

PATENTS AND COPYRIGHTS: DO THE BENEFITS EXCEED THE COSTS?

Julio H. Cole*

It seems to me highly desirable that liberals shall strongly disagree on these topics, the more the better. What is needed more than anything else is that these questions of a policy for a competitive order should once again become live issues which are being discussed publicly; and we shall have made an important contribution if we succeed in directing interest to them.

– F.A. Hayek¹

The greatest constraint on your future liberties may come not from government but from corporate legal departments laboring to protect by force what can no longer be protected by practical efficiency or general social consent.

– John Perry Barlow²

Patents and copyrights are forms of immaterial “property” that grant to their owners exclusive control over the production and sale of a specified product—a literary or artistic work in the case of copyrights, an invention or productive process in the case of patents. Though these concepts are subsumed under the broader heading of “intellectual property,” they are not completely analogous and cannot always

*Professor of Economics, Universidad Francisco Marroquín, Guatemala City. Contact him at jhcole@ufm.edu.gt. An earlier version of this paper was presented at the General Meeting of the Mont Pelerin Society (Santiago, Chile, November 16, 2000).

¹F.A. Hayek, “‘Free’ Enterprise and Competitive Order,” in *Individualism and Economic Order* (Chicago: University of Chicago Press, 1948), p. 112.

²John Perry Barlow, “The Economy of Ideas: A Framework for Patents and Copyrights in the Digital Age (Everything You Know about Intellectual Property is Wrong),” *Wired* 2.03 (March 1994), p. 3.

be justified with the same arguments. The term “intellectual property” also applies to such entirely different concepts as trademarks. Unfortunately, in recent discussions of these topics, the concept of intellectual property has often been used generically, thereby blurring some important practical distinctions.

A trademark is a sign or label that distinguishes a given manufacturer’s products from those of others. The trademark, once registered, grants its owner exclusive control over its use. This guarantees the source of the product, thus allowing consumers to buy with greater certainty (since the owners of well-known trademarks have incentives to protect their value by maintaining quality standards), and protecting manufacturers against forgeries (i.e., competitors trying to sell their own products by taking advantage of the good reputation of well-known trademarks). A trademark identifies the source of a product, but does not prohibit the manufacture of similar (or even identical) products, and therefore does not have the monopolistic character of the patent.³

The existence of a patent, on the other hand, prevents others from producing and selling the patented product. For this reason, many people who accept the protection of trademarks as perfectly legitimate and of vital importance in a modern capitalist economy nonetheless oppose patents on the grounds that they constitute monopoly privileges granted by government.

The purposes of this paper are to examine patents and copyrights in some detail, investigate their economic effects, and determine the extent to which they are compatible with the principles of a free society. This paper approaches the problem from a cost-benefit, utilitarian perspective, and will therefore deal only indirectly with arguments premised on rights-based considerations.⁴

³If I decide to manufacture and sell Chivas Regal whiskey, I would be breaking the law. However, I can manufacture and sell whiskey provided that I do not use someone else’s trademark.

⁴An excellent discussion of intellectual property issues from a rights-based, non-utilitarian perspective is that by N. Stephan Kinsella, “Against Intellectual Property,” *Journal of Libertarian Studies* 15, no. 2 (Spring 2001), pp. 1–54. See also Tom G. Palmer, “Are Patents and Copyrights Morally Justified?” *Harvard Journal of Law and Public Policy* 13 (Summer 1990), pp. 817–65; and Tom G. Palmer, “Intellectual Property: A Non-Posnerian Law-and-Economics Approach,” *Hamline Law Review* 12 (Spring 1989), pp. 261–304.

PATENTS AS PROPERTY

Although the term “intellectual property” is commonly used in the legal field, it is rather problematic in economics, since it is difficult to justify this type of property right with the same arguments that are used to justify private property in tangible goods.

According to the economic theory of property (following David Hume), society benefits from the delimitation and protection of private property rights because goods are scarce. There is no point in defining property rights over abundant goods. On the other hand, when goods are scarce and property is communal, they are not used efficiently. Private property guarantees that scarce goods will be put to their most efficient and productive uses.

It is difficult to justify intellectual property rights under this concept of property, since these rights do not arise from the scarcity of the appropriated objects; rather, their purpose is to *create* scarcity, thereby generating a monopoly rent for holders of such rights. In such case, the law does not protect property over a scarce good, since the law itself created the scarcity, and this artificial scarcity generates the monopoly rents that confer value upon those rights. The big difference between patents and copyrights on the one hand, and tangible goods on the other, is that the latter will be scarce even if there are no well-defined property rights; in the case of patents and copyrights, the scarcity arises only after the property right is defined.⁵

Although defenders of patents often try to deny that patents constitute monopoly privileges by arguing that the term “monopoly” is inapplicable,⁶ such an argument is merely semantic. There is no contradiction or incompatibility between the notions of “patent as property” and “patent as monopoly,” and, in practice, they are closely related, since the monopolistic nature of patents is precisely what confers economic value upon them. According to Sigmund Timberg:

⁵In this century, perhaps the clearest statement of this argument comes from a 1934 paper by English economist Arnold Plant, “The Economic Theory Concerning Patents for Inventions,” in *Selected Economic Essays and Addresses* (London: Routledge & Kegan Paul, 1974), pp. 35–56. On Plant’s economic thought, see R.H. Coase, “Professor Sir Arnold Plant: His Ideas and Influence,” in *The Unfinished Agenda: Essays on the Political Economy of Government Policy in Honour of Arthur Seldon*, ed. M.J. Anderson (London: Institute of Economic Affairs, 1986), pp. 81–90.

⁶See, for instance, Michael Novak, *The Fire of Invention* (Lanham, Maryland: Rowman & Littlefield, 1997), pp. 69, 144.

A patent serves a fourfold purpose. Viewed morally and socially, and perhaps psychologically, it is a reward for unusual inventive ability. From the standpoint of economics and commercial law, it is a property right. Neither of these purposes—the reward to the inventor or the creation of a property right—have any restrictive economic effect in and of themselves. But then we come to the patent's third phase—from the vantage point of the state, a patent is a grant of a monopoly to the inventor based on the public interest in promoting the growth and diffusion of technology. *It is the monopoly grant that makes tangible the inventor's reward and converts a formal into a realistic property right.* Moreover, the monopoly grant has a *prima facie* impact on trade, because the monopoly conferred by the patent is the right to exclude others from manufacturing or selling the patented product, or from practicing the patented process.⁷

Hayek argues:

The problem of the prevention of monopoly and the preservation of competition is raised much more acutely in certain other fields to which the concept of property has been extended only in recent times. I am thinking here of the extension of the concept of property to such rights and privileges as patents for inventions, copyright, trade-marks, and the like. It seems to me beyond doubt that in these fields, a slavish application of the concept of property as it has been developed for material things has done a great deal to foster the growth of monopoly, and that here drastic reforms may be required if competition is to be made to work.

In the field of industrial patents in particular, we shall have to seriously examine whether the award of a monopoly privilege is really the most appropriate and effective form of reward for the kind of risk-bearing which investment in scientific research involves. Patents, in particular, are specially interesting from our point of view, because they provide so clear an illustration of how it is necessary in all instances not to apply a ready-made formula, but to go back to the rationale of the market system and to decide for each class what the precise rights are to be which the

⁷Sigmund Timberg, "The Effect of the European Common Market on Anti-Trust and Patent Policy," in *Legal Problems in International Trade and Investment*, ed. Crawford Shaw (Dobbs Ferry, N.Y.: Oceana Publications, 1962), p. 72, emphasis added.

Julio Cole – Patents and Copyrights

government ought to protect. This is a task at least as much for economists as for lawyers.

Perhaps it is not a waste of your time if I illustrate what I have in mind by quoting a rather well-known decision in which an American judge argued that “as to the suggestion that competitors were excluded from the use of the patent we answer that such exclusion may be said to have been the very essence of the right conferred by the patent” and adds “as it is the privilege of any owner of property to use it or not to use it without any question of motive” [*Continental Bag Co. v. Eastern Bag Co.*, 210 US 405 (1909)]. It is this last statement which seems to me significant for the way in which a mechanical extension of the property concept by lawyers has done so much to create undesirable and harmful privilege.⁸

Obviously, like any other monopoly privilege, patents can be valuable for their owners, though that is not in itself a sufficient reason to justify concessions of that sort. There are several relevant questions here, such as:

- ♦ What implications do patents have for efficiency in the allocation of resources?
- ♦ Why would society want to award privileges of this sort to some of its members?
- ♦ How does society benefit from the existence of patents?
- ♦ Why should society grant special protection over the production and sale of certain products beyond what is implied in the protection of trademarks?

Though the literature on patents often stresses inventors’ rights, a perusal of relevant legislation clearly shows that it also embodies a strong presumption that awarding patents for invention favors the public interest as well. The first formal patent law was that of the United States, passed in 1790 and based on a provision of the new Constitution of 1787, which, in its enumeration of the powers vested in Congress, included the power “to promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.”⁹

⁸Hayek, “‘Free’ Enterprise and Competitive Order,” pp. 113–14. See also F.A. Hayek, *The Fatal Conceit* (Chicago: University of Chicago Press, 1988), pp. 36–37.

⁹U.S. Constitution, art. 1, sec. 4, para. 8.

In view of this, it is certainly interesting that, from the very beginning, there was never any real consensus as to the benefits of adopting a patent system. Some of the most prominent drafters of the U.S. Constitution (among them several outstanding inventors) were opposed to the idea, sometimes vehemently. One was Benjamin Franklin, who refused the offer of a patent for the invention of his famous stove. "As we enjoy great advantages from the inventions of others," he wrote, "we should be glad of an opportunity to serve others by any invention of ours; and this we should do freely and generously."¹⁰

Although patents of invention originated in Europe, there was, in the recent past, no consensus there, either. In fact, during the nineteenth century, an intense debate on the subject erupted, especially in the quarter century between 1850 and 1875, and at one point the victory of the anti-patent movement seemed likely. The eventual triumph of the pro-patent position in the legislative arena reflects a political, not necessarily an intellectual, victory.¹¹

PATENTS AND TECHNICAL PROGRESS

Modern defenders of the patent system, dazzled by the wonders of modern technology, never cease to stress the need to stimulate further technological development. Often cited in this context are the famous pioneer studies by Robert Solow and Edward Denison on the importance of technical progress for the explanation of economic growth.¹²

¹⁰Benjamin Franklin, *The Autobiography of Benjamin Franklin* (New York: P.F. Collier & Son, 1909), vol. 1, p. 112. Thomas Jefferson was also opposed to patents. See, for instance, his "Letter to Isaac McPherson (August 13, 1813)," in *The Portable Thomas Jefferson*, ed. Merrill D. Peterson (New York: Viking Press, 1975). For a detailed discussion of Jefferson's views, see Hugo A. Meier, "Thomas Jefferson and a Democratic Technology," in *Technology in America: A History of Individuals and Ideas*, ed. Carroll W. Pursell, Jr. (Cambridge, Mass.: MIT Press, 1990), pp. 17–33.

¹¹For a history of this now-forgotten debate, as well as a detailed survey of the voluminous English, German, and French literature that it generated, see Fritz Machlup and Edith T. Penrose, "The Patent Controversy in the Nineteenth Century," *Journal of Economic History* 10 (May 1950), p. 1–29.

¹²For instance, Robert M. Sherwood, *Intellectual Property and Economic Development* (Boulder, Colo.: Westview Press, 1990), pp. 82–83. The studies cited are Robert M. Solow, "Technical Change and the Aggregate Production Function," *Review of Economics and Statistics* 39 (1957), pp. 312–20; and

The manner in which these studies are cited, however, is intriguing. These citations are made in such a general manner that readers inevitably get the impression that authors who resort to this tactic want to attribute the *entirety* of said technical progress to patented inventions. The fact is, however, that the notion of “technical progress” in Solow-Denison-type studies is a broad category that covers, in principle, any increase in production that cannot be attributed directly to increases in inputs or basic factors of production—i.e., it is equivalent to what we now term “total factor productivity.” This includes not only the effect of new technologies (not all of which represent patented inventions), but also the effects of economies of scale and of improvements in the quality of the labor force, including better education (Denison tries to isolate the effect of education), health and nutritional levels of the labor force, and even changes in its demographic make-up.

Thus, it would be short-sighted to attribute “technical progress” entirely to technological innovation *per se*. But even discounting the important role of education and other improvements in the quality of the labor force, to attribute the residual effect entirely to a *certain type* of technological innovation (patented inventions) would be like attributing the effect of “education” entirely to formal instruction imparted in schools—another common error. The fact of the matter—contrary to what the pro-patents literature assumes—is that patented inventions account for only a fraction of relevant productivity growth.

Zvi Griliches, a leading expert on the study of productivity, is explicit on this point:

Not all of productivity growth is due to invention, and only some fraction of the latter arises from patented inventions. If one takes 1.5 to 2.0 percent as the approximate growth rate per year in total factor productivity, at least half of it is likely to be due to the growth in the quality of the labor force, economies of scale, and various allocations of capital between assets and industries. Moreover, it is unlikely that patented inventions could account for more than half of the relevant advances in knowledge. This leaves us with at most a quarter of total productivity growth, and an unknown fraction of its fluctuations, to be attributed to patented invention.¹³

Edward F. Denison, *Accounting for Slower Economic Growth* (Washington, D.C.: Brookings Institution, 1979).

¹³Zvi Griliches, “Patent Statistics as Economic Indicators: A Survey,” *Journal of Economic Literature* 28 (1990), p. 1699.

Even this probably overstates the net effect of patents, since, in principle, we would like to estimate the *marginal* benefits derived from them, i.e., the inventions that would not have been produced without them. Since patent protection increases the average return on inventive activity devoted to patentable inventions, thereby inducing more activity of this kind, it seems safe to conclude that the elimination of patent protection would probably adversely affect production of such inventions. But what would be the magnitude of that loss? We cannot simply assume that *all* patented inventions are due to the existence of patents, since many—like Franklin’s stove—would have been developed even without that incentive.

Indeed, there is not much agreement among economic historians as to the importance of patents to the Industrial Revolution. T.S. Ashton thought that patents were unimportant: “It is at least possible that without the apparatus of the patent system, discovery might have developed quite as rapidly as it did.” Joel Mokyr expresses a similar view: “A patent system may have been a stimulus to invention, but it was clearly not a necessary factor.”¹⁴ On the other hand, Douglass North argues that patents had a significant impact:

The failure to develop systematic property rights in innovation up until fairly modern times was a major source of the slow pace of technological change. . . . A systematic set of incentives to encourage technological change and raise the private rate of return on innovation . . . was established only with the patent system. . . . In the absence of property rights over innovation, the pace of technological change was most fundamentally influenced by the size of markets. Other things equal, the private return upon innovation rose with larger markets. An increase in the rate of technological change in the past was associated with eras of economic expansion. In summary, economic historians of the Industrial Revolution have concentrated upon technological change as the main dynamic factor of the period. Generally, however, they have failed to ask what caused the rate of technological change to increase during this period: often, it would appear that in arguing the causes of technological progress, they assume that technological progress was costless or was spontaneously generated. But in sum, an increase in the rate of technological progress will result from either an increase in the size of the market or an

¹⁴T.S. Ashton, *The Industrial Revolution, 1760–1830* (London: Oxford University Press, 1964), p. 11; Joel Mokyr, *The Lever of Riches: Technological Creativity and Economic Progress* (Oxford University Press, 1990), p. 177.

Julio Cole – Patents and Copyrights

increase in the inventor's ability to capture a larger share of the benefits created by his invention.¹⁵

North is quick to point out, however, that

It would of course be misleading to put too much stress on a single law. . . . More important than patent law per se is the development and enforcement of a body of impersonal law protecting and enforcing contracts in which property rights are specified.¹⁶

Again, it is important to stress that technological change is not the only source of productivity growth, and sometimes it is not even the major source. Interestingly enough, North goes on to cite his own study of productivity change in ocean shipping, which found that the major sources of the rise in total factor productivity from 1600 to 1850 were not primarily technological developments, but the decline of piracy (allowing ships to reduce manpower and armament, and also lowering insurance costs), an increase in the number of voyages per ship per year (due not so much to increased speed but to less average port time per ship), and an increased load factor on return trips.¹⁷ The interesting point in this context is that none of these important sources of productivity change were primarily technological. North writes:

declining transaction costs—a result of reduced piracy, increases in size of ships, growing trade, and reduced turnaround time—led to substantial productivity growth beginning (at least) 150 years before the Industrial Revolution; and they, *more than technological change*, were responsible for productivity increases.¹⁸

In any event, it seems reasonable to assume that patents must have *some* effect on technological innovation, which is confirmed by the theoretical models, but again, the interesting question is the practical magnitude of this effect.¹⁹ In this regard, the predictions of the formal

¹⁵Douglass North, *Structure and Change in Economic History* (New York: Norton, 1981), pp. 164–66.

¹⁶North, *Structure and Change in Economic History*, p. 165.

¹⁷Douglass North, "Sources of Productivity Change in Ocean Shipping, 1600–1850," *Journal of Political Economy* 76 (Sept/Oct 1968), pp. 953–70.

¹⁸North, *Structure and Change*, p. 166, italics added.

¹⁹Most modern formal models follow the "Nordhaus–Scherer model." See F.M. Scherer, "Nordhaus' Theory of Optimal Patent Life: A Geometric Interpretation," *American Economic Review* 62 (June 1972), pp. 422–27.

models stand in striking contrast to the available empirical evidence: although the effect is theoretically important, the results of the few studies that have attempted to detect it empirically do not favor the pro-patents position.

Edwin Mansfield directed two important studies on this topic in the 1980s. The first studied thirty-one patented innovations in four industries: chemicals, pharmaceuticals, electronics, and machinery. One purpose of the study was to answer a simple question: what proportion of innovations would be delayed, or not introduced at all, if they could not be patented?

To shed light on this question, we asked each innovating firm whether it would have introduced each of its patented innovations in our sample if patent protection had not been available. . . . According to the firms, about one-half of the patented innovations in our sample would not have been introduced without patent protection. The bulk of these innovations occurred in the drug industry. *Excluding drug innovations, the lack of patent protection would have affected less than one-fourth of the patented innovations in our sample.*²⁰

The results of the second study were even more negative:

According to detailed data obtained from a random sample of 100 firms from 12 manufacturing industries, patent protection was judged to be essential for the development or introduction of one-third or more of the inventions during 1981–83 in only 2 industries—pharmaceuticals and chemicals. On the other hand, in 7 industries (electrical equipment, office equipment, motor vehicles, instruments, primary metals, rubber, and textiles), patent protection was estimated to be essential for the development and introduction of less than 10 percent of their inventions. Indeed, in office equipment, motor vehicles, rubber, and textiles, the firms were unanimous in reporting that patent protection was not essential for the development or introduction of any of their inventions during this period.²¹

²⁰Edwin Mansfield, Mark Schwartz, and Samuel Wagner, “Imitation Costs and Patents: An Empirical Study,” *Economic Journal* 91 (December 1981), p. 915, italics added.

²¹Edwin Mansfield, “The R&D Tax Credit and Other Technology Policy Issues,” *American Economic Review* 76 (May 1986), p. 193. On the other hand, as Mansfield points out, “this does not mean that firms patent only a small

A more recent paper approaches this problem from a slightly different angle, but also fails to support the pro-patents position. If patents do indeed stimulate innovation, then presumably stronger patent protection should induce a higher rate of innovation. The authors addressed the question “Do Stronger Patents Induce More Innovation?” by studying the impact of a significant Japanese patent law reform implemented in 1988. Their main finding was that “the average response in terms of additional R&D effort and innovative output was quite modest.” An econometric analysis using Japanese and U.S. patent data on 307 Japanese firms confirmed that the magnitude of the response was quite small.²²

COSTS OF THE PATENT SYSTEM²³

The benefits of patents, therefore, are not as large as one might assume at first glance. On the other hand, if these benefits were costless—if patents involved a sort of “free lunch”—then there would be no reason for complaint. The fact, however, is that there are several important costs that tend to be overlooked. Apart from the considerable administrative costs and legal expenses associated with patent litigation,²⁴ perhaps the most obvious economic cost of a patent system is that, in order to create incentives for the production of inventions that otherwise would not have been developed, patents create monopoly privileges over inventions that would have been developed even without the incentive. However, there are other important costs to consider.

percentage of their patentable inventions. On the contrary, they seem to patent about 50 to 80 percent of them, which is testimony to their belief that the prospective benefits from patent protection . . . frequently exceed its costs.”

²²Mariko Sakakibara and Lee Branstetter, “Do Stronger Patents Induce More Innovation? Evidence from the 1988 Japanese Patent Law Reforms,” Working Paper 7066, National Bureau of Economic Research, April 1999.

²³A recent paper by Pierre Desrochers, “On the Abuse of Patents as Economic Indicators,” *Quarterly Journal of Austrian Economics* 1, no. 4 (Winter 1998), pp. 51–74, provides a somewhat more extended discussion of this subject, and arrives at conclusions substantially similar to those reported here.

²⁴“Legal fees during the 14-year long [Kodak-Polaroid] court battle cost Kodak . . . \$100 million.” Kevin G. Rivette and David Kline, “Discovering New Value in Intellectual Property,” *Harvard Business Review* 78 (January–February 2000), p. 65.

Patents as a Hindrance to Technical Progress

In practice, the patent system often hinders technical progress. In the automobile industry, for instance, Henry Ford did not own the patent over the automobile, and had to fight against the patent's owners, who constituted a closed cartel and were not interested in mass production of inexpensive models.

At the time the Ford Motor Company was organized, the automobile industry was dominated by the Association of Licensed Automobile Manufacturers (ALAM), a select group of makers of gasoline automobiles who were attempting to monopolize automobile manufacturing in the United States through control of a patent on the gasoline automobile that had been awarded in 1895 to George B. Selden, a New York patent attorney. The ALAM companies . . . were in the main committed to high unit profits through producing high-priced cars for a limited market. The ALAM tried to set production quotas and to freeze new entrances into automobile manufacturing. Henry Ford was denied a license . . . under the Selden patent on the ground that he had not demonstrated his competence, and when Ford persisted in producing cars, the ALAM immediately brought a lawsuit against him for infringement of the Selden patent. The suit was ultimately decided in Ford's favor in 1911 and the ALAM disintegrated.²⁵

Another interesting case is the early history of aviation.

Orville and Wilbur Wright . . . mimicked the wing twisting of gliding birds by constructing a mechanism that warped the horizontal plane of an airplane's wings at either side in opposite directions. They patented this mechanism and claimed in their patent that their rights extended to any system that varied the "lateral margins" in opposite directions.

Another group of aviation pioneers, financed by Alexander Graham Bell,

knew about the Wright patent but apparently had reservations about the wing-warping method. . . . Bell suggested wing flaps, or "ailerons," which had been used in France. [Glenn] Curtiss subsequently incorporated this concept in his successful flights of 1908. . . . The Wrights sued Curtiss for patent infringement in 1909, claiming that their

²⁵James J. Flink, "Henry Ford and the Triumph of the Automobile," in *Technology in America*, pp. 181–82.

Julio Cole – Patents and Copyrights

method applied to wing flaps as well as wing twisting. After protracted litigation, Orville Wright . . . won the case in 1914. . . . Curtiss [then made] a small change in his method of controlling the ailerons, which required the Wright corporation to begin litigating anew. Orville Wright sold out at this point, but the successor company continued to press its claims. With the formal entry of the United States into World War I imminent, however, the government sought a solution to the patent litigation, since some firms were reluctant to take contracts because of the threat of patent infringement suits. The Wright-Martin Company . . . was threatening to sue those considered to be infringers—effectively any airplane manufacturer.²⁶

The same author points out that

It seems unlikely that broad definitions—a patent on the automobile or on the airplane—could be defended on economic grounds. Although the Wright brothers threw their energies into airplane invention in the hope of becoming wealthy . . . others, imagining much smaller rewards looming ahead of them, were right behind. The development of a successful flying machine was only a matter of time, and it is unlikely that the introduction of the airplane a few years sooner would have been worth a monopoly grant on the airplane.²⁷

Inordinately broad patents are especially problematic. “For nearly a quarter of a century, for example, James Watt was able to prevent other engineers from constructing new types of steam engine, even under license from himself.” At least one historian argues that the Industrial Revolution did not really take off until 1785, the year Watt’s patent expired.²⁸

A recent example comes from the field of bio-technology. In October 1992, the U.S. Patent and Trademark Office awarded to a single company, Agracetus Inc., of Middleton, Wisconsin, a patent for rights to *all forms* of genetically engineered cotton—no matter what techniques or genes are used to create them—prompting the

²⁶George Bittlingmayer, “Property Rights, Progress, and the Aircraft Patent Agreement,” *Journal of Law and Economics* 31 (April 1988), pp. 230–32.

²⁷Bittlingmayer, “Property Rights, Progress, and the Aircraft Patent Agreement,” p. 246.

²⁸Ashton, *The Industrial Revolution*, p. 10. Louis Rougier, *The Genius of the West* (Los Angeles: Nash Publishing, 1971), p. 118.

following comment from an industry executive: “It was as if the inventor of the assembly line had won property rights to all mass-produced goods, from automobiles to washing machines.”²⁹

Patents and Product Differentiation

The existence of patents also induces wasteful expenditure of resources by competitors trying to “invent around the patent,” i.e., to develop competing products that are sufficiently differentiated so as not to infringe on an existing patent. Nelson puts it this way:

There are incentives for a firm to duplicate the prevailing best technology patented by another firm in a way that does not infringe on patents. More generally, there are incentives for a firm to develop a technology even if it is worse than the current best one, if it is better than the one it has and the best is blocked by patents.³⁰

Thus, although these activities increase the level of research-and-development spending, from the social point of view they are not necessarily an efficient use of available resources.

Worse still, patent owners also have incentives to invent around their own patents to preclude potential competition. To the extent that the patent system itself induces these activities, resources devoted to them (as well as the associated legal expenses) are essentially wasted from the social point of view, and should be regarded as another cost of the system. For example, to protect its monopoly position in the market for plain-paper copiers, Xerox patented every conceivable aspect of its technology. “IBM had spent millions to ‘invent around’ Xerox’s major patents—with 25 percent of the budget going for patent counsel, not R&D.”³¹

²⁹Richard Stone, “Intellectual Property: Sweeping Patents Put Biotech Companies on the Warpath,” *Science* 268 (May 5, 1995), p. 656.

³⁰Richard R. Nelson, “Assessing Private Enterprise: An Exegesis of Tangled Doctrine,” *Bell Journal of Economics* 12 (Spring 1981), p. 107; see also, by the same author, “Research on Productivity Growth and Productivity Differences: Dead Ends and New Departures,” *Journal of Economic Literature* 19 (September 1981), p. 1047.

³¹Timothy F. Bresnahan, “Post-Entry Competition in the Plain Paper Copier Market,” *American Economic Review* 75 (May 1985), p. 16. For an interesting case study of “preemptive patenting” during the early history of radio broadcasting, see Leonard S. Reich, “Research, Patents, and the Struggle to Control Radio,” *Business History Review* 51 (Summer 1977), pp. 208–35.

Enforceability and Innovation

Technological innovation is often stimulated precisely when patents are not effective. This was the case with Eastman Kodak, which adopted its well-known policy of permanent research and “continuous innovation” as a way to maintain its competitive leadership in view of the practical impossibility of enforcing all of its patents.³² Presumably, had they been able to enforce their patents, they might well have devoted fewer resources for research and development of new products, and technological development in this industry would have been less rapid.

Distorted Incentives

One aspect of this problem that does not receive adequate consideration is the fact that the existence of patents might distort incentives, diverting inventive activity toward more easily “patentable” products. Again, we should bear in mind that not all discoveries and innovations are patentable, even when they are highly beneficial. Milton Friedman made an interesting comment in this regard. After declaring himself pro-patents, he added:

At the same time, there are costs involved. For one thing, there are many “inventions” that are not patentable. The “inventor” of the supermarket, for example, conferred great benefits on his fellowmen for which he could not charge them. Insofar as the same kind of ability is required for the one kind of invention as for the other, the existence of patents tends to divert activity to patentable inventions.³³

Consider a case in point:

The biotech firm Genetics Institute decides which version of a drug to develop partly based on which iteration shows the best results in clinical trials but also according to which version can command the strongest patent protection. Genetics Institute patent counsel says the strength of the potential patent position is “a leading factor” in deciding what research to pursue.³⁴

³²Reese V. Jenkins, “George Eastman and the Coming of Industrial Research in America,” in *Technology in America*, pp. 134–36.

³³Milton Friedman, *Capitalism and Freedom* (Chicago: University of Chicago Press, 1962), p. 127.

³⁴Rivette and Kline, “Discovering New Value in Intellectual Property,” p. 58.

This leads us back to the key question: in the absence of patent laws, would we really have fewer inventions, or would we simply have different *kinds* of inventions?

THE CASE OF COPYRIGHTS ³⁵

Murray Rothbard thought that patents and copyrights are actually quite different forms of legal protection, and made a strong case *in favor of* copyrights but *against* patents.³⁶ This is not a common viewpoint, as opinions on intellectual property tend to be “all or nothing.” Nonetheless, it is a respectable position with a distinguished intellectual ancestry that runs at least as far back as Henry George:

The two things [patents and copyrights] are not alike, but essentially different. The copyright is not a right to the exclusive use of a fact, an idea, or a combination, which by the natural law of property all are free to use; but only to the labor expended in the thing itself. It does not prevent any one from using for himself the facts, the knowledge, the laws, or combinations for a similar production, but only from using the identical form of the particular book or other production—the actual labor which has in short been expended in producing it. It rests therefore upon the natural, moral right of each one to enjoy the products of his own exertion, and involves no interference with the similar right of any one else to do likewise.

The patent, on the other hand, prohibits any one from doing a similar thing, and involves, usually for a specified time, an interference with the equal liberty on which the right of ownership rests. The copyright is, therefore, in accordance with the moral law—it gives to the man who has expended the intangible labor required to write a particular book or paint a picture security against the copying of that identical thing. The patent is in defiance of this natural right. It prohibits others from doing what has already been attempted.

Every one has a moral right to think what I think, or to perceive what I perceive, or to do what I do—no matter

³⁵The views expressed in this section are largely based on Arnold Plant, “The Economic Aspects of Copyright in Books,” in *Selected Economic Essays and Addresses*, pp. 57–86; and Robert M. Hurt, “The Economic Rationale of Copyright,” *American Economic Review* 56 (May 1966), pp. 421–32.

³⁶See Murray N. Rothbard, *Man, Economy, and State* (Princeton, N.J.: Van Nostrand, 1962), pp. 652–60.

Julio Cole – Patents and Copyrights

whether he gets the hint from me or independently of me. Discovery can give no right of ownership, for whatever is discovered must have been already here to be discovered. If a man makes a wheelbarrow, or a book, or a picture, he has a moral right to that particular wheelbarrow, or book, or picture, but no right to ask that others be prevented from making similar things. Such a prohibition, though given for the purpose of stimulating discovery and invention, really in the long run operates as a check upon them.³⁷

It is interesting to note that, once we establish a major distinction between copyrights and patents, four situations are theoretically possible: one might favor both (the conventional view), one might oppose both (a minority view), one might favor copyright but oppose patents (the George-Rothbard view), or one might oppose copyright but favor patents (a conceptual possibility, though it appears to be an empty set—no one seems to have articulated this position publicly).

In any event, though patents and copyrights have different legislative histories, they share several features, and much of what has been said about patents applies equally to copyrights. Just as the pro-patents literature stresses inventors' rights, the pro-copyrights literature stresses the rights of authors and other creators to benefit from their creations. However, it should be noted that the term "copyright," as currently used, actually comprises a bundle of several different rights that are unfortunately (and misleadingly) conflated due to the use of a single concept to describe the whole bundle.

The expressions used in other languages to denote "copyright" (*derecho de autor*, *droit d'auteur*, *diritto d'autore*, *direito do autor*) literally translate as "authors' rights," which include the notion of copyright in the narrower sense (the right to control reproduction of the work), though it also implies a broader range of rights. These include the so-called "moral rights" of the author, which view literary and artistic works as extensions of the author's personality, and encompass the following protections: (1) the right to be identified as the creator of the work (so-called "paternity rights" of authorship and protections against plagiarism), and (2) protections against unauthorized alterations or mutilations of the work (so-called "integrity rights" of authorship). As opposed to mere copyright, these two moral rights of authorship have always been regarded as inalienable and perpetual.

³⁷Henry George, *Progress and Poverty* (1879; reprint, New York: Robert Schalkenbach Foundation, 1990), p. 411n.

A third moral right is also recognized: the right to withhold publication, which is an aspect of a broader right to privacy. However, it is not always clear whether it should be regarded as perpetual, or whether it applies only to living authors, i.e., if society should be bound by an author's wishes after his death.

Opposition to copyright in the narrower sense does not imply opposition to the moral rights of authorship, which are ancient legal concepts. Copyright, on the other hand, is a fairly recent notion which dates from about the time of the invention of printing. Whether or not we regard the right to control the reproduction of creative works as a "natural right" of authors, the historical fact is that, prior to the invention of printing, this right was not regarded as implicit in the concept of authorship. Copyright law was created by specific acts of legislation, and every extension of its scope to cover new productions resulting from technological innovations (such as photography, phonographic recordings of musical creations, film productions, computer software) has required special legislation to that effect, since these extensions did not arise "naturally" from judicial decisions, as the courts were unwilling to apply to these situations a concept created specifically for the case of printed books.

The concept of copyright is rooted in the technology of print. The recognition of a copyright and the practice of paying royalties emerged with the printing press. . . . Copyright was a specific adaptation to a specific technology, and to the problems and opportunities it created. The law recognized that.

The landmark case in the United States was *White Smith v. Apollo* [1908]. It denied protection to piano rolls or sound recordings because they were not "writings" in tangible form readable by a human being. That common law concept of copyright excluded from protection many new technologies of communication since 1908. But the motion picture industry, the recording industry, and more recently the broadcasting industry have persuaded Congress to extend various protections to them, since courts were not willing to do so. . . .

However, with the arrival of radio and electronic reproduction, and now photocopy reproduction, the concept becomes inappropriate. There is no easy way to keep tabs on the numerous reproductions in somewhat variable form that can take place in innumerable locations with these new technologies. The analogy is to word-of-mouth communications in the 18th century, not to the print shop of that era.

Julio Cole – Patents and Copyrights

Nonetheless, information and publishing industries, whose welfare and survival depends on finding some way to charge for their information processing services, have latched on to copyright protection under statute law, and are trying to get the courts or the Congress to extend copyright protection to computerized data, photocopies, and telereproduction. Though recognizing that in those technologies the existent copyright law is basically unenforceable, they nonetheless grab on to whatever frail reed it may provide, rather than turn to the even frailer reed of trying to invent, and to get into legislation, some entirely new as yet undevised system for rewarding the creators of information. . . .

The U.S. Congress passed a new copyright law in 1976, which was designed to solve all the new problems of copyright for cable television, photocopying, and computers. It has solved few if any of them. . . .

How inappropriate the concept of copyright is to computer communications becomes evident as we examine how the law has to squirm to deal with the simplest problems. . . . The process of computer communication entails processing of texts that are partly controlled by people and partly automatic. They are happening all over the system. Some of the text is never visible but is only stored electronically: some is flashed briefly on a terminal display; some is printed out in hard copy. . . . The receivers may be individuals and clearly identified, or they may be passers-by with access but whose access is never recorded; the passer-by may only look, as a reader browsing through a book, or he may make an automatic copy; sometimes the program will record that, sometimes it will not. To try to apply the concept of copyright to all these stages and actors would require a most elaborate set of regulations. It has none of the simplicity of checking what copies rolled off a printing press. . . .

One would like to compensate an author if a computer terminal is used as a printing press to run off numerous copies of a valuable text. One would not like to impose any control as someone works at a terminal in the role of a reader and checks back and forth through various files. The boundary, however, is impossible to draw. In the new technology of interactive computing, the reader, the writer, the bookseller, and the printer have become one. In the old technology of printing, one could have a right to free press for the reader and the writer but try to enforce copyright on the printer and the bookseller. That distinction will no longer work, any more than it would ever have worked in the past on conversation.

Those whose livelihood is at stake in copyright do not like that kind of comment. They contend that creative work must be compensated. Indeed it must. . . . But the system must be practical to work. . . . In an era of infinitely varied, automated text manipulation, there is no reasonable way to count copies and charge royalties on them. . . . It may be very unfair to authors. It may have a profoundly negative effect on some aspects of culture, and in any case, whether positive or negative, it may change things considerably.

If it becomes more difficult for authors and artists to be paid by a royalty scheme, more of them will seek salaried bases from which to work. Some may try to get paid by personal appearances or other auxiliaries to fame. Or the highly illustrated, well-bound book may acquire a special significance if the mere words of the text are hard to protect. Or one may try to sell subscriptions to a continuing service. . . . These are the kinds of considerations one must think about in speculating about the consequences for culture of a world where the royalty-carrying unit copy is no longer easy to protect in many of the domains where it has been dominant. . . . It is clear that with photocopiers and computers, copyright is an anachronism.

Like many other unenforceable laws that we keep on the statute books from the past, this one may be with us for some time to come, but with less and less effect.³⁸

The final passages from this rather long quotation suggest the intriguing possibility that, in arguing whether authors “should” have a copyright over their creations, we may be posing what will increasingly become a moot question: technological developments in certain areas—photocopiers, video and sound recording, computer scanning, etc.—are making it harder and harder to enforce the law. We may, at some point, have to give up—indeed, we may have already reached this point in the case of musical recordings, due to the development of downloadable “.mp3” computer files³⁹—so the interesting question then becomes: what would be the consequences of a world without copyright? Since the main *utilitarian* argument for copyright is that it stimulates literary and artistic creation, the relevant question should

³⁸Ithiel de Sola Pool, *Technologies without Boundaries: On Telecommunications in a Global Age* (Cambridge, Mass.: Harvard University Press, 1990), pp. 254–59.

³⁹For a balanced and informative analysis of the implications of the “.mp3” revolution, see Charles C. Mann, “The Heavenly Jukebox,” *Atlantic Monthly* 286 (September 2000), pp. 39–59.

be: would the absence of copyright significantly affect the quality and quantity of literary/artistic output?

Academic and Ideological Authors

Even today, most authors never make much money writing books, and some actually print their works with their own money. Others are willing to accept payment in copies of their works (often in the form of off-prints of journal articles). Much scientific and academic writing is of this kind. For many of these authors, writing for publication is a way to increase their “brand-name capital” in order to obtain higher incomes from other activities.

Other authors are interested in spreading their views, so they presumably have no interest in discouraging reproduction of their writings—provided their authorship is acknowledged, they would be quite happy if others were willing to reprint them with their own resources. The output of this type of writing would evidently not be much affected by the absence of copyright.

Professional Writers

Other writers do it for a living. If there is no other way to reward them, then the absence of copyright would most likely reduce their literary output. The question is whether copyright is the only way to guarantee an income for this type of writer. Plant, for one, thought that writers would find a way to sell their product, provided that a demand for it exists at all.⁴⁰

We cannot know *a priori* what kinds of market structures would dominate in a different legal setting, though possibly (as Pool suggested) there would be greater reliance on salaried writers for subscription-type publications, perhaps with content more or less “given away” as loss-leaders to stimulate sales of other products. This is the business model underlying present-day journalism, which essentially hires staff writers in order to help sell the main product, which is advertising.

There are many other examples of such arrangements. Early radio broadcasters, for instance, were subsidized by radio manufacturers,

⁴⁰Copyright does not *create* this demand, it only provides a means to *monopolize* a demand once it exists. See Plant, “The Economic Aspects of Copyright in Books,” p. 61.

who were willing to lose money on broadcasting in order to stimulate demand for radio sets. This may also solve the problem of computer software in the absence of copyright. Many claim that if software could be copied freely, then software developers would have no incentive to create it. Note, however, that *hardware* manufacturers would have an incentive to support software development (and perhaps even give it away), since the availability of more and better software increases the demand for hardware.

Also, as Pool suggests, there might be greater reliance on such collateral sources of income as personal appearances, lectures, consulting, live performances, etc. In the case of music, it is interesting to note that, prior to the development of the phonograph, copyright over music applied only to sheet music; i.e., it did not extend to musical performance. It is an open question whether the gradual extension of copyright to cover not only musical recordings but *any* kind of public performance has resulted in increased quantity and quality of musical composition. In any case, if musical recordings could be freely copied (which increasingly happens to be the case now), musicians would still have an incentive to compose and record music in order to stimulate the demand for live performances.

Whether alternative market arrangements would fully compensate for the loss of income currently derived from copyright is an empirical question. Best-selling writers and composers might well earn less money in a world without copyright. If so, then the *quantity* of literary and artistic output would most likely be lower, but how much lower we cannot know.

Title “Lotteries”

One ingenious argument proposed by Plant suggests that in the case of book publishing, the absence of copyright protection would likely result in a smaller number of *titles* published.⁴¹ This would not necessarily be a bad thing, since what we really want is not more titles, but more good books at lower prices. Plant argues that the copyright system has a somewhat perverse consequence in that it encourages publication of more titles, but not enough copies of the books people really want to read.

Because of the nature of his business, a publisher cannot be sure of the success of a new title, and most titles do not cover their costs.

⁴¹Plant, “The Economic Aspects of Copyright in Books,” pp. 72, 80.

However, a successful title can be quite profitable, and these profits subsidize losses from unsuccessful titles. Since a publisher cannot know beforehand which new titles will be successful, publishing has some aspects of a lottery: in order to make money on successful titles, the publisher has to take a chance on many different titles, most of which he knows will be failures.

Copyright affects this situation by increasing the profitability of successful titles: in terms of the lottery, copyright protection increases the “prize” without affecting, on the other hand, the risks involved. *Ceteris paribus*, we expect that, with equal risks, a larger prize will induce a player to buy more “tickets.” Therefore, more *titles* will be published under a copyright system, but the resulting monopoly position guarantees that the books people really want (the successful titles) will be published in smaller quantities and at higher prices.

CONCLUSIONS

Issues related to intellectual property rights are becoming increasingly important in policy discussions. Technological developments have created whole new areas of patentable products that pose problems for the definition and delimitation of “property rights,” e.g., biotechnologies and computer software, to mention only two of the most noteworthy areas at the cutting edge of leading technologies—witness the problems involved in “patenting life-forms,” and the question of so-called “internet patents.”⁴²

At the same time, some of these very developments are making it harder to enforce many of the more conventional forms of intellectual property—for instance, the advent of “.mp3” file-swapping on the Internet, which raises questions regarding the future viability of copyright in musical recordings. The stresses and strains which newer technologies are imposing on current intellectual property law have led to calls for tougher and more stringent enforcement of existing legal mechanisms. For several years, the United States government

⁴²On the former, see John H. Barton, “Patenting Life,” *Scientific American* 264 (March 1991), pp. 18–24. Regarding the latter, in October 1999, Price-line.com sued Microsoft’s Expedia group for infringement of its patented “name your own price” auction system, while Amazon.com, the leading Internet book retailer, sued its main rival, Barnes & Noble, for infringement of its patented “one-click” ordering system. See Rivette and Kline, “Dis-covering New Value in Intellectual Property,” pp. 56, 66.

has taken the lead worldwide in pressuring other countries to strengthen their intellectual property laws and make them more closely conform to current U.S. standards.

In view of such developments, now is a good time for a radical rethinking of traditional intellectual property concepts. Instead of considering reforms to *strengthen* patents and copyrights, perhaps we should be moving in the opposite direction. To be sure, given current trends, copyright might well die out on its own, whether we like it or not. If so, discussions of the merits of copyright will become essentially moot.

As for patents, in the absence of precise estimates of the costs and benefits of patent systems, we cannot provide an unequivocal answer to the question posed in the title. Perhaps we will never know for sure. However, we *can* point out that the benefits stressed by the pro-patents camp turn out, on closer inspection, to be smaller than conventionally assumed, while there are many costs involved that can easily be overlooked. Thus, the cost-benefit relationship is not as favorable as the pro-patent camp would have us believe. At the very least, we should oppose current efforts to broaden the scope of patent and copyright laws until a stronger case can be made that the benefits do, indeed, exceed the costs.

BIBLIOGRAPHY

- Ashton, T.S. *The Industrial Revolution, 1760–1830*. London: Oxford University Press, 1964.
- Barlow, John Perry. “The Economy of Ideas: A Framework for Patents and Copyrights in the Digital Age (Everything You Know about Intellectual Property is Wrong).” *Wired* 2.03 (March 1994).
- Barton, John H. “Patenting Life.” *Scientific American* 264 (March 1991), pp. 18–24.
- Bittlingmayer, George. “Property Rights, Progress, and the Aircraft Patent Agreement.” *Journal of Law and Economics* 31 (April 1988), pp. 227–48.
- Bresnahan, Timothy F. “Post-Entry Competition in the Plain Paper Copier Market.” *American Economic Review* 75 (May 1985), pp. 15–19.
- Coase, R.H. “Professor Sir Arnold Plant: His Ideas and Influence.” In *The Unfinished Agenda: Essays on the Political Economy of Government Policy in Honour of Arthur Seldon*, edited by M.J. Anderson. London: Institute of Economic Affairs, 1986.

Julio Cole – Patents and Copyrights

- Denison, Edward F. *Accounting for Slower Economic Growth*. Washington, D.C.: Brookings Institution, 1979.
- Desrochers, Pierre. “On the Abuse of Patents as Economic Indicators.” *Quarterly Journal of Austrian Economics* 1 (Winter 1998), pp. 51–74.
- Flink, James J. “Henry Ford and the Triumph of the Automobile.” In *Technology in America: A History of Individuals and Ideas*, edited by Carroll W. Pursell, Jr. Cambridge, Mass.: MIT Press, 1990.
- Franklin, Benjamin. *The Autobiography of Benjamin Franklin*. Vol. 1. New York: P.F. Collier & Son, 1909.
- Friedman, Milton. *Capitalism and Freedom*. Chicago: University of Chicago Press, 1962.
- George, Henry. *Progress and Poverty*. 1879. Reprint, New York: Robert Schalkenbach Foundation, 1990.
- Griliches, Zvi. “Patent Statistics as Economic Indicators: A Survey.” *Journal of Economic Literature* 28 (1990), pp. 1661–707.
- Hayek, F.A. “‘Free’ Enterprise and Competitive Order.” In *Individualism and Economic Order*. Chicago: University of Chicago Press, 1948.
- . *The Fatal Conceit*. Chicago: University of Chicago Press, 1988.
- Hurt, Robert M. “The Economic Rationale of Copyright.” *American Economic Review* 56 (May 1966), pp. 421–32.
- Jefferson, Thomas. “Letter to Isaac McPherson (August 13, 1813).” In *The Portable Thomas Jefferson*, edited by Merrill D. Peterson. New York: Viking Press, 1975.
- Jenkins, Reese V. “George Eastman and the Coming of Industrial Research in America.” In *Technology in America*, edited by Carroll W. Pursell, Jr. Cambridge, Mass.: MIT Press, 1990.
- Kinsella, N. Stephan. “Against Intellectual Property.” *Journal of Libertarian Studies* 15, no. 2 (Spring 2001), pp. 1–54.
- Machlup, Fritz, and Edith T. Penrose. “The Patent Controversy in the Nineteenth Century.” *Journal of Economic History* 10 (May 1950), pp. 1–29.
- Mann, Charles C. “The Heavenly Jukebox.” *Atlantic Monthly* 286 (September 2000), pp. 39–59.
- Mansfield, Edwin. “The R&D Tax Credit and Other Technology Policy Issues.” *American Economic Review* 76 (May 1986), pp. 190–94.
- Mansfield, Edwin, Mark Schwartz, and Samuel Wagner. “Imitation Costs and Patents: An Empirical Study.” *Economic Journal* 91 (December 1981), pp. 907–18.

Journal of Libertarian Studies

- Meier, Hugo A. "Thomas Jefferson and a Democratic Technology." In *Technology in America*, edited by Carroll W. Pursell, Jr. Cambridge, Mass.: MIT Press, 1990.
- Mokyr, Joel. *The Lever of Riches: Technological Creativity and Economic Progress*. London: Oxford University Press, 1990.
- Nelson, Richard R. "Assessing Private Enterprise: An Exegesis of Tangled Doctrine." *Bell Journal of Economics* 12 (Spring 1981), pp. 93–111.
- . "Research on Productivity Growth and Productivity Differences: Dead Ends and New Departures." *Journal of Economic Literature* 19 (September 1981), pp. 1029–64.
- North, Douglass C. "Sources of Productivity Change in Ocean Shipping, 1600–1850." *Journal of Political Economy* 76 (September/October 1968), pp. 953–70.
- . *Structure and Change in Economic History*. New York: Norton, 1981.
- Novak, Michael. *The Fire of Invention*. Lanham, Maryland: Rowman & Littlefield, 1997.
- Palmer, Tom G. "Intellectual Property: A Non-Posnerian Law-and-Economics Approach." *Hamline Law Review* 12 (Spring 1989), pp. 261–304.
- . "Are Patents and Copyrights Morally Justified?" *Harvard Journal of Law and Public Policy* 13 (Summer 1990), pp. 817–65.
- Plant, Sir Arnold. "The Economic Theory Concerning Patents for Inventions." In *Selected Economic Essays and Addresses*. London: Routledge & Kegan Paul, 1974.
- . "The Economic Aspects of Copyright in Books." In *Selected Economic Essays and Addresses*. London: Routledge & Kegan Paul, 1974.
- Pool, Ithiel de Sola. *Technologies without Boundaries: On Telecommunications in a Global Age*. Cambridge, Mass.: Harvard University Press, 1990.
- Reich, Leonard S. "Research, Patents, and the Struggle to Control Radio." *Business History Review* 51 (Summer 1977), pp. 208–35.
- Rivette, Kevin G., and David Kline. "Discovering New Value in Intellectual Property." *Harvard Business Review* 78 (January–February 2000), pp. 54–66.
- Rothbard, Murray N. *Man, Economy, and State: A Treatise on Economic Principles*. Princeton, N.J.: Van Nostrand, 1962.
- Rougier, Louis. *The Genius of the West*. Los Angeles: Nash Publishing, 1971.
- Sakakibara, Mariko, and Lee Branstetter. "Do Stronger Patents Induce More Innovation? Evidence from the 1988 Japanese Patent Law Reforms."

Julio Cole – Patents and Copyrights

Working Paper 7066, National Bureau of Economic Research, April 1999.

Scherer, F. M. “Nordhaus’ Theory of Optimal Patent Life: A Geometric Interpretation.” *American Economic Review* 62 (June 1972), pp. 422–27.

Sherwood, Robert M. *Intellectual Property and Economic Development*. Boulder, Colo.: Westview Press, 1990.

Solow, Robert M. “Technical Change and the Aggregate Production Function.” *Review of Economics and Statistics* 39 (1957), pp. 312–20.

Stone, Richard. “Intellectual Property: Sweeping Patents Put Biotech Companies on the Warpath.” *Science* 268 (May 5, 1995), pp. 656–58.

Timberg, Sigmund. “The Effect of the European Common Market on Anti-Trust and Patent Policy.” In *Legal Problems in International Trade and Investment*, edited by Crawford Shaw. Dobbs Ferry, N.Y.: Oceana, 1962.