1982. More than one year later, defendant filed two U.S. utility patent applications, claiming the benefit of the filing date of the '081 design application. Patents nos. 4,568,329 ('329) and 4,692,141 ('141) issued in 1986 and 1987, respectively.

Plaintiff claimed that the '329 and '141 patents were not entitled to the filing date of the '081 design application because the drawings in the

'081 application failed to provide an adequate "written description" of the claimed invention as required by 35 U.S.C. § 112. Therefore, plaintiff argued that the '329 and '141 patents were anticipated by the Canadian patent and were thus invalid under 35 U.S.C. § 102(b). The question before the district court was whether the drawings in the '081 design application by themselves met the "written description" requirement of § 112. The district court held that the drawings alone were not enough to satisfy the "written description" requirement. Thus, it ruled that both of the defendant's patents were invalid.

The Court of Appeals for the Federal Circuit ("CAFC") reversed, holding that drawings alone *may* be sufficient to meet the "written description" requirement of § 112. To satisfy the written description requirement "the applicant must convey with reasonable clarity to those skilled in the art that, as of the filing date they were in possession of the invention." 935 F.2d at 1563. The CAFC stated that in some situations drawings alone could be sufficient to meet this standard. The court remanded the case to the district court to decide whether the drawings of the '081 design application satisfied the written description requirement for each of the claims in the defendant's patents.

Licensee of a Federally-Owned Patent Can Maintain an Infringement Action Without the United States as a Party.

Nutrition 21 v. United States, 930 F.2d 862 (Fed. Cir. 1991).

Plaintiff Nutrition 21, an exclusive licensee of a federally-owned patent, invited the United States to join its planned infringement suit against Thorne Research, Inc. When the United States refused, Nutrition 21 filed suit against Thorne and named the United States as a party defendant pursuant to Rule 19(a) of the Federal Rules of Civil Procedure. The United States moved to be dismissed from the case under Rule 19(b), arguing that Nutrition 21 could maintain the suit without its participation. Nutrition 21 opposed this motion fearing their infringement action might be dismissed on appeal for lack of an indispensable party. The district court denied the United States' motion and realigned the United States as an involuntary plaintiff.

The Court of Appeals for the Federal Circuit ("CAFC") reversed the district court's order, holding the words "right of enforcement" in 35 U.S.C. § 207(a)(2) authorized federal agencies to grant enforcement rights to licensees. Furthermore, the court held that the United States' authority to grant enforcement rights included the authority to grant licensees the right to maintain actions without the United States as a party. Applying its holding, the court ruled that Nutrition 21 could maintain its action without the United States because the license agreement between Nutrition 21 and the United States provided the "LICENSEE is

empowered . . . to bring suit in its own name, at its own expense, and on its own behalf for infringement" 930 F.2d at 864.

Federal Circuit Rejects Challenge to PTO Rule on Patenting Life.

Animal Legal Defense Fund v. Quigg, 932 F.2d 920 (Fed. Cir. 1991).

Plaintiffs, assorted individual farmers and animal rights organizations, brought a challenge to a rule promulgated by the Patent and Trademark Office ("PTO") confirming the patentability of multicellular living organisms and sought to enjoin the PTO from approving or issuing any patents under the rule. Plaintiffs alleged that the Commissioner of Patents had violated the Administrative Procedure Act ("APA") by promulgating the rule without any period for public notice and comment, and had exceeded his authority under the Patent Act.

The rule in question, *see* 1077 OFF. GAZ. PAT. OFFICE 23 (Apr. 21, 1987), interpreted the decision of the Supreme Court in *Diamond v. Chakrabarty*, 477 U.S. 303 (1980) (live, non-naturally occurring microorganisms are patentable subject matter under 35 U.S.C. § 101), to extend the scope of patentable subject matter under 35 U.S.C. § 101 to include man-made multicellular living organisms but not human or naturally occurring organisms. The Commissioner therefore proclaimed the PTO's intention to examine such claims and stated they would not be rejected as nonstatutory subject matter.

The District Court dismissed the suit and the Court of Appeals for the Federal Circuit ("CAFC") affirmed. A five-judge panel held that the plaintiffs lacked standing to sue and that the rule was "interpretative" of prior decisional law, and therefore was not subject to the APA's notice and comment requirement, 5 U.S.C. § 533(b)(A). The CAFC noted the rule was simply an agency interpretation of the *Chakrabarty* decision and thus fit into the exception in § 553(b)(A), so the plaintiffs could not allege injury based upon the PTO's failure to allow for notice and comment.

The CAFC was also unconvinced by the plaintiffs' arguments that they were injured by the rule because of an increase in cruelty to animals which plaintiffs alleged would follow the issuance of "animal" patents. Here, the CAFC found no grounds for finding that the PTO rule caused such injury to the plaintiffs, even if the injury was real, because there was no indication that the issuance of such patents would encourage researchers to violate existing animal protection laws.

TRADE/ANTITRUST

Software Considered Goods Under U.C.C.

Advent Systems Ltd. v. Unisys Corp., 925 F.2d 670 (3d Cir. 1991).

Unisys appealed from a judgment of breach of contract with Advent Systems. Unisys contended on appeal that its agreement with Advent for special software was for goods and the Uniform Commercial Code ("UCC") provisions for the statute of frauds applied, making the agreement unenforceable.

The Court of Appeals for the Third Circuit, applying Pennsylvania's traditionally broad interpretation of goods under its UCC law, found that while the creation of software was intellectual property, once it is put on media such as magnetic disc, it can be widely distributed. Since a good is anything which is movable at the time of the identification for sale, the court held that software becomes a good when it is put on a disc because it is identified for sale, tangible, moveable, and available in the marketplace.

The court analogized software to a musical performance which is intellectual property but which becomes a good when it is recorded on a compact disc. Further, the UCC applied despite the fact that the software was specially designed to convert engineering documents into a database. The UCC contemplated specially manufactured goods and thus specialized software was included.

